Official Journal of
The American Radio
Relay League

QST

devoted entirely to
AMATEUR RADIO

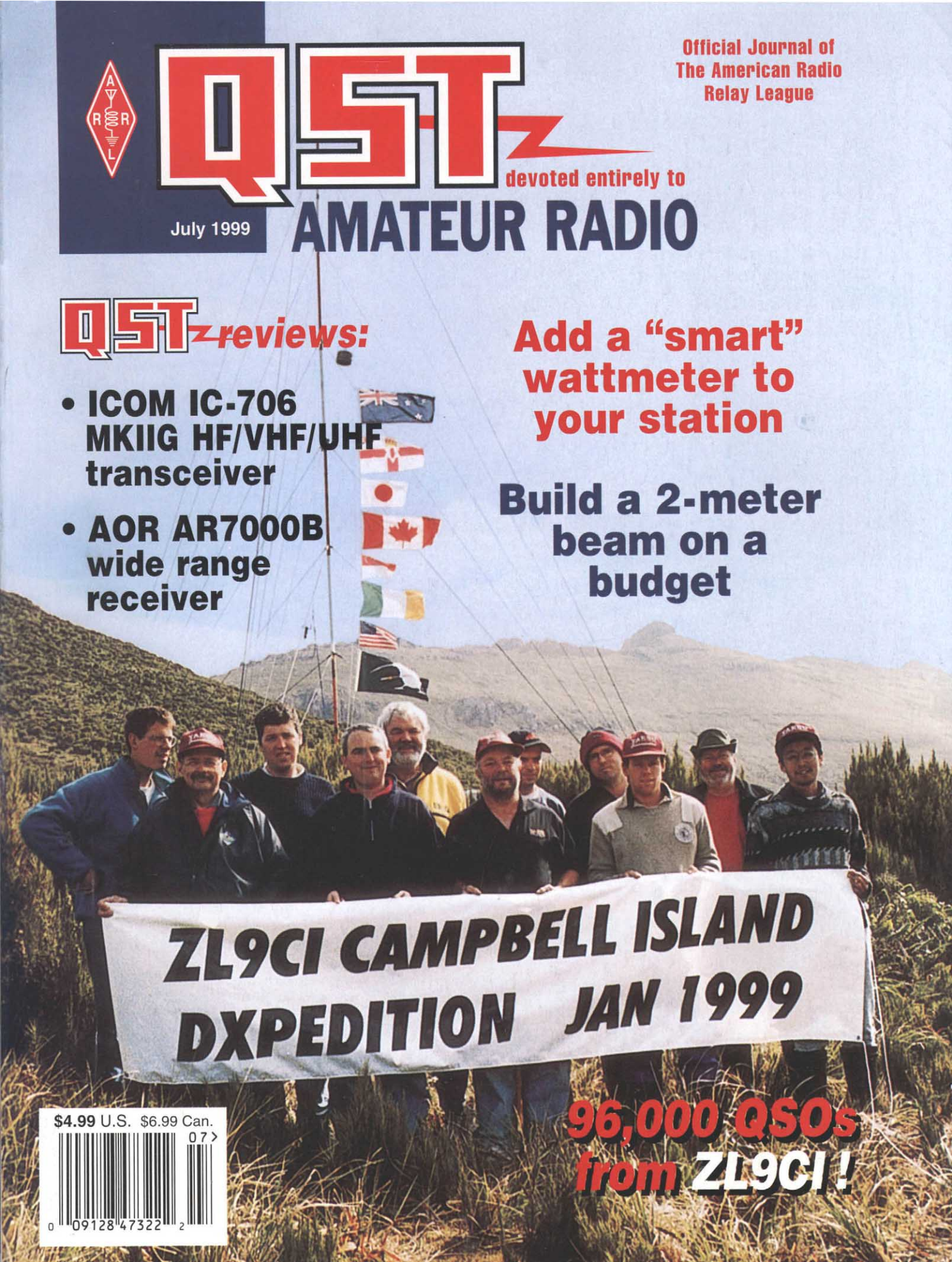
July 1999

QST reviews:

- ICOM IC-706 MKIIG HF/VHF/UHF transceiver
- AOR AR7000B wide range receiver

Add a "smart" wattmeter to your station

Build a 2-meter beam on a budget



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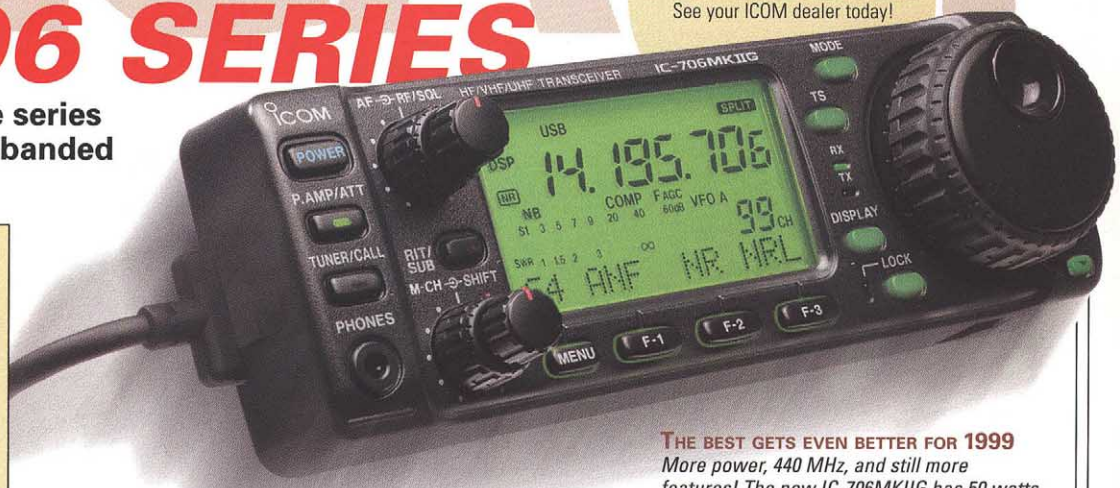
LEGACY

IC-706 SERIES

The most versatile series of compact, multi-banded rigs ever made.

The new "G" is
NOW AVAILABLE
See your ICOM dealer today!



PROVEN PERFORMANCE:

"Great portability vs. performance ratio. It's great to have a radio where you can talk on your local repeater, work on your mobile DXCC total and still not miss out on six meter openings!"
– Kevin Olson, K3OX

"I enjoy everything about the IC-706MKII; size, ease of operation, power."
– Richard Lemme, K9FA

"This is my first ICOM & I am very pleased with it."
– Merlin R. Myers, KAØQZK,

"God, I love this rig. My little 706MKII goes with me everywhere and is on 24 hours a day."
– James H. Weidner, K2JXW

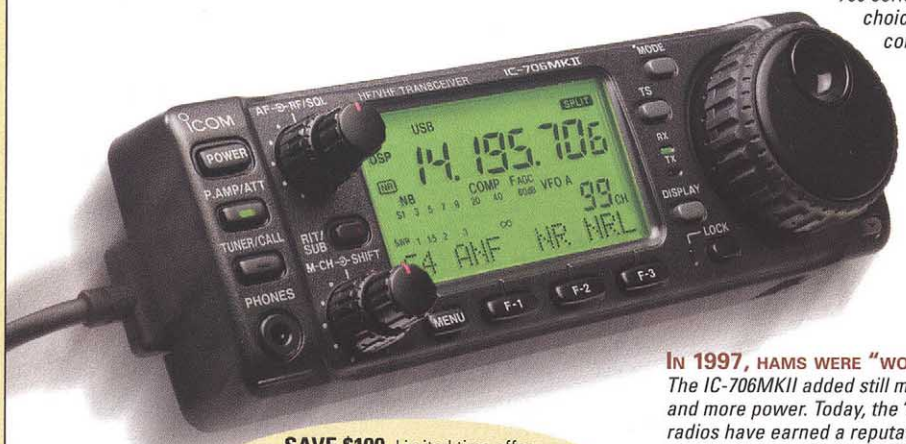
"The DSP unit works great for knocking out the heterodynes from the foreign broadcast on 40 meters. Thanks for making such a great compact rig."
– Bill Youse, N6DZS

"706 -- the love of my life."
– Gary Mashburn, KF4PTW

See and hear the new IC rigs in the ICOM Funmobile. We'll be with the Nashua area Radio Club for Field Day June 25-27. Talk-in repeater 147.045.

NEW IC-706MKIIG

THE BEST GETS EVEN BETTER FOR 1999
More power, 440 MHz, and still more features! The new IC-706MKIIG has 50 watts on 2 meters, 20 watts on 440 MHz, DSP as standard equipment, auto repeater, CTCSS, and backlit keys. Tried, tested and proven, the 706 series is your best choice for a complete ham rig.



NOW WITH **DSP** AS STANDARD EQUIPMENT

SAVE $100. Limited time offer.

IC-706MKII

See your ICOM dealer for details.

IN 1997, HAMS WERE "WOW"ED AGAIN
The IC-706MKII added still more features and more power. Today, the '706 series radios have earned a reputation among hams as rugged, hard working rigs. They perform as well on a serious DX'pedition as they do in a car or in a contest shack.

ICOM options required for PC operation:
CT-17 Level Converter
OPC-478 Cable
Third party software

PC Ready!

IC-706

WAY BACK IN 1995...
The ICOM IC-706 was introduced to the amateur community. Never before had so many features and so much fun been put together in such a small package. HF, 6 meters AND 2 meters in one box? Yes.

Join the thousands of hams who use ICOM's '706 series radios, and GET IN ON THE FUN! Contact your authorized ICOM dealer today, or call our 24-hour free brochure line. **425-450-6088**

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ICOM IC-2800H

NEW Top-of-the-Line Dual Bander Adds Video Excitement to Audio Excellence

High Visibility Color LCD
Customizing the brightness, contrast and background color to fit your operating requirements is fast and easy.

APRS,™ SSTV, GPS... Now You're Ready.
The '2800H's color LCD screen is more than a pretty face. Display the latest in visual ham communications, and open up a new dimension to your hobby.**

9600 BPS Packet Control.**
Packet popularity is growing. Have fun! The '2800H offers a dedicated data port on the main unit.

Independent Band Controls.
Independent controls make it easy to work dual or cross band repeat. Tuning, AF and squelch level, and four function switches are available per band.

External Video Input
Accepts NTSC video signals (PAL in European model). Simple connection works with most digital camera or VCR plugs.

Separate Control Head
Install the main body under a seat, in the trunk, or wherever it remains out of the way.

Full Function Microphone
Total control! Backlit keys, too.

6 Pin Data Port
*Simple packet connection.**

SPECIFICATIONS

Transmit: ..... 2 Meter, 440 MHz (70 CM)
Receive: ..... 118-174 MHz, 430-450 MHz*
*(guaranteed 144 - 148 and 440 - 450 MHz only)
Mode: ..... AM (118 - 135.9 Rx only), FM
Power: ..... 2 Meter: 50W/20W/10W/5W
440 MHz: 35W/20W/10W/5W
Power Supply Requirement: ... 13.8 V DC
Memory Channels: ..... 232 Total
Including 12 Scan Edges, 10 Log, 10 Repeater, and 2 Call
Size & Weight (approximate):
Control head: . 5.5(W) x 2.75(H) x 1.3(D) in.
140(W) x 70(H) x 34(D) mm.
10.2 oz /290 g
Main Unit: ..... 5.5(W) x 1.6(H) x 6.6(D) in.
140(W) x 40(H) x 165.8(D) mm.
2 lb, 9 oz /1.15 kg

FEATURES

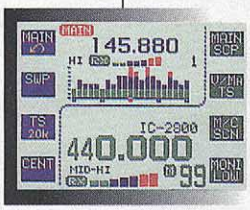
- **Totally Separate Control Head**
  - Independent band controls
  - High visibility TFT color LCD monitor
  - Connection cable included
- **Independent Tuning Controls**
  - Tuning, AF and squelch level, and 4 function control switches per band
- **Tone Squelch (CTCSS Encode) with Pocket Beep and Tone Scan (CTCSS Decode) Standard**
  - 50 independently programmable tone frequencies for repeater and tone squelch use, respectively
- **On-Screen Menu "Soft Keys"**
- **Simple Band Scope**
- **9600 BPS Packet**
- **Fast Scanning**
- **Air Band Rx***
- **Auto Power OFF**
- **Built-in Duplexer**
- **Selectable Attenuator**
- **Auto Repeater Function**
- **Rugged ICOM Construction**
- **Mounting Brackets Included**
  - One for controller, one for main unit
- **Wireless Mic (optional)**

HOW WILL YOU SEE YOUR IC-2800H?

Put your knowledge to the test. **ICOM will reward the best, most original working application for the IC-2800H's visual display with a $1000 cash prize.** All entrants must describe how to execute the application. The best entries will be shown on the ICOM America Website where fellow hams will be asked to select a winner. For details, visit your authorized ICOM dealer or ICOM America's Website. No purchase necessary, void where prohibited. Contest ends 8/31/99.

Simple Band Scope
The high visibility screen offers a wealth of information: scope, S meter, memory names, scan conditions, and more. User-adjustable brightness and contrast controls are easily located in the edit menu.

Other Images
*Preview real time VCR or digital camera images**, monitor TV broadcasts with a TV tuner**, scan GPS maps**,... maybe even keep an eye on traffic behind your RV**. Experiment!*



Explore SEEING as well as hearing more of today's amateur activity. Visit your ICOM dealer, or call our 24-hour brochure line. **425-450-6088**

See and hear the new IC-2800H on the ICOM Funmobile. We'll be with the Nashua area Radio Club for Field Day June 25-27. Talk-in repeater 147.045.

ICOM options required for PC connections:
CS-2800 Cloning Software
OPC-478 Cloning Cable

PC Ready!

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1050MAH

MH-PB-39
1050mAh 9.6V for Kenwood TH-G71A / D7

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MH-BP-200
680mAh 9.6V for Icom IC-T8A.

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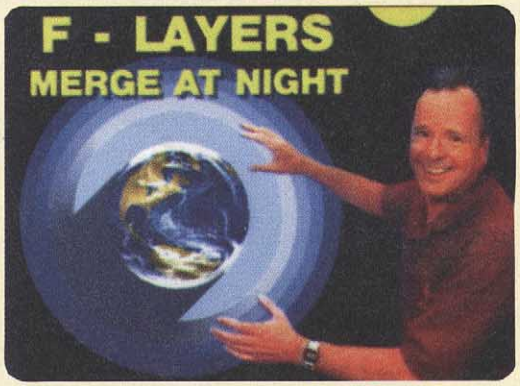

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—E. Allen Thomas, NP2JZ, US Virgin Islands

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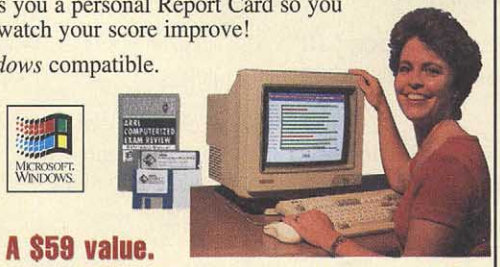
After you've taken your video course, let your computer make it fun to ensure a top score on your exam.

The ARRL Computerized Exam Reviews are fun, user-friendly programs that let you choose questions by subject, or take them all. At your command, you'll see on-screen correct answers with ARRL's detailed explanations.

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!

Windows compatible.



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NAME _____
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CHARGE TO: ☐ MASTERCARD ☐ VISA ☐ DISCOVER ☐ AMEX
CARD NO. _____ EXP. ____
☐ CHECK OR MONEY ORDER ENCLOSED

TOTAL PURCHASE $ _____
CT add 6% tax
CA add applicable tax
VA add 4.5% tax
SUBTOTAL $ _____
SHIPPING & HANDLING
☐ UPS SURFACE $5
☐ 2 DAY AIR $15
☐ Foreign $69
TOTAL AMOUNT $ _____

The American Radio Relay League
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QS07

Also available from your local Amateur Radio dealer.

***Future License Restructuring**

Recent proposals for restructuring Amateur Radio licensing are being considered. When changes finally occur, current license materials may expire earlier (or later) than originally expected, and new licensing materials will be published.

License restructuring could easily take many months. You won't lose any privileges that you've earned when restructuring finally takes place. **So don't put off *Upgrading* or *Getting Your First License*! Start studying *today*, and *enjoy*** new frequency privileges and the hot sunspot cycle **NOW!**

For more information about future license restructuring, see the January 1999 *QST* editorial, "Restructuring: The Next Step" on page 9, and the latest news on the ARRLWeb: http://www.arrl.org/news/restructuring/

Question Pool revision dates are on hold, pending the outcome of license restructuring.

ARRL May 1999

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Volume 83, Number 7

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Technical

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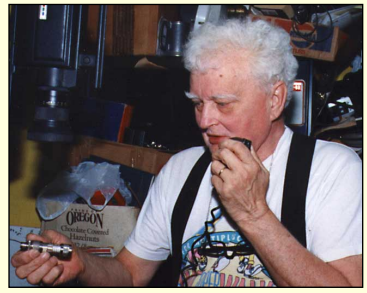
News and Features

New Ham Companion



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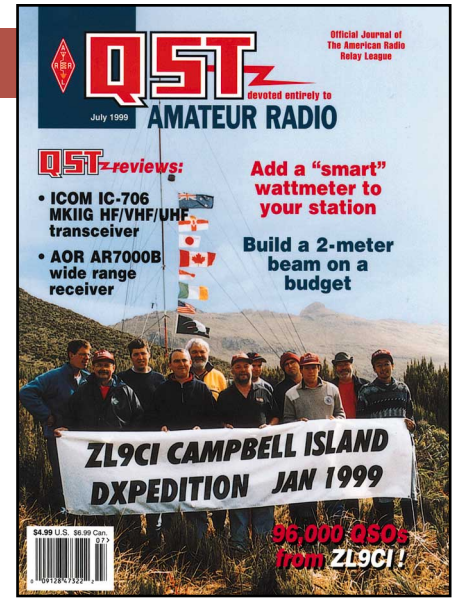
Operating

Departments



Our Cover

Fresh from 1999 New Year celebrations, the ZL9CI DXpedition crew boarded a ship and headed for Campbell Island where they made more than 96,000 contacts. Here we see the crew on the island at Beeman Hill. From left to right: Junichi Tanaka, JH4RHF; Lee Jennings, ZL2AL; Brian Biggings, VE3XA; Declan Craig, EI6FR; Trey Garlough, N5KO; Ken Holdom, ZL2HU; Murray Woodfield, ZL1CN; Andrew Williamson, GI0NWG; James Brooks, 9V1YC; Wilbert Knol, ZL2BSJ and Jason Christiensen, ZL2URN. Read of their adventures in this month's *QST!*

Membership in the ARRL, including a subscription to *QST*, is available to individuals at the following rates: $34 per year in the US and possessions, $47 elsewhere, payable in US funds. Age 65 and over, with proof of age, $28 (US only). Licensed radio amateurs age 21 and under may qualify for special rates; write for application. Life membership is also available. Membership and *QST* cannot be separated. Fifty percent of dues is allocated to *QST*, the balance for membership. Subscription rate for libraries and institutions: $34 per year postpaid in the US and possessions, $47 elsewhere. Single copies $5 in the US.

Membership without *QST* is available to the immediate family of a member living at the same address, and to anyone who is legally blind, for $5 per year.

Foreign remittances should be by international postal or express money order or bank draft - in the US and for an equivalent amount in US funds.

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In order to ensure prompt delivery, we ask that you periodically check the address information on your mailing label. If you find any inaccuracies, please contact the Circulation Department immediately. Thank you for your assistance.

The Future Has Arrived....

The next generation of amateur single band mobile radios has arrived. The new ADI AR-147, AR-247, and AR-447 bring new and exciting features to the amateur Two Meter, 1.35 Meter, and 70 Centimeter bands.

All three units feature lots of memories (81), impressive intermod immunity and receiver sensitivity, wideband receive, and more. These are also the first amateur mobile radios ever to feature both CTCSS and DCS (Digtially Coded Squelch) encode/decode, and tone scan. DCS adds 106 new tones to the radio, in additon to the 50 standard CTCSS tones, that can be used for selective calling or repeater access. This ensures that the radios will be compatible with the more advanced amateur repeater systems of the future.

The compact, ergonomic design of these new mobile radios makes them a pleasure to operate. The number of operating controls has been kept to an absolute minium to assure ease of use. Features like direct frequency entry from the supplied **BACKLIT** DTMF microphone, and DTMF redial for failed autopatch calls make mobile operation an absolute snap.

MARS operators will love the wideband performance these units offer. All three units are fully MARS expandable, with proof of license. Canadian amateur radio operators can also expand the AR-247 to cover the complete 220-225 MHz Canadian ham band.

For more information check out our web site at **www.adi-radio.com** or contact your local ham dealer today!

ADI AR-147, AR-247*, AR-447
Advanced Monband Mobiles

Transmit Range:
- AR-147: 144-148 MHz
- AR-247: 222-225 MHz
- AR-447: 430-450 MHz

Receive Range:
- AR-147: 118-171 MHz (includes AM Air)
- AR-247: 216-229 MHz
- AR-447: 400-470 MHz

Power Output:
- AR-147: 50 / 15 / 5 watts
- AR-247: 30 / 15 / 5 watts
- AR-447: 35 / 15 / 5 watts

- 80 memories plus a CALL channel
- CTCSS (50 tones) and **DCS** (106 tones) encode, decode, and tone scan
- MARS capable (permits required)
- 9 DTMF autodialer memories
- Built-in redialer for autopatch use
- Programmable band and memory scan
- Time Out Timer
- DTMF paging
- Dual frequency watch
- Auto Repeater Offset (AR-147 only)
- Direct frequency entry using multi-function Backlit DTMF microphone
- PC programmable (with optional software)
- Auto Power Off
- Frequency or channel display modes
- Four-step display dimmer
- Power line over/under voltage protection
- Small! Size: 1.5" (H) x 5.5" (W) x 6.25" (D)

ADI AR-247
Advanced Mobile Radio for 222 MHz!

"WOW! ADI's new AR-147, AR-247, and AR-447 radios feature both CTCSS and DCS encode, decode, and tone scan! These units will be compatible with amateur repeater systems for years to come. Just another reason why ADI is the Best Value in Amateur Radio℠."

ADI

Win FREE ADI equipment on the web at www.adi-radio.com!

* The AR-247 has not yet been approved by the FCC. It may not be offered for sale until after such approval is granted.

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ADI

NOW! Pre-Programmed with over 100 of Gordon West, WB6NOA's favorite Ham and Public Service channels!

- Operate on simplex or repeaters, *straight out of the box!*
- Receive police, fire, medical, and more without programming
- All NOAA weather channels are already pre-programmed
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- Clone to any other AT-600

$40
Instant Coupon
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untill July 31, 1999

Gordon West, WB6NOA

ADI AT-600 / AT-600HP

Dualband 2M / 70 CM Handheld

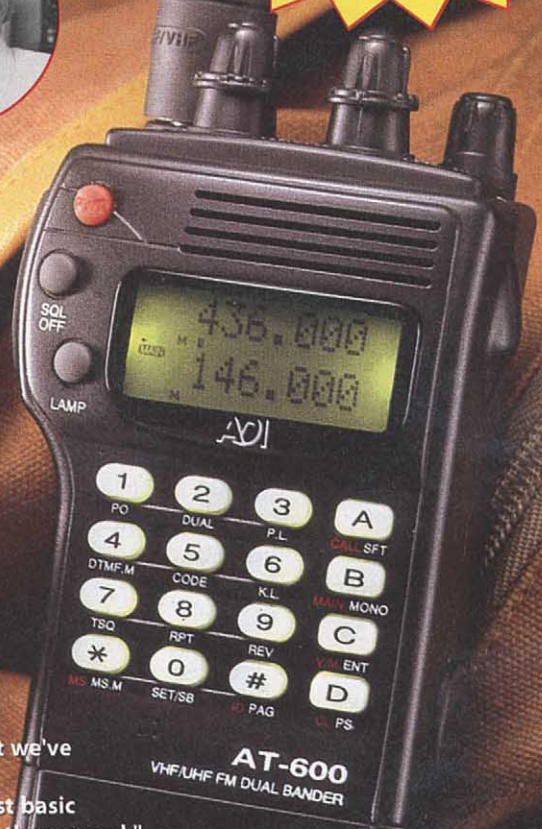
Transmit Range:
VHF: 144-148 MHz
UHF: 430-450 MHz

Receive Range:
VHF: 108-171 MHz (includes AM Air)
UHF: 400-470, 830-999 MHz
(Cellular Blocked)

Power Output (Standard Battery):
High Power: 2.5 Watts (both bands)
Medium Power: 1 Watts (both bands)
Low Power: 0.35 Watts (both bands)

Power Output (HP Battery):
High Power: 5 Watts (both bands)
Medium Power: 2 Watts (both bands)
Low Power: 0.35 Watts (both bands)

200 memories plus 2 CALL channels
CTCSS (50 tones) encode, decode, and tone scan
Six-character alphanumeric display
MARS capable (permits required)
Simultaneous VHF/UHF receive
Crossband repeater mode
Separate volume / squelch controls for each band
10 DTMF autodialer memories for autopatch
DTMF paging included
Auto Power Off
Adjustable battery save
PC programmable (with optional PROG-600 programming kit)
On-the-air and wired cloning
Large backlit keypad and display
Internal battery voltage meter
Small! 4.25" (H) x 2" (W) x 1.5" (D) excluding battery pack
HP version includes rechargeable 12 Volt NiCd battery pack. Standard version icludes 7.2 Volt rechargeable NiCd battery pack.



"A very rugged, solid feel"
"The display is one of the best we've seen in awhile."
"We were able to execute most basic functions without cracking the manual."
"Pleasant, natural-sounding transmit audio."
"Communication quality plus!"
--March '98 *QST*

Study for your ham license or upgrade at www.hamtest.com!

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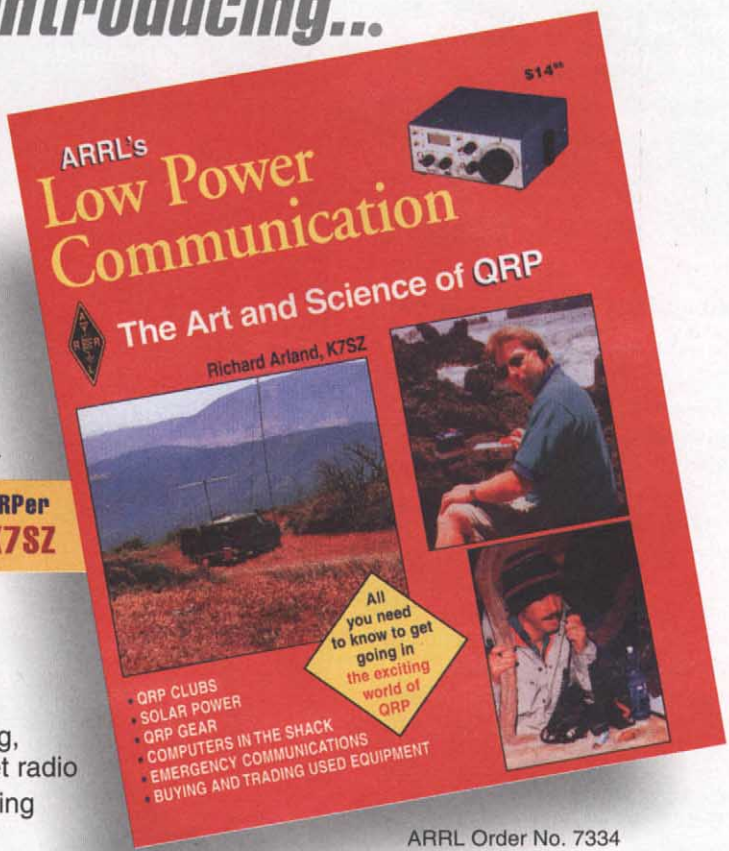
What is QRP? **QRP** is the Q signal for **low power.** It's also used to describe low power communications. Interested in communicating with every corner of the globe using less than 5 Watts? Want to build a complete station for less than $100? —Then you're on the way to becoming a **QRP**er! ***It's Low Power and Low Cost!***

Experience the *Fun* and *Satisfaction* of Low Power Operating!

Introducing...



Build, experiment, operate and enjoy!

These are the fundamental goals of the QRPer, and this is the book to help you get in on the action! There are thousands of active QRPers, and you can get involved with help from ***ARRL's Low Power Communication***.

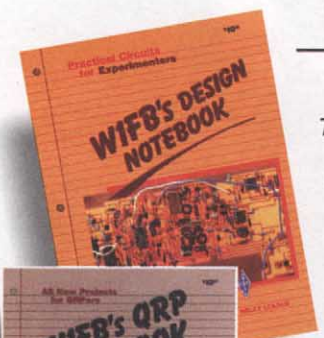
Written by noted QRPer Rich Arland, K7SZ

Contents

- **Operating tips** and station suggestions
- **Kit and commercial gear** information
- **DXing and contesting tips**
- **Antennas**, including hidden or low profile designs
- **Harnessing the sun** to power your station
- **Computer applications** for logging, satellite tracking, antenna modeling, propagation prediction and packet radio
- **Emergency and portable communications**, including Year 2000 steps for testing your computer
- **QRP clubs** and Internet sites

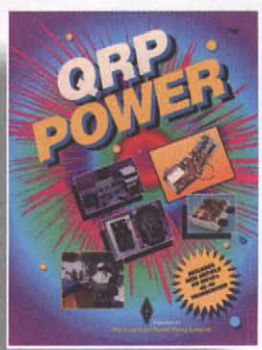
ARRL Order No. 7334
—**$14.95**
plus shipping*

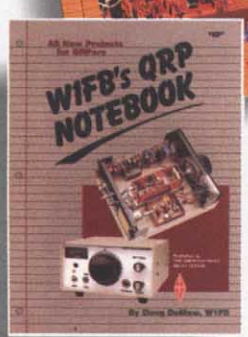
Try these other QRP-related titles!



QRP Power

The best QRP-related articles from *QST*, *QEX* and *The ARRL Handbook*, and an in-depth article on a popular 40-40 transceiver. Discover just how much fun it is to operate with 5 W or less! Crammed with projects you can build and resource information you can use. 1st edition, ©1996. ARRL Order No. 5617—**$12** plus shipping*.





W1FB's QRP Notebook

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"It Seems to Us..."

You *Can* Take It With You

Do you plan to travel this summer? Take Amateur Radio with you! It's never been easier or more fun for Amateur Radio to be your companion wherever you may go.

Vacation time is a time to spend some precious hours with our families, get away from the pressures and constraints of our usual routines, and enjoy a change of scene. It's an opportunity to devote undivided attention to those interests for which there never seems to be enough time or energy after the household chores are done. In short, it's our chance to enjoy the quality of life that is the reason we labor for the rest of the year.

Vacation travel provides a wonderful opportunity to expand one's horizons. With a bit of planning, you can expand your Amateur Radio horizons at the same time. The current crop of compact, multimode HF/VHF/UHF transceivers is ideally suited for taking along with you, whether you're driving or flying to your destination. If you're driving, you even have the option of operating mobile all the way there and all the way back (provided that the other occupants of the vehicle don't conspire to leave you behind at the first rest stop).

Another enticing option is to bring along one of the wide variety of QRP rigs now available, perhaps one you've built yourself from a kit. Many QRP rigs have the additional advantages of light weight and long battery life, making them perfect for slipping into a backpack when you hit the trail. Toss in a simple wire antenna and you can talk to the world from trailside! There's something almost mystical about maintaining an ionospheric connection with civilization from a remote, pristine setting.

If you're like many hams, operating from home may be pretty frustrating. Covenants, apartment regulations, or spousal or parental restrictions limit your antenna farm. When you tune across the bands you hear more birdies from neighbors' computers and other electronic devices than DX. A vacation cottage or cabin, far away from electronic smog, may be the perfect prescription for rekindling your interest in getting on the air. There you can explore seldom-visited bands or string that killer wire array you've always wanted to try if only you had the room.

For years it's been legal to operate in Canada without applying for a license or sending any advance notification. Thanks to the United States being accepted as a participant in the CEPT Radio Amateur License (see p 81, this issue), this summer you will be able to take your gear to most European countries and French islands on a similar basis. You don't need to be rare DX to enjoy operating away from home. It will be more relaxing if you aren't! Still, it's a lot of fun to activate a seldom-heard prefix, island, county, or VHF/UHF grid square. Even checking into your regular net or roundtable from an unusual location can be a lot of fun for everyone, including the stay-at-homes.

What better time could there be to show your kids what Amateur Radio is all about, without the usual distractions and interruptions? Get them to help you put up the portable antenna. Let them listen around, in and out of the ham bands, and answer their questions about what they hear. Give them a chance at the microphone or keyboard (you did remember the laptop with the PSK31 software, didn't you?). With a bit of advance preparation you might even be able to hold a family hidden-transmitter hunt. It really doesn't matter what the activity is; what matters is that you're spending time with your kids, giving them memories they will share with your grandkids. If those memories give them good feelings about Amateur Radio, so much the better.

Don't have an HF or multimode rig that's small enough to take along? Your everyday FM rig can lift you out of the ranks of the ordinary tourist and introduce you to friendly locals. If you're backpacking in a remote area it may be more valuable in an emergency than a cell phone—but remember to bring along a better antenna than your usual "rubber duck," just in case.

We may not always practice what we preach here on page 9, but in this case we do. Later this summer will mark our seventh trip in ten years, each time with a complete ham station, to Prince Edward Island in eastern Canada. Each year in the bleak midwinter we begin the search for a cottage to rent for the following summer's excursion. We've rented five different cottages in different parts of the island and have never had a bad experience. The Canadians could hardly be more hospitable—they've even built a bridge to the island so we don't have to take a ferry anymore. If you hear K1ZZ/VY2, please give us a call!—*David Sumner, K1ZZ*

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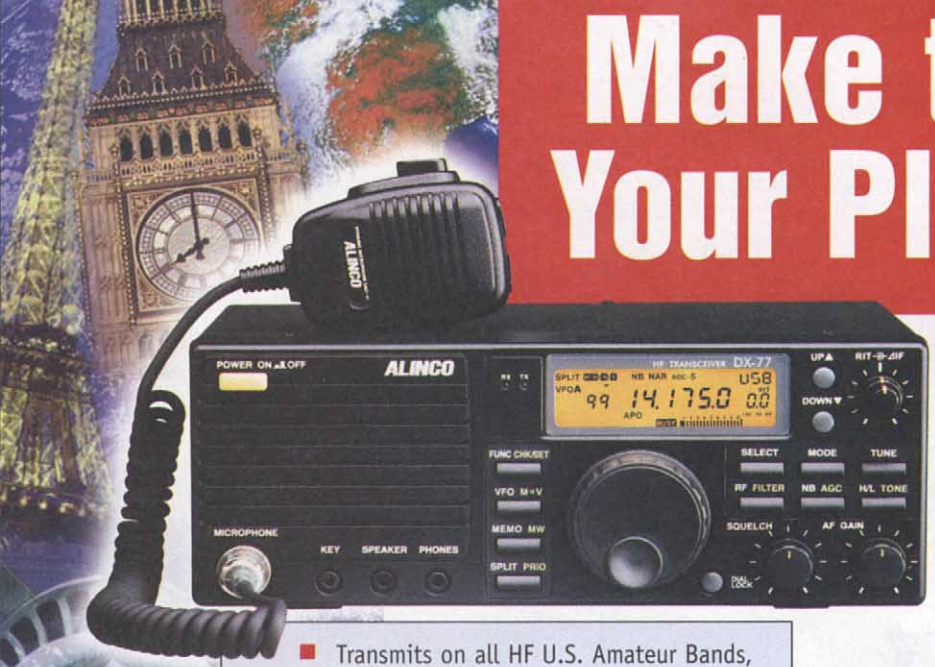

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- Front panel jacks for convenient connections of key, headphones or external speaker
- QRM/QRN reduction with IF shift, standard CW audio filter and RF attenuator
- Built-in electronic keyer, adjustable from 6 ~ 50 wpm
- Full QSK, 7-step semi break-in operation or Auto Break-In CW modes
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- Computer control with optional ERW-4
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—QST Product Review, June 1998

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Georgia	Sandy Donahue, W4RU, 960 Ralph McGill Blvd, Atlanta NE, GA 30306 (404-875-9450); **w4ru@arrl.org**
Northern Florida	Rudy Hubbard, WA4PUP, PO Box 843, Milton, FL 32572-0843 (850-626-0620); **wa4pup@arrl.org**
Southern Florida	Kevin Bunin, K4PG, 3307 Lakeview Dr, Delray Beach, FL 33445 (561-496-5257); **k4pg@arrl.org**
Puerto Rico	Raul Escobar, KP4ZZ, PO Box 366051, San Juan, PR 00936 (787-760-9070); **kp4zz@arrl.org**
Virgin Islands	John Ellis, NP2B, PO Box 24492, Christiansted, St Croix, VI 00824 (340-773-9643); **np2b@arrl.org**

Southwestern Division

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Los Angeles	Phineas J. Icenbice Jr, W6BF, 19323 Halsted St, Northridge, CA 91324 (818-349-3186); **w6bf@arrl.org**
Orange	Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (909-687-8394); **w6ubq@arrl.org**
San Diego	Tuck Miller, K6ZEC, 3122 E 2nd St, National City, CA 91950 (619-475-7333); **k6zec@arrl.org**
Santa Barbara	Robert Griffin, K6YR, 1436 Johnson Ave, San Luis Obispo, CA 93401-3734 (805-543-3346); **k6yr@arrl.org**

West Gulf Division

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Oklahoma	Charlie Calhoun, K5TTT, 16101 E 98th St N, Owasso, OK 74055 (918-272-9872); **k5ttt@arrl.org**
South Texas	E. Ray Taylor, N5NAV, 688 Comal Ave, New Braunfels, TX 78130 (830-625-1683); **n5nav@arrl.org**
West Texas	Charles C. Royall, WB5T, 2063 Putter Dr, San Angelo, TX 76904 (915-944-0469); **wb5t@arrl.org**

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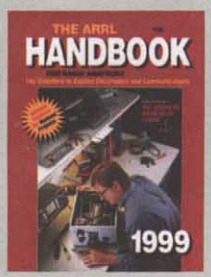

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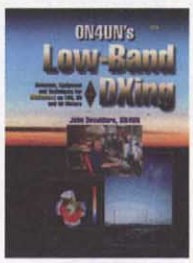

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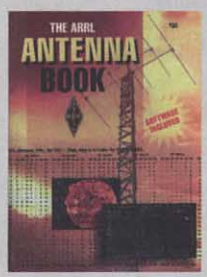

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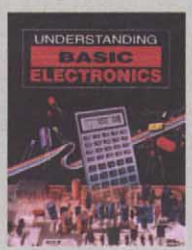

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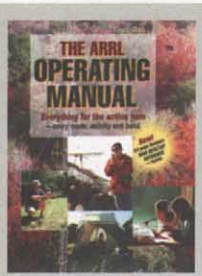

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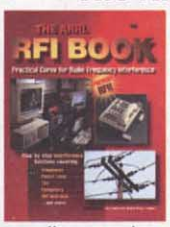

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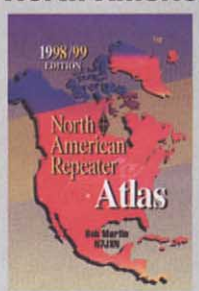

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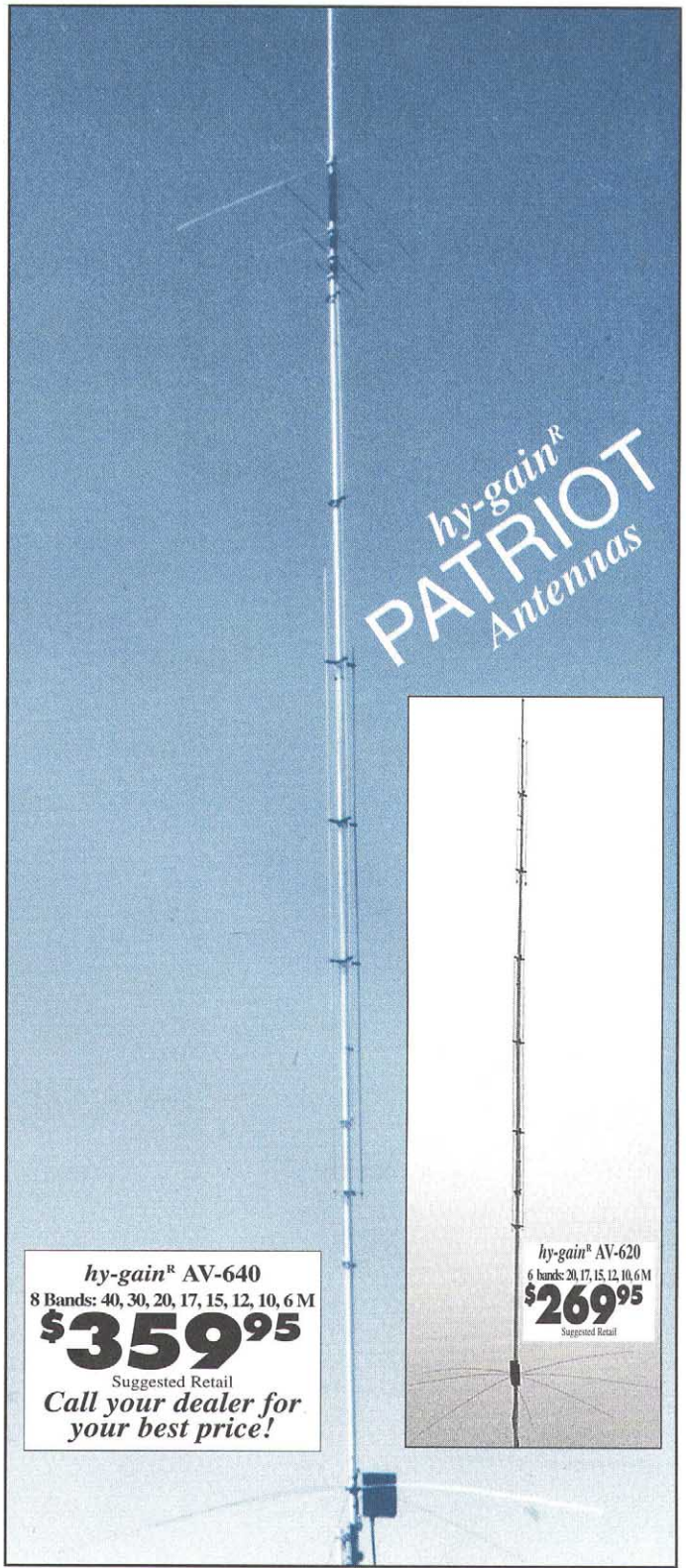

Specifications	AV-620	AV-640
Bands covered (meters)	6,10,12, 15,17,20	6,10,12,15, 17,20,30,40
2:1 VSWR Bandwidth (KHz)		
40M	N/A	150
30M	N/A	175
20M	500	500
17M	500	500
15M	500	500
12M	500	500
10M	1500	1500
6M	2000	1500
VSWR at resonance (typical)	1.5:1	1.5:1
Power handling (watts output) key down 2 minutes	1500	1500
Vertical radiation angle (degrees)	17	17
Horizontal radiation angle (degrees)	360	360
Height (feet)	22.5	25.5
Weight (pounds)	10.5	17.5
Wind surface area (square feet)	2.4	2.5
Wind survival (mph)	80	80

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DC Currents

By Steve Mansfield, N1MZA
Manager, Legislative and Public Affairs

Just as radio waves aren't constrained by artificial boundaries, neither is ARRL's government relations effort. "DC Currents" covers behind-the-scenes activity you need to know about in Congress, at the FCC and other regulatory agencies, as well as at worldwide bodies such as the International Telecommunication Union.

Telecommunications Bills Beginning to Move in Congress

With a quarter of the 106th Congress now history, it's time to look at the progress being made in telecommunications legislation. Here's a list of bills that affect the radio waves in the US (descriptions are edited from the THOMAS web site). These bills are moving through the legislative process. None has yet passed both houses and been signed by the President. HR 514, the Wireless Privacy Enhancement Act, and HR 1554, the Satellite Copyright, Competition and Consumer Protection Act, have passed the House, but have not moved in the Senate at this writing.

HR.89: A bill to reform the copyright law with respect to satellite retransmissions of broadcast signals, and for other purposes.

HR.486: A bill to require the Federal Communications Commission to preserve low-power television stations that provide community broadcasting, and for other purposes.

HR.514: A bill to strengthen and clarify prohibitions on electronic eavesdropping, and for other purposes.

HR.539: A bill to establish 9-1-1 as the universal emergency assistance number for wireless telecommunications users, and for other purposes.

HR.598: A bill to require the Federal Communications Commission to eliminate from its regulations the restrictions on the cross-ownership of broadcasting stations and newspapers.

HR.768: A bill to reform the copyright law with respect to satellite retransmissions of broadcast signals, and for other purposes.

HR.783: A bill to ensure the availability of spectrum to Amateur Radio operators.

HR.851: A bill to require the Federal Communications Commission to establish improved predictive models for determining the availability of television broadcast signals.

HR.866: A bill to protect critical infrastructure radio systems from interference and to promote efficient spectrum management of the private land-mobile radio bands, and for other purposes.

HR.942: A bill to reduce restrictions on media ownership, and for other purposes.

HR.952: A bill to preserve State and local authority over the construction, placement or modification of personal wireless service facilities.

HR.1027: A bill to provide for the carriage by satellite carriers of local broadcast station signals, and for other purposes.

HR.1078: A bill to amend the Communications Act of 1934 with respect to retransmission consent and must-carry for cable operators and satellite carriers.

HR.1087: A bill to require the relocation of a National Weather Service radar tower that is on Sulfur Mountain near Ojai, California.

HR.1554: A bill relating to copyright licensing and carriage of broadcast signals by satellite.

S.151: A bill to ensure the continuing provision of certain global satellite safety services after the privatization of the business operations of the International Mobile Satellite Organization, and for other purposes.

S.247: A bill to reform the copyright law with respect to satellite retransmissions of broadcast signals, and for other purposes.

S.303: A bill to enhance the ability of direct broadcast satellite and other multichannel video providers to compete effectively with cable television systems, and for other purposes.

S.363: A bill to establish a program for training residents of low-income rural areas for, and employing the residents in, new telecommunications industry jobs located in rural areas, and for other purposes.

S.376: A bill to promote competition and privatization in satellite communications, and for other purposes.

S.411: A bill to provide for a process to authorize the use of clone pagers, and for other purposes.

S.800: A bill to promote and enhance public safety through the use of 9-1-1 as the universal emergency assistance number, further deployment of wireless 9-1-1 service, support of States in upgrading 9-1-1 capabilities and related functions, encouragement of construction and operation of seamless, ubiquitous, and reliable networks for personal wireless services, and for other purposes.

Wireless Privacy Debate Reveals Congressional Concerns

Back in the 105th Congress when HR.2369 set the recreational radio enthusiast community into turmoil by effectively banning most forms of scanner listening, the ARRL fought to have the bill redrafted to cover only cellular and PCS transmissions. This year, the floor debate over the sanitized bill, HR.514, revealed a range of congressional concerns. Telecommunications Subcommittee Chairman Billy Tauzin (R-LA-3rd) told the Congress that his Committee hearing uncovered the fact that "some people believed that the law did not prohibit them from modifying legal scanners to turn them into eavesdropping devices. In fact, a whole modification industry had developed. It was openly advertising in print media and over the Internet, complete with easy-to-follow instructions on how to listen in on neighbors."

Tauzin indirectly referred to concerns raised by many in the amateur community, and many more scanner enthusiasts, that were based on "a residual belief out there, harkening to the early days of radio, that because the airwaves are a public good, all communications traversing over them are public as well. We discovered an almost right-to-listen mentality, and that mentality is directly inconsistent with cellular users' expectations and, of course, would hamper the growth of wireless communication services…."

The chairman noted that the revised HR.514 leaves most users of scanners alone. In that class he included those who listen public safety channels or NASCAR communications for automobile races, groups that raised a particularly loud noise last year. But he also acknowledged that consumers would best be protected through a combination of the scanner provisions and encryption technology.

The sole dissenting voice on the floor was Texas libertarian Ron Paul (R-TX-14th). Paul said that "passage of this legislation will, as does so much of the legislation we pass, move our nation yet another step close to a national police state by further expanding a federal crime and empowering more federal police—this time at the Federal Communications Commission." Paul compared the scanner bill to other unpopular federal "bans" such as prohibition. His colleagues did not share his distaste and passed the bill 403 to 3.

The full debate can be found in the February 25 *Congressional Record* on THOMAS (**http://thomas.loc.gov**).

Low Power FM Radio a Mixed Bag

Early this year the FCC proposed to license new 1000 W and 100 W low-power FM (LPFM) stations as well as 1-10 W "microradio" facilities. The idea was to "provide new opportunities for community-oriented radio broadcasting, foster opportunities for new radio broadcast ownership and promote additional diversity in radio voices and program services." While the idea looked good on paper, the broadcasting community has found some cause for heartburn. Their overt message to Congress is that the proposal holds plenty of potential to create unwanted interference in local communities. The unspoken, but very real concern, is increased competition for ad revenues and market share by upstarts with much lower overhead.

The FCC proposed ways to protect existing radio services from interference, such as minimum distance separations between LPFM stations, as well as co-channel (or same channel) and first adjacent channel protections. The 1000-W low power service would have a maximum antenna height of 60 meters, producing a service area radius of about 8.8 miles. The 100-W service would have a 30-meter antenna restriction with a service radius out to 3.5 miles. The 1-10-W microradio class would have an antenna height of 30 meters with a service radius of one to two miles.

FCC to Streamline Itself into the 21st Century

♦ FCC Chairman William Kennard told a House subcommittee that in a world of fully competitive communications markets, the FCC should focus only on those functions that are not addressed by market forces, including universal service, consumer protection and information; enforcement of pro-competition goals domestically and worldwide; and spectrum management. The Chairman submitted a report that outlines how he envisions the restructuring, and steps the Commission is already taking to make the transition to this model. The report is available on the FCC's web site at **http://www.fcc.gov/Reports/fcc21.html**. It is likely that Kennard is attempting to steal the momentum from an FCC reform operation already underway in Congress.

Heading the Congressional FCC reform effort on the House side will be Ohio Congressman Paul Gillmor (R-OH-5th) a long time member of the Telecommunications Subcommittee. The reform effort should culminate in an FCC reauthorization bill expected to emerge sometime over the summer. The FCC has not been reauthorized since the early 1990s.

HR.783 Continues to Gather Cosponsors…

♦ When we went to press, HR.783, The Amateur Radio Spectrum Protection Act of 1999 had gathered 56 cosponsors. There is no word yet as to when, or how, the Telecommunications Subcommittee might take up the bill. However, the more cosponsors, the more likely it is HR.783 will move to the next step.

…But the Effort Needs Help, and Here's How

Congress looks at about 10,000 bills every session, ranging from one paragraph "technical" measures to appropriation and authorization bills that are measured in pounds. How does an organization like ARRL get attention for our issue amidst all this competition? The single biggest factor to most members of Congress is whether or not local constituents have some interest in the issue. And how do they determine that? Letters, e-mail and telephone calls.

ARRL member Pete Chamalian, W1RM, had wondered why his Congressional Representative Nancy Johnson (R-CT-6th) was not a cosponsor. So when the call came from New England Division Director Tom Frenaye, K1KI, asking for Connecticut hams to call their Representatives, Chamalian was glad to respond. How he did it holds some lessons for all of us.

"First, I went to Representative Johnson's Web site," he says. "That site has a feature for sending e-mail. After I e-mailed her my point of view on HR.783, I invited her to call me, and gave her my phone number."

Then he sat back to see what would happen.

"A couple of weeks later, her legislative counsel Philip Maggi called me back. He was very interested in what I had to say, and appreciative of the communication from a constituent in the district."

Maggi confirms the perception. "We get plenty of visits from organizations on issues, but what really helps many members of Congress is to hear from their own constituents. That's what often makes the difference."

Chamalian notes that the whole thing was painless, and he felt like his views were listened to. As we went to press, the Congresswoman's staff had expressed interest in her visiting a Field Day site in the district, and had just signed on as a cosponsor of HR.783.

Cosponsors for HR.783 (In order of sign on)

Michael Bilirakis (R-FL-9th)
Frank Pallone, Jr (D-NJ-6th)
Michael R. McNulty (D-NY-21st)
Ronnie Shows (D-MS-4th)
Nathan Deal (R-GA-9th)
Patsy T. Mink (D-HI-2nd)
Robert A. Underwood (D-GU-delegate)
John E. Baldacci (D-ME-2nd)
Sam Farr (D-CA-17th)
James M. Talent (R-MO-2nd)
Stephen E. Buyer (R-IN-5th)
Dale E. Kildee (D-MI-9th)
Norman D. Dicks (D-WA-6th)
Owen B. Pickett (D-VA-2nd)
Barbara Cubin (R-WY-1st)
Steve C. LaTourette (R-OH-19th)
Jo Ann Emerson (R-MO-8th)
George R. Nethercutt, Jr (R-WA-5th)
Robert B. Aderholt (R-AL-4th)
David L. Hobson (R-OH-7th)
Michael G. Oxley (R-OH-4th)
Dan Burton (R-IN-6th)
Bernard Sanders (I-VT-At Large)
Sonny Callahan (R-AL-1st)
Deborah Pryce (R-OH-15th)
Michael F. Doyle (D-PA-18th)
Steven R. Rothman (D-NJ-9th)
Ron Klink (D-PA-4th)
Greg Walden (R-OR-2nd)
Rick Boucher (D-VA-9th)
Charles H. Taylor (R-NC-11th)
Sanford D. Bishop, Jr (D-GA-2nd)
Donna Christian-Christensen (D-VI-delegate)
Ken Bentsen (D-TX-25th)
Thomas H. Allen (D-ME-1st)
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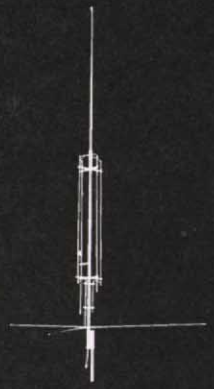
Bob Stump (R-AZ-3rd)
Bob Etheridge (D-NC-2nd)
Thomas M. Davis (R-VA-11th)
William Mac Thornberry (R-TX-13th)
Bruce M. Vento (D-MN-4th)
Baron Hill (D-IN-9th)
John McHugh (R-NY-24th)
David Bonior (D-MI-10th)
Ike Skelton (D-MO-4th)
Norm Sisisky (D-VA-4th)
Michel Simpson (R-ID-2nd)
Nancy Johnson (R-CT-6th)

Media Hits

- ARRL PIC Gary Pearce, KN4AQ, of Cary, North Carolina, contributed an excellent piece to the latest issue of *Tar Heel Junior Historian* magazine, dedicated to natural disasters. The article featured local operators and emergency communication when Hurricane Fran hit parts of North Carolina in 1996. Bob Keys, NA4G, and Drew Claybrook, KF4ZQF provided photos for the article.
- The May 1999 issue of *Radio Resource Magazine*, features an article on ARES, written by ARRL staffer Steve Ewald, WV1X. The piece covers several recent emergencies in which ARES members were activated.
- The *News-Press*, of Fort Myers, Florida, ran a big feature story on the National Weather service. Ham Radio got some ink for its role in weather spotting and how Amateur Radio operators serve the community and emergency officials after a hurricane hits. Leonard Deibert, KC4GOA, of the Lee County RACES group and Julio Ripoll, WD4JNS, the first Amateur Radio coordinator for the National Hurricane Center were interviewed.
- Amateur Radio weather spotters were highlighted in *The Vindicator*, of Youngstown, Ohio. The story covered a recent training session conducted by the Mahoning Valley SKYWARN group. Weather watchers Mike Orto, WD8CSN, and Rich Hamaker, KB8YHC, both of Youngstown were interviewed about local SKYWARN activities.

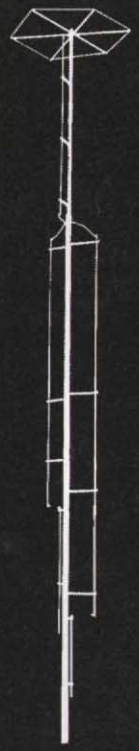
GAP: THE PERFECT ANTENNA

We at GAP realize there isn't a perfect antenna. No singular antenna will scream DX on 80 and be the best for local nets on 10. If anyone tells you there is, beware! The perfect antenna does not exist, but the right one for you may. If you want something to bust the pile on the low bands, then consider the Voyager. Just starting out in ham radio and need a great general coverage antenna, the Challenger is easy to assemble and for little effort will yield superior performance, especially on DX. Maybe you knowingly or unknowingly moved into one of those "restricted areas" where the Eagle's limited visibility, but unlimited ability is desired.



Eagle DX

Challenger DX



Voyager DX

This chart helps you select the right GAP antenna. When comparing GAPs, bandwidth is not a concern. With few exceptions, a GAP yields continuous coverage under 2:1 for the **ENTIRE BAND**.

All antennas utilize a GAP elevated asymmetric feed. A major benefit is the virtual elimination of the earth loss, so more RF radiates into the air instead of the ground. This feed is why a GAP requires **NO RADIALS**. Just as elevating a GAP offers no significant improvement to its performance, adding radials won't either, making set up a breeze.

A GAP antenna has no traps, coils or transformers. This is important. The greatest sources of failure in multiband antennas are these devices. Perhaps you heard someone discuss a trap that had melted, arced or became full of water. Improvements to these inherent problems are the focus of the antenna manufacturer, while the basic design of the antenna remains unchanged. **GAP improved the trap by eliminating it!** Removing these devices means they don't have to be tuned and, more importantly, won't be detuned by the first ice or rain. The absence of these devices improves antenna reliability, stability and increases bandwidth.

Another major advantage to a GAP antenna is its NO tune feature. Screws are simply inserted into predrilled holes with a supplied nutdriver.

The secret is out and people in the know say:

CQ–"The GAP consistently outperformed base-fed antennas...and was quieter."

73–"This is a real DX antenna, much quieter than other verticals."

RF–"To say this antenna is effective would be a real understatement. Switching back and forth on 40m between another multiband HF vertical and the GAP, there was no comparison. Signals were always stronger on the GAP, sometimes by S units, not just DB's."

Worldradio – "These guys have solved the problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. A half-wave vertical does need radials if it is end fed (at the bottom). But the same half-wave vertical does not (as much, hardly at all) if is fed in the center."

IEEE–"Near field and power density analyses show another advantage of this antenna (asymmetric vertical dipole): it decreases the power density close to the ground, and so avoids power dissipation in the soil below it. The input impedance is very stable and almost independent of ground conductivity. This antenna can operate with high radiation efficiency in the MF AM standard broadcast band, without the classical buried ground plane, so as to yield easier installation and maintenance."

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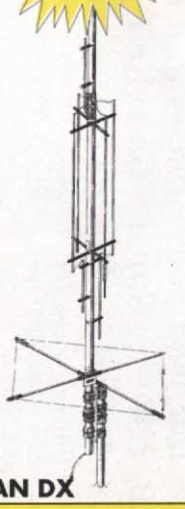

TITAN DX

This all purpose antenna is designed to operate 10m-80m, WARC bands included. It sits on a 1-1/4" pipe and can be mounted close to the ground or up on a roof. Its bandwidth and no tune feature make it an ideal antenna for the limited space environment as well as a terrific addition to the antenna farm.

MODEL	BANDS OF OPERATION											HT	WT	MOUNT	COUNTER-POISE	COST
	2m	6m	10m	12m	15m	17m	20m	30m	40m	80m	160m					
Challenger DX	■	■	■	■	■		■		■	■		31.5'	21 lbs	Drop In Ground Mount	3 Wires @ 25'	$279
Eagle DX			■	■	■	■	■		■			21.5'	19 lbs	1-1/4" pipe	80" Rigid	$289
Titan DX			■	■	■	■	■	■	■	■		25'	25 lbs	1-1/4" pipe	80" Rigid	$319
Voyager DX							■		■	■	■	45'	39 lbs	Hinged Base	3 Wires @ 57'	$399

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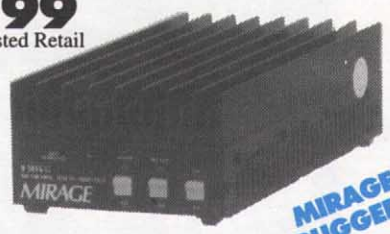
B-5016-G
$299
Suggested Retail



The MIRAGE B-5016-G gives you 160 watts of brute power for 50 watts input on all modes -- FM, SSB or CW!

Ideal for 20 to 60 watt 2 Meter mobile or base. *Power Curve* chart shows typical output power.

Hear weak signals -- low noise GaAsFET preamp gives you excellent 0.6 dB noise figure. Select 15 or 20 dB gain.

B-5016-G has legendary ruggedness. *We know of one that has been in constant use since 1979!*

Heavy-duty heatsink spans entire length of cabinet -- prevents overheating. Power transistors protected by MIRAGE's *Therm-O-Guard*™.

Fully protected from high SWR and excessive input power. Has warning LED.

Has smooth adjustable Transmit/Receive switching with remote external keying.

RC-1B, $45, Remote Control. On/Off, preamp On/Off, selects SSB/FM. With 18-ft cable.

Draws 17-22 amps at 13.8 VDC. 12x3x5½ in.

Power Curve -- typical B-5016-G output power								
Watts Out	130	135	140	145	150	155	160	165
Watts In	20	25	30	35	40	45	50	55

More 160 Watt, 2 Meter Amplifiers . . .

B-2516-G, $299. For 10 to 35 watt mobile or base stations. 160 watts out for 25 watts in.

B-1016-G, $379. MIRAGE's most popular *dual purpose* HT *or* mobile/base amplifier. 160 watts out/10 W in. For 0.2-15 watt transceivers.

B-1016-G Great for ICOM IC-706!

B-215-G, $379. MIRAGE's most popular *handheld* amp. 150 watts out/2 watts in; 160 watts out/3½ W in. For 0.25 to 5 watt handhelds.

100 Watts for 2 Meter HTs

B-310-G
$199
Suggested Retail

Power Curve -- typical B-310-G output power							
Watts Out	25	50	75	95	100	100+	100+
Watts In	¼	½	1	2	4	6	8

- ***100 Watts out with all handhelds up to 8 watts***
- ***All modes: FM, SSB, CW***
- ***Great for ICOM IC-706***
- ***15 dB low noise GaAsFET preamp***
- ***Reverse polarity protection/SWR Protection***
- ***FREE mobile bracket*** • ***Auto T/R switch***
- ***FREE handheld BNC to B-310-G cable***
- ***Ultra-compact 4³/₄x1³/₄x7³/₄ inches, 2½ pounds***
- ***One year MIRAGE warranty***

Boost your 2 Meter handheld to 100 Watts!

Ultra-compact all mode B-310-G amp is perfect for *all* handhelds up to 8 watts and multimode SSB/CW /FM 2 Meter rigs. *Great for ICOM IC-706!*

35 Watts for 2 Meter HTs

B-34-G
$89.95
Suggested Retail

Power Curve -- typical B-34-G output power								
Watts Out	18	30	33	35+	35+	35+	35+	35+
Watts In	1	2	3	4	5	6	7	8

- ***35 Watts Output on 2 Meters***
- ***All modes: FM, SSB, CW***
- ***18 dB GaAsFET preamp***
- ***Reverse polarity protection***
- ***Includes mobile bracket***
- ***Auto RF sense T/R switch***
- ***Custom heatsink, runs cool***
- ***Works with handhelds up to 8 watts***
- ***One year MIRAGE warranty***

MIRAGE RUGGED!

35 watts, FM only . . . $69.95

B-34, $69.95. 35 watts out for 2 watts in. Like B-34-G, FM only, less preamp, mobile bracket. 3⅛x1¾x4¼ inches.

MIRAGE Dual Band 144/440 MHz Amp

BD-35
$159.95
Suggested Retail

Power Curve -- typical BD-35 output power							
Watts Out (2Meters)	30	40	45	45+	45+	45+	45+
Watts Out (440 MHz)	16	26	32	35+	35+	35+	35+
Watts In	1	2	3	4	5	6	7

- ***45 Watts on 2 Meters/35W on 440 MHz***
- ***Auto Band Selection*** • ***Auto T/R switch***
- ***Full Duplex Operation*** • ***5x1³/₄x5 inches***
- ***FREE mobile bracket*** • ***"On Air" LEDs***
- ***Single Connector for dual band radios and antennas***
- ***Reverse polarity protection***
- ***Works with all FM handhelds to 7 watts***
- ***One year MIRAGE warranty***

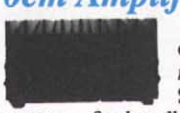
Add this Mirage *dual band* amp and boost your handheld to a *powerful* mobile or base -- 45 watts on 2 Meters or 35 watts on 440 MHz! **Mirage's** exclusive *FullDuplexAmp*™ lets you talk on one band and listen on the other band at the same time -- *just like a telephone conversation.* (Requires compatible HT).

6 Meter Amplifier

FCC Type Accepted

The A-1015-G, $389, is the *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 watts out for 10 in. For 1 to 15 watt transceivers.

70cm Amplifiers (420-450 MHz)



D-3010-N, $365, -- 100 W out/30 in. For 5 to 45 watt *mobile/base*. **D-1010-N, $395,** 100 W out/10 in. *Dual purpose* -- for handhelds or mobile/base. **D-26-N, $269,** 60 W out/2 in, for *handhelds*.

Amateur TV Amps

Industry standard ATV amps -- **D-1010-ATVN, $414,** 82 watts PEP out / 10 in. **D-100-ATVN, $414,** 82 watts PEP out/2 in. (without sync compression).

Remote Control Head for Amps

RC-1, $45, remote controls most MIRAGE amps. Power On/Off, preamp On/Off, switch for SSB/FM. 18 foot cable (longer available). 1¾x3¾x2½ inches.

Repeater Amps

11 models -- continuous duty all modeFM/SSB/CW repeater amps for 6, 2, 1 1/4 Meters, 70cm, 450 MHz ATV.

Low noise GaAsFET preamps

High gain *ultra low noise* GaAsFET preamps for receiving weak signals. Selectable gain prevents receiver intermod. 15 to 22 dB gain. Less than 0.8 dB noise figure. Automatic RF switching up to 160 Watts. **Choose** In-*Shack* model or *Mast-Mount* (includes remote control) model to reduce loss. Rugged die-cast enclosure.

Frequency (MHz)	*In Shack $139*	*Mast Mount $195*
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

1¼ Meter Amps (223-225 MHz)

Choose from 10 models -- 20 to 220 watts out for 2 to 50 watts in, $129 to $655.

Commercial Amps ($199 to $395)

FCC Type Accepted

Commercial amps for 150 - 174, 450-470 MHz and VHF marine bands, 70 -130 watts out.

Accurate SWR/Wattmeters

Read SWR directly andForward/ Reverse, Peak/Average power. Remote Coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

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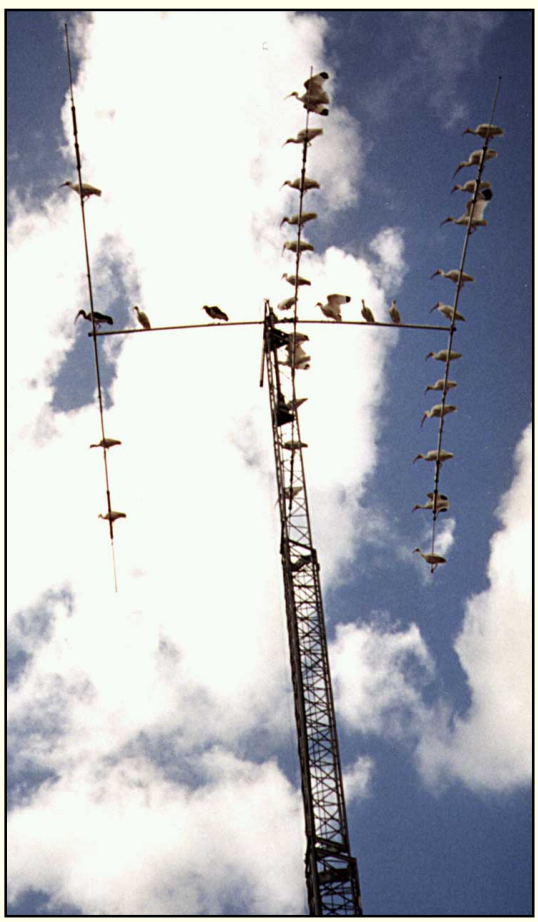
Up Front in QST

Palm Springs antenna party. Leo Meyerson, W0GFQ (center) received some much needed assistance installing his 600-foot long-wire antenna. Bart, K6UNR (right) and Gary, KD6QLT (left) of the Desert Radio Amateur Transmitting Society of Palm Springs (California) volunteered to string the wire through Leo's palm trees. The job of tower…er, "palm" climber fell to KD6QLT (above).

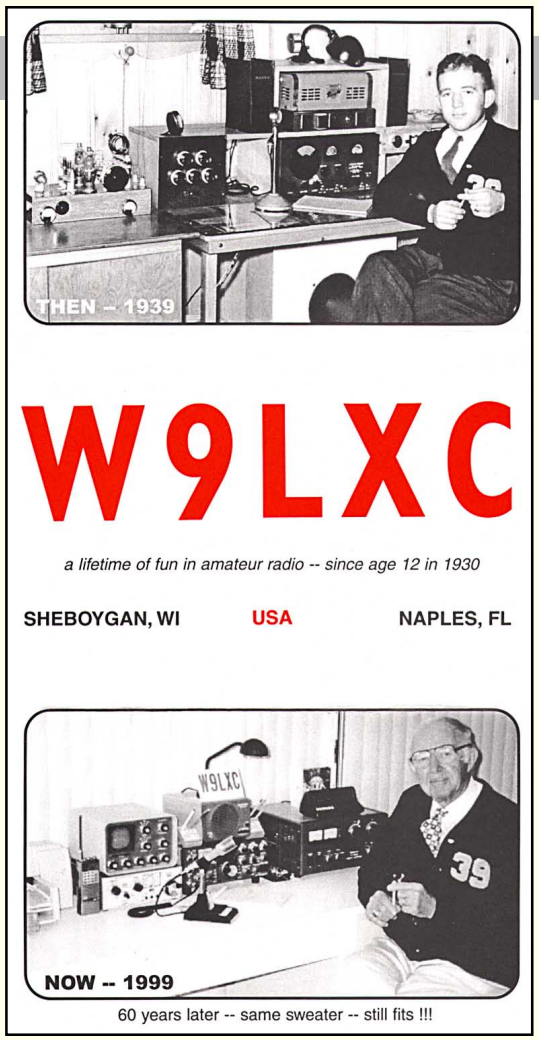
Greetings from Bosnia! Vlado, T97V, maintains an active station in the attic of his home in Vitez. His tower (left) supports a 20, 15 and 10-meter Yagi as well as a 6-meter Yagi. Vlado plans to install antennas for 80 and 160 meters this summer so that he'll be ready for next winter's contest and DX season.



Antennas sold to Florida hams should be wind and "bird" rated! Jim, K4JUQ, in Punta Gorda captured this flock of ibises resting on his tribander. Both the antenna and the birds survived the encounter intact.

His aircraft, his call sign! Bob Chesley, N4YH, homebrews radios *and* airplanes. He recently completed and flew this Lancair 320, a high-performance two-seater with retractable gear. He was able to register his aircraft with his call sign as the tail number.

Animal shelter SOS. When Wayside Waifs in Kansas City, Missouri needed publicity, they relied on Morse code—using "doggie treats," of course! John, WR0R spotted their eye-catching billboard last February and snapped this photograph.



A then-and-now QSL. Bob, W9LXC, is proud of his 60 years in Amateur Radio and he shows it on this unique foldout QSL.

Familiar calls from Belarus. Boris, EU6DX and Tanya, EU6TT are often heard from their home station in Vitebsk, or from the EW6WF club station signing EU5F during contests.

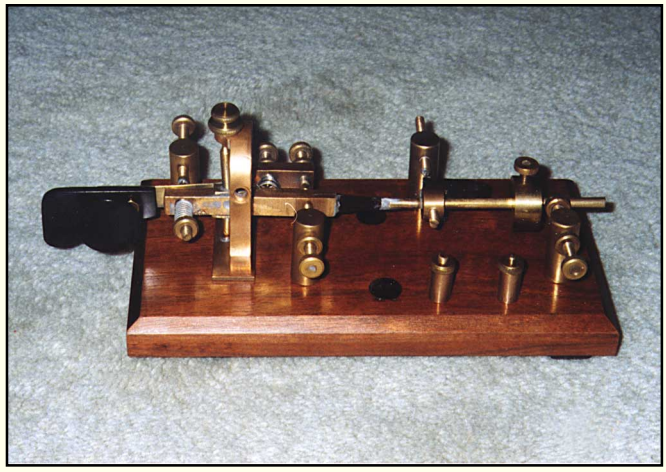
ARRL Roanoke Division vice director Dennis Bodson, W4PWF (right) and Steve Karty, N5SK (left), received a *QST* cover plaque award last March at ARRL's Washington office. Their article, "FAX480 and SSTV Interfaces and Software" appeared in the July 1998 *QST*. Paul Rinaldo, W4RI, ARRL Technical Relations Manager made the award presentation.

MICHELLE HOLLENBECK, AA0OF

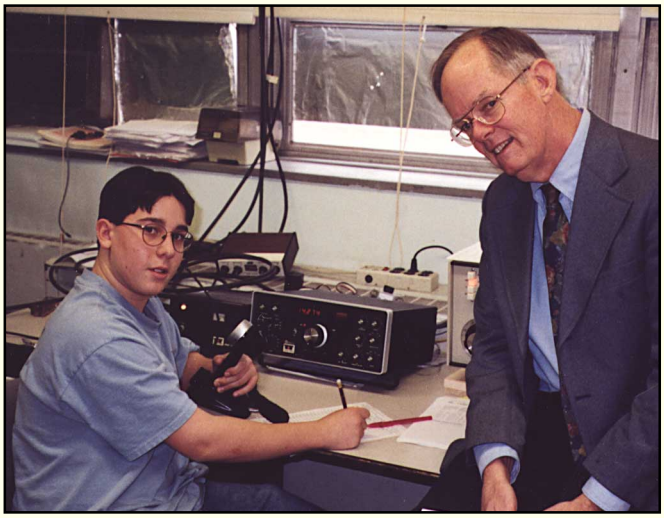
Get them while they're young! The North Lawn Elementary School in Neodesha, Kansas held its own a mini-Field Day. Part of the event involved assembling and testing AM radio kits. In this photograph, Ed Martin, KG0NK, assists a group of sixth-grade students.

Still active after all these years. From left to right, Bill, W4YWV; Bert, W4YWW; Bill W4YWY; and Gene, W4YWZ. All were licensed while students at Lanier High School in Macon, Georgia. (Notice the sequential suffixes!) They were recently reunited at their 45th class reunion.

An HO repeater? Or is it N gauge? When Matthew, N2RER, attended a model railroad exhibition in Nyack, New York, he was pleasantly surprised to find his call sign gracing a layout created by Dan, AA2FF.



Family heirloom. Bill, K4GXA, inherited this beautiful bug from his uncle, W8MCJ (SK). His uncle hand crafted the key in 1930 and it still works perfectly today.



Ham radio week at Chatham Middle School in Chatham, New Jersey. Under the guidance of science teacher and station trustee Joseph Reid, K2JAO, the students participated in the School Club Roundup and made contacts with the *Mir* space station. At school station WA2RGV (left) Jason Schaeffer finishes a contact as K2JAO supervises. Bryan McGookin (right) talks to another school radio club while Chris Berdos logs the contact.

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FT-2600M

HEAVY-DUTY VHF FM TRANSCEIVER

The FT-2600M is a deluxe, compact FM mobile transceiver providing high power output and outstanding receiver performance for the 144 MHz band. Included in the FT-2600M's feature complement are:

Features

- 60 Watts of power output, with selection of four power levels for every operating situation.
- Expanded receiver coverage: 134-174 MHz.
- Keyboard entry of operating frequencies from the microphone.
- Excellent protection from receiver intermodulation distortion, thanks to Yaesu's renowned Advanced Track Tuning front end.
- Outstanding packet radio capability at 1200 or 9600 bps with easy interface via a dedicated rear-panel jack.
- 175 memories which can store repeater shifts, odd repeater shifts, CTCSS/DCS tones, and 8-character Alpha-Numeric labels.
- Built-in CTCSS and DCS Encoder/Decoder circuits.
- The Smart Search™ feature automatically sweeps a band and loads active frequencies into a dedicated memory bank.
- The Yaesu-exclusive Omni-Glow™ multi-function LCD display.
- Yaesu's exclusive ARTS™ (Auto-Range Transponder System), which alerts the operator when an "out-of-range" condition exists with another ARTS™- equipped station. This feature is especially valuable during search-and-rescue operations with hand-held units.
- Extensive MENU system, which allows customization of a number of transceiver performance characteristics.
- Additional features include a transmit Time-Out-Timer (TOT), Automatic Power-Off (APO), Automatic Repeater Shift (ARS), plus provision for reduction of the TX deviation in areas of high channel congestion. And an all-new S-Meter Squelch circuit allows the owner to set the squelch to open at a programmable setting of the S-Meter, thus reducing guesswork in setting the squelch threshold.

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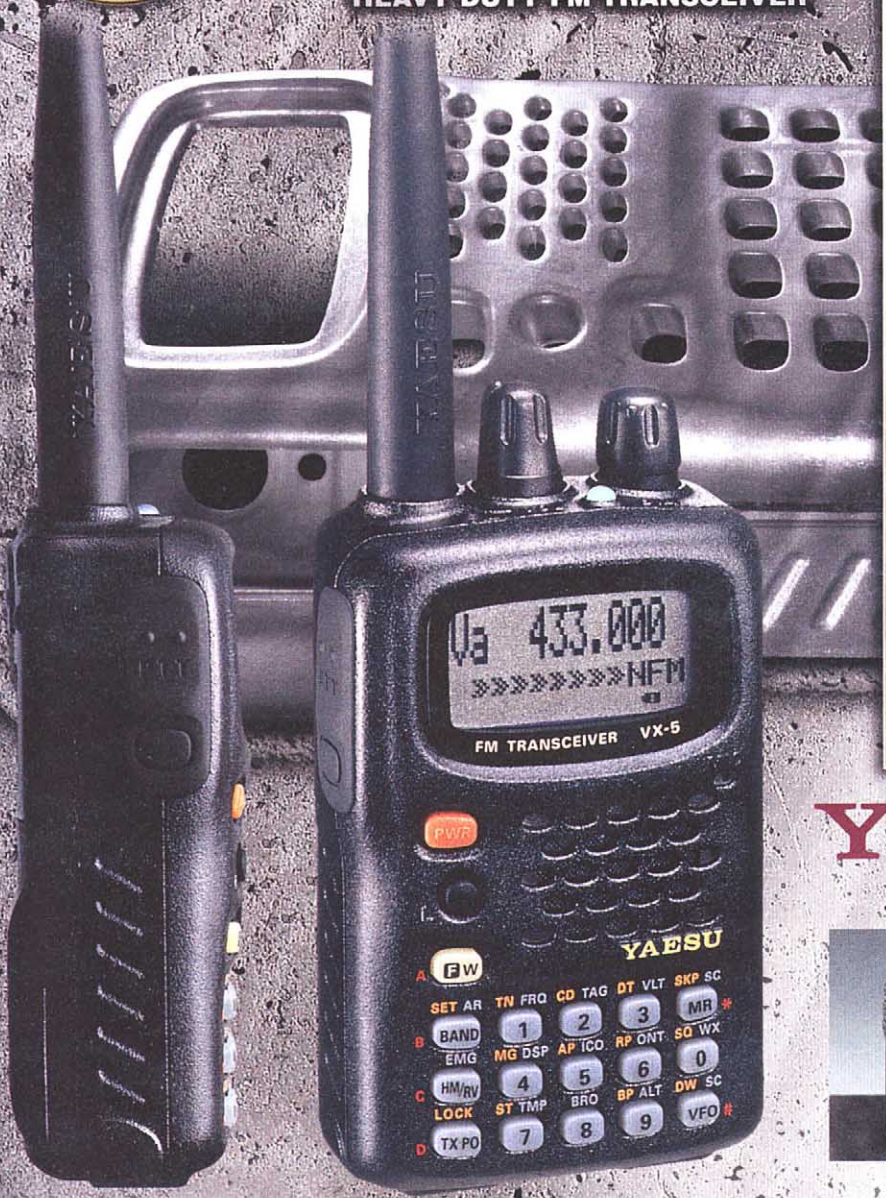
VX-5R

50/144/430 MHz TRIPLE-BAND HEAVY DUTY FM TRANSCEIVER



Actual Size 5 W Version

Features

- Frequency Coverage
  Wide Band Receive
  RX : 0.5-15.995 MHz 48-728.990 MHz
  800-998.990 MHz (Cellular Blocked)
  TX : 50-54 MHz 144-148 MHz
  430-450 MHz
- 5 W Power Output (430 MHz: 4.5 W)
- AM/Shortwave Receive
- AM Aircraft Receive
- Ultra Compact: 2.4" x 4.1" x 1.3"
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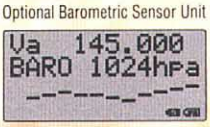

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- Versatile High-Speed Scanning
- 16-Digit 9-Memory DTMF Autodialer
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WORLD ABOVE 50 MHZ

♦ The March 1999 "World Above 50 MHz" column by Emil Pocock, W3EP/1, was the most informative and interesting piece I have read in any magazine on any subject—ever! The column just got better and better as I read along. Since I first received the issue I've gone back to it several times to retrieve more information from the "World Above 50 MHz."

Beginning with the introduction Emil's enthusiasm was infectious, and the amount of information to help the newcomer get started was superb. But there was also a lot of information useful to those of us who've been doing it for a bit longer. I found that I didn't know of several of the Web sites mentioned, even though I have been surfing the Web for VHF/UHF sites for a couple of years.

I could go on to list everything I found wonderful in the column, but I'd be rewriting the whole thing here. Congratulations on a job extremely well done, and keep up the good work. I know I speak for a lot of other grateful VHF, UHF and microwave oriented hams.—*Roger Rehr, W3SZ, Reading, Pennsylvania*

INTERNET AND AMATEUR RADIO COMPLEMENT EACH OTHER

♦ Several years ago, my nephew rescued a Heathkit HW-101 transceiver from a defunct high school radio club (an unfortunate message there). To my disappointment the manual and power supply cables were missing, and I knew that I would have some work to do before it would be on the air. Since I do my ham radio on a shoestring budget (in both time and dollars), I was nonetheless grateful for the start.

Gradually, I put together the pieces. I found a manual for $5 at the local hamfest, along with a homebrew power supply cable, slightly used coax, a $10 dummy load and a 10-meter dipole for the attic. I was ready to go.

I carefully worked through the alignment and tune-up procedure for the receiver. Okay so far. Was the transmitter's final amplifier still in working order? Yes! there was RF power indicated on my $20 SWR/power meter. I soon discovered, to my dismay, that there was no modulation in the SSB mode. Enter the Internet.

Having heard of the ham radio news groups on the Web, I decided to give one a try. I made a somewhat tentative posting to rec.radio.amateur.boatanchors. I described the symptom and simply asked for help. I was unsure whether anyone would find my problem interesting enough to answer. My lack of confidence was completely unfounded. In less than 24 hours I saw answers posted as replies for all of the readers of the news group to see. Six fellow hams also sent me personal e-mails with their experiences and suggestions!

Following the advice I had gathered, I replaced a couple of resistors and decided to try SSB on 10 meters. My first HF contact *ever* was a station in Vancouver! Then, "just so he could be my second contact," I got a call from a station in Washington. What a thrill (even at age 38)!

I suppose that I'm writing this note for a couple of reasons: perhaps for the consideration of those who say that the Internet will be the downfall of Amateur Radio; perhaps for those who say that the bands are full of malfeasance. I would like to submit that both the airwaves and the Internet are chock full of folks who enjoy helping a fellow ham get started. Maybe the Internet complements our wonderful Amateur Radio hobby rather than competing with it.—*Dan Zimmerman, KB8STT, Waukesha, Wisconsin*

@ARRL.NET

♦ I want to thank the League for its new Internet e-mail forwarding service. Ignoring the great feature that it lets me give out only one address no matter how often I change my ISP, it also lets people know that I am a ham and incidentally gives the League added publicity. Thanks for a great service.—*David Kaplan, WA1OUI, West Simsbury, Connecticut*

HEARTS AND RF

♦ I read with great interest the caption to the "Up Front" photograph on page 21 of April 1999 *QST* that described how 4X4MU had to have much of his station shielded to avoid dangerous RF interference to his implanted heart defibrillator.

In October 1996 I too had a defibrillator installed. It was a Medtronic 7221CX, otherwise known as a "Micro Jewel" (new that year!). Inside the "User Guide" were frightening warnings about all sorts of electromagnetic dangers. Do not sit near a microwave oven. Avoid cell phones, CB radio, large magnets, walkie-talkies and just about everything that produces a field of any kind.

I thought "Wow—there goes my ham radio operating!" However a Medtronic engineer was in attendance during my operation and afterward I expressed my concerns to him. I explained that at times I found it necessary to run my Alpha 87 amplifier at full legal power. Would its 1.5 kW output put me "out of business?" He said, "Let's wait until you are on the road to recovery and I will come out and make some tests."

About a month later (after running my FT-990 transceiver at about 20 W—as much as I dared) the engineer showed up with a trunk full of test equipment. We went to my shack where he proceeded to wire me like an astronaut. There were scopes, recorders and several strange devices, along with sensors attached to my skin. The engineer asked me to make transmissions on all bands (including VHF) at minimum power using SSB, CW, PACTOR and packet. Then he asked me to increase the power output in stages at each frequency until we reached the maximum legal power on the HF bands and my maximum power of 150 W on VHF. I was using a 4-element beam antenna on 20 meters, 13 elements on 2 meters and dipoles on the other bands. My operating chair is within 1 meter of my Alpha 87.

The scope traces from the sensors outside my body resembled the scratchings of a seismograph showing an earthquake of 7.5 on the Richter scale. However, the readout of the defibrillator showed nothing, zip, nada! The RF rejection capabilities of the device were great.

My doctor "interrogates" my implant every four months. It gives information as to the device's battery voltage, condition, past "events," and just about anything you would want to know (or not know!). Since that test by the engineer, I have been running my station at full output and the implant has yet to record a fault.

Well…there was one exception.

As my doctor read the graph in January 1997 he said, "My, my. We have an 'event' of nine rapid beats at 2010 hours on December 24, 1996. Were you operating your radio at that time?" After much recollection I realized exactly where I had been at that time. "I wasn't at the radio, doctor. I was sitting at a blackjack table at the Foxwoods Casino in Ledyard, Connecticut, riding the most incredible winning streak of my life!"

Of course, the experience I've had with my implant may not apply to all patients. But don't give up on ham radio without checking with your doctor and the implant manufacturer. Perhaps you will not have to go through all the precautions taken by 4X4MU and crew. You still may be able to operate as normal.—*Jack Schmock, W1DXQ, Quincy, Massachusetts*

WHERE THERE'S SMOKE...

♦ While the April *QST* article "The Smoketron" is interesting and informative, the author and his development group have made the mistake of narrowly focusing on the repair aspect of their technique, rather than upon the exciting possibilities that exist for enhancement of undamaged devices.

I have been pondering the latter aspect of the technology and have reached the following preliminary conclusions:

1. A wide variety of devices could be made to achieve better performance by adding extra smoke, using carefully regulated compressed air as an injection medium. For example, 486-based CPUs could be upgraded to Pentium-level performance via a modest smoke supplement. In the analog department, the gain-bandwidth product and power rating of operational amplifier ICs and discrete transistors could be greatly increased. Unfortunately, most software is already saturated with smoke and would not benefit.

2. Adaptation to special needs could also be achieved by the reverse process, ie, by letting out carefully controlled amounts of smoke rather than the full content, which is expelled in most accidental releases. The apparent degradation of performance that results could have positive aspects; for example, 10 meters in a radio that covers 80 through 10 meters could be sacrificed by limited smoke release so that the radio covers 160 through 15 meters. The process should be reversible, so smoke could be let out during sunspot minima and re-inserted during maxima when 10 meters is hot. Partial smoke release might also be handy for stabilizing amplifiers and for minimizing harmonic radiation.

3. Ultra-high concentrations of injected smoke could completely transform the function of some devices and lead to new applications. For example, dense smoke could convert ordinary logic families to "fuzzy" logic. Light-emitting diodes could become dark-emitting diodes (DEDs), with obvious applications in darkrooms and for light pollution control. The possibilities are endless.

Since my schedule does not permit me to pursue these ideas, I make a free gift of them to those in a better position to bring them to fruition and expand them. Who knows? Perhaps even improved lasers could result, thus bringing about a marriage of smoke and mirrors.—*Cliff Bader, W3NNL, West Chester, Pennsylvania*

♦ I always look forward to your April issue and your attempts to "suck us in" to some new concept or technology. "The Smoketron" certainly lived up to your long-established reputation for April chicanery. I have been a licensed amateur since 1957, a League member since 1961, an electrical engineer since 1963, and a League Life Member since 1978 and I can't remember when I enjoyed an article so much! I read "Gullible's Travels" in high school and look forward to future articles about bourbon enhancing the performance of LCDs and the announcement that Y2K is a new and exotic DXCC locale! Keep up the good work.—*Stephen R. Bird, W7SRB, Wickenburg, Arizona*

Y2K AND AMATEUR RADIO

♦ Thanks to Karl Anderson, W6JUA, and *QST* for publishing the first *intelligent* article I've seen about the Y2K problem in the nonprofessional press ("The Millenium Bug and Amateur Radio," April 1999 *QST*, page 56). The amount of misinformation, misunderstanding and resultant hysteria that exists among the uninitiated is mind-boggling.

I'd like to take the opportunity to add a few relevant comments that might help put things into better perspective:

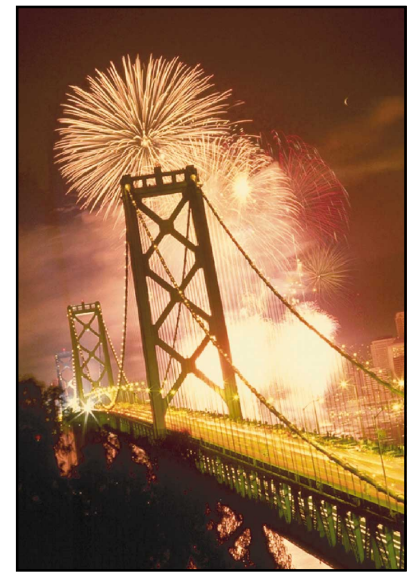
• Y2K is *not* a bug! The Y2K problem results from known and deliberate compromises made by programmers and their management in a time when memory and disk (or drum or tape) storage was very expensive and very limited. Frankly, no one could predict in the mid sixties that programs being written then would still be in service at the end of the century—the probability seemed extremely low.

• The doom-mongers and other unscrupulous people (including the leaders of some religious cults), individuals seeking to profit from mass hysteria and just plain fools are predicting dire consequences that cannot occur. It is extremely unlikely that your utilities will be shut off—unless you haven't paid your bills. You might, however, receive a January bill for 100 years of service. Your water will not be shut off unless the religious cultists are right and the Lord repeals the law of gravity. The most serious consequences of the Y2K problem are likely to be in the financial arena, and those can be resolved without loss of services.

• Most of the embedded controllers do not track year data. Devices such as sprinkler controllers and many others don't care what year it is; thermostats will continue to function normally, etc. Systems that track year data are largely in the control of entities such as governments and corporations. They do have problems, but these problems are being adequately addressed throughout most of the industrial world.

Finally, those folks who are using PCs and running any version of *Windows* (3.1, 95, 98), or most later versions of *DOS*, can set their operating system software to use the long date form (1999) and at least avoid the problem at the system level.—*Tom Geiger, W2KVA/6, Santa Maria, California* QST

This Month in Amateur Radio

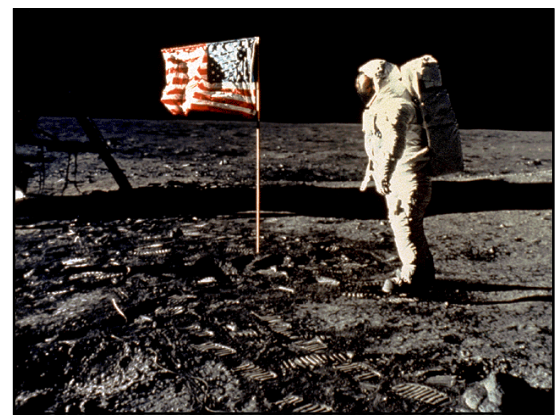


Start July with a bang! Fire up your radios for the **Canada Day** contest on July 1. "Contest Corral" in this issue has the details.

July 4, the American **Independence Day**, falls on a weekend this year. That should give you plenty of time to get together with friends and family—and to spend some time on the air! Between hamburgers, volleyball and fireworks listen for special-event stations such as N8GB, the Lake County Amateur Radio Association, celebrating on the air from Thompson, Ohio.

The **IARU HF World Championship** is the *numero uno* HF contest of the summer. You'd be surprised at how many DX stations you can work in just 24 hours, July 10 and 11. You might even get those last few contacts for your DXCC. See your April *QST* for more information. Digital contesters will be pounding their keyboards July 17 and 18 for the **North American RTTY QSO Party** sponsored by the *National Contest Journal*. Check the *NCJ* site on the Web at **http://www.waterw.com/~ncj/**.

July 20 is the **30th anniversary of the mankind's first steps on the Moon**. The Space Age Radio Society will be on the air from Beardstown, Illinois signing W3O from July 16 through July 24 to celebrate the historic Apollo 11 mission. Astronaut **Neil Armstrong** was the first person to actually touch the lunar surface and the Reservoir Amateur Radio Association will be operating K8QYL from his hometown of Wapakoneta, Ohio on July 18. See "Special Events" for complete information on both activities.



Apollo 11 astronauts Edwin Aldrin (shown here) and Neil Armstrong were the first humans on the Moon, 30 years ago this month.

If you're making your vacation plans, put the **Central Division Convention** in Indianapolis, Indiana and the **Midwest Division Convention** in Kansas City, Missouri on your itinerary. Both gatherings take place July 10. Not only is Montana a beautiful state, it's the home of the **Montana State Convention,** July 16 through 18 in East Glacier. Out in Arizona they'll be gathering in Flagstaff for the **Arizona State Convention** July 23 through 25. The **Pacific Northwest DX Convention** in Portland, Oregon nails down the last day two days of July and the first day of August. See "Coming Conventions."

Happy 15th birthday ARRL VEC! July 21st marks the 15th anniversary of the creation of the ARRL's Volunteer Examiner Coordinator operations. While the ARRL was not the very first VEC (the Anchorage Alaska ARC VEC was the first), the ARRL VEC has been the highest volume VEC overall—in most recent years accounting for the coordination of more than 66% of all examination elements administered. There are 14 VECs active in the VEC system today (see June 1999 *QST* "Exam Info" for a current VEC list).

The ARRL Headquarters VEC department celebrates 15 years of service in July. From left to right: Wayne Irwin, W1KI; Maria Somma; Bart Jahnke, W9JJ; Pete Warner; Nonie Madone; Lynne Anderson; and Ann Brinius.

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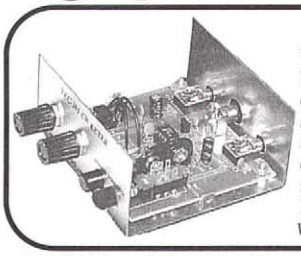

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VEC-201K, the best electronic keyer bargain in ham radio! Send beautiful sounding Morse Code. Self-completing dot-dashes and dot-dash memory forgive timing errors -- makes sending CW easy and accurate. Front panel volume/speed (3-65 wpm) controls. Weight adjusts 25-75%. Sidetone (300 -1000Hz) has LM386 audio amp for external speaker/phones. Select Iambic A or B, fully automatic or semi-auto "bug" mode. Tune mode for tuning rig. RF proof. Sleep Mode battery saver. Use 9V battery. 1¾x4x3½ in. *Simple skill level.*

VEC-201K shown in optional case (vinyl cover top not shown), VEC-201KC, $14.95

Aircraft Receiver Kit tunes entire voice aircraft band 118-136 MHz. Picks up air traffic 100 miles away. Track progress of incoming/outgoing traffic in your area, gain advanced weather information, and discover how the National Air Traffic System really works. Great way to learn about aviation. Use 9V battery. Drives external speaker/phones. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-131K, $29.95.**

20/30/40/80 Meter Receiver Kits give high performance! Covers entire band or tailor to cover desired portion. Copy CW/SSB/AM. NE602/ 612 mixer-oscillator, LM386 high gain audio amplifier. 1¾x4¾x5¼ in. *Moderate skill level.* Order **VEC-1120K** (20 Meters),**VEC-1130K**(30 Meters),**VEC-1140K** (40 Meters), **VEC-1180K** (80 Meters), **$29.95 ea.**

20/30/40/80 Meter QRP CW transmitter Kits have variable crystal oscillator tuning, front panel switch selects 1 of 2 crystals. 1 crystal included. Transmit and Receive switch. Connect receiver. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-1220K** (20 Meters), **VEC-1230K** (30 Meters), **VEC-1240K** (40 Meters), **VEC-1280K** (80 Meters), **$29.95 ea.**

Tunable SSB/CW Audio Filter Kit has sharp *four* pole peak and notch filters. Zero in with frequency control & adjust bandwidth for best response. Tune frequency from 300-3000 Hz. Notch is an outstanding 50 dB. 1 Watt amplifier. Speaker/Phone jacks. 12 VDC at 300 mA. 1¾x4¾x5¼ in. *Intermediate skill level.* Order **VEC-841K, $34.95.**

Vectronics Comprehensive Soldering Course **and Kit** is the best home study soldering course available! Includes theory, quizzes, PC board, tools, safety, techniques and materials. Get professional soldering skills and a fun blinking LED project. Gets you ready for "through-hole" PC board assembly and repair. *Simple skill level.* Order **VEC-1500K, $29.95.** *New!*

Super CW filter/amplifier Kit has powerful 1 watt audio amplifier to drive speaker. 8 poles active IC filtering uses cascaded low-Q stages. 3 bandwidths: 80,110, 180 Hz. Center frequency: 750 Hz. Up to 15 dB. Use 9-18VDC, 300 mA max. 1¾x4 x3½ in. *Simple skill level.* Order **VEC-821K, $29.95.**

Super SSB Audio Filter Kit improves readability with 8 poles, optimizes audio bandwidth, reduces SSB splatter, low, hi-pitched interference, hiss, static crashes, background noise. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-830K, $19.95.**

144/220/440 MHz Low-Noise Preamp Kits soup up your antenna system. Helps pull in weak signals. Works wonders for scanner or ham-band receiver. Gives great low-noise performance and immunity from damaging electrostatic discharge. 1x1½ in. *Simple skill level.* Order **VEC-1402K** (144 MHz),**VEC-1422K** (220 MHz), **VEC-1444K** (440 MHz), **$17.95.**

CW Memory Keyer Kit stores 512 characters in four 128 character non-volatile EEPROM message memories. *Carry on entire QSOs by just pressing memory message buttons.* True sinewave sidetone with soft rise and fall time eliminates harsh keyclicks. Has all features of VEC-201K CW Keyer Kit. 1¾x 6¾x5¼ in. *Simple skill level.* Order **VEC-221K, $69.95.**

High-performance 2 Meter Preamp Kit pulls weak signals out of noise. Solves three reception problems -- boosts signals using a 1-dB noise figure microwave transistor, provides razor-sharp bandpass filtering, eliminates unwanted electrical noises with built-in balun. Uses 9-14 volts DC. Tiny 1½x3x1 in. fits in any size box. *Intermediate skill level.* Order **VEC-1402DK, $59.95.**

2/6/10 Meter FM Receiver Kits let you tune into the world of ham radio. Catch all the action! Each covers the entire FM sub-band and runs off your 9 volt battery. Plug in speaker or headphones for loud clear reception. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-1002K** (2 Meters), **VEC-1006K** (6 Meters), **VEC-1010K** (10 Meters), **$34.95 each.**

2 Meter Monitor Kit receives 144-148 MHz. Low noise, high gain RF preamp gives you excellent 0.1 uV sensitivity. Air variable tuning capacitor has 8:1 reduction. Dual conversion superhet provides selectivity and stability. Automatically eliminates squelch tails. Built-in speaker, squelch, tone, volume controls. 19¼ in. telescopic whip. 9V battery. 2x4¼x4 in. *Intermediate skill level.* Order **VEC-104K, $79.95.**

5 Watt 2 Meter FM transmitter Kit lets you transmit voice and data -- AFSK data (up to 1200 baud) and FSK data (up to 9600 baud). Jumper select reactance or direct FM modulators. Reliable Motorola NBFM transmitter IC and PA transistor. Crystal controlled (x8 frequency multiplication). -60 dBc spurs and harmonics. Use 12-14 VDC, 1.5 amps. 5-pin DIN microphone jack. 1¾x4¾x5¼ in. *Difficult skill level.* Order **VEC-1202K, $99.95.**

Ni-Cad/Ni-MH Battery Charger Kit safely quick charges expensive batteries -- no overcharging -- many in less than an hour. HTs, cell phones, camcorders, lap top computers. Handles 1 to 12 cells. Charging status LEDs. Discharge before charge function reconditions batteries. Also removes memory effect. Runs on 12-15 VDC. 1¾x4¾x5¼ inches. *Moderate skill level.* Order **VEC-412K, $49.95.**

Shortwave Converter Kit converts AM or AM/FM radios to shortwave receivers at a push of a button. Choose two 1 MHz bands between 3 and 22 MHz. Popular 13, 16, 19, 25, 31, 41, 49 and 60 Meters international broadcast bands. On/off bypass, NE-602/612 mixer-oscillator IC and tuned input circuit. Use 9 V battery. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-101K, $27.95.**

Crystal radio set Kit lets you relive the experience of early radio pioneers. This baby really works! Wind your own inductor, wire up the earliest radio circuit without soldering a thing and listen to the magic of radio that needs no power. Put up an antenna, connect a ground. Stations come in amazingly loud and clear. Includes antenna wire, sensitive earphone. 1¾x5x6½ in. *Simple skill level.* Order **VEC-121K, $19.95.**

Shortwave Receiver Kit lets you listen to the world! Covers 75/80, 49, 40, 30, 31, 20, 25, 22, 19, 17, 16, 15 and 13 Meter bands. Explore AM, SSB, CW, WWV, RTTY and Packet signals. Vernier reduction drive, smooth regeneration control, RF stage. *Includes all metal cabinet.* 2 earphone jacks. Use 9V battery. 2½x7x6 in. *Intermediate skill level.* **VEC-102K, $59.95.**

QRP Transceiver Kits for 80/40/30/20 Meters

Great introduction to QRP, the hottest and fastest growing activities in ham radio. With this tiny *transceiver*, you'll discover what thousands of QRP enthusiasts already know -- you don't need a $1000 radio to get on the air and communicate worldwide. All it takes is some simple circuitry using less energy than a pen-light bulb! You get VXO frequency control, broad-banded transmitter circuitry, solid one Watt plus output, shaped keying, .3 uV sensitivity, direct conversion receiver. Includes crystal for popular QRP calling frequency. 1¾x4¾x5¼ in. *Intermediate skill level.* Order **VEC-1380K** (80 Meters), **VEC-1340K** (40 Meters), **VEC-1330K** (30 Meters), **VEC-1320K** (20 Meters) **$59.95 each.**

Super CW Audio Filter Kit gives you three bandwidths: 80, 110, 180 Hz. Eight poles gives super steep skirts with no ringing. Pull CW QSOs out of terrible QRM! Plugs into phone jack to drive phones. QRM down 60 dB one octave from center frequency (750 Hz) for 80 Hz bandwidth. Improves S/N ratio 15 dB. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-820K, $19.95.**

AM Radio Transmitter Kit lets you set up your own AM station and broadcast crystal clear programming from your studio with *you* as the disc jockey or talk show host. Play music from CD player, tape deck or other source. Choose clear frequency from 530-1750 KHz. Standard line level or microphone input. Easy CD, tape deck or mike mixers connect. Audio level adjustment. 1¾x4x3½ inches. *Simple skill level.* Order **VEC-1290K, $29.95.**

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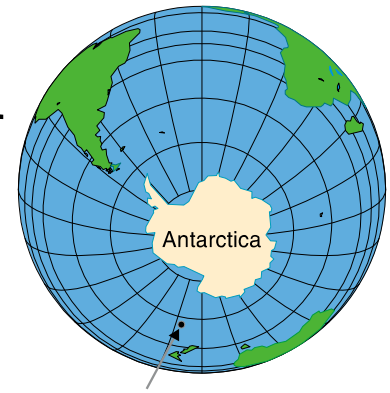
By Lee Jennings, ZL2AL

The ZL9CI DXpedition to Campbell Island



"Never again," I said to Ken, ZL2HU, as we departed the yacht *Evohe* in 1996 after the ZL8RI Kermadecs DXpedition. ZL8RI was exhilarating, but the voyage was very difficult. Fortunately, we both have short memories. Within two weeks I was after Ken to "do Campbell."

"I don't even want to think about it for three months," he replied. Three months later, his reply to the same question was "When?"

We both agreed on January of 1999 because it's summer holiday time in New Zealand. Campbell Island is at 52° south, with a sub-Antarctic climate. Getting there would be a problem, but getting a permit—Campbell Island is a nature reserve, protected and administered by the New Zealand Department of Conservation—would be harder.

Bureaucracy

The first hurdle was obtaining a permit. The Kermadec DX Association is well known by the New Zealand Department of Conservation (DoC). The agency knew we were interested only in Amateur Radio and that our track record in the Kermadecs was impeccable. DoC policy, however, states that because Campbell Island has a rich abundance of flora and fauna, any overnight tourists would impact the island's delicate environment. If the DoC let us "tourists" stay, a precedent would be set that would allow other groups to stay on Campbell Island.

Ken used every possible argument to persuade the DoC to grant us special dispensation. Numerous letters were exchanged, but at the end of the day it was activate Campbell Island with some loss of nighttime operations or don't activate it at all.

The Team

Compatible personalities and committed team members make for successful operations. The key is always going to the "right" people. We wanted team players who could also be responsible for specific areas of the DXpedition—and definitely no pessimists! The DX community is small, and it wasn't difficult to find 11 members out of nearly 100 excellent applicants.

Ken Holdom, ZL2HU, was project leader and administrator. I handled logistics. James Brooks, 9V1YC, managed radio operations. Declan Craig, EI6FR, and Andrew Williamson, GI0NWG, were in charge of antennas. Ken Holdom, ZL2HU, and Murray Woodfield, ZL1CN, were responsible for power distribution. Junichi Tanaka, JA4RHF, worked RTTY and 6 meters. Trey Garlough, N5KO, and Wilbert Knol, ZL2BSJ, wrangled computers and computer logs. Brian Biggings, VE3XA, was in charge of safety. Department of Conservation representative Jason Christiensen, ZL2URN, brought the team to 11.

Financing

Considering that most modern DXpeditions no longer run on shoestring budgets, our biggest problem was finding the right ship. The *Braveheart,* a 134-foot ex-

ALL PHOTOS BY LEE JENNINGS, ZL2AL

Japanese research vessel, was just about perfect. We lived aboard the ship, which is capable of a 9000-km journey at just under 10 knots, for a month.

The *Braveheart* was expensive, however, and each team member was required to put "money on the table" many months before departure to cover part of the trip's $90,000 budget.

Objectives

Most of the planning was outlined in a comprehensive operations manual that detailed every aspect of how the DXpedition would progress. I wrote a set of objectives to define our goals:

- Arrive on Campbell Island and be on the air with at least four stations within 36 daylight hours of arrival and to maintain six operational stations for the duration.
- Make more than 60,000 QSOs, with at least 30,000 on CW.
- Operate on 160 meters, 30, 17 and 12 meters, 6 meters and RTTY.
- Complete the DXpedition safely with no equipment failures, no accidents, no major medical problems and satisfy all DoC and ARRL DXCC requirements.
- Have fun and return home with a great sense of accomplishment and camaraderie.

Campbell Island

Campbell Island is about 1400 km south of Wellington. There are no regularly scheduled ship or aircraft services to the island. In fact, the original purpose of a weather station was superseded by an automated satellite weather service when the Campbell site was abandoned several years ago. We were forced to take everything—five tons of gear, 23,000 W of generator power and enough antennas to blanket the globe. We wanted ZL9CI to be easy to work.

Campbell Island is a nature reserve, and the flora and fauna are protected (for good reason). During the middle 1800s, Campbell, Macquarie, Auckland, Heard and other islands in the southern ocean had huge populations of sea lions, elephant seals and whales. Most of these species were decimated by whalers and sealers in past decades. In a single year, one whaling company based in Australia took 165,000 skins and 56 tons of seal and whale oil. It's difficult to imagine how the town of Perseverance Harbour, named after the ship that discovered it, looked in those days.

The ZL9CI site was located at Tucker Cove in Perseverance Harbour. The harbor is about 1 km wide by 4 km long. The weather can change from pleasant sunshine to a howling gale in an hour. Rain falls 325 days a year and winds of over 50 knots occur on more than 100 days each year.

The island is cold, wet, windswept, wild and strikingly beautiful. The rapid weather changes are remarkable—as we discovered on day three. The CW antenna site was situated south of the "technical" building (the old meteorological office), while the SSB antenna site was 200 meters to the north. Anyone traveling between the two sites was subject to the weather—whatever it was!

Voyage to Campbell

Ken, ZL2HU, offered to host the entire team at his Wellington home until departure on January 1st. Ken's wife Emily was extremely tolerant and a wonderful hostess. We then began loading five tons of equipment on the *Braveheart,* finishing just as the ship's crew was frantically making last-minute preparations and loading provisions.

Our many local helpers included Ron, ZL2TT; Chris, ZL2DX; Win, ZL2GI; Bob, ZL1RS; and others. The following night, many local hams stopped at Ken's house to wish us well.

Up early, some team members were showing the effects of New Year's Eve. The trip out of Wellington Harbor was magnificent. Our dolphin escorts were a good omen. Shipboard life quickly became routine, but we could feel the excitement building. A 20-meter dipole was hoisted into the rigging, and dinnertime saw us cruising east of the South Island and working local 2-meter repeaters in glorious weather with six-foot swells. Brian, VE3XA, kept track of our progress on his portable GPS receiver. January 2 was antenna day. Eight antennas were assembled on the rear deck of the ship thanks, in part, to excellent weather.

The *Braveheart* was stable, with a gentle pitch and roll. Seabirds, like miniature fighter aircraft, did runs at the boat looking for food in the ship's wash. A beautiful sunset appeared on the horizon as we left Stewart Island at the bottom of New Zealand.

As we changed course and headed southeast toward Campbell Island, the ocean swells immediately loomed larger. The boat rolled and pitched in protest. Then the weather began to deteriorate. Forty-knot winds howled across the rear deck, blowing froth off the top of the waves. It was quite uncomfortable.

Most team members went into hibernation down below in their bunks. The ship's pitch and roll aren't as extreme there. Few of us ate lunch. Dinner was a nonevent. Days turned into nights, but soon the Captain confirmed that we would reach the island well ahead of schedule.

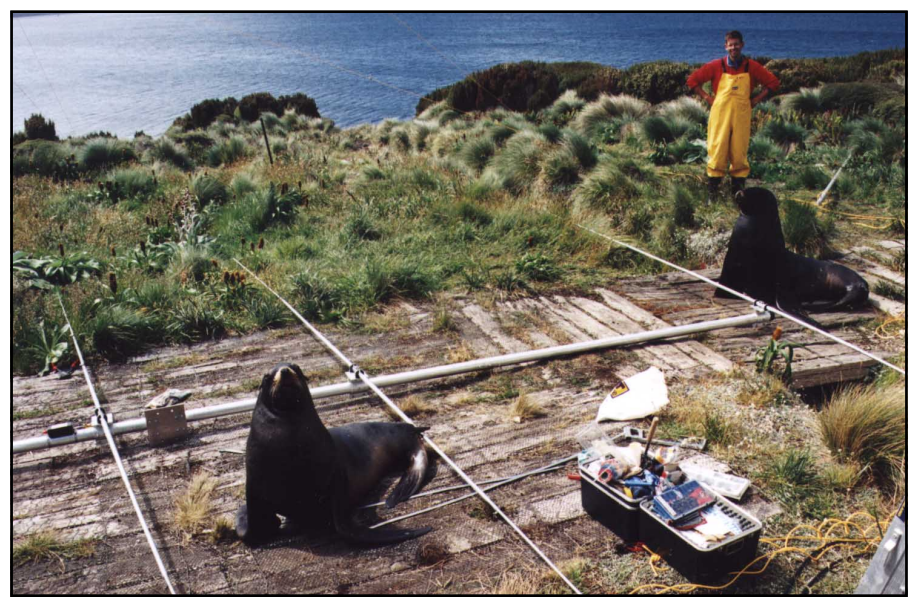
Arrival and Setup

On the evening of January 4, Campbell Island appeared on radar. Soon, it loomed out of the mist. We arrived at Perseverance Harbour at about 9 PM local—24 hours earlier than planned. Sea lions played around the boat while giant royal albatrosses cruised the cliffs above the bay. Everyone suddenly appeared on deck, having made miraculous recoveries!

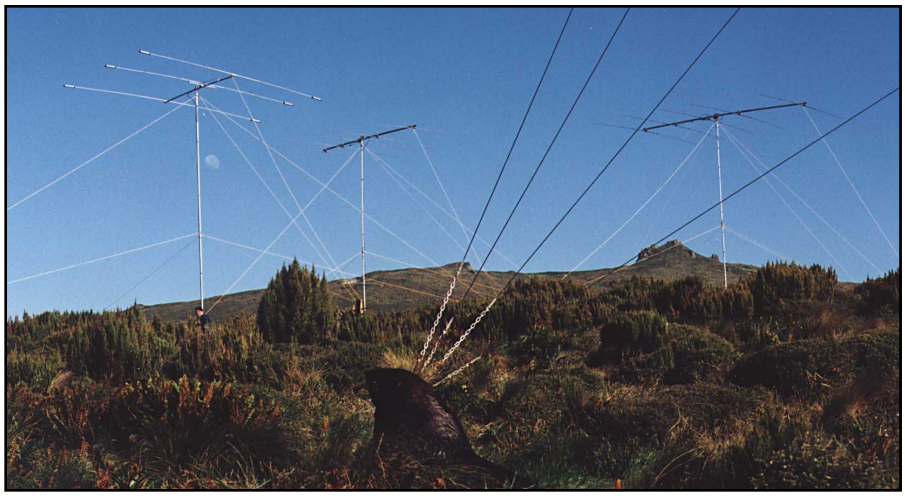
Congratulations were followed by a meeting with Nigel and the crew of the *Braveheart*. Crewmembers would help us move the equipment ashore at 4 AM. Antennas were the top priority. We could only pray that the weather would hold.

We got up the next morning at an early 3.30 AM and were heading to Campbell Island by 4 AM. After surveying the area we decided to set up the eight complete stations at the old Meteorological Office. Simultaneous CW and SSB operation on the same band was a priority, and Declan and Andrew decided to develop two antenna sites. The SSB antenna farm was "planted" north of the building, while the CW antennas were set up

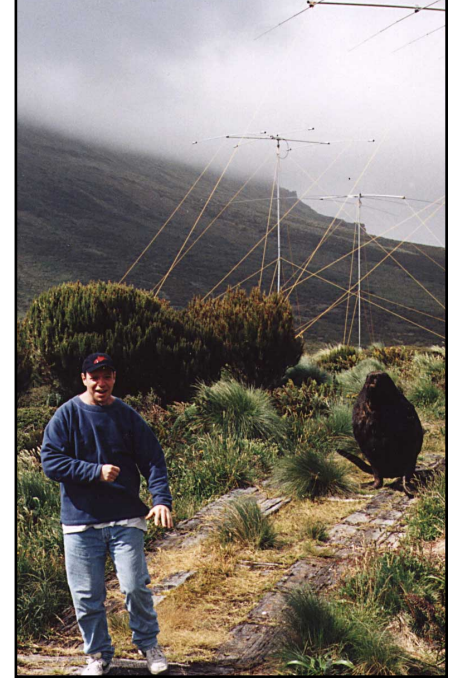
Jun, JH4RHF, wades through the pileups.



Seals and sea lions are everywhere on Campbell island! Two sea lions showed up to inspect our 15-meter Yagi as Wilbert, ZL2BSJ, looked on.



The ZL9CI SSB antenna field.



James, 9V1YC, is chased by an irritable male sea lion near the CW antenna field.

to the south—a separation of 200 meters.

The sea lions were incredibly inquisitive, very aggressive and quite territorial. As we landed they gathered around the wharf and foreshore, challenging us with loud grunts and aggressive posturing. Later, as we were assembling the 15- and 20-meter Yagis, two young male sea lions chased several team members around a small shed. The sea lions then reclaimed their territory which, unfortunately, was covered by two very large Yagis!

Chaos reigned as sea lions, guy wires, antenna elements, nuts, bolts, hand tools, coaxial cables and guy ropes all mixed up together. After much laughter and a lot of running, the sea lions departed. We maintained a safe distance and worked the rest of the day while looking over our shoulders.

After 14 hours without a break, both Nagara WARC antennas, the 20-meter Force 12 and several Cushcraft 10- 15- and 20-meter Yagis were in place. The 30-meter Gladiator vertical, an 80-meter vertical and a Battle-creek Special 80/160 antenna were installed the next morning.

The next day, again starting at 4 AM, we were busy setting up shacks and conducting antenna tests. We could hear hams from around the world talking about ZL9CI before we went on the air! Setting up the entire ZL9CI site took 29 hours—and the weather was perfect.

January 7 was consumed with last-minute preparations. The shack turned into a battle zone as James, our five star general, issued orders, answered questions and got last-minute checks completed.

ZL9CI's first QSO was completed with Don Henderson, N1DG, one of our two USA pilots. James called a team meeting before turning us loose on the world. "Have fun, guys," was all he said.

On the Air

What a blast! We hit the bands in style, making more than 11,000 QSOs in the first 24 hours. We opened with six stations operating on most bands to give everyone a good chance of working us. We were introduced to unpredictable weather when a late afternoon storm plunged the temperature and scoured the antennas with 70-knot gusts.

It's usually difficult to attribute good results to bad weather, but we somehow managed. Conditions became so bad that it was dangerous to move the team off the island and back to the *Braveheart.* We were forced to stay ashore for the night—much to the joy of 80- and 160-meter ops worldwide. Trey, N5KO, Declan, EI6FR, and Andrew, GI0NWG, were very popular on low band CW. One-sixty was brilliant all night, and Trey racked up 180 QSOs.

N1DG was the first on 15-meter SSB, with W6EA first on 15 CW. W4YV won the race on 80- *and* 40-meter CW. N6FF took top honors on 160-meter CW.

Many USA ops achieved a "Clean Sweep," working ZL9CI on all bands and modes. We were amazed at the number of QRP and mobile stations that got through the big pileups. In fact, "run rates" always seemed to be a bit better when we were working into the USA. The pileups were astonishing, though, with a solid wall of signals from Europe, North American or Japan depending on where our antennas were pointed.

The high QSO rate produced plenty of tired grins and high fives when the logs were merged the next morning. Each day, the logs were compressed, sent by a PACTOR II link, (equipment provided by Germany's SCS) to ZL2DX in New Zealand, who forwarded them to the QSL/log server. This was probably the first time that logs have been transferred by PACTOR from an ongoing DXpedition.

Individual CW team members were working more than 200 stations per hour on a regular basis. We put up a second 80-meter vertical so we could run 40, 80 and 160 at the same time. The CW setup simply hummed! Walking into the shack and looking at the *CT* screens scrolling by hour after hour was amazing. The totals grew rapidly, sometimes topping 6000 per day. After 2 days we had more than 20,000 QSOs in the log.

One of our objectives was to give everyone, in every country, that elusive "new one." Stations running 100 W to a trap vertical seemed to be able to work us as easily as the big guns. Europe was a priority, and we were glad that we could lay down a good signal into Europe most nights. The pileups were very well behaved, with plenty of patience and goodwill flowing both ways. Internet feedback from the pilots showed that we were right on the money with Europe.

January 13 was an excellent day. We hit 43,000 QSOs. Amazingly, the pileups were growing instead of diminishing. The 30, 17 and 12 meter bands were loaded with amateurs looking for a new one. Could things get any better?

Perhaps as an answer, on January 14, at 0430, somebody switched off the bands.

The Aurora Australis, sunspots or Murphy dealt us a hammer blow—and the exact cause didn't really matter. The bands were dead for 12 hours. Nothing—not even broadcast stations—were heard. We took a much-needed rest.

As soon as the ionosphere was once again cooperating, James cranked up on 40-meter SSB with fabulous results. The lower bands got more play as we moved closer to January 24, our planned "shutdown day." Unfortunately, with the exception of our first night weather emergency, the opportunity for all-night low-band operation never returned.

Our 6-meter beacon was heard in VK, and our first 6-meter QSO took place with VK2DN. The beacon operated chirped constantly every day while we listened for answers on 50.110 MHz. Jun worked many JAs and became an instant celebrity in Japan. We worked New Zealand, Australia and Japan but we were never able to contact American ops on that band.

Thirty meters was an outstanding CW band, yielding thousands of QSOs from early morning until we closed down.

Just after midnight, back on the *Braveheart*, we talked for an hour or so before we slowly disappeared below to catch some shuteye. The computer operations room was in the bow, next to the anchor

Table 1

ZL9CI DXpedition Statistics

	Band (meters)											
Region & Mode	*160*	*80*	*40*	*30*	*20*	*17*	*15*	*12*	*10*	*6*	*Total*	*(%)*
CW												
North America	265	612	1510	2011	3319	2160	5159	2278	3630	0	20944	(21.8)
South America	0	2	24	34	195	32	112	11	9	0	419	(0.4)
Europe	6	529	3589	5115	6846	524	1498	131	200	0	18438	(19.2)
Asia	101	487	1517	1551	1689	1499	2813	943	1006	44	11650	(12.1)
Africa	0	0	8	7	19	1	22	4	3	0	64	(0.1)
Oceania	50	68	76	104	126	71	149	44	56	17	761	(0.8)
SSB												
North America	0	381	1144	0	4734	1843	6846	2774	2233	0	19955	(20.8)
South America	0	5	17	0	331	66	165	15	9	0	608	(0.6)
Europe	0	194	769	0	6710	858	1437	132	201	0	10301	(10.7)
Asia	0	192	752	0	1327	1737	3097	786	742	0	8633	(9.0)
Africa	0	1	1	0	70	19	48	9	0	0	148	(0.2)
Oceania	2	133	109	2	686	223	348	53	103	33	1692	(1.8)
RTTY												
North America	0	0	0	0	791	0	448	0	0	0	1239	(1.3)
South America	0	0	0	0	24	0	8	0	0	0	32	(0.0)
Europe	0	0	0	0	602	0	1	0	0	0	603	(0.6)
Asia	0	0	0	0	103	0	366	0	0	0	469	(0.5)

locker, where we had a PACTOR terminal driving a small transceiver into a 40-meter dipole strung up in the rigging. A second laptop was used to write e-mail.

After six hours it was time for breakfast, which was usually subdued. Most of the ZL9CI ops needed another 10 hours of sleep, but the pileups were only a fast Zodiac trip away. We always knew what was in store for us.

On January 21 we passed the 81,000 QSO mark with four days left. By this time a numbing fog had overtaken most of the operators. They'd had enough. Imagine working the CQWW for weeks on end!

Return Home

On January 24 it was suddenly over. The end was swift and a bit sad, as it is with most DXpeditions. The ZL9CI team had achieved all of its objectives. Our New Zealand pilot Chris, ZL2DX, on 20 meters, had the pleasure of the last QSO.

We were worried about the weather, as the barometer had been dropping for 30 hours and *very* bad weather was on its way. There were some anxious moments as we lowered the big Yagis in the strong gusts that hit in the morning.

It took just nine hours to dismantle the antennas, eight stations and ancillary gear and get it back on board the *Braveheart*. Perhaps it was a measure of how much we wanted to get home. Lee had sent the last press release from Campbell Island a few hours before we left. The final logs, detailing 96,004 QSOs, were uploaded to the log server as we sailed out of Perseverance Harbour with a magnificent rain cloud sunset off the stern of the ship.

Support

Lyndon Nerenberg, VE7TCP, set up KDA, a private reflector (Internet bulletin board) for us. We probably couldn't have managed the details and solved the problems without it. We are deeply indebted to Lyndon. KDA has run for nearly two years.

We must also pay tribute to our webmaster and pilot Don, N1DG, and our other pilots: Ron Lago, AA7DX; Rob Cummings, GI0KOW; and Joe Aoki, JJ3PRT.

Special thanks must also go to Chris Hannagan, ZL2DX, who was the other end of the PACTOR link in New Zealand. Chris downloaded all our logs and forwarded our e-mail traffic to friends and family. In short—he kept us in touch with reality.

Bob Sutton, ZL1RS, built our 40-meter four-square array and researched the propagation possibilities for the DXpedition.

Support was also provided by ZL2TT, ZL2GI and other New Zealand amateurs. The help from these dedicated amateurs was incredible.

Midway into the operation we were informed by the ARRL that we were the recipients of the Colvin Award grant for 1999. Everyone at ZL9CI was extremely pleased. We were carrying on the DXpedition legacy of Lloyd and Iris Colvin, who gave so much to the amateur community in the many years they traveled the world giving out "new ones."

Our heartfelt thanks go to the ARRL and the members of the amateur community for supporting this DXpedition.

Statistics

The stats are impressive: Eleven operators from seven countries; Six stations operating 18 hours per day; 52,000+ CW QSOs; 41,000 SSB QSOs; Europe QSOs making up nearly a third of the totals. See Table 1.

We were surprised by the activity on 30 meters, where we netted just under 9000 QSOs, 10% of the total. Twenty was the "king" band, followed by 15. Ten and 12 meters never really "fired" for the long runs we had hoped for. The Magic Band supported 95 QSOs. We'd hoped for more activity on 6 meters, but radio propagation is still rocket science!

Equipment

Some equipment was provided by team members. The rest came from major and minor sponsors. The Yaesu radios operated flawlessly and were a delight to use in the pileups. We used three FT-1000MPs, one FT-1000, two FT-920s, one FT-990, two FT-900s and an FT-655. Cushcraft donated several new five-element XM-series antennas—which worked very well. Force 12 gave us a three-element 20-meter beam, which put out a nice signal, as did the Nagara WARC-band antennas and the Gladiator 30-meter vertical.

The team's Commander amplifiers performed perfectly and without failure. The new Yaesu VL-1000 solid-state amplifier showed us the future of high-power, solid-state DXpeditioning.

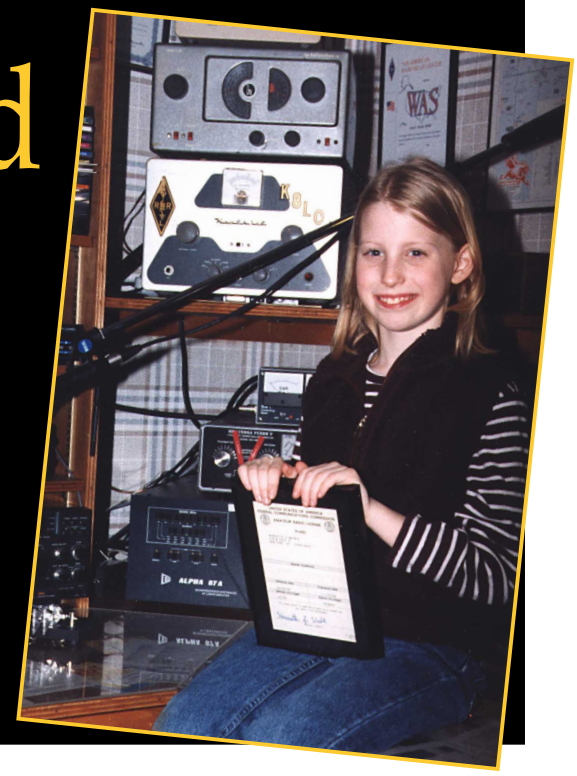
Other than one generator failure and a dose of "computer virus," luck was on our side. Luck favors the prepared, however, and DXpeditions are all about redundancy. It was a joy to have seven operational stations, with the option of setting up another, if necessary.

Acknowledgments

We are grateful to the international amateur community and our commercial sponsors for their fantastic support. Without their help, ZL9CI would not have happened. The wonderful e-mails inspired us to give as many amateurs as possible a chance to work Campbell Island. A DXpedition is a lot like a skyrocket. A lot of preparation precedes the launch. Anticipation focuses on what will happen when it explodes. It's spectacularly beautiful when it does—but only briefly, and then it's all over (until the next one). And so it was with ZL9CI.

By Brian Wruble, W3BW, and Zane Wruble, W1HIC

Help Your Child Earn a Ticket



What do you get when you mix a determined youngster, a patient father, ham radio and a few appropriately sized bribes? A 10-year-old Amateur Extra ham! Perhaps the strategies used in this father-daughter success story will work at your house...

"CQ, CQ, CQ, this is Whiskey One Hotel India Charlie Stroke Alfa Echo"—the voice of my daughter Zane was heard on 20 meters, just a few weeks after her 10th birthday. She had passed the Amateur Extra exam less than five months after receiving her no-code Technician license. I hope my experience with Zane will encourage you to introduce your kids to Amateur Radio.

One spring evening in 1998, my wife Kathleen, Zane, and I were having dinner at a neighborhood restaurant. Zane asked us if she could use some of *her* savings to buy a rare Beanie Baby for an outrageous price. In a moment of inspiration, I blurted out, "*I'll* buy it for you if you agree to get a ham radio license."

Negotiations ensued and a deal was struck—a no-code Technician ticket at an *unspecified time in the future* in exchange for the Princess Diana Bear—*immediately*. We finished dinner, walked to the nearest Beanie vendor, and the deed was done.

Generally, it's not a good idea to pay in advance of delivery. To my delight, though, Zane honored her commitment. Over the next 9½ months she managed to acquire not only the agreed upon Technician class license, but made it all the way to Extra, just five weeks after her 10th birthday.

The Beginning...

Zane began studying for the Novice written exam in early May. We used the ARRL's *Now You're Talking!*[1] and *Ham It Up!*[2], a computer program that produces simulated ham radio tests based on the publicly available pool of test questions. I also gave her one of ICOM's brightly colored band plan charts, the kind that are given away at various ham radio stores.[3] Candidates are required to know the operating privileges of each license class, and it really helps. Moreover, the chart constantly reminded Zane of the *additional privileges* she would gain at each upgrade. I found her walking around with the chart, making pronouncements about privileges General-class ops had that Technicians did not.

I soon discovered that whenever I lectured Zane on electronic theory, she developed a terrific interest in her socks. I concluded that she would learn most of the theory only after she became an active ham, so we focused on simply passing the test. For a child, this means learning some things, like Ohm's Law, but memorizing others.

Our study sessions started with the question pools at the back of the book, not with the text itself. The book provided a lot of devices that helped me present the material to Zane, however, and I devised a number of other ways to help her remember things.

For example, one question in the current Novice pool requires that candidates recognize the schematic symbol for an NPN transistor. Zane easily remembered that for the NPN, the arrow points away from the center, or *N*owhere.

The Technician exam asks which region of the ionosphere is mainly responsible for absorbing radio signals during the daytime. Zane remembered this as "the D region Dries out signals in Daytime."

I rarely tried to teach her anything more complicated than that, but I pointed out that a lot of the correct answers came down to courtesy, integrity, safety and common sense.

After covering all the sections, Zane began taking simulated exams that were randomly generated by the computer. I suggested that she take as many exams per night as time permitted, and that she keep a record of her scores.

There were days when she just didn't want to do it. Hard as it was, I tried to make myself say, "It's your decision." I usually had her take the exams by herself and then call me when it was time to review the wrong answers. Day after day, her test scores crept toward the passing zone, and then beyond. We shot for consistent scores by test day.

On the evening of June 15, I took Zane to her first VE session, hosted by the Columbia University Amateur Radio Club.[4] The exam was run with great competence, perfect integrity and a relaxed atmosphere. The VEs were led by Alan Crosswell, N2YGK, and included Bill Hindin, W2BH, Harry Xu, AA2NO, and John Kiernan, KE2UN.

Zane passed her Novice written exam at that session with a very respectable 34 out of 35. Studies resumed, and she passed the Technician written exam on September 21. Zane was issued KC2EDK on October 2,

[1]Notes appear on page 33.

and soon after had her first QSO, H-T to H-T, with me. The QSLs we exchanged are framed together and hang on the wall of our shack.

The return of W1HIC

As a special ego boost to Dad, Zane applied for a vanity call sign in early November. She was issued W1HIC, the call sign I held from 1974 until 1996. She began working local hams on 2 meters, and she also quickly worked hams in four states via satellite. The hobby was starting to hook her. We discussed learning Morse code. She negotiated a suitable bribe—a Spice Girls doll—and we began...

Learning the code turned out to be easier and more fun than either of us had expected. We used the "Koch Method," as described by David Finley, N1IRZ, on his Web site.[5] As he recommends, we used *Super Morse,* a readily available shareware program.[6] We set it to generate five-letter groups of random letters, and we started using only "K" and "M."

Initially, Zane could print only fast enough to practice at a word speed of 5 WPM, but we set the *character* speed to 18 WPM (the Farnsworth method). When she could had nearly perfect copy for five minutes, we added another letter (see the Web site for the order) for the next practice session.

We also used *Code Quick 2000*[7]*,* a program that teaches "sound-alikes" for the different characters. For example, instead of "di-dah" for "A," *Code Quick* teaches "say Ahhhh." For the first few weeks, Zane listened to *Code Quick* for about five minutes a night as it sent random code accompanied by a voice saying the "sound-alikes." I believe *Code Quick* speeded the process of learning, and Zane enjoyed it.

We followed a schedule intended to get Zane to 5 WPM over the three months between the September and December exam sessions. That left us 90 days to learn 43 characters. We also limited practice sessions to about 10 minutes a night, and frequently less.

Zane picked up Morse code very easily. She figured out that she could write faster using cursive, which she was then learning in school. This boosted her speed to 7 WPM (and improved her handwriting as well!).

After she had all 43 characters pretty well in hand, she started taking the realistic practice exams generated by another program, *Morse Academy.*[8] She took one 5-WPM sample exam each night.

I believe the closer you can come to simulating the actual test-taking experience, the more likely your child will pass. Even when her copy was nearly perfect, I gave her a written multiple-choice quiz after each run.

About a week before the CW exam, I asked Zane if she wanted to hear what 13 WPM sounded like. To our surprise, she copied 13 WPM nearly as well as 5. On December 21, she sat for the 13 WPM test, and she passed with solid copy for the first minute. Zane now had a Technician Plus and credit for 13 WPM. The world was about to open up for her, big-time!

Zane's World

Hi! Zane speaking.

Attention kids—don't be in a rush to get your Amateur Extra license. If you rush, you might fail the exams and take even more time. Don't bite off more than you can chew. If you don't think you can handle two exams in one session, don't try it. But keep studying. If you quit studying before a test, how are you going to pass it?

I was surprised when Alan asked me if I wanted to take the 20 WPM Morse code test. I didn't expect to pass it, especially since I hadn't practiced since December. But I passed. If the VEs give you a chance to take the 20, do it! You never know—you might pass, too.

I felt that this was a big accomplishment for me. You can do it, too, if you try. I'd like to have some kids to talk to on the air. You can probably find me on 20 meters.—*Zane, W1HIC*

Suddenly, Zane was pushing the pace. My focus was on getting her through the General, but she asked for a schedule that would have her attempt *both* the General and Advanced written exams in just one sitting–just 5 weeks away. Her ambitions for herself had gotten ahead of my aspirations. Our study materials became more extensive and the study sessions stretched to 30 minutes. We used the *ARRL License Manuals*[9] and the excellent *ARRL Advanced Class Video Course*.[10]

QSL via W3BW

We followed the same process as we had for earlier written elements, and on test night, January 25, she performed as the practice exams had predicted: She aced the General and passed the Advanced with one answer to spare.

Zane had jumped to W1HIC/AA in one evening!

The following weekend she called CQ on 20 meters and generated a pileup! I sat next to her helping with logging while she told the other ops to "QSL via W3BW!"

It was the most fun I've ever had as a ham—and I'm still processing QSLs.

The Last Hurdle

We were now in the home stretch. We laid out a study plan for attempting the Amateur Extra written exam on Presidents Day, February 15, only three weeks away, and—*the big scary hurdle*—the 20 WPM code test in June.

The studies proceeded relatively painlessly, again using the *ARRL License Manual*. We had figured out how Zane learned most efficiently. To no one's surprise, she passed. Then Alan dropped the bomb.

"Zane, why don't you try 20 WPM?"

Zane hadn't worked on her Morse code since December, and she had *never* tried to copy faster than 13 WPM. She was feeling pretty cocky, however, and put on the headphones. I looked on from the next room.

It appeared that Zane was writing *something*, but I couldn't imagine what it could be. This was a kid who could barely move her hand fast enough to copy at 13 WPM only two months earlier.

As it turned out, she had managed to write down the key items—call signs, names, cities, states, etc. She easily passed the multiple-choice questions and, looking elated, accepted her CSCE from an equally elated Alan. I got a huge hug (from Zane)—which was reward enough for me.

Epilogue

Some years back, I trained for and ran a number of marathons. I learned something that every marathoner knows—it looks impossible before you do it and merely difficult after it's done. This is how I view Zane's 300-day trip to Extra—difficult for both of us, but very achievable. As in training for a marathon, there are some rules to follow:

- Work *with* your child. Don't give your kid a book and walk away!
- Work *consistently*. Try to study no fewer than five days a week.
- Keep the sessions *short*. Twenty minutes per session seemed about right for a nine-year-old.
- *Tune in* to your kid's mood. There are days when a study session will be a bad idea. Skip those.
- *Experiment* with different study aids. Some will be more to your kid's liking than others.
- Tailor explanations to the child's age. They remember better than you do; let *memory* do the work.
- Schedule specific *milestones* and challenge your child to achieve them.
- Make it *fun*—for both of you.

You can contact the authors at 318 West 78th St, New York, NY 10024-6503; **bfw@bigfoot.com**.

Notes

[1]*Now You're Talking!*, available from the ARRL. See the ARRL Publications Bookcase in this issue, call 888-277-5289, or check the Web site at **http://www.arrl.org/**.

[2]*Ham It Up!,* The W5YI group, Dallas, TX

[3]ICOM "Amateur Radio Band Plan", ICOM America, Inc, Bellevue, WA

[4]**http://www.cc.columbia.edu/~alan/ham/cuarc-exams.html**

[5]**http://www.qsl.net/aarcc/finley_m.html** See also: **http://www.qsl.net/aarcc/finley_s.html**

[6]By M. Lee Murrah, WD5CID. See **http://www.murrah.com/sm/**

[7]**http://www.cq2k.com/cq2000.htm** or call 800-782-4869

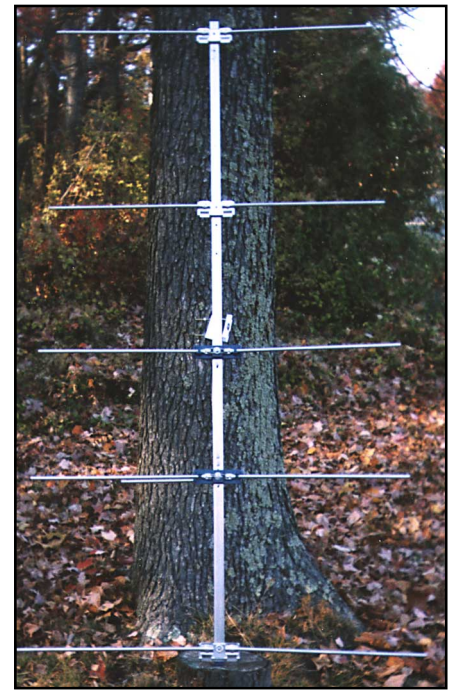
[8]Packaged with *Ham It Up!* (see note 2), or available at many sites on the Web. Try: **http://www.speroni.com/AH0A.html**

[9, 10]See the ARRL Publications Bookcase in this issue, call 888-277-5289, or check the Web site at **http://www.arrl.org/**.

By Ron Hege, K3PF

A Five-Element, 2-Meter Yagi for $20

This antenna is easy on your wallet and easy to build!



In a matter of a few hours, you can easily build a broadband, 2-meter Yagi—complete with mounting hardware—for $20. The antenna offers a gain of about 10 dB, is lightweight, mechanically strong and rivals the performance of similar commercial antennas.

The antenna's low cost is made possible by modifying a RadioShack FM broadcast receiving antenna (RS 15-2163). For $19.99, plus tax, you get a 70-inch-long by 1-inch-square boom, a set of six 3/8-inch-diameter elements, antenna-mounting hardware and two plastic end caps to seal the boom ends. In addition to RadioShack's antenna, you'll also need some nuts and bolts to remount elements, an 11-inch length of RG-8 (or similar) coax, an SO-239 connector and a 9×1-inch-long aluminum strip. This strip is cut into two pieces to fabricate a strap for the gamma match and a mount for the SO-239 connector. The thickness of the strip is not important as long as it can be bent easily and is strong enough to hold the SO-239 connector firmly in place. To close any unused holes and the tips of the elements, you'll need some noncorrosive sealant, such as RTV. Most amateurs I know have these items on hand. If you don't, you'll spend a few more dollars.

Element Relocation

Refer to the accompanying photo and Figures 1, 2, and 3. First, open all the antenna elements to their fully extended positions. Three of the elements are attached to plastic insulators and are tied together electrically with stiff, crossed, bare-aluminum wires. Each of these three elements looks like a dipole broken in the middle at the plastic insulators. One element measures about 58 inches from end to end, another about 56 inches and the third about 43 inches. You'll not need the 43-inch element.

Cut the wires next to the rivets on the 43-inch element. Drill out the rivet holding the element to the boom and discard the element. Use a screwdriver and pliers to release one wire from beneath one of the rivets on the 58-inch element. Try not to damage the rivet. Pull the wire out and away from the rivet. Go to the remaining wire on the 58-inch element; its opposite end attaches to another rivet on the 56-inch element. Unwind the end of the wire from beneath the rivet on the 56-inch element and pull it towards the 58-inch element. You now have a single wire on the 58-inch element with one loose end. Pull that wire straight across to the opposite rivet that no longer has a wire under it. Use pliers and whatever force is necessary to loop the wire around and under the rivet head as was the original wire. Seat the wire *fully* beneath the rivet head (see Figures 2 and 3). I was able to get the wire fully seated by pulling hard on the wire with my hand and squeezing the wire under the rivet head using the jaws of Vise Grip pliers. If you cannot get the wire fully wound and seated under the rivet, drill out the rivet and replace it with a bolt and nuts. *Do not* cut the wire off at the rivet. Pull the wire back toward the opposite rivet and cut it off leaving a pigtail about 1 1/2 inches long. You may want to reseat the rivet by hitting it with a hammer. Just be sure to back up the rivet's head with a hard object before striking the rivet's opposite end. Be careful not to damage the plastic insulator. You have now turned a two-piece element into a one-piece element, and this will be the driven element.

Drill a mounting hole in the boom (for the one-piece element) 17 inches away from the center of the adjacent 66-inch element (reflector). Remove the 58-inch element from its original location and mount it at the new position using a bolt, two washers and a nut. Place one washer directly against the plastic insulator under the wire that connects the two 3/8-inch-diameter tubing halves together. Position the other washer on top of the wire so it bears down on the wire when the bolt is tightened. This puts the center of the element at the same electrical potential as the boom. Using the 1 1/2-inch pigtail, bend it and place it between the two washers so there is a piece of wire on each side of the bolt. This prevents the washers from tilting and makes for a cleaner fit. Trim off any excess wire. (All of the foregoing is more difficult to describe than it is to perform! It doesn't take long to do once you understand what is going on.)

The next element (56 inches long; Director 1) is handled similarly to the preceding one. However, this element originally had *two* wires beneath each rivet head. One of those wires has already been removed. At the opposite rivet, unwind one of the two wires so that only one wire remains beneath each rivet. Pull one loose end of a wire straight across to the opposite rivet and force the wire into place under the rivet just as before. Pull the other loose wire end to its opposite rivet and force it into place. The two element halves should now be connected together with two wires. The wires will be parallel to each other and on opposite sides of the rivet that secures the element to the boom.

Next, drill a hole in the boom 13 inches from the center of the 58-inch element (DE). Remove the 56-inch element from (D1) its original location and mount it on the boom at the new hole. Again, place a

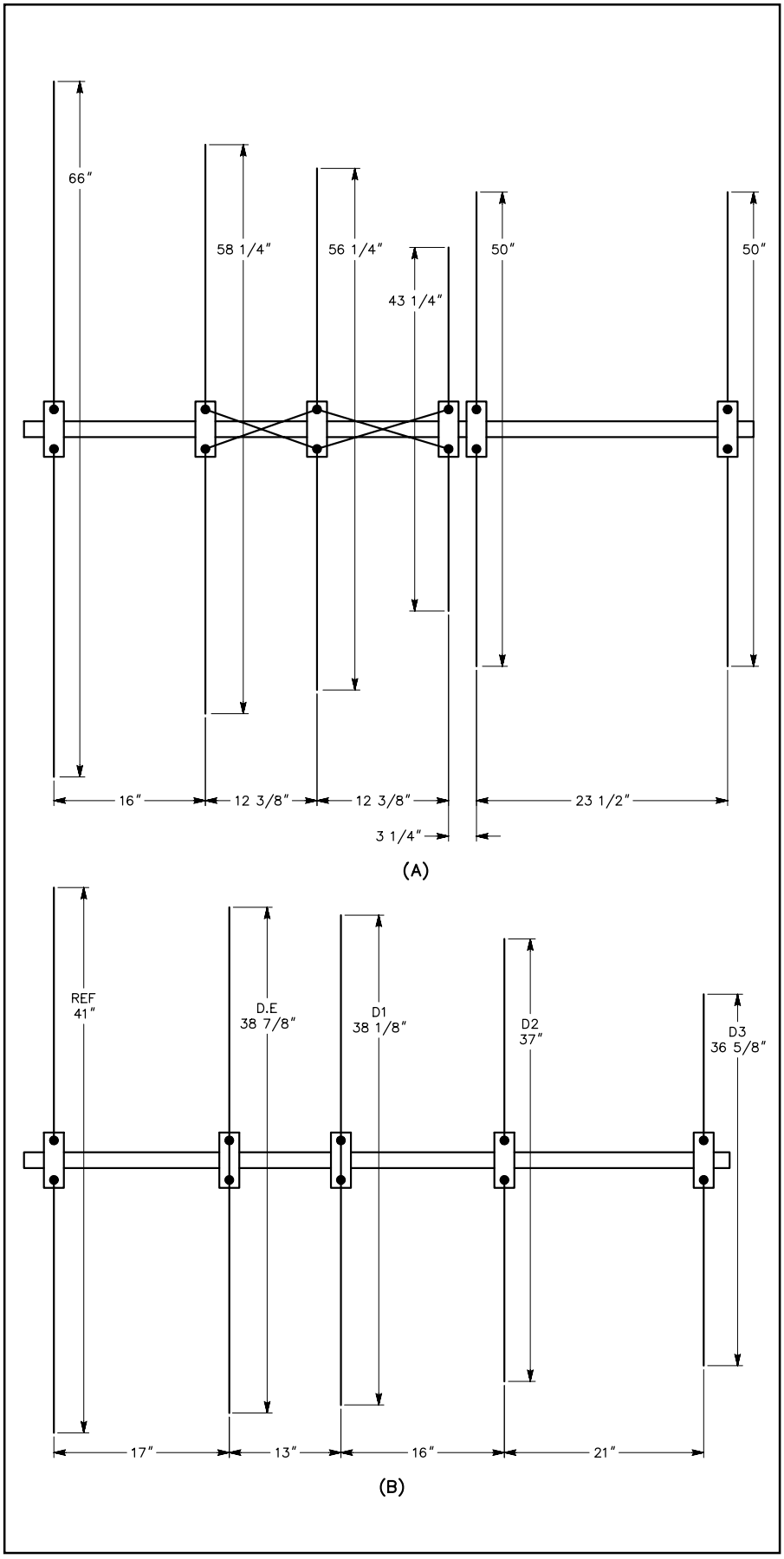


Figure 1—At A, the original configuration of the RadioShack FM receiving antenna. The element lengths and spacings at B are chosen for operation on 144 MHz. For operation on higher frequencies, shorten the elements even more; see text.

washer on opposite sides of the wires so that the washers squeeze against the wires as the bolt and nut tighten the element to the boom.

The remaining three elements (REF, D2 and D3) don't need to be modified; their individual dipole sections are already joined by metal plates. All you need to do is remove two of them from the boom, drill new mounting holes and mount them at their new locations. The first 50-inch element (D2) is placed 16 inches—(center to center)—from the adjacent 56-inch element. The end element (D3)—also 50 inches long—is placed 21 inches (center to center) from the new location of its adjacent 50-inch element. All of the elements are now in place ready to be cut to length for 2-meter operation.[1, 2]

Element Trimming

For this job, a fine-toothed saw works well. (Caution: During the following steps, be sure that you cut *half the total amount* from each half [ie, each side] of an element.) For operation at the low end of the band (144 MHz), cut the 66-inch element to a total length of 41 inches (see Figure 1B). This element becomes the reflector. Cut the next element in line (the driven element) to a length of $38\frac{7}{8}$ inches. Cut the next three elements (directors D1, D2 and D3) to lengths of $38\frac{1}{8}$, 37 and $36\frac{5}{8}$ inches, respectively. If you want to trim the elements for use at higher frequencies, cut $\frac{1}{4}$ inch off of each element for each 1-MHz frequency increase. For instance, cutting a total of $\frac{1}{2}$ inch from each element tunes and maximizes the antenna for 146 MHz. (Again, cut *half* the total amount from each half of an element section. For 146 MHz, the preceding example, that's $\frac{1}{4}$ inch from each half-element section.)

SO-239 Connector and Mount

Refer to Figures 4 and 5. Attach the SO-239 connector to the bottom of the boom beneath the driven element using an L-shaped piece of aluminum. Fabricate the bracket from a $3\frac{3}{8}$ inch length of aluminum cut from the 9×1 inch strip. Bend it at a right angle so that one side is about $1\frac{1}{4}$ inches long. Make the necessary holes to mount an SO-239 connector on the $1\frac{1}{4}$ inch long section and secure the connector to it. Fasten the bracket to the boom bottom using bolts and nuts, positioning the bracket so that the tip of the SO-239 center pin faces the reflector. Position the tip of the pin about $\frac{3}{16}$ to $\frac{1}{4}$ inch in front of the center of the driven element toward the director side.

Making the Gamma Match

Remove the outer insulation and braid from an 11-inch piece of RG-8 coax, leaving the center conductor and its insulation. Strip off $\frac{1}{2}$ inch of the insulation and solder the center conductor to the SO-239 pin. At the pin, bend the wire at a right angle so that

[1]Notes appear on page 37.

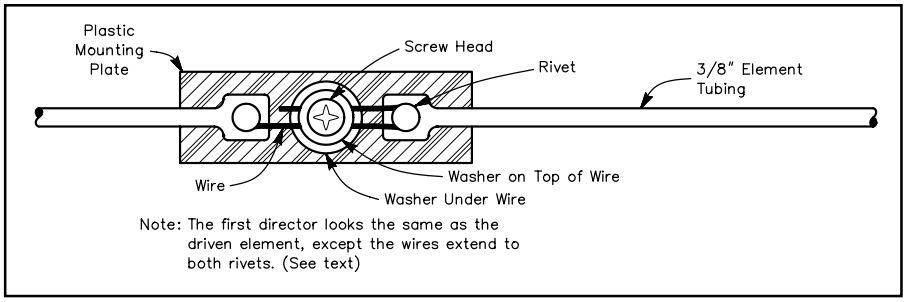


Figure 2—Drawing of the driven-element modification.

Figure 3—Here's the modified driven-element.

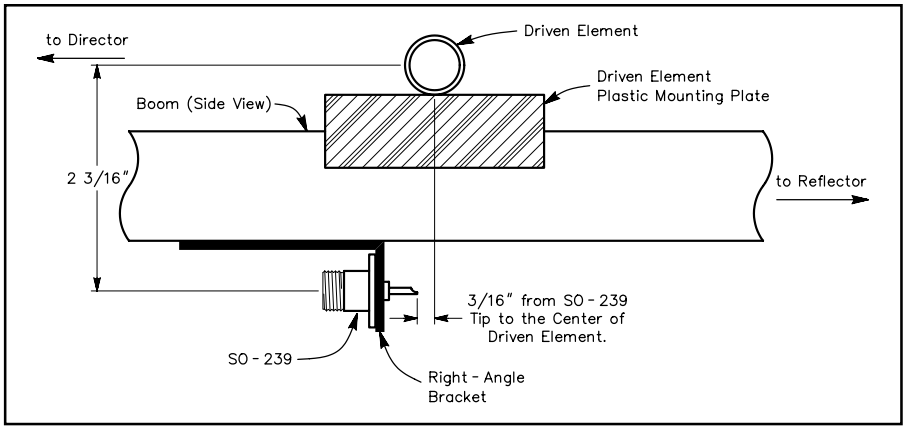


Figure 4—Side view of the driven-element area and SO-239 mounting bracket.

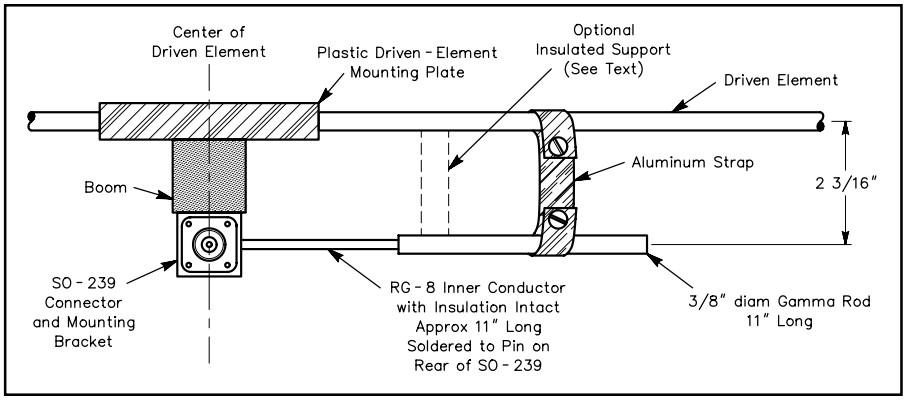


Figure 5—The 2-meter Yagi's gamma match. A piece of RG-8 coax and a length of tubing combine to create an inexpensive and rugged gamma-match capacitor.

the wire is parallel to and about $2^{3}/_{16}$ inches away from the driven element along its length (see Figure 5). This lead forms the inner plate of the gamma capacitor. Next, select a piece of the scrap $^{3}/_{8}$-inch tubing you cut from one of the antenna elements and cut it to a length of 11 inches. Slip this tubing over the RG-8 inner-conductor insulation to form the outer plate of the gamma capacitor. Position the tube seam so it faces the ground when the antenna is at its operating position; this allows moisture an easy way out. To complete the capacitor construction, wrap the remainder of the 1-inch aluminum strip around the driven element on one side and around the 11-inch tube on the other. Construct the strap so that the centers of the tubing sections are approximately $2^{3}/_{16}$ inches apart. Leave a tang on each side of the strap to accept a locking screw. Trim away any excess material.

Tuning the Gamma Match

Before applying RF to the antenna, connect an SWR meter to the SO-239 connector *at the antenna*, not at the transmitter end of your transmission line. This ensures that you are tuning *just the antenna*. For a quick adjustment of the matching network, you can try positioning the antenna straight up toward the sky, with the reflector sitting on the ground. Using this approach, however, I found that when I raised the antenna to a height of 10 feet on a metal mast, the gamma capacitor needed readjustment. If you're a perfectionist, it might ultimately be less work to tune the antenna while it's mounted in the clear a few wavelengths above ground or sitting at its intended operating position. If you're going to use a metal support mast, attach it to the antenna prior to tuning. Use a nonmetallic mast (wood, fiberglass, etc) if you're going to mount the Yagi vertically (so that the elements are in line with the mast); otherwise, antenna performance will suffer a bit. It's okay to use a metal mast when using horizontal polarization.

Reduce your transmitter's output power to about 1 or 2 W for safety use or, an antenna analyzer. Don't use more than a few watts—you don't need it. Set the transmitter frequency to that for which you cut the antenna. (Remember to ID your station during this adjustment period.) First, adjust the gamma strap (sliding it back and forth) on the driven element for the lowest SWR. Then slide the gamma tube (capacitor) back and forth within the strap for lowest SWR reading. You should be able to get a match by alternately making adjustments to the strap and gamma tube. I was able to tune my antenna to a 1:1 match. (An SWR of 1.5:1 or less is acceptable.) Recheck the SWR reading after finally tightening the strap to be certain that everything is still okay. Check by eye to ensure the gamma-capacitor tube is parallel with the driven element from one end to the other. It doesn't matter if the gamma-capacitor tube is slightly in front of or behind the driven element, but it should be parallel to it.

Performance

I don't have the proper equipment for making antenna-gain measurements. However, I made a crude comparison of the Yagi to a dipole using the following approach: First, I erected a 2-meter dipole on a 10-foot-long metal mast and adjusted the antenna for a 1:1 SWR. While feeding the dipole with a few milliwatts, I placed my H-T about 75 feet away from the dipole. The S meter reading on the H-T went full scale, so I removed the antenna from the H-T. The reading was *still* full scale. I then wrapped the H-T case with a shield of aluminum foil and the S meter reading dropped to S3. After that, I never touched or moved the H-T throughout the rest of the test. I rotated the dipole 90 degrees and, as

Figure 6—The gamma match and driven element.

expected, I got a zero reading on the H-T's S meter. I then turned the dipole back to its original position and rechecked the S meter. Again, it read S3. I used this reading as the dipole reference. Then, removing he dipole, I replaced it with the Yagi. I pointed the Yagi directly at the H-T and fed it with the same power level used to feed the dipole. The S meter read full scale on my H-T! Because S meters are notoriously inaccurate and not calibrated, I have no way of knowing how much gain that indicates, but it's a lot! (A five-element Yagi on a boom this long is capable of producing a gain of about 10 dB.[2]) When I turned the Yagi so that its reflector faced the H-T, the meter reading dropped to S4. That's a nice front-to-back ratio![3] I also checked radiation off the sides of the antenna. I was pleased to see an S0 meter reading from each side. [*The ARRL Lab modeled Ron's Yagi using* YO *software and verified his claims*.—Ed]

Summary and Acknowledgment

After I finished my project, I decided that it might be a good idea to make sure that the gamma match worked okay when the elements were cut for 146 MHz because many readers might want to use the antenna for working distant FM repeaters. I sawed off 1/2 inch from each element and went through the tuning procedure again. I was still able to get a 1:1 match. Those wishing to use the antenna for FM repeater work should orient the antenna elements vertically.

I wondered what effect moisture would have on the gamma capacitor. So, I poured water into one end of the gamma tube until it came out the other end. I rechecked the SWR and I found only a barely noticeable effect. I recommend you plug the ends of the tube with a dab of RTV or other noncorrosive sealant to keep out dirt and insects.

The driven element holding the gamma match will not fold for portable use if the bracket holding the SO-239 connector is bolted to the boom. One simple solution is to remove the bolts holding the bracket. Removal and replacement is made easier if you use wing nuts on the bolts. An optional, second support for the gamma-capacitor tube, made from nonmetallic material, provides better support for the tube during transportation.

My thanks to Larry, K3PEG, for instructing me about this type of gamma match fabrication.

If you're looking for a good 2-meter antenna, try this one! It's inexpensive, easy to tune and is the simplest construction approach I've seen for quickly "homebrewing" a 2-meter Yagi.

Notes

[1]The element lengths and spacing dimensions for this antenna are taken from page 631 of The 1974 *ARRL Handbook*.

[2]See also Edward P. Tilton, W1HDQ, *The Radio Amateur's VHF Manual* (Newington: ARRL, 1972), third edition, p 155, Figure 8-4.

[3]Using *YA* and assuming 1/4-inch-diameter elements with no tapering, modeling the 1974 *Handbook* antenna shows a gain of about 10 dBi and a 9-dB F/B ratio.–*Zack Lau, W1RF*

Ron Hege, K3PF, has been a radio amateur since he got his Novice ticket in 1968. The following year, he took and passed the General and Advanced class exams, then holding the call sign WA3JFX. In June 1998, Ron got his Extra class ticket, held the call sign K3OR for about one month, then opted for his present call sign, K3PF. Ron worked as an aircraft electrician in the US Air Force and at Martin Marietta Corp. He has a BS in management/leadership from Johns Hopkins University. Ron is retired from his position as supervisor of electronic technicians at the Westinghouse Engineering Research and Development Labs. You can contact Ron at 3425 Taylor Ave, Baltimore, MD 21234; **heger@erols.com**.

All photos by the author.

Strays

QST Congratulates W9NEZ

◊ Geoffrey N. Mendenhall, W9NEZ, received the National Association of Broadcasters 1999 Radio Engineering Achievement Award on April 21st at the annual NAB convention in Las Vegas.

Geoff is Vice President for Advanced Product Development at the Harris Broadcast Systems Division. He has spent over 30 years working in the broadcasting industry where his technical contributions and passion for higher audio quality have made him one of the best known experts on FM transmission.

Geoff has been a licensed Amateur Radio operator for over 38 years and gives much of the credit for his career in broadcast equipment design to Clyde May, W3NDO, his ham radio mentor, and to early experiences designing and building his own ham radio equipment. He has had amateur call signs K3VLN, W9NEZ, and has also operated from the Cayman Islands as ZF2CQ. Geoff's wife Nike, N9FHW, and daughter Merideth, N9YQC, also enjoy Amateur Radio.

Next Stray

New Products

TRIPP LITE *SUPER 10* SERIES SURGE SUPPRESSORS

◊ Tripp Lite announces the addition of three new models of ac power strips offering a variety of surge suppression capabilities for connected electronic devices. All *Super 10* models include a 10-foot cord with a space-saving right angle plug, 10 ac outlets with built-in safety covers and a 2-line RJ11 phone/modem/fax surge protector. Three diagnostic LEDs indicate incoming power problems, such as faulty receptacle wiring.

The *Super 10 DBS* also includes 2 sets of gold-plated F connectors for providing surge protection for cable fed audio and video home electronics equipment. This model has a fourth diagnostic LED that will reveal low voltage conditions that can damage connected equipment.

The *Super 10 Deluxe* carries a surge current rating of 103,500 joules and a surge energy rating of 2,800 joules. The *Super 10* is rated at 97,000 joules surge current and 2,300 joules surge energy. The *Super 10 DBS* is rated at 97,000 joules surge current and 2,100 joules energy. These protectors are backed by $50,000 lifetime insurance coverage for connected equipment against surge damage—even lightning strikes.

Suggested retail price: *Super 10* and *Super 10 DBS*, $79.95; *Super 10 Deluxe*, $99.95. Additional information, including a list of Tripp Lite's sales offices and authorized dealers can be found by calling Customer Support at 773-869-1234 or by visiting their Web site **http://www.tripplite.com/**. Tripp Lite Power Protection, 111 W 35th St, Chicago, IL 60609; tel 773-869-1111; fax 773-869-1329.

Next New Product

By Sam Ulbing, N4UAU

Surface Mount Technology —You *Can* Work with It!

Part 4—This month, we wrap up the series. Before we do, though, here's that project I mentioned last month…

The first three parts of this article[22] have described rather easy-to-build projects. This one is a bit more complex. If you like to experiment, you have the opportunity to tailor this project to your specific needs and optimize its operation. Build it for a loved one and impress them with your skills! If you spend as much time working on electronic projects as I do, that loved one might appreciate a little project like this made just for them!

Project 4—The Hourglass 10-Minute Timer

This month's project is a modernized version of "A Simple 10-Minute ID Timer," that appears in *The ARRL Handbook*.[23] You can use the Hourglass as an egg timer, or to remind you to move the sprinkler, or put the laundry in the dryer, or as a two-hour timer to remind your teenager it's time to get off the telephone! You start the timer by *turning it upside down*, just like a sand hourglass! As you'll see, the operations of the old and new circuits are similar, but not exactly the same.

The Old-Technology Circuit

The *Handbook* circuit (Figure 15) is specified for use with a 12 V supply, which could limit its portability and application. LM555 timer U1 is set up for a short duty cycle: 1 second *on* and 59 seconds *off*. Pin 3 of the 4017 counter, U2, triggers after 10 cycles, increasing the time delay to 600 seconds. The alarm sounds, the circuit resets and starts counting again. Ten minutes is about the maximum practical time delay of this circuit.

The New-Technology Circuit

Surface-mount technology allows us to build this month's project (including its power supply) on a board that fits inside a 35-mm film canister (see Figure 16), so it's completely portable.[24] The low voltage and current demands of the ICs allow powering the circuit with a 3-V lithium battery.

Refer to Figure 17. An RC controlled timer, U1, is routed to a counter, U2, to extend the time base to 10 minutes. When

[22]Notes appear on page 41.

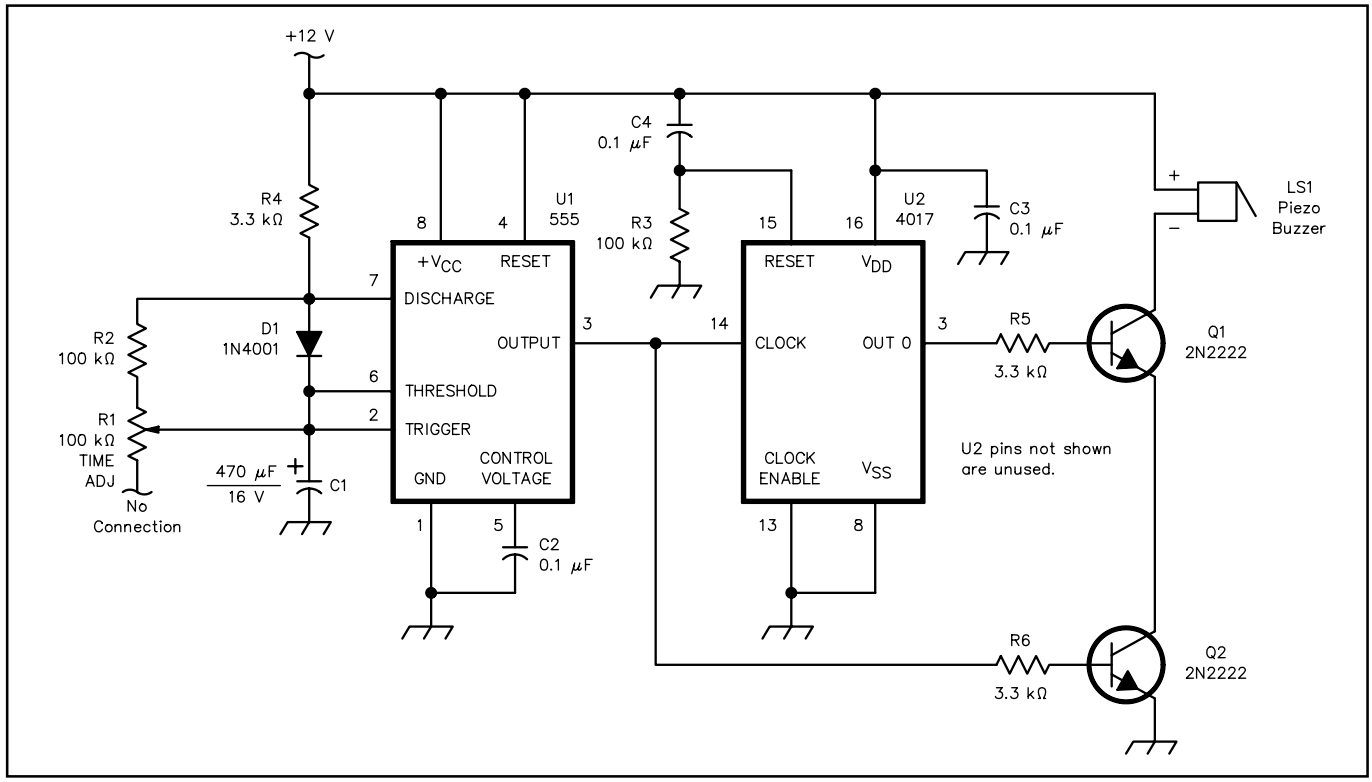


Figure 15—Schematic of the older 10-minute timer. Unless otherwise specified, resistors are 1/4 W, 5% tolerance carbon-composition or film units. Equivalent parts can be substituted.

PHOTO BY LODER BROOKS, KD4AKW

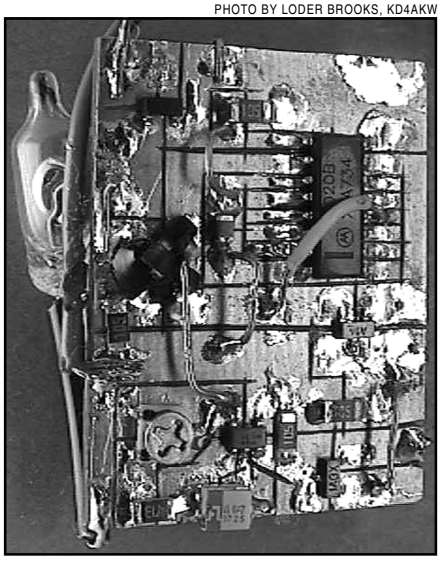


Figure 16—A top view of the SM version of the timer described in the text. The 3-V battery that powers the circuit is mounted on the bottom side of the board.

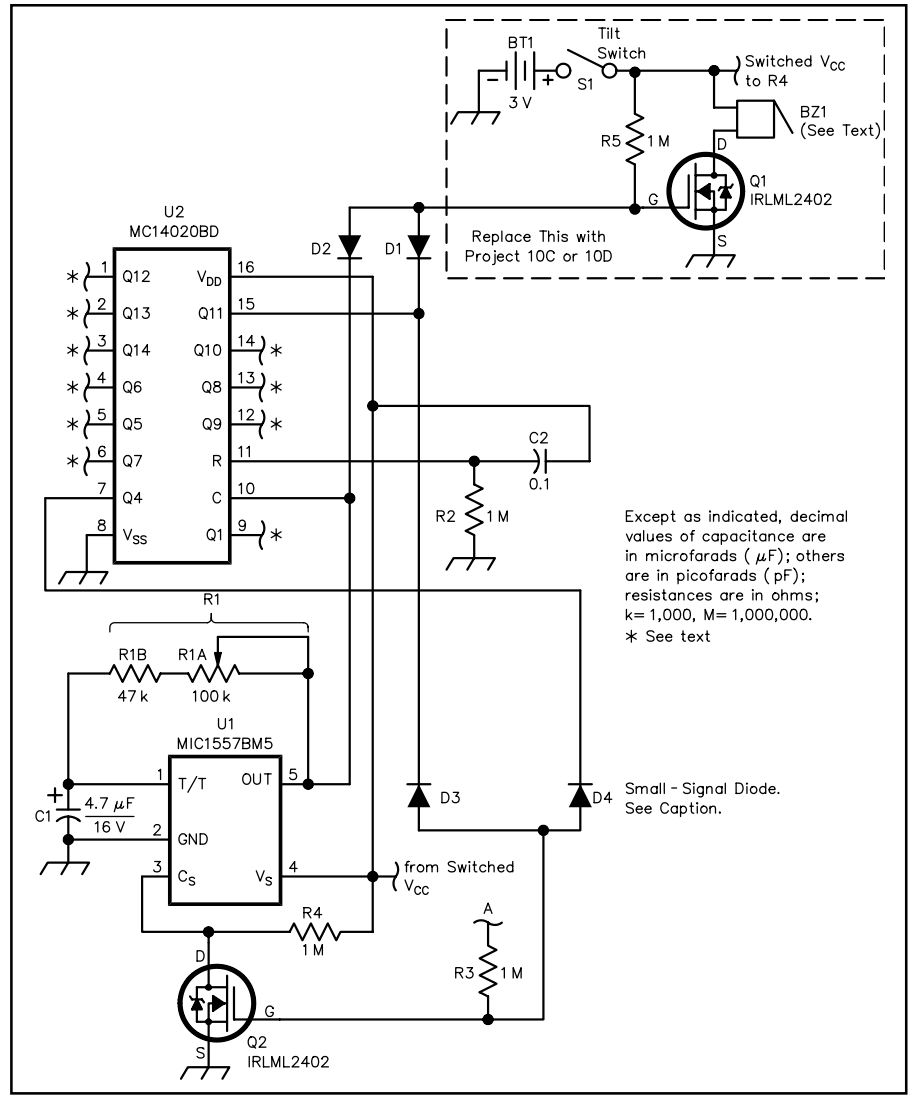


Figure 17—Schematic of the SM "hourglass" 10-minute timer. A 3-V lithium battery powers the circuit. The section of the circuit enclosed in dashed lines can be replaced by either of the circuits shown in Figures 18A and 18B. Unless otherwise specified, resistors are 5% tolerance SM units. The resistors I used are SM devices in 1206 cases. Equivalent parts can be substituted. See the sidebar "Manufacturers and Distributors of SMT Equipment and Parts," in Part 1, *QST*, May 1999, for a list of suppliers.

BT1—3-V, lithium CR2032, etc.
BZ1—Piezo buzzer (see text)
C1—4.7 µF, 16 V tantalum.
C2—0.1 µF ceramic (I used a SM device in a 0805 case).
D1/D2, D3/D4—BAW56LT1 (common-anode diode pairs in an SOT23 case); pairs of 1N914 or 1N4148 diodes can be substituted.
Q1, Q2—IRLML2402 MOSFET
R1A—100-kΩ pot (Bourns 3364W)
SW1—Encapsulated tilt switch (available from author)
U1—MIC1557BM5, Micrel IttyBitty RC timer/oscillator
U2—MC14020BD, 14-bit binary counter
Misc: Battery holder, Keystone #3002.

the 10 minute limit is reached, the appropriate pin on U2 goes high, turning on a switch, Q1, which sets off an alarm.

U1 of Figure 17 is an MIC1557. Dubbed the "IttyBitty RC Timer" by the manufacturer,[25] it's an SOT-23 version of the 555. R1 and C1 set the cycle time. (R1 is composed of a pot, R1A, and a fixed-value resistor, R1B.) I use a 50%-duty-cycle timer because it requires fewer parts than an asymmetrical-duty-cycle timer. I selected a cycle time of about one second because the data sheets for the LM555 and the MIC1557 indicate that capacitor leakage affects the accuracy of periods longer than 10 seconds. With just a one-second cycle time, it's necessary to use a longer delay in U2, so I added an MC14020, a 14-bit binary counter that can count up to 16,384. By using a count of 1024—and adjusting the values of R1 and C1—I achieved an accurate 10-minute delay.

This flexible circuit can be modified for longer or shorter delays, from as little as a few seconds to as long as 24 hours! (See **Experimenting with the Timer** later.) I had a difficult time finding counters in SM packages, and as you can see in the photo, the chip is "huge." (Perhaps this indicates there's a better way to handle delay circuits with SMT.)

The output at pin 15 of U2 triggers Q1 through D1. Q1 is not just any MOSFET—the IRLML2402 is a state-of-the-art device. Its gate turn-on voltage is only 1.5 V, and at 3 V, the MOSFET is fully on. (Not too many years ago, MOSFETs required 10 or 12 V to turn on. Most logic-level MOSFETs today still require 5 V, which makes them useless in a 3-V supply project.) Although the IRLML2402 is packaged in a Micro 3 package (which is smaller than an SOT-23 package), its *on* resistance is only 0.25 Ω and it can switch current levels up to 1 A.

You might ask, "Why not use a bipolar transistor instead of a MOSFET?" There are several reasons. Transistors require bias current, MOSFETs do not. A small transistor with a 30 mA load develops a 300 mV drop. The MOSFET has only a 4 mV drop, an important consideration when the supply voltage is only 3 V.[26] Also, a MOSFET can be used as a comparator. At levels less than 1 V (for this device), the MOSFET is *off*, and for levels above 1.5 V, it is *on*.

I wanted to use an **AND** condition to sound the buzzer, BZ1. D2 connects the gate of Q1 to the output of U1. This arrangement turns on the buzzer only when U2 pin 15 is positive *and* pin 5 of U1 is positive. Because the level at U1 pin 5 changes at about one cycle per second, the result is a pulsating buzzer that is more noticeable and uses less power than a continuously sounding buzzer. Another reason I could not use a transistor at Q1 is because the voltage drops of D1 and D2 result in a low voltage level of 0.6 V at Q1; that is too high to turn off a transistor.

With a battery-powered device, I didn't want the timer to cycle continually; that would deplete the battery if I forgot to shut

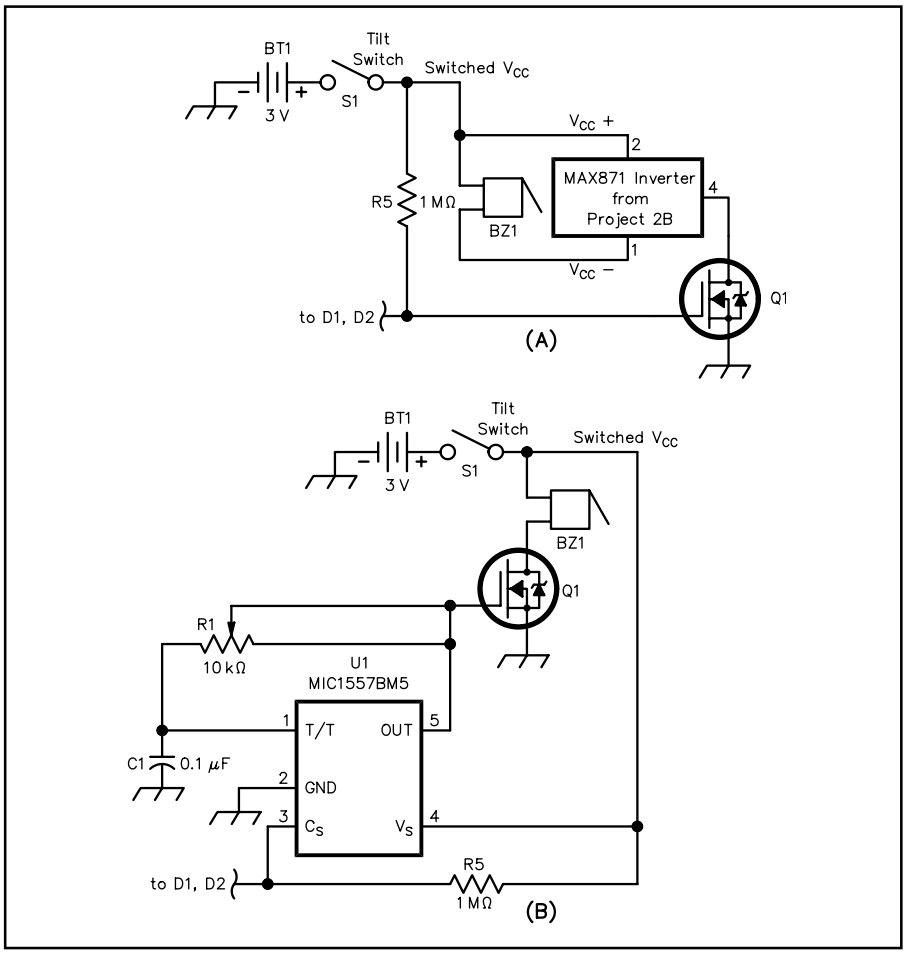
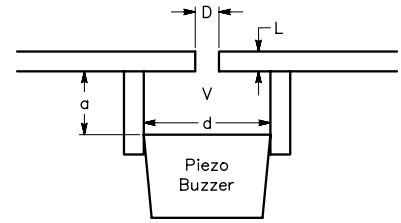


Figure 18—Two modifications you can make to the basic hourglass timer of Figure 17. At A, use of a piezo buzzer requiring a higher supply voltage (6 V) can take advantage of the MAX871 inverter circuit described in Project 2B. R5 is a 1 MΩ resistor in a 1206 SM case. An externally driven buzzer can employ the circuit shown at B using an MIC1557. Component identifications are those given in Figure 17. Note the value change of R1.
R1—10-kΩ pot (Bourns 3364W)



f_0 = Resonant frequency
C = Speed of sound (3.44×10^5 mm/s) = 344 m/s
D = Diameter of the sound emission hole
L = Depth of sound emission hole
d = Diameter of chamber
a = Depth of chamber
V = Volume of resonant chamber = πda

$$f_0 = \frac{CD}{4}\sqrt{\frac{1}{\pi V(L + 0.75D)}}$$

Figure 19—Here's the fundamental approach to constructing a resonator to improve the loudness and purity of the buzzer's tone. The resonant frequency (f_0) should equal twice the frequency of the buzzer to increase sound pressure. Do not make dimension D too small, or the acoustic resistance will increase. The equation is a starting point; experimentation will optimize your results (see text). Dimensions are in millimeters unless otherwise noted.

off the timer. This circuit shuts itself off. The buzzer sounds for about three seconds, and if it is not restarted, the circuit goes to sleep. It works like this: D3 and D4 form an **AND** gate controlling Q2. After pin 15 of U1 goes high and the buzzer sounds, the timer continues to count until U2 pin 7 also goes high. Then, Q2 turns on and pin 3 of U1 goes low. Pin 3 is U1's **CHIP SELECT** pin; when it goes low, U1 stops running and its current drain is reduced to 1 µA. With U1 sleeping, its output goes low. That shuts off the buzzer via D2. Total current drain while sleeping is about 5 µA. Under these conditions, a lithium 2032 battery should last several years.

To restart the timer (from sleep mode or when it is buzzing), just turn it upside down and then right side up. The tilt switch turns the power off, then on. C2 and R2 form a power-up reset that restarts U2 at 0 with a positive pulse to pin 11 through C2.

Experimenting with the Timer

Using the right audio transducer makes a major difference in audibility. Most transducers require more than 3 V to operate. I tried a RadioShack 273-074 transducer and it worked, but its output level was quite low. One way to raise the sound level is to raise the buzzer voltage. I did that with the circuit of Project 2B, as shown in Figure 18A. Some parts catalogs list piezo transducers that are externally driven and operate at 1.5 or 3 V. (The RadioShack buzzer mentioned earlier is internally driven: It has a square-wave generator built into it). I used a piezo transducer driven by an MIC1557, as shown in Figure 18B. It has a loud signal, but I found that setting the exact frequency needed for maximum sound was tricky. The best signal I could obtain came from a TMB-05[27] buzzer that I placed in a resonator and drove with the MAX871 circuit.

A Resonator

A neat way to improve the loudness and purity of the buzzer's tone (some piezo resonators have a harsh note) is to place the buzzer in a Helmholtz resonator.[28] This is a cylinder or tube designed to resonate at a certain frequency. Every resonator I used made the sound available from the transducer louder and clearer. The information in Figure 19 can help you design a resonator. If the math bothers you, try using a simple resonator made from a half-inch water pipe PVC end cap and drill a 3-mm diameter hole in the end; it worked well for me. I ground down the material surrounding the hole to make it thinner (smaller L) and adjusted the distance (A) for maximum sound. Best results are obtained when the tube's resonant frequency is about twice that of the piezo transducer's frequency.

Other Time Delays

In Figure 17, instead of connecting D1 to pin 15 of U2, you can attach it to another pin to obtain a different time delay. Table 2 shows the delays you can achieve when using a one-second cycle time at U1. By adjusting the values of R1 and C1, you can obtain nearly any time delay you want. For the arrangement to work correctly, the U2 pin you use to trigger Q1 must have a greater number of counts than the pin you use to shut down the circuit, which is why the data in Table 2 starts at 16 counts.

If you make your own PC board, you can customize it as needed. The premade PC board (see Note 24) is designed so you can add the circuits of Figure 18A or B on a separate board to drive the buzzer.

Construction Comments

I used a 0.005-inch wheel for the critical cuts at U1, Q1 and Q2 (see Figure 20). For the other cuts, I switched to a 0.009-inch wheel. The 0.005-inch cut is so narrow that

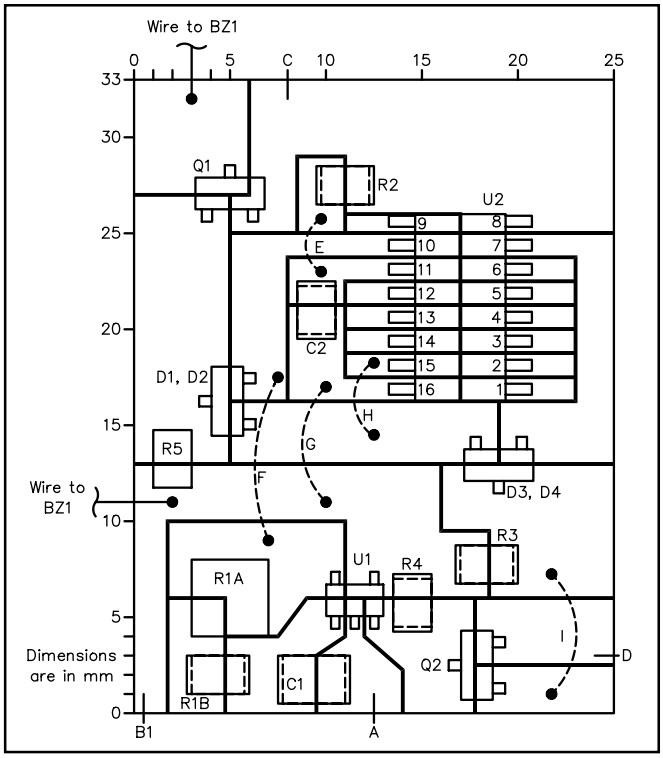


Figure 20—PC board layout of the 10-minute timer. Heavy lines designate cuts made in the foil to create component-mounting islands as described in Part 1 of this series.

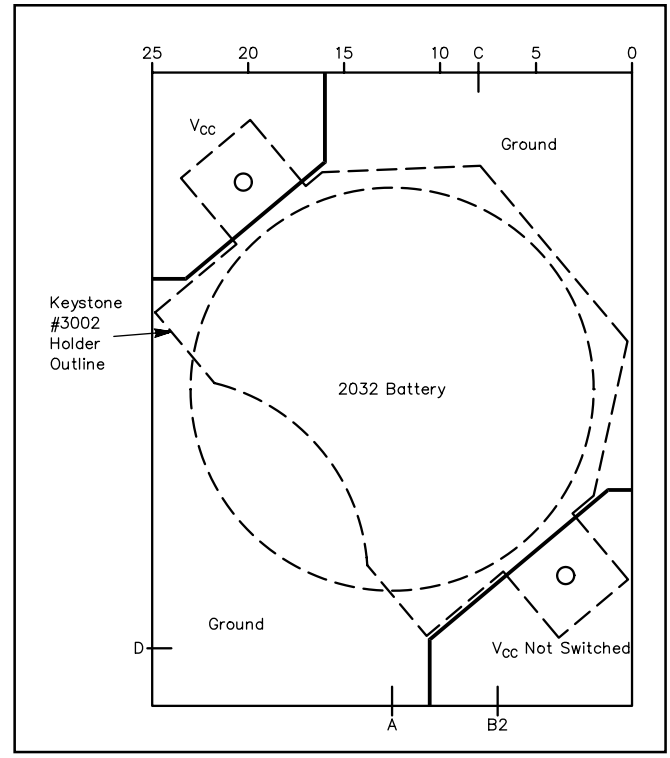


Figure 21—The 3-V battery occupies the bottom side of the 10-minute timer. Again, the heavy lines indicate where cuts are made in the PC-board foil.

solder tends to bridge the gaps. With a 0.009-inch cut, bridging is much less likely to occur. The circuit is on the board's top side; the battery and holder are on the bottom as shown in Figure 20. The tilt switch is connected between B1 of Figure 20 and B2 of Figure 21.

Summary

After completing these projects described over the past months, you should feel comfortable working with SMT devices. And, as I do, you'll probably be turning the pages of *QST* looking for a neat SMT radio project. A couple of the projects I would like to see include: a small, inexpensive VHF transceiver and a pocket-size HF receiver. In addition to the Maxim parts I mentioned earlier, Phillips Semiconductor sells a single-chip SMT AM receiver, MicroChip has an SMT microprocessor and Texas Instruments (TI) has a highly efficient SMT Class-D stereo amplifier. The parts are there. I hope we amateurs start to make use of them. [Let's see some of those projects! *QST* depends on readers and authors such as Sam and you for projects. Send your manuscripts to Steve Ford, WB8IMY, 225 Main St, Newington, CT 06111; **sford@arrl.org**.—*Ed.*]

Notes

[22]Parts 1, 2, and 3 of this series appear in the April, May and June 1999 issues of *QST*, pages 33-39, 48-50 and 34-36, respectively.

[23]R. Dean Straw, N6BV, Ed., *The 1999 ARRL Handbook* (Newington: ARRL, 1998), p 22.58

[24]A limited number of parts kits are available from me for $11, which includes all the parts (including the hard-to-find tilt switch) except for the buzzer and PC board. If you want a premade PC board, add $2 (Florida residents must add sales tax). Piezo buzzers are widely available at places like RadioShack or many of the parts sources listed in the article.

If you are interested in learning to make your own boards as I described in Part 1, I have a limited number of parts kits available. These consist of a 3 × 6-inch double-sided copper-clad board, eight cutoff wheels (two 0.005 inch, four 0.009 inch and two 0.025 inch) and the special mandrel recommended for use with the ultra-fine cutoff wheels; price: $13. (Florida residents must add sales tax.)

[25]The MIC1557 has a brother, the MIC1555, optimized for monostable operation. It is described in the same data sheet.

[26]These are the results of measurements I made.

[27]The TMB-05 internally driven buzzer is made by Star Micronics, 70-D Ethel Rd West, Piscataway, NJ 08854; tel 800-782-7636 (X512), fax 732-572-5095; **sales@starus.com**; **http://www.starmicronics.com/product/audio/index.cfm**. See the Star Micronics Buzzers and Transducers catalog, page 5.

[28]A resonator based on this principle is described by Wally Millard, K4JVT, "A Resonant Speaker for CW," Hints and Kinks, *QST*, Dec 1987, p 43—*Ed.*

Table 2
Timer Delay for a U1 Cycle Time of One Second

Pin	*Counts*	*Time*
5	16	16 s
4	32	32 s
6	64	1 m 4 s
13	128	2 m 8 s
12	265	4 m 16 s
14	512	8 m 32 s
15	1024	17 m 4 s
1	2048	34 m 8 s
2	4096	1 h 8 m 16 s
3	8192	2 h 16 m 32 s

Time shown in hours, minutes and seconds.

You can contact Sam Ulbing, N4UAU, at 5200 NW 43rd St, Suite 102-177, Gainesville, FL 32606; **n4uau@afn.org**.

New Products

MFJ'S *SMALLWONDER* H-T ANTENNA

◊ At less than an inch tall, the MFJ-1719 *SmallWonder* H-T antenna certainly won't outperform the longer antenna that came packed with your H-T. If you often find yourself in situations where you're willing to trade off some communications range for increased H-T carrying convenience, this little antenna might be just the ticket. The *SmallWonder* covers 2 meters, 70 cm and 1.2 GHz, and is available in both BNC and SMA (MFJ-1719S) versions. Price: $19.95 for either model.

These antennas are covered by MFJ's "*No Matter What*" one-year limited warranty. For more information, see your local Amateur Radio products dealer or contact MFJ, PO Box 494, Mississippi State, MS 39762; tel 800-647-1800; fax 601-323-6551; **http://www.mfjenterprises.com/**.

Next New Product

Dwayne L. Kincaid, WD8OYG

The DWM-4: A Microprocessor Controlled Multichannel Wattmeter for HF, VHF and UHF

This handy station accessory saves desk space and centralizes all your RF power and SWR metering.

My radio desk was already cluttered, and I was thinking of adding a backup HF rig. Unfortunately, there was no desk space left! I started looking at items that could be removed or consolidated. I combined a couple of antenna switches into a larger one, but that merely cleared out a few square inches—not enough. Then I realized that each rig had at least one SWR or power meter on it! My HF rig, an IC-706, has two coaxial outputs, so it had one external SWR/power meter on each output. My dual-band VHF/UHF rig has separate antennas, so it had separate meters on it. On top of that, my VHF packet rig had an SWR meter on it! Combined, the lot took up more room than a backup rig!

The thought that I might be able to combine *all* the meters into one unit had me visualizing lots of saved table space. Looking through the catalogs, I found many dual and triple-band meters, but none with multiple inputs. Taking this as a challenge to clear the desktop, designing what I needed got under way. The result—presented here—is the DWM-4: a digital wattmeter with four inputs.

ALL PHOTOS BY JOE BOTTIGLIERI, AA1GW

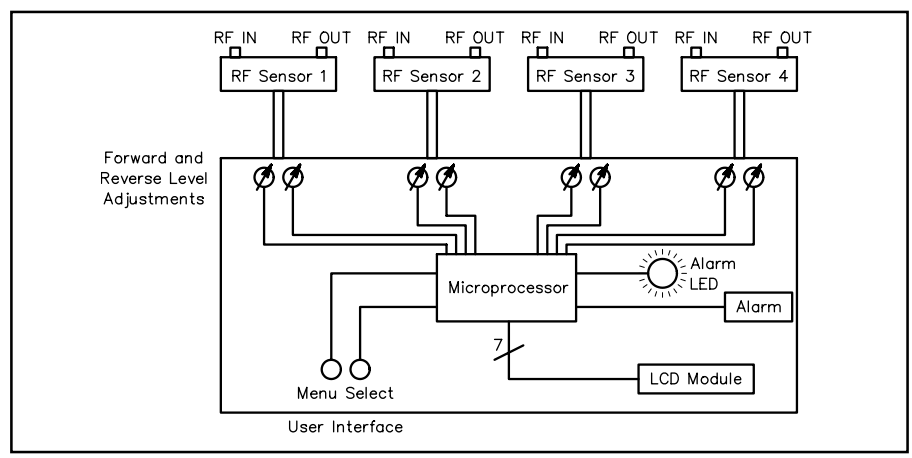


Figure 1—Block diagram of the multichannel wattmeter.

Research

Because nothing like this existed (at least, nothing that I could find), I had to do some research on wattmeters. I set about gathering information on the various wattmeters and SWR meters currently available. It was then that I realized there are *many* meter functions to take into consideration. Some units allow selection of peak or RMS power readings. Others have alarms

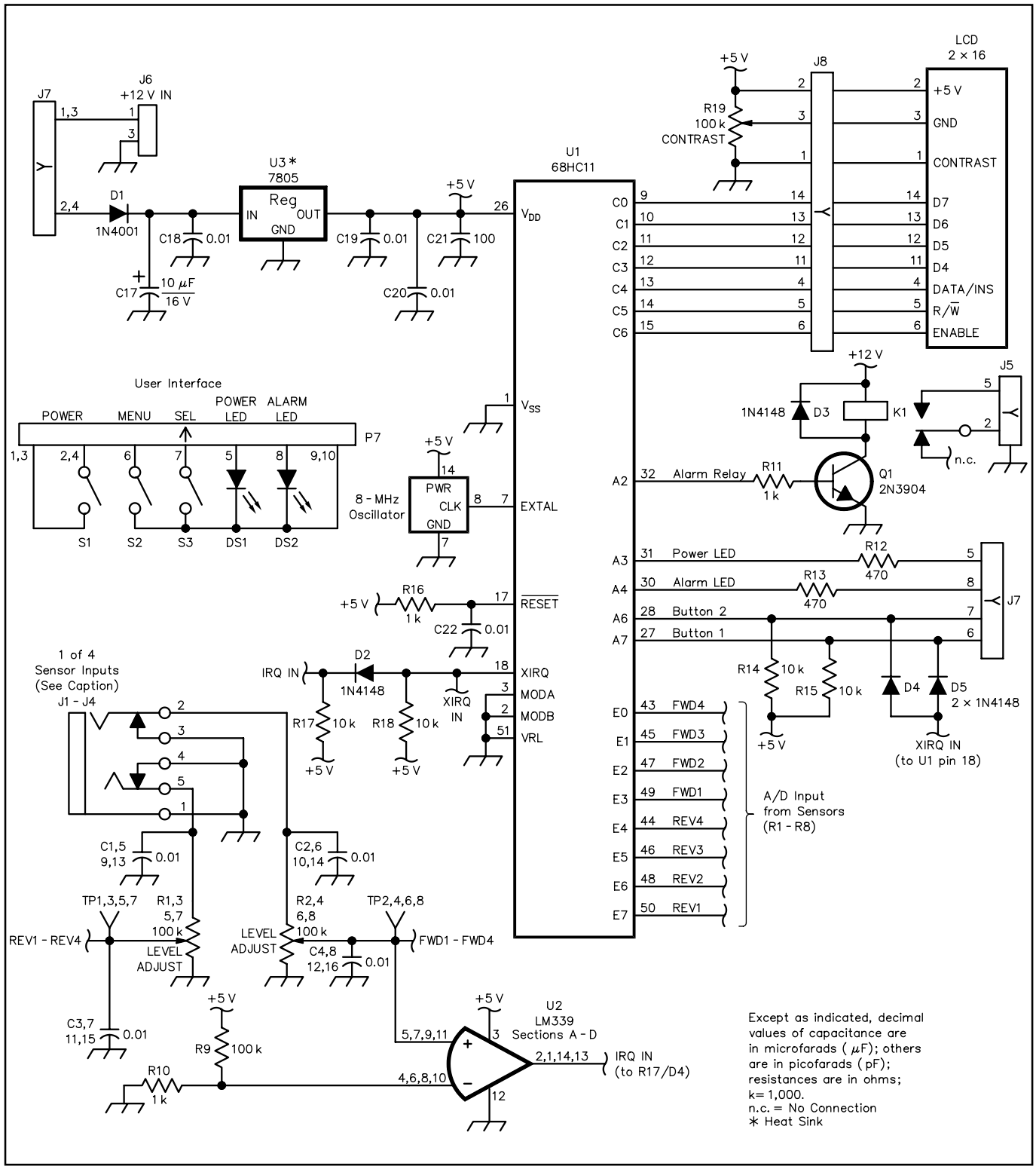


Figure 2—Schematic of the multichannel wattmeter. Unless otherwise specified, resistors and capacitors are standard leaded units. Equivalent parts can be substituted; n.c. indicates no connection. For compatibility with existing construction, some component identifiers deviate from standard *QST* style. A single sensor-input circuit is shown with part IDs for four such units.

D1—1N4001 silicon diode
D2-D5—1N4148 silicon switching diode
DS1—Green LED
DS2—Yellow LED
J1-J5—PC-mount, three-circuit (stereo) 1/8-inch jack
J6— PC-mount, 2.0-mm male coaxial power jack
J7—Female header, 2 row, 7 conductor, 0.1 inch spacing.
J8—14-pin socket
K1—12-V, 10-A SPDT relay (Aromat JS1-12V)
LCD—Timeline 2-line, 16-character LCD
OSC—8.0-MHz oscillator module
P7—Male header, 2-row, 7-conductor, 0.1-inch spacing
Q1—2N3904
R1-R8, R19—100 kΩ PC-mount potentiometer
S1—SPST toggle switch
S2, S3—SPST momentary pushbutton
U1—68HC11 *programmed* microprocessor; see Note 1.
U2—LM339 quad comparator
U3—LM7805 three-terminal regulator
Misc: 10-pin header, 10-conductor IDC ribbon cable, 14-pin header, 14-conductor IDC ribbon cable, enclosure, hardware.

that notify the operator of a high SWR condition. A number of units have dual-reading meters to allow simultaneous viewing of forward and reverse power. There are meters with analog and digital displays. Some meters have microprocessors that calculate the power and SWR, but use an analog meter for display. Finally, I noted that most of the meters have an accuracy of 10 to 20%. There are some units with better accuracy, but they carry a high price tag.

The greatest difference among the meters appeared to be the SWR-sensing systems used. HF meters usually employ a toroidal bridge pickup. VHF and UHF meters generally use a stripline sensor. Some more-expensive hybrid meters use both sensor types.

For my DWM-4, most of the design choices were obvious. A 16-character, two-line LCD module provides the greatest flexibility and allows considerable information to be displayed at once. Because a microprocessor would control the LCD, all kinds of functional possibilities opened up. The processor's A/D converters could digitize the sensor readings, making it easy to display bar graphs, numbers and alarm messages. A menu system could be used to allow user selection of settings and display options. (More on the menus later.)

The most important choice I had to make was that of sensor type. Having a single sensor that operated from 1 to 500 MHz would be *really* nice, but it would add considerable cost to the unit, especially if four separate sensors were used. Instead, I opted to use two inexpensive sensors: a toroidal bridge for HF and 6 meters, and a stripline sensor for VHF/UHF. Both sensors are designed to handle power levels of up to 150 W.

Design

To see the layout of the major system functions, refer to the block diagram of Figure 1 and the schematic of Figure 2. Basically, there are three major subsystems: the sensors, the microprocessor and the user interface. Because this is a microcontroller project, some of the hardware is highly integrated with the software. The microprocessor and display have physical hardware, but are controlled by software.

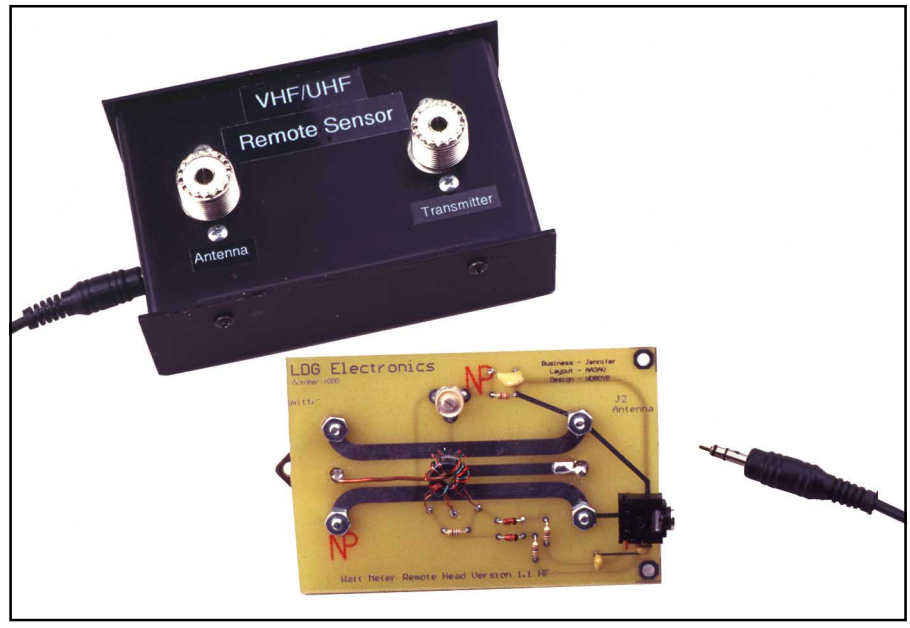
The signal flow is straightforward. The sensors detect the power and send the information to the microprocessor, which changes the incoming analog voltage to a digital signal. Then, the microprocessor performs the calculations and displays the resulting information on the LCD.

HF Sensor

The HF sensor (Figure 3) is a common toroidal bridge.[1] This SWR measuring technique is seen in most HF dual-meter and direct-reading SWR meters. Normally current is used to drive a meter movement. I made slight modifications to the circuit to provide voltages (instead of currents) that are proportional to the forward and reverse power.

The single-lead primary passing through the toroid center of T1 provides RF-current sampling to the secondary winding. Variable capacitor C1 allows adjustment of circuit balance. D1 and D2 rectify the forward and reverse current samples and provide the required dc voltages.[2] Bypass capacitors help filter out the RF to provide a smooth dc signal.

The two voltages are sent to variable resistors in the display unit (Figure 3) that are used in conjunction with the A/D converters of U1 to adjust the forward and reverse power sensitivity. Once in a digital format, the resulting forward and reverse values are used to calculate forward and reverse power and SWR. The sensor delivers about 4.5 V dc to indicate full-scale readings on the display. Using menus, the display scale can be set for 15 or 150 W on HF. For QRP operators, the 15-W scale may



A VHF/UHF sensor inside its enclosure and a rear view of an HF sensor's PC board.

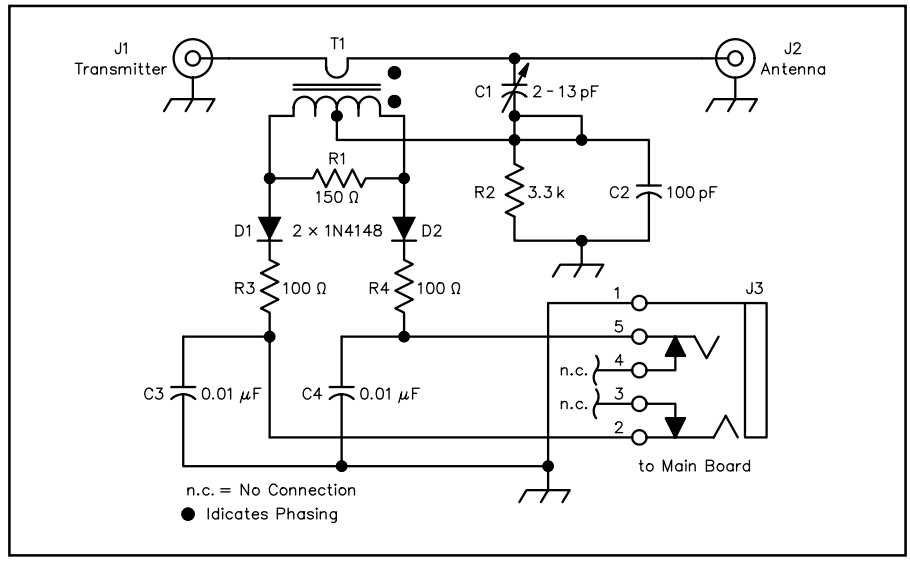


Figure 3—Schematic of the wattmeter's HF sensor.

C1—2-13 pF air-variable trimmer
D1, D2—1N4148 silicon switching diode
J1, J2— SO-239 chassis-mount connector
J3—PC-mount, three-circuit (stereo) 1/8-inch female jack
T1—14 bifilar turns #28 enameled wire wound on an FT-37-43 core
Misc: Shielded 1/8-inch stereo cable, 6 feet long, male plug ends, enclosure, hardware.

[1]Notes appear on page 46.

be more useful. It provides rougly 10 times the resolution of the 150-W scale.

VHF/UHF Sensor

The VHF/UHF sensor is similar to others found in dual-meter and direct-reading meters for those bands. It is also modified to provide voltages instead of current. This sensor differs primarily from the HF sensor in its use of stripline sampling. The strip-lines above and below the main line provide the forward and reverse sampling. Germanium diodes (1N34As) are used for greatest sensitivity. The diodes, along with the bypass capacitors, rectify and smooth the sample to provide the dc voltages. Again, variable resistors on the display board and the A/D converters of U1 allow for adjustment of the full-scale reading on the LCD. For VHF/UHF, there is but one scale of 150 W.

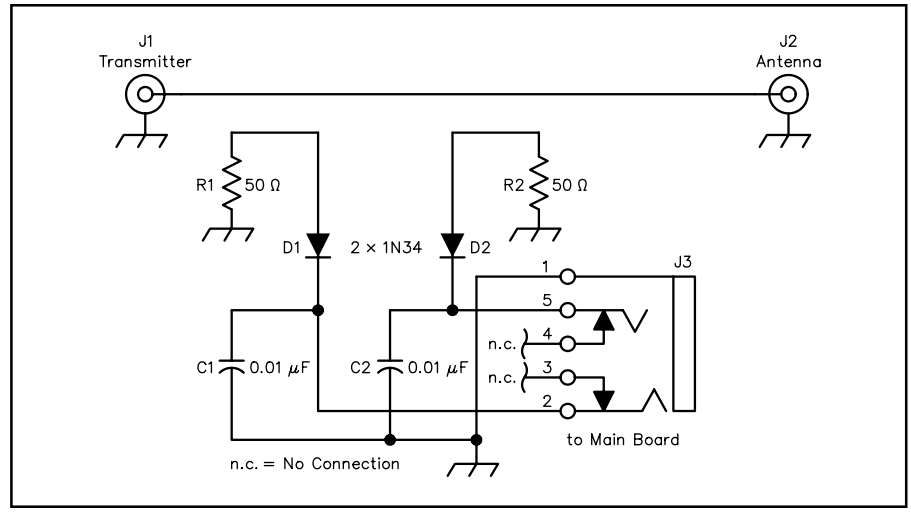


Figure 4—VHF/UHF sensor diagram.

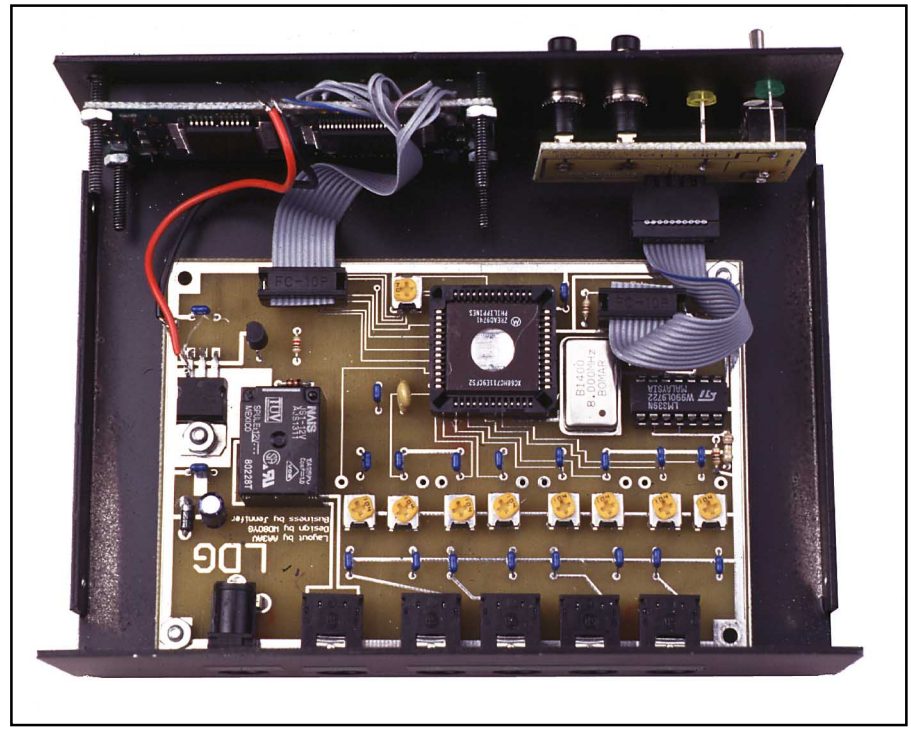
D1, D2—1N34A germanium diode
J1, J2—SO-239 chassis-mount connector
J3—PC-mount, three-circuit (stereo) 1/8-inch jack
Misc: Stereo 1/8-inch cable, 6 feet long, male plug ends, enclosure, hardware.

Hardware

Most of the hardware is in the display unit. U1 is an MC68HC11E9FN microcontroller. Inside the chip are 12 kB of one-time programmable EPROM (for assembly language program space), 256 bytes of RAM for data storage, 512 bytes of nonvolatile EEPROM to store user settings, an 8-bit output port, an 8-bit input/output port, an 8-channel, 8-bit A/D input port and an 8-bit timer port. The chip also contains a serial port (useful for RS-232 connections) and a high-speed serial peripheral interface (SPI), but they are not used in this application.

The eight A/D inputs of U1 port E are used to read up to four sensors; each sensor has a forward and reverse output. Port C, the 8-bit output port, drives the LCD. The user-interface pushbuttons (S2 and S3) and LEDs (DS1 and DS2) are controlled via port A. Each power sensor's **FWD** input also drives a voltage sensor (a section of quad comparator U2) that triggers a hardware interrupt (IRQ). This alerts the 68HC11 that a transmitter is active.

U1 and the other active devices operate from a 5-V dc source delivered by U3, an on-board 7805 regulator. The combined current consumption of U1 and the backlit LCD is only about 60 mA. The total current drawn by the DWM-4 depends upon whether or not the alarm relay is energized, the maximum drain being about 90 mA.



Inside view of the DWM-4 multichannel wattmeter.

Software

The DWM-4 software is written in 68HC11 assembly language.[3] The main routine monitors an interrupt line that lets the processor know that one of the channels is detecting forward power. Once U1 knows a sensor is active, it looks at the A/D inputs to see which one is active and makes the necessary calculations to display the results on the LCD.

User Interface

The user interface consists of the LCD, one toggle switch (S1), two pushbutton switches (S2 and S3) and two LEDs (DS1 and DS2). The LCD provides the operator with a series of menus. Each menu offers information about each of the four sensor inputs. Some items are common across different menus.

There are two basic wattmeter modes: setup and operate. During setup, you can select bargraph or numeric display, peak or average display, set SWR alarms and select which sensor type is connected to each input along with a power range for each sensor.

In operation, the display shows forward or reverse power (as a bargraph or numeric display), SWR (in digits) and status.

Menus

The heart of the user interface is the menu system. There are seven menus through which you can scroll to set the functions of each channel (see Table 1). Under normal operation, you start at the **MAIN** menu. This menu displays the forward and reverse power, SWR, active channel and alarm status. Pressing the **SELECT** (**SEL**) button, S3, cycles the displayed channel from **1** to **4** and

Table 1
Menu System of the DWM-4

Menu	*Select*
Main Menu	**1 2 3 4 A**
Display Readout (Bargraph or Numeric)	**BAR / NUM**
Sample Report (Peak or Average)	**P** or **A**
Alarm Threshold (SWR)	**OFF, 1.1 to 10.0**
Relay Threshold (SWR)	**OFF, 1.1 to 10.0**
Relay Reset	**AUTO® / MANUL®**
Sensor Type HF High or HF Low VHF or UHF	**HH / HL/ VH / UH**

A. Option **A** stands for automatic operation. When in automatic mode, the display is automatically switched to the channel that is currently sensing forward power.

Pressing **MENU** button S2 cycles through the menus for the selected channel. The **DISPLAY READOUT** menu chooses between **BAR** and **NUMBER** for the forward and reverse displays. The **SAMPLE REPORT** menu chooses between a **PEAK** and **AVERAGE** for the forward and reverse power. There are **PK** and **AV** icons on the status line to show the selection.

The **ALARM THRESHOLD** menu selects the point at which the front-panel yellow LED illuminates to warn of high SWR. Pressing and holding the **SEL** button turns on the alarm and counts from 1.1 to 10.0 for the alarm threshold. Pressing the **SEL** button again turns off the alarm.

The **RELAY THRESHOLD** menu is separate from the **ALARM THRESHOLD**. The **SEL** button works as it does with the **ALARM THRESHOLD**, but only controls the relay, K1. The **RELAY RESET** menu chooses between **MANUAL** and **AUTO** reset. In **MANUAL** reset, you must press the **SEL** button to deenergize the relay. In **AUTO** reset, the relay is reset when the SWR drops below the **RELAY THRESHOLD** value.

The **SENSOR TYPE** menu allows you to select one of the four sensor types available. The sensors and ranges are **HF HI** (0 to 150 W), **HF LOW** (0 to 15 W), **VHF** (0 to 150 W) and **UHF** (0 to 150 W).

At any time, pressing the **MENU** and **SEL** buttons simultaneously returns you to the **MAIN** menu.

Errors

There are three error conditions for the DWM-4: (1) The forward maximum power level has been exceeded; (2) the reverse maximum power level has been exceeded, and (3) the reverse power level is greater than the forward power level. The display indicates these errors as they occur. When the error condition is removed, the display returns to normal.

Construction

Assembly is straightforward. Place each sensor in a shielded enclosure to reduce exposure to stray RF fields. PC boards are available for the main board and each sensor type.[4] The sensors are built on PC boards and connect directly to SO-239 connectors mounted on the boards. Within the enclosure, the SO-239 connectors support the sensor PC board.

A ribbon cable connects to the front-panel toggle switches, pushbuttons and LEDs (J7/P7) to the main board. Another ribbon cable (P8) connects to the LCD module. Be sure to refer to the schematic when wiring the LCD. When installing U1, take the precaution of using a static-discharging wrist strap. Once in its socket, U1 is well protected.

In the HF sensor, be sure to orient T1 properly. If connected incorrectly, the forward and reverse power indications will be exchanged. In the VHF/UHF sensor, some of the components are attached "dead bug" style with the leads tack-soldered to the PC board traces.

Adjustments

Most of the adjustments are on the main PC board. As mentioned earlier, each forward and reverse line is equipped with a variable resistor for calibration. The HF sensor also has a balancing capacitor on its PC board. There are no adjustments to be made within the VHF/UHF sensor.

Observe proper safety practices when adjusting the sensors. Keep your fingers away from the wires and traces that carry RF. An RF burn from a 100-W transmitter can be quite painful. Keep each sensor's enclosure cover in place during operation.

At a minimum, a 100-W HF radio and 50-Ω dummy load can be used to calibrate the unit. Even if you know how much power your radio emits, consider using an additional wattmeter of known accuracy to assist you during the calibration process.

Start by setting R1 through R8 to their center positions. Connect the HF sensor to **INPUT 1** on the main board. Attach a voltmeter between ground and the reverse test point of the HF sensor. Apply 100 W through the HF sensor to a dummy load or resonant antenna, adjust C1 in the HF sensor for minimum voltage. The minimum reading should be just about 0 V. A reading of 0.1 V or less is fine.

Again apply 100 W and adjust R1 on the main board so that the forward display reads 100 W. Be sure to use the menus to set the proper sensor type and set the LCD to display numbers instead of the bargraph. Swap the input and output leads of the HF sensor and again apply 100 W. Adjust R2 to read 100 W on the reverse display. An error message (**REV>FWD)** will appear, but the display is still visible between error-message flashes.

For the QRPer using the 15-W HF sensor, repeat the preceding adjustments, but choose the **HF Low** setting from the **Sensor Type** menu and use a power level of 5 W. Adjust the variable resistors to display 5 W for the forward and reverse readings.

For VHF and UHF, connect a VHF/UHF sensor to one of the other channels. Apply RF power and adjust the corresponding variable resistor to obtain a correct forward power display. Swap the input and output leads and repeat for the procedure for reverse power. Repeat the foregoing process for the other channels by connecting the appropriate sensor to each input and adjusting the corresponding variable resistors.

Accuracy—a Virtual Bird

The accuracy of the DWM-4 is directly related to its calibration. The displayed values are derived from a huge look-up table stored in the microprocessor. These table values were taken from the readings of a Bird 43A wattmeter. The table was derived by comparing the A/D reading supplied by the HF and VHF/UHF sensors for various RF readings on the Bird meter. The Bird readings were then graphed, and extrapolated where needed to fill in the gaps.

The resolution of the DWM-4 is about 1 W on the 150-W scale and 0.1 W on the 15-W scale. Although the overall accuracy as compared to a Bird wattmeter is better than 0.1%, the actual accuracy still depends on the calibration.

Acknowledgments

Many thanks go to the members of the Southern Patuxent Amateur Radio Club for providing the testbed at project night and the feedback for this project. Special thanks to Gene Tehansky, AA3AV, for his contributions and assistance with the prototypes and PC board layout. Also thanks to Randy Norris, KE3QZ, for his assistance with testing. And thanks to my wife, Jennifer, for her patience, understanding and support with yet another project.

Notes

[1]Doug DeMaw, W1FB, Ed., *W1FB's QRP Notebook*, (Newington: ARRL, 1991, 2nd edition), pp 149-151.

[2]John Grebenkemper, "The Tandem Match—An Accurate Directional Wattmeter," *QST*, Jan 1987, pp 18-26, has some pointers on diode matching used in that unit.

[3]The software, including the source code, is in *HFVHFWAT.ZIP*. This file can be found on the Internet at the ARRL download site http://www.arrl.org/files/qst and is available from the author: Send a 3½ inch IBM preformatted diskette and a self-addressed, stamped disk mailer to Dwayne Kincaid, WD8OYG, 1445 Parran Rd, St Leonard, MD 20685.

[4]A complete parts kit (without enclosures) including a *programmed* 68HC11, PC boards, and one remote sensor (please specify HF or VHF/UHF) is available for $89 plus $8 shipping in North America. A complete kit and one sensor with pre-punched and silk-screened enclosures are available for $139, plus $10 shipping. additional rempte sensors are available for $19 each without enclosure, or $29 each with enclosure. Please specify sensor type, HF or VHF/UHF. A *programmed* 68HC11 is available for $25. Send your order to LDG Electronics, 1445 Parran Rd, St Leonard, MD 20685; tel 410-586-2177, fax 410-586-8475. Major credit cards are accepted.

You can contact Dwayne at 1445 Parran Rd, St Leonard, MD 20685; ldg@ldgelectronics.com.

By Terry Schieler, WØFM

Give your Station a "Factory Face Lift"

If your shack can't accommodate a spread of six-foot-high custom rack panels, your operating position can still showcase its one-of-a-kind appearance—and you can tidy up that rat's nest of cables and accessories to boot. How? By consolidating your station accessories into factory enclosures that match your rig!

I suppose that most hams have dreamed of owning a station consisting of desks and shelves piled high with radios, power supplies, amplifiers, tuners and other gadgets, all interconnected with relays, switches and miles of cables. But a wall full of equipment and its associated maze of wire doesn't always lend itself to the actual "shack" space allotted to most of us.

Many hams find that their operating area has been relegated to part of the laundry room, tool shed, garage, spare bedroom or, worse yet—actual living space that might be frequented by other human beings!

This is exactly what I experienced after purchasing a new condominium. When I first moved in, the unfinished walk-out basement was fine for hamming. It was nothing more than a bare concrete floor surrounded by 2 × 4 studs. Nobody ventured down there except me. This was my "Great Escape"!

The 10-meter dipole, hastily strung across the basement during a particularly good DX contest, performed secondarily as a guillotine, guaranteed to behead any intruder. Accessories were abundant. Cables were everywhere! It was heaven on earth—but only in the eyes of a ham.

The Dilemma

Keeping a promise I had made to myself shortly after moving in, my son, Ryan, and I embarked on the task of finishing the basement with drywall and carpeting, eventually transforming the area into an attractive and usable family room.

As I made plans to restore my ham station to a functional state (with only part of a desktop now available as an operating position), I suddenly realized just what we had created—*actual living space that might be frequented by other human beings!*

This new living space had turned out even nicer than we had hoped. Ryan and I had expended so much blood, sweat and tears during our construction of the new room that we felt that the ham station *had* to be a neat and attractive addition to *it*.

The very thought of station accessories unnecessarily cluttering up the new operating desk suddenly made me cringe. This was a difficult emotional time. I wanted to have all my toys available *and* have a nice-looking new room!

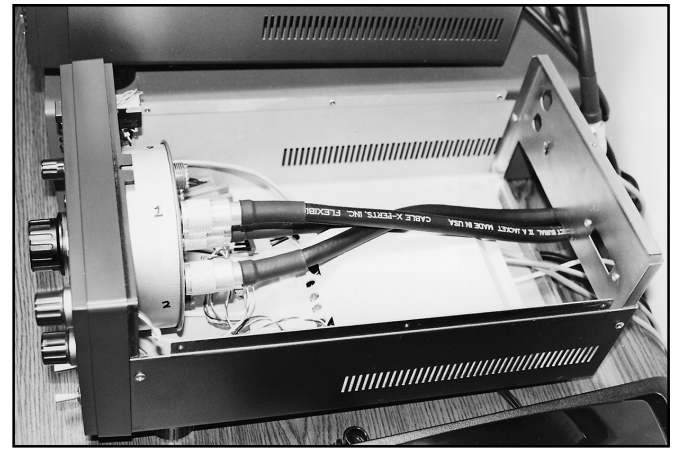
Antenna tuners, keyers, preamps, filters, SWR meters and the like are often separate, mismatched items, scattered around the station and linked together with that web of wires mentioned earlier. Even if all of your equipment *looks* good, it still takes up precious space.

I *had* to find a way to dress up the station so it would be functional, take up minimal space and be an aesthetically pleasing addition to the room. *Wow!* Functional, compact *and* good-looking? I needed a plan.

The Solution

Step one in my mission to consolidate

The front view of the Kenwood PS-52 power supply, with its spacious front panel, that inspired W0FM's custom accessory enclosure, created with matching PS-52 hardware. *All photos by the author.*



In this "look under the hood" we can see the unit's rotary antenna switch and the AEA Isoloop controller box (the original tuning LEDs are visible just to the right of the PL-259 connectors). Note the large rectangular opening nibbled out of the rear panel for cable access.

the equipment would be to trade my old transceiver for one that had as many features as possible *already built in*. Fortunately, a totally unexpected windfall from the IRS (yes, Virginia, there *is* a Santa Claus) funded the purchase of a new Kenwood TS-850S/AT with a matching power supply and speaker. Out went my old stand-alone keyer, antenna tuner, notch filter, speech compressor and noise blanker. I was well on my way to making my station nice and compact. Nonetheless, I still had some accessories not replaced by the new rig.

During an obvious period of deep "mental QSB," I had purchased this new home in (you guessed it!) an a*ntenna restricted community*. Antennas are strictly forbidden because my neighborhood includes *actual living space that might be frequented by other human beings!*

After trying to cram multiple dipoles into my tiny condo attic, I caved in and ordered an Isoloop 10-30 MHz tunable loop antenna made by AEA. The compact tunable loop is a dream come true for those of us living in communities that outlaw visible antennas *and* surplus attic space of any kind.

The Isoloop is remotely tuned by a little box called a "loop controller." While the loop controller was now a mandatory addition to my shack, it presented itself, along with my rotary antenna switch, as another stray accessory bent on trashing my plan for a functional, compact operating position that was pleasing to the eye.

I decided to build an enclosure in which I could *consolidate* my antenna switch, loop controller and whatever other accessories I could find space for. My goal was to have this new accessory cabinet match the appearance of the Kenwood TS-850 series as closely as possible.

The Search

I spent the next few weeks searching every possible source for a suitable enclosure. Although there are several really nice cabinets on the market, nothing I could find even came close to matching the color, size and shape of the Kenwood radio. And I hadn't even begun to look for similar switches, knobs or feet.

W0FM's custom accessory enclosure: In the center is a six-position rotary antenna switch. Isoloop **SENSITIVITY** and **SPEED** controls are at the upper right. The **UP** and **DOWN** paddle switches at the lower right are used to adjust the loop to resonance. The loop controller power switch and LED are at the upper left, with the tuning LEDs mounted just below. The loop antenna "band reminder" indicator is at the left center, just above the **KEY** and 12-V power jacks.

One day, while sitting in front of the new rig and about to give up on my consolidation plan, I noticed that the front panel of the Kenwood PS-52 power supply was, except for some lettering and an on-off switch, *totally blank!*

Armed with half-hearted hopes that there might be a few cubic inches of unused space in the power supply enclosure that could accommodate an extra accessory or two, I disconnected the ac and began removing screws.

Not surprisingly, the interior of the power supply was as void of surplus space as my attic. It also struck me that this might not be the best environment in which to house sensitive microprocessor-based station accessories. But as I began to reassemble the power supply, an idea hit me like a stainless-steel tower bolt from 45 feet! Maybe I could purchase a PS-52 power supply cabinet from Kenwood and build my accessories into it!

A quick call to Kenwood yielded encouraging results. A helpful technician promptly sent me an exploded drawing of the PS-52 and the fun began! I checked and double checked the drawing, noting the manufacturer's part number for the upper case, lower case, front panel, rear panel, plastic feet (why didn't I think of this earlier?) and every screw, nut and washer required to assemble a"gutless" enclosure.

I even identified the supply's power switch and pushbutton assembly, which I planned to use for the sole purpose (I thought) of cosmetically filling the empty hole intended for it on the PS-52's front panel (more on this later).

One more phone call to Kenwood's parts department and the items were on their way. During the next several days the project really began to develop.

Initially, my thought was to encase the Isoloop controller and the six-position rotary antenna switch in the Kenwood cabinet. The Isoloop controller has pushbuttons for UP and DOWN tuning, thumbwheel controls for **SPEED** and **SENSITIVITY**, an **ON-OFF** switch, power LED and four LEDs that indicate receiver noise levels for tuning purposes.

After taking a peek inside the loop controller and researching the schematic, I felt certain that I could mount the controller inside the new Kenwood enclosure and extend the leads of each of its controls and LEDs to corresponding devices mounted on the new front panel.

For the next couple of weeks I did nothing with the project but plan and plan some more. I continued to search for just the

right components: the most appropriate switches, the right-sized pots and knobs that matched or at least complimented the Kenwood '850 series. A word of caution here: Although the results are rewarding, some hardware obtained from your rig's manufacturer can be rather expensive. Extra time spent planning, measuring and rethinking each step of the project can save you a good deal of money and frustration.

Measure Twice—Drill Once

When I had carefully laid out the plastic front panel, I began measuring and marking the holes and fitting each component. It seemed to make sense to mount the rotary antenna switch dead center in the new Kenwood front panel (for added leverage) and space the other components around it.

The bat-handled momentary toggle switches that I would use for tuning the loop **UP** and **DOWN** were positioned and spaced to provide comfortable operation when using my index and middle fingers, with the heel of my hand resting on the desk to minimize fatigue. (Because of its high-Q design, the Isoloop needs to be tweaked every 20 or 30 kHz when changing frequency.)

As it turned out, the new switches and their arrangement proved to be far more comfortable for my use than the plastic pushbuttons that AEA used in its loop controller design. Again, extra planning pays off.

After an agonizing search for knobs, I made the *incredible* deduction that the best way to *match* the Kenwood knobs was to *order* Kenwood knobs! (Brilliant!) Then I simply selected potentiometers (with shaft sizes that fit the Kenwood knobs) to function as the loop controller's **SPEED** and **SENSITIVITY** controls.

This took a little extra effort, but the results were certainly worth it. I ordered two TS-850 knobs because they were less expensive than some of the rig's concentric knobs. I was able to scrounge some 50-k pots with shafts that perfectly fit these knobs to use as the loop controller's new **SPEED** and **SENSITIVITY** controls.

A local electronics surplus store had a bin full of small, red panel-mount LEDs with long insulated leads. It would be a snap to install four of these in the new front panel to serve as extensions to the loop controller's tuning indicators (which I disconnected and left in the controller's original housing).

I also located a miniature five-position rotary switch, fitted it with a small knob from the TS-850 line and mounted it in the new front panel. I connected *nothing* to this switch, but instead labeled its positions 20, 17, 15, 12 and 10 to serve as a manual reminder of the last band the Isoloop had been tuned to. (Of course, I still have to *remember* to set this *reminder!*) Finally, the large rotary antenna switch knob (ala Radio Shack) came fairly close to matching the style and color of the TS-850 knobs. And because it was somewhat larger than the knob that came with this particular B&W antenna switch, it made the operation of the switch smoother and easier.

Remember the PS-52 **ON-OFF** switch and power LED assembly that was going to be used to *cosmetically* fill the holes in the new front panel? Well, I wired that up as the 12-V power switch/LED for the loop controller (two more effective and unanticipated bonuses).

After carefully soldering small stranded "extension" wires to each necessary point on the loop controller circuit board, I installed the loop controller inside the Kenwood housing using Velcro.

All connections to the loop controller were made with the thought of eventually returning the unit to its factory condition (at some point, everything a ham owns is for sale). I used in-line pin connectors on all of the wires between the loop controller and the new front panel controls to facilitate easy removal.

Newly Created Space

I have several CW keying devices, including a Bencher paddle, an old military J-38 straight key and an MFJ Morse/RTTY keyboard, all of which are now stored out of sight in a desk drawer and connected only when I want to use them. Because the CW key jack is on the transceiver's rear panel, I often found myself fumbling around between the wall and the rear of the radio trying to connect or disconnect my CW accessories to a key jack that I couldn't see or feel. I decided to extend the CW jack from the rear of the '850 to a parallel jack mounted in an open area on the front panel of the new accessory housing using a length of shielded audio cable and a stereo phone plug.

Changing keying devices is now quick and simple. Almost as an afterthought, I added a 3.5-mm mini-jack to the front panel to provide the 12-V dc required to power the Morse/RTTY keyboard, frequency counter, antenna analyzer and several other miscellaneous accessories.

I cut out part of the housing's rear panel with a chassis nibbler to allow for cable and connector entry. If you do this, remember to leave enough metal around the perimeter of the rear panel to give the housing support and to provide an anchor for the case-mounting screws. Be careful not to remove more metal than necessary, as you may later find that you could use all of the extra weight you can get to help keep the new accessory housing in place during operation of the controls. You may even want to add extra weight inside the cabinet if space permits.

Labeling the Controls

I originally attempted to remove the silk-screened factory lettering indicating "Kenwood PS-52 Power Supply" from the new plastic front panel. First I tried an ink eraser, then fine steel wool and finally, solvent, but found that no matter what method I used I could not restore the nice glossy finish to the plastic after the lettering had been removed. So, I left it alone.

Fortunately (or maybe that's unfortunately), I was able to experiment with these print-removing techniques on the first of *two* plastic PS-52 front panels that I eventually purchased. (I had ruined the first panel by attempting to drill holes in it while simultaneously watching the Blues and Redwings battle it out on TV.)

I applied white DATAK transfer letters to the new front panel with careful consideration to size, weight and spacing. Although the new lettering isn't an *exact* match to the silk-screened factory lettering, it's quite similar and much better-looking than most other available options.

Items to Ponder

Give some thought to the *compatibility* of the accessories you plan to consolidate in the same cabinet. Things such as RF energy, high voltages, oscillating circuits and microprocessors don't always get along well in the same crowded environment! And remember to consider the effect on the manufacturer's warranty before modifying or dissecting any of your accessories. (Mine were out of warranty long before I heated up the soldering iron.)

Conclusion

Obviously, this approach could utilize *any* ham radio manufacturer's housings, switches, knobs, feet or meters. So get creative! Your lust for building doesn't have to be stifled just because your new commercial transceiver already has *most* of the "bells and whistles" you need. A matching factory enclosure purchased "a la carte" could potentially house your packet controller, SSTV interface, VHF transverter, CW keyer, digital clock, rotator controller and a host of other station accessories and home-brew projects.

So what if XYZ company doesn't offer a matching 6-meter transverter to compliment your great-looking "Supermegabucks -2000" transceiver! Choose the accessories that best fit your needs and give them a "factory face lift." Consolidate and repackage those accessories into a factory enclosure with knobs and switches that match your rig and make your ham station an attractive addition to virtually any *actual living space that might be frequented by other human beings!*

You can contact the author at 104 Ladue Woods Estates Dr, Saint Louis, MO 63141; terrys@sle.com.

Q John Dilivio, K2CF, asks, "Although I've been a ham for 38 years, I'm new to VHF FM operating. Last week I interrupted a conversation by saying 'break.' I was promptly told that it was improper to use 'break' on 2 meters. What is the correct way to break into an FM QSO?"

A On FM, "break" is usually reserved for emergencies when it is urgent for the breaking station to be recognized.

The preferred way to break into an FM conversation is to announce your call sign in the pauses between transmissions. On occasion a station needs to make a point or pass some other information without being interrupted, so he or she might reply, "K2CF recognized" or something similar. They're asking you to stand by for a moment before turning the conversation over to you.

Q What is the "skin effect?" Does it take place only at RF frequencies?

A The skin effect is a fascinating phenomenon, and it takes place at all signal frequencies. Basically, a conductor's effective resistance is not the same for alternating current as it is for direct current. With alternating current, other effects tend to force the current to flow mostly in the outer parts of the conductor. This decreases the effective cross-sectional area of the conductor, with the result that resistance increases.

At low audio frequencies, the increase in resistance is insignificant, but at radio frequencies above about 1 MHz, the skin effect is so pronounced that practically all of the current flows within a few thousandths of an inch of copper conductor's surface. Above 10 MHz, only about the outer 0.0008 inch of the surface is used, and above 100 MHz the depth is less than 0.0003 inch. The RF resistance is consequently many times the dc resistance, and increases with frequency. In the RF range a conductor of thin tubing will have just as low resistance as a solid conductor of the same diameter, because material not close to the surface carries practically no current.

Q I have a simple question, Doc, and I bet I'm not the first to ask it! Now that Pentium III computers are on the market, is it time to upgrade my shack PC? I'm only using a 200-MHz Pentium machine at the moment.

A The Doctor has been hit with this question about a dozen times this month alone. I expected it, though. Hams are obsessed with having the latest and greatest hardware—whether it's PCs or transceivers.

The simple answer to your question is "no"—at least not now. Unless you have an urge to run processor-intensive applications such as video editing, sophisticated games and so forth, your current PC is fine. In fact, I can't think of a single ham application that would require anything beyond a 200-MHz Pentium, much less a Pentium III. That's not to say that you won't run into ham software that absolutely requires more microprocessor muscle *someday*, but that day has not arrived yet.

If you have money burning a hole in your pocket and you feel you must invest in a new computer, I'd suggest that you look into a 450 MHz Pentium II. With the advent of Pentium IIIs, prices for Pentium IIs are falling like proverbial rocks. The performance differential between a Pentium II and III is not that great (there is virtually no software on the market yet that takes advantage of the Pentium III architecture). So, a fast Pentium II should be more than adequate for your ham needs well into the foreseeable future.

Q Tom Dunigan, N1VBL, asks, "My wife and I both own 2-meter H-Ts, both of which have failed within the same year. According to service technicians, as well as my own examinations, the failures appeared to be caused by a voltage polarity reversal. I don't understand how this could have happened unless the entire NiCd battery pack reversed in some fashion. I've often powered the H-Ts from a cigarette lighter adapter in the car, but the failures occurred the rigs were running off NiCds. Have you heard of similar problems with other battery packs?"

A The Doctor has been working with NiCds for a number of years now and I've seen a lot of odd behaviors. However, while I have seen individual cells in a pack reverse during the discharging process (due to variations in the current capacity between cells), I have never seen a whole pack reverse (or even a majority of cells in a pack reverse). That said, it might be possible to make a NiCd pack reverse by connecting it to a charger in reverse polarity.

The evidence points to something out of the ordinary in the H-Ts. I'd inspect the battery packs again, with particular emphasis on how they attach to the radios. With some H-Ts it is surprisingly easy to install the batteries incorrectly if you are not careful.

Q Dennis Eksten, W9SS asks, "Do you know of anyone who makes a tool that can be used to easily separate sections of Rohn 25 during a tower disassembly? Sometimes these sections don't want to be separated after being connected together in the outdoors for a long time! I understand there is a special tool available that can separate the sections without bending the rungs or leg tips. Is this true?"

A The item you are looking for is called the Tower Jack and is available from:

Tower Jack
PO Box 1191
Mt Juliet, TN 37122
Tel: 800-242-0130 (orders only)
615-758-9233 (technical questions)

Q I want to install 2-meter, 6-meter and triband HF Yagi antennas on the same tower. Is there a simple rule I can use to determine the necessary separation between each antenna?

A There are common two rules of thumb:

- The higher antenna should be separated from the antenna immediately below it by a distance equal to at least a half wavelength at the higher antenna's operating frequency (see Figure 1), or…
- The higher antenna should be separated from the antenna immediately below it by a distance equal to at least half the boom length of the higher-frequency antenna.

Using the second rule, for example, you can place your 6-meter antenna about half its boom length above the tribander. Then place the 2-meter antenna about half its boom length above the 6-meter antenna.

For some installations these rules of thumb will yield separa-

tions that are impractical. If this is the case, simply install the antennas as far apart as possible.

Q Our club is considering the idea of making our own CD-ROMs to offer to members. We could fill them with photos of club activities, useful software and even sound samples from our contest operations. Some have even suggested that special CD-ROMs could be given away at our Field Day site to promote Amateur Radio to the public. Our only question is this: What type of recordable CD-ROM drive do we need to buy for our club computer—CD-R or CD-RW?

A Your idea is very creative, and with CD-ROMs being so inexpensive these days, the project should be well within your budget. You've asked a good question about the CD-ROM drive; the choice is not as straightforward as it may seem. My suggestion is for you to purchase a CD-R drive, and I'll explain why.

For your project you'll be recording each CD-ROM only once—you won't be recording over the same CD-ROM time after time. This is exactly what a CD-R drive does—it records onto each CD-ROM only once. As a result, a CD-R drive is less complicated and significantly less expensive then a CD-RW drive. The CD-R disks are reasonably priced, too. With a little shopping you can find CD-R blanks for as little as a $2 per disk.

While a CD-RW drive has the advantage of being able to use rewritable disks and record data over and over, the rewritable disks cannot be read by all drives. Here at *QST*, for example, we have received photographs and even entire article submissions on CD-ROM. Those that are on nonrewritable disks are not a problem, but the rewritable disks are often unreadable by our systems. Blank CD-RW disks are expensive as well—about $10 each.

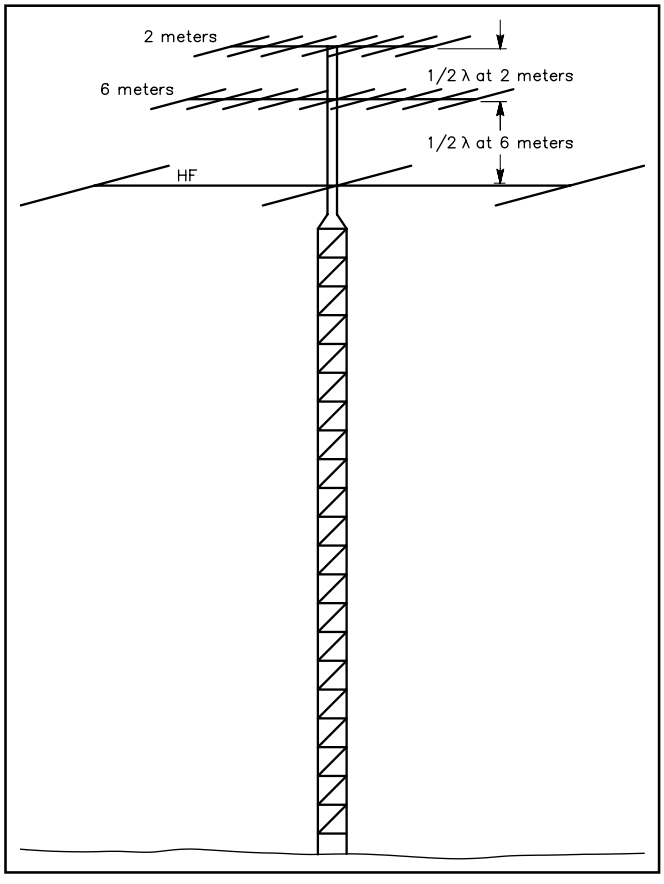


Figure 1—To minimize interaction between stacked Yagis on the same tower, a distance equal to a half wavelength at the higher antenna's operating frequency should separate the higher antenna from the antenna immediately below it. Alternatively, a distance equal to at least half of the higher frequency antenna's total boom length should separate it from the antenna immediately below.

Q D. Menkes, KF6IOL, asks, "I often take my 2-meter/70-cm H-T with me on hiking trips, but I find that it's difficult to access repeaters when I am in fringe coverage areas. I've considered purchasing a 6-meter H-T in the hope that I might enjoy greater range, but I've been told that the effective range would be limited because such an H-T uses FM instead of SSB. Is this true?"

A There are several factors that govern an H-T's effective communication range. One is the type of antenna you are using. Quarter-wavelength telescoping antennas, for example, are more efficient and vastly superior to the "rubber duck" antennas supplied with most H-Ts. Height is another important factor. Some hams have taken H-Ts to mountaintops and have communicated over 200 or 300 miles. The same H-Ts in the valleys below, however, could hardly get into the local repeaters.

When it comes to local/regional FM coverage, 6 and 2 meters are very similar. The reason that SSB outperforms FM on either band is because an FM receiver requires a much stronger signal to produce copyable audio. An SSB receiver, however, can produce copyable audio with much less signal energy. Therefore, you can achieve a greater effective range with SSB compared to FM.

Q Jerry Seligman, W7BUN, asks, "I'm teaching an Amateur Extra course and the term "common mode" has come up in our discussions of interference. Unfortunately, the definitions in the *License Manual* and in *The ARRL Handbook* fail to explain it in easily understandable language. Can you provide a brief explanation?"

A The best definition of "common mode" appears in the new *ARRL RFI Book*. Basically, common mode is a situation where a given signal appears equally on more than one conductor in a cable, with the same voltage and the same current flowing in the same direction relative to a particular device (see Figure 2). The return path of the signal is typically outside of the affected cable.

A good example is RFI to a telephone via the line cord. The 4 (or 6 or 8, depending upon the phone system) conductors act as a multiconductor, end-fed antenna.

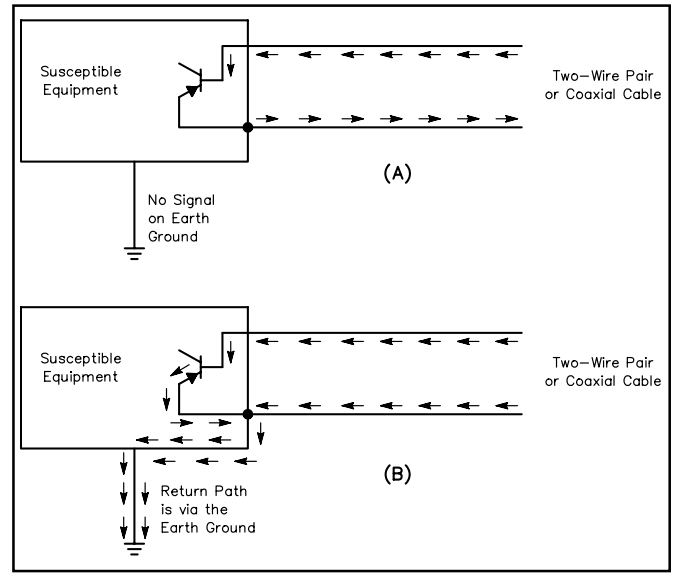


Figure 2—In (A) there are differential-mode signals conducted between two wires of a pair. This signal is independent from earth ground. In contrast, a common-mode signal (B) is in phase on all wires that form the conductor (this includes coaxial cable). All wires act as if they are one wire. The ground forms the return path.

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; doctor@arrl.org.

By Robert S. Bennett, W3WCQ

The "BRATS" Q&A Net

Have repeater, will educate? Here's one club's solution...

Although most Amateur Radio clubs maintain decent repeater systems, many could probably improve on their member services and put those repeaters to good use. For the Baltimore Radio Amateur Television Society (BRATS), going that extra mile takes the form of a popular weekly technical question and answer net. A well-seasoned effort, the net has been operating for 20 years. Visitors often mention that they'd love to have something similar on their home repeaters. We agree! To that end, here is a brief introduction to our operation.

Knowledge Nets

It's natural for hams to discuss technical problems, one on one. Since June of 1979, the BRATS Q&A (question and answer) net has taken this a step further by providing a regular time for addressing technical questions on the air, with one or two technically experienced hams on hand to moderate the discussions. FM voice and ATV—via the BRATS ATV repeater—are used. Amateur television is particularly effective because of the obvious visual appeal, but not everyone has access to ATV receiving gear. That's why we make the sessions available on FM voice repeaters as well.

Technical questions concerning Amateur Radio, antennas, electronics, video and computers are welcome. We try to focus on general questions that don't relate to specific commercial products.

The sessions begin with an opening statement and we emphasize that hams checking in need *not* be BRATS members—this is a service for all hams. Following that, participants check in with their call signs only, and are then invited in turn to ask their questions. Several technical experts monitor the net and check in only when they're needed.

Questions can range from a simple application of Ohm's Law, to more complicated queries about microphone impedances and antenna gain. Some questions can be answered by citing references in *The ARRL Handbook*, some require a bit of research, and some are handled by hams with hard-won specific knowledge! We work to make sure that everyone feels at ease. There are no "dumb" questions.

Here's W3WVV as seen at a distant ATV receiving site.

It's the author's turn to answer a question during the net.

Questions may be answered immediately by the moderators, by opening the net for discussion or, in some cases, by additional research with a response by mail. In these cases we follow up on the air the following week for the benefit of the other operators who checked in.

Our net control ops have significant backgrounds in ham radio and electronics, but it's equally important that a number of qualified "monitors" are willing to jump in with additional information (and sometimes very lively discussions)! If your club attempts such a net, make sure you enlist the services of a couple of experienced hams to moderate and/or provide answers. The BRATS have two moderators who have been licensed since 1953 (but you don't need that much experience to get a good net started). Discussions should be encouraged, and the moderators shouldn't attempt to give definitive answers to every question. "I don't know, but I know where to find out" is a perfectly good answer.

Build the Net You Need

To start your own Q&A net, choose a well-publicized meeting time and stick to it, even if there are only a few questions on some weeks. We find that Saturday afternoon works well. The duration of the net depends on the number of questions, but is generally limited to a half an hour.

ATV isn't a must, but it certainly enhances the presentation when you can *show* as well as *tell*. If you have license classes taking place in your area, why not set up an ATV net to coincide with the class times? Volunteers can set up portable ATV stations at the class sites and your Q&A net can be fully interactive!

Whichever approach you use, this is a chance for your club to do something useful with its repeater, to promote experimenting and building and add to its members' technical education. Why not give it a try?

Heru Walmsley, W3WVV, one of the BRATS net control stations, answers a question.

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By Denny Payton, N9JXY

The Poor Man's Paddle

Follow in the footsteps of scroungers everywhere and build this handy, teeny keyer paddle. It's quick, nifty, inexpensive and easy to build. What more could you want? Well, it's also a coin bank of sorts…

Here's a simple paddle you can build in just a few hours—for just a few bucks—that's dependable and comfortable. Its low cost makes it an ideal CW paddle for beginners, and a good paddle for portable use. Just plug it into a keyer—or plug it directly into your radio if it has a keyer built in.

Construction doesn't require much in the way of materials, tools, or skill, so why not give it a try? I think you'll be pleasantly surprised.

Construction

To build the Poor Man's Paddle, transfer the pattern shown in Figure 1 to a piece of paper. The easiest way to do this is simply to photocopy the page. Fasten the paper to the circuit board material with double-sided tape and cut out the four pieces. Use a large pair of tin snips or a hacksaw. Drill the two holes in the base, then carefully file away clearances in the vertical support (for the screw heads and adjustment wire) and under each paddle (for the adjustment wire). Remove the pattern right away (while it's still easy) and smooth the parts with sandpaper.

Center the base piece on top of an Altoids box, or something of similar size, with the wide end lined up with the front of the box. Mark and drill the lid holes. Using the two screws and nuts, fasten the base to the lid.

Now take the vertical support and remove the copper from two narrow strips on each side as shown in Figure 2 to create pads for mounting the switches. A hacksaw blade, used gently, works fine for this. Solder the switches to the board after bending and shortening the leads. Solder two sets of short wires on top of the vertical support for securing the cable.

Stand the vertical support perpendicular to, and centered on, the base and solder it on both sides (see Figure 3). Also solder the screw heads. Solder the

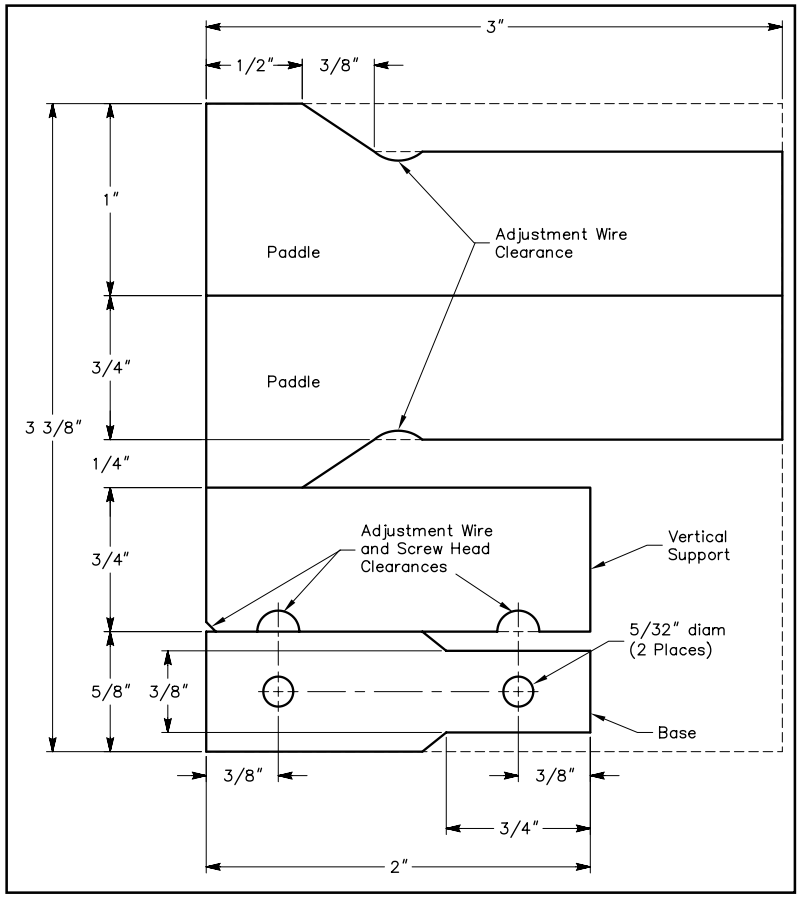


Figure 1—Patterns for both paddles, the vertical support and the base. You can cut PC board stock to the dimensions shown, or photocopy this page, cut out the patterns and use them as cutting templates.

Materials

RadioShack part numbers shown unless otherwise indicated.

1— $4\frac{1}{2} \times 6\frac{3}{8}$-inch double-sided circuit board
2—6-32 × $\frac{1}{4}$-inch brass screws
2—6-32 brass nuts
2—Miniature momentary pushbutton switches (Digi-Key P8006S-ND, order toll free at 800-344-4539)
1—#18, $1\frac{1}{2}$-inch solid copper wire
Two-conductor shielded cable (278-514)
1—Altoids box
3—Rolls of pennies
Rubber feet (64-2346)
Double-sided foam tape strips
Masking tape

A partial kit containing the PC board, microswitches and other hardware is available available from the author for $2 and an SASE with two first-class stamps.

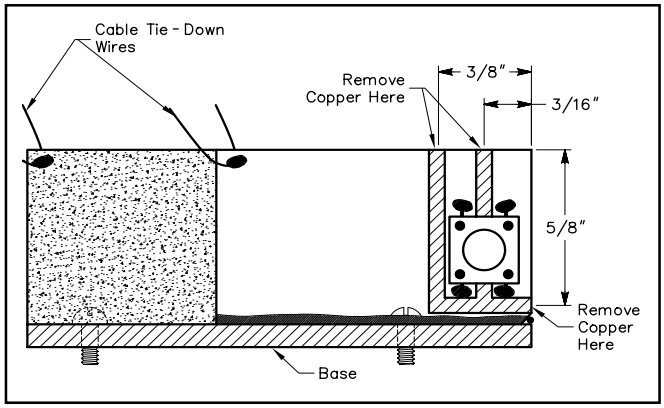


Figure 2—Take the vertical support and remove the copper from both sides as shown. The idea is to create two separate pads for mounting the switches. Solder the switches to the board after bending and shortening the leads. Solder two sets of short wires on top of the vertical support for securing the cable.

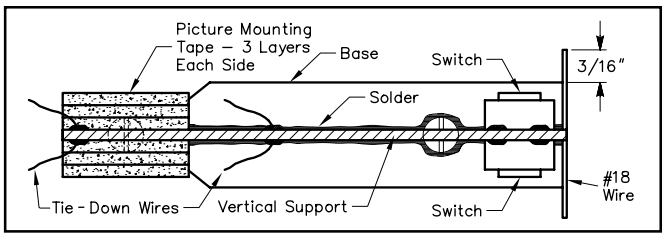


Figure 3—Top view of the vertical support soldered to the base.

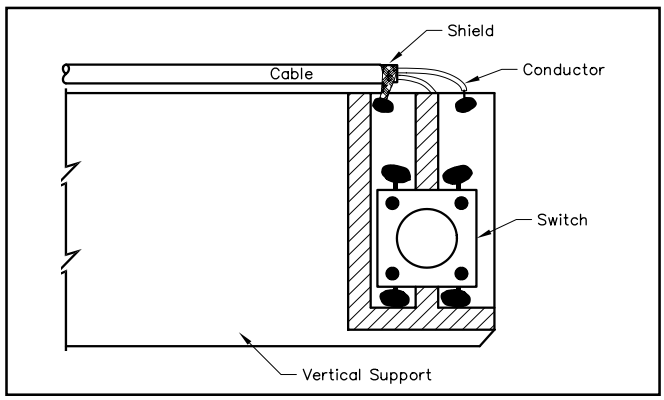


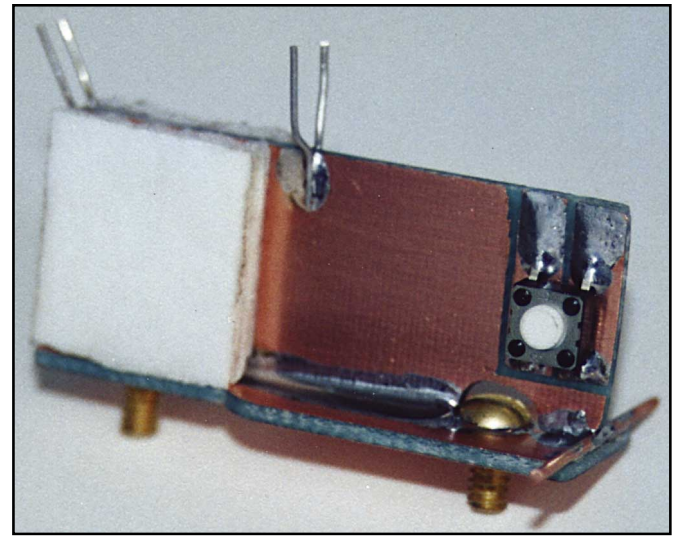
Figure 4—An enlarged drawing of the cable connections (only one side of the vertical support is shown). Solder the shield braid to one switch pad and solder one of the center conductors to the other.

#18 wire to the front edge and trim it 3/16 inch beyond each side of the base.

Remove the assembly from the lid and put three layers of foam picture mounting tape on the rear 3/4 inch of each side of the vertical support. Trim the first layer or two so that the screw head and solder don't cause a bulge. Mount each paddle by standing it on its edge over the #18 wire (parallel to the base and even with the rear of the vertical) and firmly pressing it against the picture mounting tape. Be careful, the tape is not very forgiving! Once it's there, it's there. (Also, don't remove the outside paper from the tape until you're ready to stick something to it.)

Poke a hole through the center of a 5 1/4-inch piece of masking tape and slip it over the rear screw. While slightly squeezing the paddles, wrap one side around the assembly, then the other.

Drape the cable along the top of the vertical support and solder the inner conductors and the shield braid to the switch pads as shown in Figure 4. Tie the cable down with the two sets of wires.



The base and vertical support—ready for paddles.

Making the base. Cut approximately 1 inch from each end of two rolls of pennies. Place them in the four corners and stack about eight pennies between them. Fit the third roll into the middle and place the remaining pennies around the sides.

At the transceiver or keyer end of the cable, attach the required connector. Bend the #18 wire up sharply against the paddles and you're almost finished.

The three rolls of pennies can be cut and fitted inside the Altoids box as shown (for weight). Add the feet, but avoid using the rounded variety because they flex enough to cause the paddle to wobble.

Now mount the paddle assembly back on the Altoids box and thread on the nuts from the underside of the lid to hold the assembly in place. The keyer can be adjusted by bending the adjustment wires inward with your fingernail, or by bending them outward by pulling on the paddles. The contacts can be adjusted precisely enough to simulate "touch" paddles, if desired.

Conclusion

For portable use, the paddle can be removed from the base and carried in a second Altoids box. Not only is this an easy, enjoyable project, you'll have the satisfaction of using a key you built yourself!

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By Daniel Ryan Messano, KE4RAP

An Indoor Loop for Satellite Work

If you're limited to indoor antennas, don't count yourself out of the amateur satellite fun. As this author discovered, a ceiling-mounted indoor loop puts two birds within reach—for less than $10! Why not build a few of your own?

My loop was built using the standard formula, L = 1005/frequency, where L is the total length of the loop in feet. At 29.4 MHz—the approximate frequency for downlinks from the RS13 and RS15 satellites—this figures to roughly 8½ feet on each side of a square loop—a size that my ceiling can easily accommodate (see Figure 1).

To keep the weight down I used 22-gauge wire. Of course, larger wire will work about the same—or even better. I used the formula mentioned above, multiplying by 12 to get inches and dividing by 4 to get the length of each side. As a shortcut I use L = 3015/f, where L is inches per side. It's sometimes easier to measure each side of a square loop. In this case, each side figures to 102½ inches. I cut each side to 103½ inches to allow for overlap when twisting the wires together.

Next, I solder three of the corners, leaving the fourth corner open for attaching the feed line.

I used RG-59 coax for the entire run. I know, the impedance of the loop is somewhere near 100 Ω. I suppose I could cut the RG-59 to a specific length, or use RG-58 with a small piece of RG-59 for impedance matching. I used RG-59 because I have a lot of it on hand, and I don't feel that the losses from this minor mismatch are worth worrying about. The feed line is attached by simply stripping back about a half inch of the RG-59 and soldering the center conductor to one of the loop ends, and the shield to the other.

The antenna—all eight ounces of it—is attached to the ceiling with garden-variety thumbtacks. The RG-59 runs to a corner and down the wall. Solder a connector to the end of your feed line and you're done!

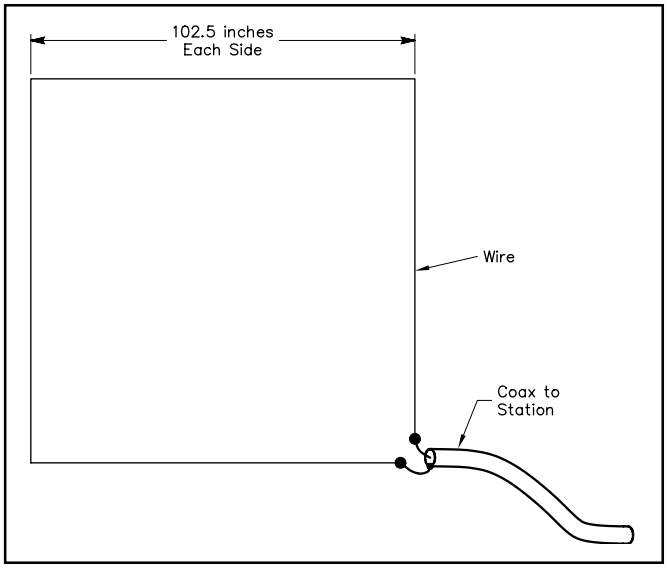

Figure 1—The simple satellite receiving loop.

RS-13 and RS-15: Two Satellites *You* can Work!

The Russian RS-13 and RS-15 satellites are among the most popular birds for hams who are new to the satellite game. They are relatively easy to work and require minimal radios and antennas. The receiving loop described in this article is more than sufficient for listening to the downlink signals. Simple wire dipole antennas are all you need for transmitting.

RS-13 and RS-15 listen on one band of frequencies (the *uplink passband*) and repeat what they hear on another band (the *downlink passband*). Users transmit SSB or CW, but not FM because the satellite cannot handle the hefty power demands of several FM signals.

Both satellites will pass over your location several times in every 24-hour period. If you have satellite-tracking software you can determine when the passes will occur. If not, you can obtain pass predictions on the Web at **http://acsprod1.acs.ncsu.edu/scripts/HamRadio/sattrack**. Depending on how long the satellite is available to you, contacts can last as long as 15 minutes and can span 2000 miles or more!

Satellite	*Uplink Passband (MHz)*	*Downlink Passband (MHz)*
RS-13	21.260—21.300 145.960—146.000	29.460—29.500
RS-15	145.858—145.898	29.354—29.394

Since this antenna is for receiving only, you don't need to trim and tweak it for SWR like you would if you were going to be transmitting with it as well. However, if you have an antenna analyzer handy, or if you can borrow one, you can improve the loop's performance by trimming it for resonance at 29.4 MHz.

What's the total cost? If you figure about $3 for cable, a couple of bucks for the wire, $1 for cable clips, 50 cents for a box of thumbtacks and $1 for a connector, the total cost is about $8. If you have some of the stuff in your junkbox, the antenna might not require any additional outlay.

Results

My first reception of RS-13 proved the antenna's effectiveness! With a good overhead pass, signals were S5 to S7 on my HR-2510 transceiver. I switched to my vertical several times during the pass and heard very little. I enjoyed impressive results with RS-15, a much weaker satellite.

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By H. Ward Silver, N0AX

Test Your Knowledge!

A tower project is a difficult undertaking—and so is this quiz!

After much deliberation and penny-pinching, you have decided that no less than 120 feet of steel rising above your domain will do the job. After reviewing your wind loading and antenna requirements, the manufacturer's table dictates that the tower is to be guyed on three sides at heights of 110 feet, 70 feet, and 30 feet above the ground. The guy points are to be at a distance of 100 feet from the tower.

Based on the tower I've just described…

1. How much guy wire is required, including an extra 5% for clamping and wastage?

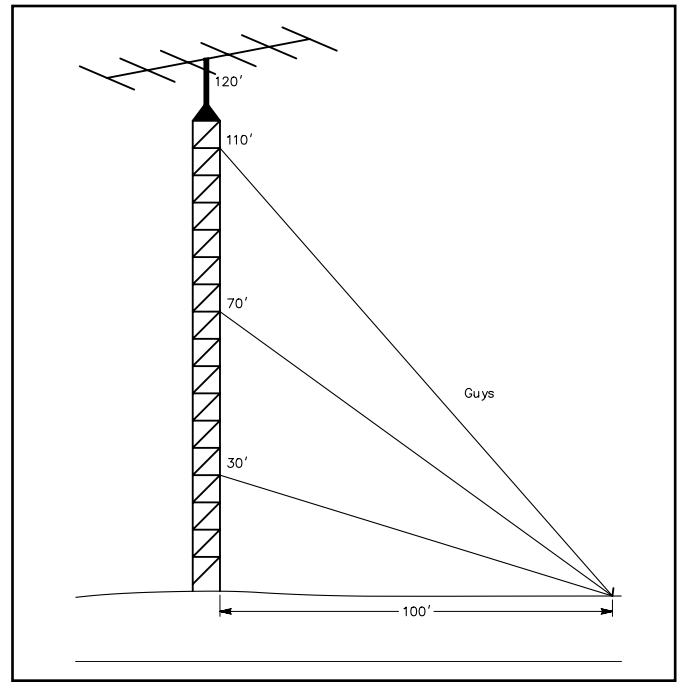
2. If the guys are to be broken with insulators at intervals of 27 feet, starting at the tower, how many insulators are required?

3. What is the minimum dimension of a rectangular plot of ground on which this project can be erected and still leave 3 feet from the guy points to the property line?

4. What is the maximum height (other than in the top 10 feet) at which a rotating Yagi with a 30-foot boom (mounted at the midpoint) and a reflector length of 28 feet can be side mounted? (Ignore sag in guy wires and antenna material.)

5. If a 160-meter dipole cut for 1.850 MHz is tied to the top of the tower, and the opposite end is at ground level (assuming flat ground), how far will the opposite end be from the base? If the feed cable is to connect to a switch box at the tower base and drops vertically to ground level from the feed point, how much cable is required?

6. If the distance traveled in free-fall is $^1/_2gt^2$, how long will it take that nut you just dropped from the top of the tower to hit the ground? (ie, How long does the ground crew have to get out of the way?) Use a value of 32 ft/sec^2 for g, the acceleration of gravity.



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QST

Answers

1. Solve for the hypotenuse of each of the three triangles formed by a guy wire, tower, and the ground by using the formula:

guy wire length = $\sqrt{\left[(\text{attachment height})^2 + (100\text{ feet})^2\right]}$

The top guy is 148.7 feet, the middle 122 feet, and the bottom 104.4 feet for a total of 375.1 feet per side. Totaling all three sides gives 1125.4 feet, plus 5% is 1181.7 feet. Better order at least 1200 feet.

2. Start at the tower end of each guy wire and mark off 27-foot increments. The top guy has 5 insulators, the middle 4, and the bottom 3 for a total of 12 insulators per side and 36 total. Don't forget that you'll need two sets of cable clamping hardware at each insulator!

3. The minimum dimension across an equilateral triangle goes from one vertex (ie, guy point) straight through the center (ie, tower) to the opposite side. This distance is 1.5 times the distance from any vertex to the center. In the case of this tower, the minimum distance across the triangle is 150 feet. Add 3 feet on each side for the property line and the minimum width of the land must be 156 feet.

4. The question asks how high the antenna can be mounted without bumping any of the guy wires. First, figure the turning radius of the antenna: turning radius =

$$\sqrt{\left[\left(\frac{1}{2}\text{boom length}\right)^2 + \left(\frac{1}{2}\text{reflector length}\right)^2\right]} = 20.5\text{ feet}$$

Being optimistic, start at the top guy point on the tower and work down from there. Sketch the triangle to help visualize the problem.

The angle between the top guy and the tower is:
angle = arcsin (height / guy length) = 42°
Now figure the distance below the guy point at which the guy wire is at least 20.5 feet from the tower:
tan (42°) = 20.5 / distance
distance = 20.5 / tan (42°) = 22.8 feet

Since this is a shorter distance than to the next lowest guy point (40 feet between guy points), you can mount the Yagi at a height of 87.2 feet. Better not cut it quite so close, though. A height of 75 to 80 feet will keep the antenna well clear of any electrical interactions with the guys and give you room to work with the antenna.

5. Using our favorite formula for the length of a dipole (468/f), the length is found to be 253 feet. With one end at 120 feet, the other is on the ground this far from the tower:

distance = $\sqrt{\left[(\text{length})^2 + (120')^2\right]} = 222.7\text{ feet}$

The second parts are pretty easy if you use a simple trick—the feed point is exactly in the middle of the dipole, isn't it? That means that it's 120/2 = 60 feet above the ground and 222.7/2 = 111.4 feet from the tower for a total of 171.4 feet of cable.

6. Ground crews, pay attention! Neglecting air resistance, that nut gets to the ground in 2.75 seconds. If the guy at the top yells as he drops it and the sound gets to the ground in about a tenth of a second, *and* you're paying attention and react in three-quarters of a second, you've got less than 2 seconds to vamoose. Better leave the discussion of DXing techniques until later.

Edited by **Joe Bottiglieri, AA1GW** • Assistant Technical Editor

ICOM IC-706MKIIG HF/VHF/UHF Transceiver

By Rick Lindquist, N1RL
Senior News Editor

Recently I was scanning the automobile ads—a vain exercise in wishful thinking—when I spotted a writeup for the latest model of my current vehicle. Some of the features of the 1999 model were *exactly* the ones I'd often wished my car possessed. My vehicle was the first of its line, however.

This got me thinking about the time I bought my first 2-meter all-mode transceiver back when I was active on the satellites. It was a fine little transceiver, and I only recently parted company with it. But I never quite got over the fact that not six months after I'd bought my latest and greatest radio, the manufacturer came out with a new and improved version that incorporated all the features I'd come to wish that my rig had.

By now it should come as no surprise that I own an "original" IC-706 transceiver. We "original" owners have become greener with envy with each incarnation of the IC-706 line. Some have happily "traded up." Since the "original" debuted in 1995 to the oohs and aahs of the Amateur Radio community, ICOM has continued to up the ante (but not the price) almost each succeeding year, almost like model years in the auto industry. But while the Amateur Radio industry is not like the auto industry, ICOM has distinguished itself in recent years by trumping its own aces and by correcting in subsequent models shortcomings that we have revealed during the course of our product reviews.

Getting yet another look at this hugely popular model gave us the opportunity to dig a bit more deeply into the basic unit, and to see how the various enhancements over the subsequent two models have made the IC-706 a better radio.

So, it is trade-in time again? Let's see what the IC-706MKIIG brings to the table.

What's New, Pussycat?

The *primary* new features of the MKIIG are the addition of the 70-cm band, the inclusion of DSP, and more power—50 W—on 2 meters (history buffs will recall the original '706 put out 10 W on 2, the MKII 20 W). Yes, there are some other features that some users will consider significant or important, but for most folks, these are the big three. We'll get to the others in due course. They are largely incremental improvements, however.

DSP was an approximately $150 option in the initial MKII. Now, it's standard. If for nothing other than competitive reasons, this was a wise move on ICOM's part. We recently praised the Yaesu FT-100 for having superb DSP features—including the ability to digitally tailor your transmit audio on SSB—something you won't find on the MKIIG. The DSP features on the IC-706MKIIG are not quite as rich, but they are competent as far as they go.

The DSP menu offers two primary features: noise reduction and an autonotch filter to zap heterodynes while operating SSB. The IC-706MKIIG lets you adjust the level of noise reduction you prefer. While overall noise reduction was measured in the vicinity of 10 dB, as with the FT-100 we found a bit of rolloff at the high end plus a substantial amount of frequency ripple. With the NR cranked up full tilt boogie on SSB, the digital processing noise becomes much more apparent—even annoying at times. But, it might very well be far less annoying than the noise you're trying to reduce, so it's one of those trade-offs.

One characteristic where the DSP in the '706 excels is the autonotch. Lab measurements revealed a notch depth for a single tone at greater than 50 dB. This is considerably better than the 20 dB notch depth on the FT-100.

Something new for FM-lovers: The MKIIG lets you set the "automatic" splits for repeater operation for HF, 50, 144 and 430 MHz, a real plus for repeater users. These settings are part of the initial set mode menu. This split is the one you'll get when you press the **DUP** button in FM mode. The IC-706MKIIG "knows" the split direction too, depending upon the band segment.

The MKIIG also includes tone scan capability—something that's optional in the nearest competitor, the FT-100. The Instruction Manual is a little unclear about this, but you have to be in repeater mode and have **TON** enabled.

The SWR Graph mode is a new and potentially useful feature that generates a little graphic representation of your SWR over a selectable range of HF or 6-meter frequencies. The menu lets you set the number of sample points to graph (3, 5, 7 or 9) and the step size between each point (10, 50, 100 or 500 kHz). The resulting "graph" is a set of vertical bars. The number of bars corre-

BOTTOM LINE

With the addition of yet another band (70 cm), more power on 2 meters and the incremental improvements made with each new version of this popular transceiver, perhaps the '706 has reached its zenith. There's not much left to improve.

Table 1

ICOM IC-706MKIIG, serial number 01674

Manufacturer's Claimed Specifications	***Measured in the ARRL Lab***
Frequency coverage: Receive, 0.03-200, 400-470 MHz; transmit, 1.8-2, 3.5-4, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7, 50-54, 144-148, 430-450 MHz.	Receive, as specified; transmit 1.8-2, 3.5-4.1, 6.9-7.5, 9.9-10.5, 13.9-14.5, 17.9-18.5, 20.9-21.5, 24.4-25.1, 28-30, 50-54, 144-148, 430-450 MHz.
Power requirement: Receive, 2.0 A; transmit, 20 A.	Receive, 1.4 A; transmit, 21 A. Tested at 13.8 V.
Modes of operation: SSB, CW, AM, FM, AFSK, WFM (WFM receive only).	As specified.
Receiver	*Receiver Dynamic Testing*
SSB/CW sensitivity, bandwidth not specified, 10 dB S/N: 1.8-30 MHz, <0.15 μV; 50-54 MHz, <0.12 μV; 144-148, 430-450 MHz, <0.11 μV.	Noise floor (mds), 500-Hz filter: *Preamp off* / *Preamp on* 1.0 MHz: –124 dBm / –130 dBm 3.5 MHz: –137 dBm / –142 dBm 14 MHz: –136 dBm / –142 dBm 50 MHz: –139 dBm / –142 dBm 144 MHz: –138 dBm / –142 dBm 432 MHz: –138 dBm / –143 dBm
AM sensitivity, 10 dB S/N: 0.3-1.8 MHz, <13 μV; 1.8-30 MHz, <2 μV; 50-54,144-148, 430-450 MHz, <1 μV.	10 dB (S+N)/N, 1-kHz tone, 30% modulation: *Preamp off* / *Preamp on* 1.0 MHz: 3.3 μV / 1.7 μV 3.8 MHz: 0.68 μV / 0.44 μV 50 MHz: 0.25 μV / 0.21 μV 120 MHz: 0.91 μV / 0.39 μV 144 MHz: 0.68 μV / 0.39 μV 432 MHz: 0.67 μV / 0.37 μV
FM sensitivity, 12 dB SINAD: 28-30 MHz, <0.5 μV; 50-54 MHz, <0.25 μV; 144-148, 430-450 MHz, <0.18 μV.	For 12 dB SINAD: *Preamp off* / *Preamp on* 29 MHz: 0.39 μV / 0.20 μV 52 MHz: 0.25 μV / 0.17 μV 146 MHz: 0.29 μV / 0.16 μV 440 MHz: 0.29 μV / 0.16 μV
Blocking dynamic range: Not specified.	Blocking dynamic range, 500-Hz filter: *Preamp off* / *Preamp on* 3.5 MHz: 125 dB / 118 dB 14 MHz: 122 dB* / 120 dB* 50 MHz: 116 dB* / 112 dB* 144 MHz: 111 dB* / 101 dB* 432 MHz: 109 dB* / 106 dB*
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range, 500-Hz filter: *Preamp off* / *Preamp on* 3.5 MHz: 89 dB / 87 dB 14 MHz: 89 dB / 86 dB 50 MHz: 89 dB / 82 dB 144 MHz: 88 dB* / 83 dB 432 MHz: 85 dB / 82 dB
Third-order intercept: Not specified.	*Preamp off* / *Preamp on* 3.5 MHz: –3.4 dBm / –13 dBm 14 MHz: –1.3 dBm / –11 dBm 50 MHz: –4.9 dBm / –15 dBm 144 MHz: –3.0 dBm / –16 dBm 432 MHz: –8.7 dBm / –18 dBm
Second-order intercept: Not specified.	Preamp off, +36.4 dBm; preamp on, +38.5 dBm.

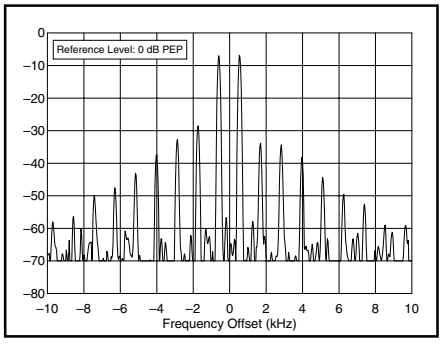


Figure 1—Worst-case HF spectral display of the IC-706MKIIG transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 30 dB below PEP output, and the worst-case fifth-order product is down approximately 33 dB. The transceiver was being operated at 100 W PEP output at 21.25 MHz.

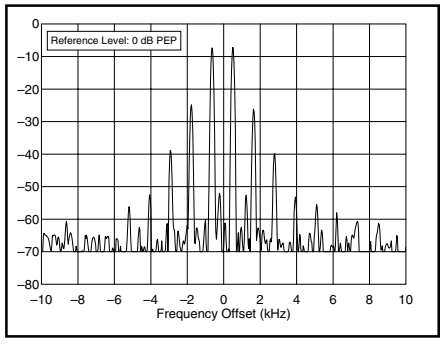


Figure 2—Worst-case VHF/UHF spectral display of the IC-706MKIIG transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 25 dB below PEP output, and the worst-case fifth-order product is down approximately 40 dB. The transceiver was being operated at 50 W PEP output at 144.2 MHz.

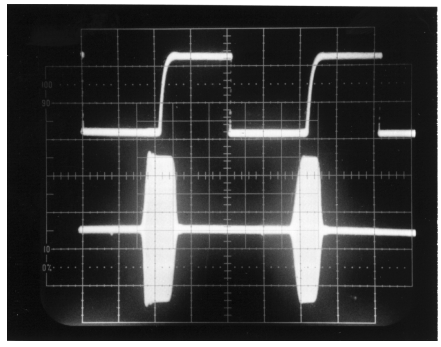


Figure 3—CW keying waveform for the IC-706MKIIG showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is approximately 60 wpm. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output at 14.2 MHz. Note the considerable shortening of both dits.

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
FM adjacent channel rejection: Not specified.	20 kHz channel spacing, preamp on: 29 MHz, 66 dB; 52 MHz, 64 dB; 146 MHz, 70 dB; 440 MHz, 71 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing, preamp on: 29 MHz, 66 dB*; 52 MHz, 64 dB*; 146 MHz, 70 dB*; 440 MHz, 75 dB; 10 MHz channel spacing, preamp on: 52 MHz, 91 dB; 146 MHz, 78 dB; 440 MHz, 80 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: preamp off, 34 μV; preamp on, 11 μV; 52 MHz, preamp off, 14 μV; preamp on, 6.6 μV; 146 MHz, preamp off, 18 μV, preamp on, 4.1 μV; 432 MHz, preamp off, 17 μV, preamp on, 5.7 μV.
Squelch sensitivity: SSB, <5.6 μV; FM, <0.3 μV.	At threshold, preamp on: SSB, 14 MHz, 1.4 μV; FM, 29 MHz, 0.11 μV; 52 MHz, 0.06 μV; 146 MHz, 0.06 μV; 440 MHz, 0.06 μV.
Receiver audio output: 2.0 W at 10% THD into 8 Ω.	2.1 W at 10% THD into 8 Ω.
IF/audio response: Not specified.	Range at -6dB points, (bandwidth): CW-N (500 Hz filter): 200-1000 Hz (800 Hz); CW-W: 182-3077 Hz (2895 Hz); USB-W: 182-3077 Hz (2895 Hz); LSB-W: 182-2667 Hz (2485 Hz); AM: 275-2860 Hz (2585 Hz).
Spurious and image rejection: 1.8-30 MHz, 70 dB; 50-54 MHz, image rejection, 65 dB, IF rejection unspecified; 144-148, 430-450 MHz, IF and image rejection, 65 dB.	First IF rejection, 14 MHz, 120 dB; 50 MHz, 54 dB; 144 MHz, 64 dB; 432 MHz, 108 dB; image rejection,14 MHz, 112 dB; 50 MHz, 121 dB; 144 MHz, 71 dB; 432 MHz, 80 dB.
Transmitter	*Transmitter Dynamic Testing*
Power output: HF & 50 MHz: SSB, CW, FM, 100 W AM, 40 W (high); 144 MHz, 50 W (high); AM, 20 W (high); 430 MHz, 20 W (high); AM, 8 W (high).	HF & 50 MHz: CW, SSB, FM, typically 103 W high, <1 W low; AM typically 29 W high, <1 W low; 144 MHz: CW, SSB, FM, typically 53 W high, <1 W low; AM, typically 19 W high, <1 W low; 430 MHz: CW, SSB, FM, typically 20 W high, <1 W low; AM, typically 6 W high, <1 W low.
Spurious-signal and harmonic suppression: ≥50 dB on HF; ≥60 dB on VHF & UHF.	HF, 53 dB; 50 MHz, 67 dB; 144 MHz, 61 dB; 430 MHz, 68 dB. Meets FCC requirements for spectral purity.
SSB carrier suppression: ≥40 dB.	As specified. >59 dB.
Undesired sideband suppression: ≥50 dB.	As specified. >64 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	See Figure 1.
CW keyer speed range: Not specified.	6 to 50 WPM.
CW keying characteristics: Not specified.	See Figure 3.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, 21 ms.
Receive-transmit turn-around time (tx delay): Not specified.	SSB, 20 ms; FM, 210 ms. Unit is suitable for use on AMTOR.
Composite transmitted noise: Not specified.	See Figures 4 and 5.
Bit-error rate (BER), 9600-baud: Not specified.	146 MHz: Receiver: BER at 12-dB SINAD, 2.2×10^{-3}; BER at 16 dB SINAD, 4.6×10^{-5}; BER at –50 dBm, $<1.0\times10^{-5}$; transmitter: BER at 12-dB SINAD, 4.6×10^{-3}; BER at 12-dB SINAD + 30 dB, 2.1×10^{-4}. 440 MHz: Receiver: BER at 12-dB SINAD, 2.3×10^{-3}; BER at 16 dB SINAD, 8.4×10^{-5}; BER at –50 dBm, $<1.0\times10^{-5}$; transmitter: BER at 12-dB SINAD, 2.8×10^{-3}; BER at 12-dB SINAD + 30 dB, 1.9×10^{-4}.

Expanded Product Review Report Available

The ARRL Laboratory offers a detailed test result report on the ICOM IC-706MKIIG that gives in-depth, technical data on the transceiver's performance. Request the *IC-706MKIIG Test Result Report* from the ARRL Technical Department, 860-594-0278; e-mail **mlevesque@arrl.org**. Members can see this on-line on our Members Only Web site.

Size (HWD): 2.3×6.6×7.9 inches; weight, 5.4 pounds.
Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.
*Measurement was noise-limited at the value indicated.
Third-order intercept points were determined using S5 reference.

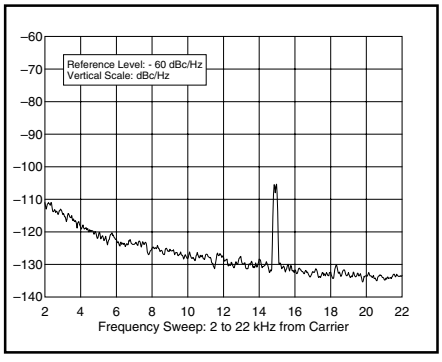


Figure 4—Worst-case HF spectral display of the IC-706MKIIG transmitter output during composite-noise testing. Power output is 100 W at 14.02 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

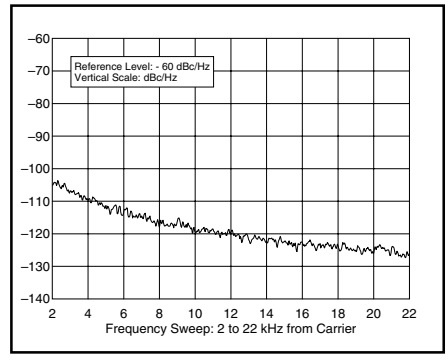


Figure 5—Worst-case VHF/UHF spectral display of the IC-706MKIIG transmitter output during composite-noise testing. Power output is 20 W at 432.02 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

sponds to the number of sample points, the height of each bar indicates the SWR at that point. This is a very neat feature—especially if you're trying to figure out where your antenna system is going wrong.

What Got Better?

One of the nice little touches on this transceiver is how the IF bandwidth icon pops up in the menu keys area as soon as you touch the **IF SHIFT** knob. The bandwidth narrows appropriately if you switch in a narrow filter too.

Another nice touch is the backlighted buttons. Even the **P.AMP/ATT**, **RIT/SUB** and **TUNER/CALL** buttons are visible in darkness. When not activated, they emit a dull, orange glow.

An annoying and potentially damaging problem that we'd spotted in the earlier models in the IC-706 line appears to have been eliminated for the most part in the MKIIG. In

the earlier incarnations, if you cut back the power—say to match the required input for an amplifier—the transmitter still would put out a very brief "spike" of up to full output power when the transmitter was first keyed that lasted until the ALC took hold and reined in the output to the desired level. Some users reported that amplifiers sometimes would kick off as a result. ICOM apparently was listening. The leading-edge spike on the MKIIG is much less prominent and should not cause the same sorts of problems.

Déjà vu

The IC-706MKIIG continues the worthy tradition of being an easy-to-use and (almost as important) easy-to-mount subcompact radio.

As with all the previous '706s, this version's control buttons and knobs are logically positioned and adequately spaced and sized for convenient operation. The tuning speed automatically increases with faster knob rotation and a well-designed knob spinner and a drag adjustment lever is provided.

The built-in speaker in the last two iterations actually sounds pretty decent. The thermostatic control for the cooling fan, also added with the MKII model, was a welcome improvement–especially for fixed-station operation.

ICOM offers a nice selection of optional IF filters. Two slots are available (up from one in the original '706), and the plug-in sockets make the filters easy to install or swap out.

Unlike the competition, the radios in the '706 series only require a single quick-release separation cable for remote mounting of the control head. The head includes a connection point for the mike, and a switch on the back of the front panel allows you to use the "phones" jack for either headphones *or* an external speaker. This is a real convenience if you intend to use the radio in multiple applications.

Two notable weak points present in both of the earlier units, unfortunately, have also remained unchanged in the G.

From the advent of the IC-706 series, one of the things we'd complained about was fact that turning on the noise blanker can impart a lot of crackling artifacts, especially on a busy band or in the presence of nearby strong signals. Yes, it does work to eliminate pulse noise—I checked it out on the engine noise of passing vessels while operating marine mobile one weekend, and it worked just fine. Only when the band started to fill up a bit later did I start hearing the characteristic crackling noise—and realize I'd left the NB on.

The AGC is another thing that's the same across the entire model line. It can be fast or slow (no display indication means it's in the slow mode), but not off. For my tastes, the fast AGC is too fast for comfortable SSB listening, and I wasn't crazy about it for CW either. My tendency was to leave the AGC in the slow mode at all times. The AGC is accessible via the main menu.

Multiple Menus

First-time users of the IC-706MKIIG (or of any of the '706 lineage, for that matter) will encounter a bit of a learning curve getting used to all the menus. The IC-706MKIIG has not one, not two, but four menus; unfortunately, the *Instruction Manual* does not cover all of them in the same place. Let's take a look at the layers of menus.

First, there's the "M" menu—a primary menu set that includes four sets of three choices apiece. These have not changed from the previous model. Successive quick presses of the **DISP** button get you to the "S" menu and the "G" menu. The S menu includes the Memo Pad, the Scan Func, the B.S.R. (band-stacking registers), and the D.S.P. functions. The G menu includes the *Band Scope*, an SWR Graph mode, a TX Freq readout mode, and a Memory Name mode.

But wait, there's more: press and hold the **DISP** button and you get to the "Q" or "Quick Set" menu, which sets a variety of mode-related functions in addition to power output. There are some changes in this menu set, owing to the fact that ICOM has shifted some settings that were manual adjustments on the MKII are now menu adjustments on the MKIIG. The **VOX GAIN** and **ANTI VOX** used to be little trimpot adjustments on the side of the transceiver. Putting them into the Quick Set menu is a giant step toward greater convenience. The only trimpots on the side of the radio now are **COMP**ression **GAIN** and the **BEEP/SIDE T**one adjustments.

To top it all off, the 706 series provides what's called an "Initial Set" menu. The Initial Set menu in the MKIIG contains 37 choices as opposed to 28 in the MKII, so there are some changes in the Initial Set menu from the previous model. One possibly convenient setting—it's the first one in this set of adjustments—is called Mode Select. It lets you inhibit the selection of unneeded modes. This eliminates the admittedly minor annoyance of having to step through, say, RTTY, when switching modes when you have no intention of operating RTTY.

Since the buttons now are backlighted on the MKIIG, the Initial Set menu provides a way to set the backlighting at either the HI or LO brightness level.

The MKIIG is 9600 bps capable; you set the packet speed—1200 bps or 9600 bps—via the Initial Set menu. In the 9600 bps setting, the signal from the TNC passes through an internal limiter to maintain bandwidth. This brings up another new item from the previous model. The MKIIG has a new 6-pin mini-DIN **DATA** jack on the rear apron for packet connections to a TNC for either 1200 bps or 9600 bps operation.

Something that's really handy for FM repeater ops is that the Initial Set menu on the MKIIG also lets you select a DUP offset—±9.999 MHz—to set the standard repeater split on HF, 50, 144 and 430 MHz. You still can set a standard split that you then can retrieve at the push of a menu function button.

Once enabled via the Initial Set menu, the DUP offset makes available the one-touch repeater function. As it suggests, it allows you to set repeater operation with the push of one switch.

Something new on the MKIIG, the auto repeater function, also is enabled via the Initial Set menu. This automatically activates the repeater settings (duplex direction and tone encoder on or off) when the operating frequency is within a repeater subband. This means, for example, that the duplex direction automatically will be + if you're in the 147 MHz range of 2 meters and within the repeater subband.

The upside of the individual menus is that not all items are in one big menu and, as a result, are more accessible. The downside is that all menu items are not in one big menu. It can be difficult to remember which menu function is where, and the groupings are not always intuitive. In addition to other information, the convenient *Operating Guide* that accompanies the manual includes a Menu Switch Flow Chart that certainly is a step in the right direction to simplifying matters.

Let's do the Numbers

In performance terms, did anything important change between the MKII and the MKIIG? SSB and CW sensitivity numbers are about the same across the board—HF and VHF. The 70-cm band falls into the same ballpark as well. Blocking dynamic range was slightly better—as much as 12 dB better and not noise-limited on 3.5 MHz this time.

Two-tone, third-order IMD dynamic range measurements were ever so slightly better than the previous model—and only noise-limited on 144 MHz this time, not on all bands. There was one difference. On the MKII we looked at early last year, third-order intercept had been in the positive numbers (preamp off) on 3.5 and 14 MHz. All third-order intercept numbers were negative on our MKIIG.

AM sensitivity appeared to be significantly improved on the MKIIG we tested. On 3.5 MHz, it went from 1.0 µV to 0.68 µV. In the aircraft band, it went from 2.0 µV to 0.91 µV. FM sensitivity numbers between the MKII and the MKIIG were comparable on 50 and 144 MHz and slightly better on 10 meters.

CW Keying

In the two earlier IC-706 models, we'd noted some limitations on the CW keying, especially when transmitting at speeds in excess of around 30 WPM using full-break-in, with or without the internal CW keyer. Our Lab measurements (see Figure 3) backed up the on-air reports we'd received of clipped characters. Dits were all shortened with high-speed keying. In the semi-break-in mode, only the first dit was shortened.

The on-air reports I received from my CW connoisseurs on 40 meters were not especially flattering of the IC-706MKIIG while using full-break-in and the internal keyer at or above 30 WPM or so. By the way, the IC-706MKIIG menu reads out CW

sending speed using the actual number (or a rough approximation) of words per minute. On the FT-100, you have to guess, since the number is only a relative indicator of sending speed.

Compared to the Competition

The IC-706MKIIG seemed to appear in response to the Yaesu FT-100, the first radio of the subcompact genre to offer the 70-cm band and announced at Dayton Hamvention 1998. Their features and street prices are similar, but there are some differences that go beyond the merely cosmetic. Whether these will matter to you depends a lot on how you plan to use the radio. We'd strongly suggest you take a close look at the product review for the Yaesu FT-100 (see "Product Review," *QST*, Jun 1999) as well as our earlier reviews of the IC-706 (see "Product Review," *QST*, Mar 1996) and the IC-706MKII (see "Product Review," *QST*, Jan 1998). Pay especially close attention to the numbers in the respective technical data tables from our ARRL Lab testing.

Some of the things we like on the IC-706MKII side: a single remoting cable that snaps to the faceplate and to the radio body; dual microphone connections; bulkhead-type SO-239 antenna jacks; and a relatively quiet cooling fan.

The Final Chapter?

Overall, this latest IC-706 incarnation is a competent transceiver for mobile or portable operation. The incremental improvements in this version give rise to speculation that, with the MKIIG, ICOM has written the final chapter in this line of little transceivers. There's not much left to improve.

Manufacturer: ICOM America, 2380 116th Ave NE, Bellevue, WA 98004, tel 425-454-8155; fax: 425-454-1509; **http://www.icomamerica.com**. Manufacturer's suggested retail price: IC-706MKIIG, $1680. Typical current street price, $1390. MB-62 mobile mounting bracket, $25; OPC-581 separation kit, $60; MB-63 front panel mounting bracket, $18; FL-100 500-Hz CW filter, $133; FL-101 270-Hz CW filter, $133; FL-103 2.8-kHz SSB filter, $123; FL-223 1.9-kHz narrow SSB filter, $105; FL-232 350-Hz RTTY/CW filter, $113; CR-502 high-stability crystal unit, $95; UT-102 voice synthesizer, $74.

The AOR AR7000B Wide Range Communications Receiver

Reviewed by Joe Bottiglieri, AA1GW
Assistant Technical Editor

Of all the advances that we've seen in communications equipment over the last few decades, perhaps the most noticeable changes are in control and display technology. The AOR AR7000B wide range scanning receiver uses a 3.1-inch diagonally measured rectangular color LCD display—similar to those used in handheld television receivers—to provide a new level of flexibility in alphanumeric text and graphics display.

All front panel controls, with the exception of the main tuning dial, are push buttons. An infrared remote control is included, and allows duplicate control of nearly all of the front panel operations.

While the bright, busy, colorful display is certainly the first aspect of this unit that catches the eye, this receiver also sports an extensive list of capabilities and features that should attract the attention of those whose radio listening interests might range nearly anywhere between dc and daylight. (OK, so I'm exaggerating a bit—100 kHz to 2000 MHz, cellular blocked, of course.) Modes include WFM, FM, AM, CW, USB and LSB.

Getting Started

The programming scheme used in this radio is really quite unique—for a communications receiver that is… If your VCR has been flashing "12:00 PM" since the day you plugged it in, perhaps this is not the radio for you.

Several different menus and submenus are used to configure general operating parameters; to set the clocks and timers; to program the individual memories; to assign frequency limits for searches; to set upper and lower memory positions for programmed scans and to input alphanumeric tags. These appear on the screen in much the same format as the programming menus on most current VCRs and television sets. Each menu screen contains a list of related settings—move a cursor to the setting you wish to change and press the **ENT**er key. This gives you access to a submenu, or puts you in position to input digits with the keypad. Some settings—mode and bandwidth for example—require stepping through a group of choices with the main tuning knob or the **+** and **–** buttons on the remote. Once you get a feel for it, it's really quite simple.

The receiver includes two separate VFOs and a memory mode. 100 channels in 15 banks provide plenty of storage for your favorite frequencies. Alphanumeric tagging, up to 7 characters (practically a necessity with 1,500 memories), lets you easily keep track of your stored information. Each memory/bank location retains the frequency, the memory name, the AGC setting, the mode and the IF bandwidth settings—and displays them all simultaneously (see Figure 6).

After tuning around a bit and catching some action in the VFO mode, it won't be long before you'll want to try programming a few frequencies into the memories. Press and hold the **EDIT/.** key on the front panel to bring up the "Memory Function" menu (see Figure 7). Here you'll find menu items that let you edit or delete memories—or copy, move or swap memory information. The memory menu is only accessible using the front panel mounted **EDIT/.** key. This key is not included on the remote.

Search and Scan

In addition to the typical scan and search operations, the '7000B also includes eight search and eight scan *memories*.

Press and hold the **SEARCH/8** button and the "Program Search" menus appear. You use the main tuning dial or the **+** and **– TUNE** buttons on the remote to move between the search memories. You can program into each a search name (40 Mtrs for example), stop and start frequencies, scan direction, tuning step size, mode, bandwidth and scan pause duration. Hit the **RUN/BRK** key and a band scope display appears (see Figure 8). The receiver then searches the range, graphically displaying the relative signal strength and pausing on active frequencies. There's even a setting that can automatically store up to 100 active frequencies into your choice of memory banks.

Bottom Line

A combination of cutting-edge display technology and impressive spectrum agility make the AR7000B an attractive and versatile tool for the wide-range communications enthusiast.

Table 2
AOR AR7000B, serial number 050011

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 0.1-2000 MHz (cell blocked).	As specified.
Power requirement: Receive, 1.5 A;	Receive, 1.2 A. Tested at 13.8 V.
Modes of operation: SSB, CW, AM, FM, WFM.	As specified.
Receiver	*Receiver Dynamic Testing*
SSB/CW sensitivity, bandwidth not specified, 10 dB S/N: 0.1-0.7 MHz, <1.6 μV; 0.7-20 MHz, <1.5 μV;20-1200 MHz,. <0.5 μV; 1200-2000 MHz, <2.0 μV	Noise floor (mds), 500 Hz filter: 1.0 MHz –127 dBm 3.5 MHz –129 dBm 14 MHz –131 dBm 50 MHz –137 dBm 144 MHz –135 dBm 432 MHz –140 dBm
AM sensitivity, 10 dB S/N: 0.1-0.7 MHz, <4.2 μV; 0.7-20 MHz, <3.5 μV; 20-1200 MHz, <1.3 μV; 1200-2000 MHz, <4.0 μV.	10 dB (S+N)/N, 1-kHz tone, 30% modulation: 1.0 MHz 3.67 μV 3.8 MHz 3.16 μV 50 MHz 1.23 μV 120 MHz 1.33 μV 144 MHz 1.88 μV 432 MHz 0.676 μV
FM sensitivity, 12 dB SINAD: 0.1-0.7 MHz, <4.0 μV; 0.7-20 MHz, <2.0 μV; 20-1200 MHz, <0.56 μV; 1200-2000 MHz, <1.6 μV.	For 12 dB SINAD (15 kHz bandwidth): 29 MHz 0.305 μV 52 MHz 0.489 μV 100 MHz 0.489 μV 146 MHz 0.402 μV 223 MHz 0.320 μV 440 MHz 0.214 μV 902 MHz 0.335 μV 1270 MHz 0.421 μV
Blocking dynamic range: Not specified.	Blocking dynamic range, 500-Hz filter: 3.5 MHz 95 dB 14 MHz 98 dB 50 MHz 69 dB 144 MHz 67 dB 432 MHz 69 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range, 500-Hz filter: 3.5 MHz 78 dB 14 MHz 78 dB 50 MHz 80 dB* 144 MHz 102 dB* 432 MHz 98 dB
Third-order intercept: Not specified.	3.5 MHz –12 dBm 14 MHz –14 dBm 50 MHz –17 dBm 144 MHz +18 dBm 432 MHz +7.0 dBm
Second-order intercept: Not specified.	+51.4 dBm.
FM adjacent channel rejection: Not specified.	20 kHz channel spacing: 29 MHz, 44 dB; 52 MHz, 43 dB; 146 MHz, 46 dB; 440 MHz, 36 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing: 29 MHz, 44 dB*; 52 MHz, 43 dB*; 146 MHz, 46 dB*; 440 MHz, 36 dB*; 10 MHz channel spacing: 52 MHz, 73 dB; 146 MHz, 91 dB; 440 MHz, 63 dB.
S-meter sensitivity: Not specified.	S9 signal[1] at 14.2 MHz: 242 μV; 146 MHz, 237 μV.
Squelch sensitivity: Not specified.	At threshold: SSB, 14 MHz, 2.5 μV; FM, 29 MHz, 0.45 μV; 52 MHz, 1.0 μV; 146 MHz, 0.71 μV; 440 MHz, 0.35 μV.
Receiver audio output: 1.0 W at 10% THD into 8 Ω.	0.8 W at 10% THD into 8 Ω.
IF/audio response: Not specified.	Range at –6dB points, (bandwidth): CW-N (500-Hz filter): 526-1111 Hz (585 Hz); USB-W: 222-2666 Hz (2444 Hz); LSB-W: 222-2666 Hz (2444 Hz); AM: 176-3317 Hz (3141 Hz).
Spurious and image rejection: Not specified.	First IF rejection, HF, 89 dB; VHF, 65 dB; UHF, 48 dB; SHF, 71 dB; image rejection, HF, 114 dB; VHF, UHF, SHF, N/A.[2]

Size (HWD): 3.5×8.7×9.4 inches; weight, 7.7 pounds.
Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.
*Measurement was noise-limited at the value indicated.
Third-order intercept points were determined using noise-floor reference.
[1]S-meter is color based, so "S9" figures were taken at the maximum limit of the green region.
[2]The image rejection for these frequencies is outside of the ARRL Lab's measurement capabilities.

Press and hold the **SCAN/9** key to access the "Program Scan" memories. Each contain settings to set up a memory channel scan between selected upper and lower memory channel limits. A setting in the memory menu allows you lock out specific memories from the scan modes. The scan speed in either search or scan is 20 channels per second.

One priority channel is also included. With the priority feature activated, the selected memory channel will be checked for activity at an adjustable time interval between 1 and 60 seconds.

Hook Ups

The rear panel includes a jack for 12 V dc in—an external ac power supply is provided. The antenna connector is a BNC type. There's an 8-pin DIN auxiliary socket, a female DB-9 jack for direct connection to your PC COM port for computer progamming or control and a 3.5 mm external speaker jack. (You'll find a second 3.5 mm jack on the front panel for headphones.) The remaining items mounted here are two RCA type connectors—labeled "VIDEO" and "AUDIO," and a small slide switch marked "PAL/NTSC."

The 8-pin auxiliary socket contains connections for switching circuitry tied to squelch activity, a mute control point, a fixed level audio output, a 12V dc (10 mA) voltage source and ground.

The "VIDEO" and "AUDIO" jacks and the associated switch allow some interesting possibilities. You can connect the video output to TVs or VCRs that have auxiliary NTSC or PAL inputs (in the US, video equipment typically uses the NTSC format). The receiver's display will now appear on your TV. You can even connect the audio output of the '7000B to the audio input of your home electronics.

Much to the consternation of my spouse, I connected the audio and video jacks to the television in our living room—instant big screen receiver! While I couldn't get away with this arrangement long enough to run further tests, I'm confident that similar interconnection with our VCR would have resulted in a great system to capture frequency activity—such as the local public service traffic—for later review. Pop in a tape, set the VCR for LP, hit record and you're in business. Not only will you have a record of the radio communications—you'll also capture the full front panel display—frequency, signal strength, date/time, etc… Sitting there in my living room, remote control in hand, enjoying one of *my* favorite pastimes was tremendous fun. It didn't last long—I was soon once again banished to my basement shack.

If DX listening is your passion, you'll be happy to find that the AR7000B includes five separate clock/date displays. You can program in local and UTC time/date and still have space to set information for three distant locations. You can assign any three letter alphanumeric tag to identify the displayed time zone (EST, UTC, PST, for example). A

Figure 6—The display screen of the AR7000B showing the contents of memory channel 2 of bank 1. Graphic representations of the signal strength and volume level appear at the top of the screen. The selected squelch level is indicated in S units.

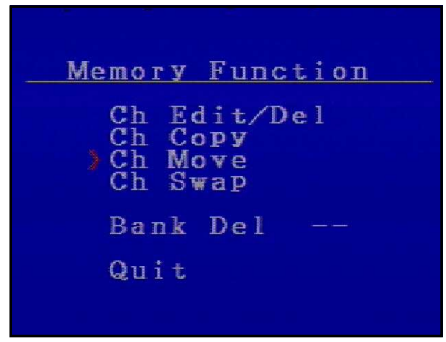


Figure 7—Most programming operations are carried out using a system of menus—does this arrangement look familiar?

Figure 8—The AR7000B band scope in the search mode. The band limits, search name (40 Mtrs in this example), mode, step size, bandwidth, sweep direction and pause duration can all be varied in a setup menu.

press of the front panel **CLOCK/ESC** button on the remote or the front panel cycles you through the selections.

Five receiver on/off timers are also available. These are programmable for both the time *and* date. Use these in conjunction with the squelch activated relay control and the fixed level audio output (accessible from the 8-pin auxiliary jack), and you can set up a tape recorder to capture scheduled communications. You could also use these timers and the audio/video outputs to tape with your VCR—just program identical stop/start times into both units.

Back to the Shack

The AR7000B is a triple conversion superhet with digital signal processing applied at the 10.7 MHz IF. This allows a wide range of DSP-based selectable filter bandwidths and an IF shift feature—both very handy for fighting off nearby interference. Fast and slow AGC settings are available, and there's a 10 dB attenuator included as well.

Tuning around in this wide a chunk of frequency spectrum is a blast. You can use the front panel tuning knob, the tune buttons on the remote, or enter frequencies into the VFOs directly on the front panel or the remote keypad. The main tuning knob rotation action is detented. I did run into some instances where the rebound of the switching action bounced the frequency back a step as I cranked. While this was a bit unusual, it was not a major annoyance—I did most of my tuning with the remote control.

I started out on the lower end of the range tuning through the AM broadcast band. Although the AM sensitivity in this frequency range is greater than 3 µV (see Table 2), there were still plenty of distant stations to explore between the big locals. I tuned past a weather report from Toronto, a talk show in Buffalo and finally settled on listening to a ballgame rebroadcast from an Ohio station. AM audio quality, even when using the built in top-firing speaker, is quite good—on both broadcast and shortwave AM.

Tuning up into the HF ham bands and listening in the SSB and CW modes revealed decent overall performance. While not quite up to the standards we've come to expect in radios designed specifically for the Amateur Radio market, this unit compares favorably with some of the other communications receivers we've looked at recently.

The ability to tune in 10-Hz steps, the wide variety of available DSP-based filters and the IF shift feature worked very well for casual HF listening. In the SSB modes, you can select digital filter bandwidths of 3, 2.5 or 2 kHz. For CW, you can choose from 5 bandwidths ranging from 800 Hz all the way down to 50 Hz. AM choices are 8, 6 and 3 kHz. Lab tests revealed two-tone, third-order IMD dynamic range in the HF bands in the high seventies—performance does suffer a bit under busy band conditions.

Moving up into the VHF region and beyond, the tremendous memory capacity, the band scope and the automatic frequency storage system make it easy to find and collect interesting subjects for your listening library. Sorting through the accumulated frequencies, choosing which ones to keep or delete, assigning alphanumeric tags and deciding which bank to archive them in will keep you occupied for hours.

If your main listening interests center around local FM activity in this upper end of the frequency spectrum, you may be a bit disappointed the lack of CTCSS squelch.

Overall Impressions

The AR7000B lures you in with its pretty face and its user-friendly programming scheme. What true electronics buff could possibly resist the opportunity to connect yet another audio/video device to the home entertainment system and add one more remote to the ever-growing pile on the coffee table?

The AR7000B falls slightly short of the performance benchmarks set by some of the other tabletop receivers currently available in the AOR line. That said—it's likely that some may be willing to compromise a bit of performance for the unique display and control arrangement and the interesting interconnectivity options offered by this receiver.

Manufacturer: AOR USA, Inc, 20655 S Western Ave, Suite 112, Torrance, CA 90501; 310 787-8615; fax 310-787-8619; **http://www.aorusa.com**. Manufacturer's suggested list price, $1460. Typical current street price, $1150. QST

Feedback

◊ Please refer to "A Doppler Radio-Direction Finder," *QST*, May and June 1999. Silk-screened panels are now available for this project. The black panels have white lettering and are ready for drilling. The panels simplify locating and drilling the holes for the LEDs, pots, jacks and switches. A drawing indicating the recommended hole sizes is also included. A set of panels is available from Mouser Electronics (371-RDFPANELS); price: $10.—*Mike Kossor, WA2EBY*

◊ Please refer to "A Simple 50-Ω Feed for W8JK Beams," *QST*, Jun 1999, p 41. The second line in Table 1 is incorrect. The spacings for 2 and 6 meters, respectively, are 15.4 inches (39 cm) and 44.3 inches (112.6 cm).—*Robert K. Zimmerman, NP4B*

◊ In June 1999 "The Doctor is IN" the 5-V power supply shown in Figure 2 contains an error. The fuse should be placed between the plug and S1, and its value should be 1/4 amp. QST

Hints & Kinks

*Edited by **Bob Schetgen, KU7G** • Senior Assistant Technical Editor*

A NEW SLANT ON LCDs

◊ As many people have no doubt realized, liquid-crystal displays have the additional property of polarizing light. Though this side effect is generally benign, it can cause a problem for electronic equipment users wearing polarized sunglasses. In fact, the majority of prescription sunglasses are polarized, for the good reason that this cuts down on the windshield glare from other cars. Polarized sunglasses are uniformly set so that the polarization angle is correct to filter out such glare. Unfortunately, however, the LCD on the ICOM 706, and presumably the LCD displays on other equipment, happens to emit its polarized light 90° from this uniform angle. Therefore, the LCD display of the 706 appears completely dark when viewed through polarized sunglasses. The obvious workaround is to rotate one's head clockwise or counterclockwise, and yes, the display becomes visible. This solution, however, quickly becomes too inconvenient to be acceptable. To get full contrast, one must rotate ones head a full 90° in either direction. When one considers the chiropractic and driving safety ramifications of this solution, this minor inconvenience becomes significant indeed. Fortunately, there is an elegant and excellent, albeit obscure solution to this problem.

While perusing the Edmund Industrial Optics catalog, I came across something called "retarder films." The informative catalog entry described how entering light, which is polarized at an angle to the axis of the film, will emerge from the film rotated at twice that angle. Perfect. Theoretically, a piece of this film—rotated 45° and taped in front of my 706 LCD display—should rotate the light polarization by the exact 90° necessary for maximum readability. For $15 plus shipping, I decided this was a worthy experiment. Voila! It works perfectly! With 0° of head rotation, contrast through the film is now maximal rather than minimal. Figure 1 illustrates the solution. The corners of the film can be clipped to better fit the display and facilitate taping. The Edmund catalog number for this retarder film is H53206. It is on page 69 of the 1999 Edmund Optics catalog (tel 609-573-6250). It comes in a package of two 2×2-inch pieces. I love it when technology just works.—*Mitch Bogart, KA1MIT, 3 Abbott Ave, Sharon, MA 02067;* **mbogart@rampageinc.com**

YET ANOTHER CABLE LABEL

◊ In the rat's nest of cables and wires behind our rigs in the shack, or rigs in vehicles, it becomes an exercise in futility to identify one cable from another.

Enter the ubiquitous bread/bun/English-muffin bag clip. See Figure 2. These plastic tags fit over cables of various diameters and may be labeled using a permanent felt-tip marking pen. For even more permanence, place a length of transparent tape over the identifiers and trim it with scissors. These clips are also handy for audio/video equipment cabling.—*Paul Stump, N0LRF, 3575 Hwy 68, Ottawa, KS, 66067*; **n0lrf@amsat.org**

BASIC STAMP REMOTE-BASE CONTROLLER ADAPTED FOR KENWOOD TS-870

◊ John Hansen's excellent design and implementation of a remote-base station controller in the May 1998 *QST* [1] caught my interest, except that he built his for the ICOM IC-706. Therefore, I set out to modify it for my Kenwood TS-870S. The differences are in two areas: The TS-870 has a serial port built in (hardware and software changes), and the command structure for controlling the rig is completely different from the IC-706 (software changes). I bought the PC board from FAR Circuits and downloaded John's program as a basis for my project.

I don't have any good way to cut rectangular openings in sheet metal, so I decided to use five-pin DIN jacks (RS 274-005) to bring the two serial connections out the back of the case. (A $^{9}/_{16}$-inch hole saw made nearly perfect openings for them.) I wired the PC board pretty much as directed, although I replaced R12 with a 10-kΩ potentiometer. The one I used included an SPST switch so I wired that into the power line. There's also a place on the board that requires a jumper wire to be installed. I split the wire and ran power to a red LED (RS 276-208) in a holder (RS 276-068) on the front of the box.

John was able to use a single line from the Basic Stamp II for both input to and output from the HF rig. The Kenwood needs two separate lines for this, as well as a third signal for handshaking. I chose two unused pins on the Basic Stamp II, soldered wires to them and connected them to the DIN jack. I used one (P10, pin 15) for transmit-data line (TxD) and the other (P15, pin 20) for request-to-send (RTS). The other issue was that, because the TS-870 provides an RS-232 serial port (–12 V to +12 V) instead of TTL-level signals (0 to 5 V), I wired a 22-kΩ resistor in series with the receive-data line (RxD). That pretty much completed the hardware changes, so I moved on to modifying the software.

PBASIC is the programming language for the Basic Stamp II. At first glance, *PBASIC* looks very much like every other *BASIC*. Then you begin to notice that it has a number of commands that are unfamiliar, but that obviously have to do with controlling the hardware. The first thing I changed was all the serial output commands (*serout*)

[1] John Hansen, W2FS, "An Inexpensive, Remote-Base Station Controller Using the Basic Stamp," *QST*, May 1998, pp 33-37.

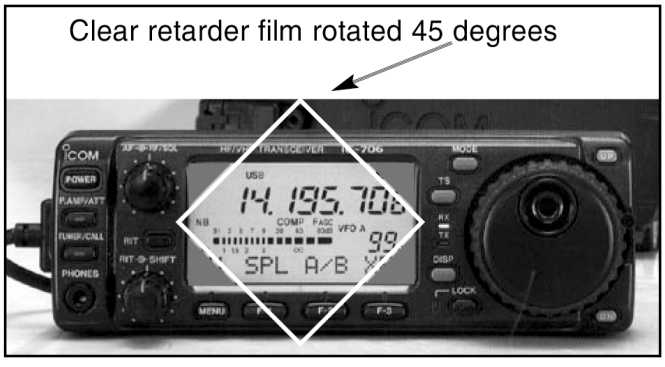


Figure 1—"Retarder film" from Edmund Scientific can rotate the light polarization angle of LCDs to make them compatible with polarized sunglasses.

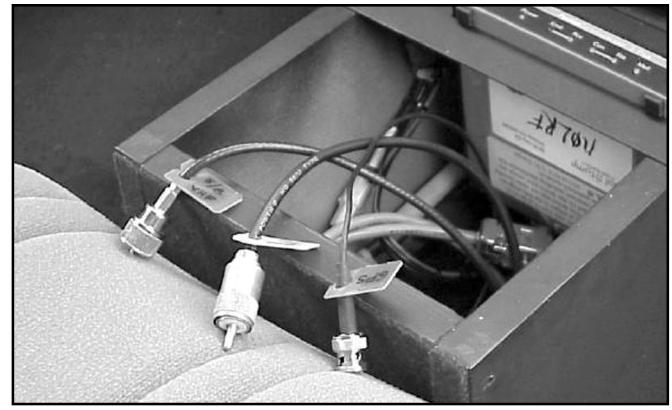


Figure 2—N0LRF uses plastic-bag clips to label cables.

to use the pin I had selected for transmitting to the HF rig. I also looked up the appropriate parameter for the configuration of the TS-870's serial port (in my case, 4800 bps, 8 data bits, inverted: 16572) and entered this as a constant for use by the *serin* and *serout* commands. Next I needed to drive the RTS line either high or low; I wasn't sure which. High seemed to do the trick. Programs are restricted to about 500 lines in size, so I chose to drive the line high at start-up and low at shutdown. The other, "more correct" way would be to make it high just before each serial input and drop it after the data is received. That would have taken four lines of code instead of two. The biggest challenge for me was manipulating the data to be sent to and received from the HF rig. The frequency, for instance, is an 11-byte field of ASCII numbers. *PBASIC* allows you to look at half bytes with the variable modifiers *lownib* and *highnib*. It seemed obvious to me how these should work. Finally, of course, I read the manual and found out how they really worked. After that, it was a simple matter to send the appropriate Kenwood command for the various functions and parse the responses.

The Kenwood TS-850S uses the same command set as the TS-870, and with an IF-232C level converter, the controller should work with the '850. However, as John points out with the IC-706, you don't need a level converter. Just don't put the 22-kΩ resistor in the RxD line. Also, the "rate" constant in *870STAMP.BS2*[2] would need to be changed to a value appropriate for noninverted logic (ie—4800 bits per second, 8 data bits, noninverted: 188). Since I'm still a little confused about the level on the RTS line, you might have to switch the *high* and *low* commands for that pin. If you don't want to do the programming yourself, preprogrammed chip sets are available.[3]

It's been a long time since I built anything electronic, but I found this project easy. I did manage to forget that tantalum capacitors have polarity. Putting one in backwards produces an impressive display and a lot of smoke. The Basic Stamp II is so versatile that I'm now looking for other things to do with it.—*Robert J. Molloy, KD2UJ, 12 Ashton Dr, Voorhees, NJ 08043,* **rmolloy@snip.net**

CLEAN UP OL' SMOKEY

◊ I purchased an SP-930 matching speaker for my Kenwood TS-930S through a trader's net. I asked all of the appropriate questions during the telephone negotiation: price, condition, shipping charges and serial number. I failed to ask, "Are you a smoker?"

The SP-930 arrived in perfect condition, while my son Todd, KG0EJ, was visiting. The only problem with the SP-930 was an extremely strong residual tobacco-smoke odor. I was about to return the unit to the sender (It was that bad!), when Todd remembered a method car dealers use when smoke odor permeates a used car. They place a sheet of fragrant laundry softener (such as Bounce) inside the car to absorb the smoke odor.

Why couldn't I use this for the SP-930? I placed a sheet of Bounce inside the speaker cabinet for two days; then I used the sheet to wipe the cabinet's inside surfaces. The smoke odor totally disappeared! This method should be useful for readers who are avid nonsmokers. Thanks Todd!—*Neile LeMense, W0HBK, 4360 Ridge Rd NE, Cedar Rapids, IA 52411*

EXTRA HANDS FOR ANTENNA EXPERIMENTS

◊ Have you ever needed an extra set of hands to help with some antenna experiments? I have, in the form of switching a component in/out of a circuit, closing a circuit to see if there is any influence on the air, etc. I recently needed to open/close the center of an antenna reflector element about 40 feet from the shack—and in the air—to see if there was any signal-strength change. My solution was to use an inexpensive, "remote wireless doorbell." They are sold in hardware and other stores from $9 up to $50. The model I used had 2.5-V dc across the piezo speaker element when the doorbell was activated, and it held the voltage for about three seconds, long enough for my testing purposes. I found that a 5-V dc reed relay (Radio Shack part number 275-232) connected across the piezo element would close when the element was activated. Then it was just a matter of connecting the relay contacts at the element center. While the advertised range of the unit, "up to 200 ft" was not met, the range was adequate for my purposes. I could press the doorbell button and watch the S meter (on receive) to see if the circuit change had any effect.—*Evan Rolek, K9SQG, 1295 Oakleaf Dr, Beavercreek, OH 45434-8002*; **k9sqg@aol.com**

CLEANING RELAY CONTACTS

◊ In the first weekend of the '98 EME contest, I experienced wild excursions of received signal strengths on 432 MHz. After the excitement was over, troubleshooting revealed that the phenomenon was caused by the switchover Transco Y relay. When connected to a noise-figure meter, the Transco yielded noise figures varying from 0.5 to 12 dB, even during a single switching cycle. Since the relay is first in the receiving chain, the effect on my noise figure was catastrophic.

While I was lamenting my ruined relay to the assembled gang of EMEers on 3.846 MHz one night, Frank Lumney, W2UHI, described a quick and sure fix for cleaning the contacts of such relays.

The Method

Connect 12-V ac (not dc!) in series with an automobile lamp and the relay contacts. Cycle the relay four times. Do this for both sets of contacts. The relay will be as good as new.

This "Lumney" method rejuvenated the Transco to a noise level below 0.1 dB. Frank explains that in such relays with negligible throw, there is no wiping (and cleaning) of the contacts by the flexing of the armature. Instead, the cleaning is accomplished by high ac current. AC is necessary to extinguish the resulting arcs during cycling.—*Chuck MacCluer, W8MQW, 1390 Haslett Rd, Williamston, MI 48895;* **maccluer@ieee.org**

Hints and Kinks items have not been tested by *QST* or the ARRL unless otherwise stated. Although we can't guarantee that a given hint will work for your situation, we make every effort to screen out harmful information. Send technical questions directly to the hint's author.

QST invites you to share your hints with fellow hams. Send them to "Attn: Hints and Kinks" at ARRL Headquarters (see page 10), or via e-mail to **rschetgen@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing an item, please send the author(s) a copy of your comments. QST

New Products

TELEFLEX H-T ANTENNAS

◊ MFJ Enterprises, Inc adds two new models to their H-T replacement antenna line.

The MFJ-1817 144/440 MHz handheld antenna blends the durability and flexibility of the typical "rubber duck" with the improved communications range provided by the longer telescoping designs. The collapsed length is nine inches and the lower section is flexible and narrow. The total extended length is 14½ inches. The upper section is also very flexible, making this antenna considerably less susceptible to damage than the rigid type telescoping antennas. A durable synthetic rubber compound protects the radiator and the extending section has a safety tip.

The MFJ-1816 dual-band VHF/UHF antenna is similar in design, but significantly more compact at 6 inches retracted and 8½ inches at full extension. Both of these antennas terminate in a male BNC connector.

The MFJ *Teleflex* antennas are covered by MFJ's *No Matter What* one-year limited warranty. For more information, see your local Amateur Radio products dealer or contact MFJ, PO Box 494, Mississippi State, MS 39762; tel 800-647-1800; fax 601-323-6551; **http://www.mfjenterprises.com**.

Next New Product QST

[2]You can download this package from the ARRL Web **http://www.arrl.org/files/*qst-binaries/***. Look for *870STAMP.ZIP*.

[3]A partial kit is available for this project. It includes all of the parts that are not available at RadioShack. This includes a Basic Stamp II programmed with the remote-base controller firmware (ICOM or Kenwood version), a CM8880 DTMF transceiver, a 3.58 MHz crystal and a 390 kΩ resistor. The kit is available for $99, US postage paid from John Hansen, W2FS, 49 Maple Ave, Fredonia, NY 14063. When ordering, please specify the call sign for the IDer, the two-digit password and the version: ICOM or Kenwood.

Happenings

*Edited by **Rick Lindquist, N1RL** • Senior News Editor*

FCC Spikes Restructuring Rumors at Dayton

The big FCC announcement about Amateur Radio license restructuring that many hams erroneously had been expecting at the Dayton Hamvention turned out to be that there would be no announcement. Speaking to a packed house at the Sunday FCC forum at Dayton Hamvention, Bill Cross, W3TN, of the Wireless Telecommunications Bureau spiked rumors that the FCC would have something substantive to say at Dayton about restructuring, WT Docket 98-143.

"I can confirm without reservation that the rumors that have been flying fast and furious as to what the Commission has decided or will decide are just rumors," he said, after baiting the audience at the start of his talk. He said the Commission had not decided anything as of mid-May.

Cross said the FCC received 2250 comments from the amateur community in the proceeding. Comments continue to straggle in, although the deadline passed in January, he said.

"Most of you thought that three or four operator classes was enough," Cross said. The League's proposal has recommended a four-license structure, eliminating the Novice and Tech Plus classes and grandfathering those licensees into General. Other proposals called for three license classes. Cross inferred that the FCC would propose either three or four license classes, no more, no less.

Based on the comments received, Cross said, many hams believe amateur examinations are not testing on the correct information. He invited hams to suggest questions to the Question Pool Committee, the body that comes up with the questions that appear on amateur exams. Send questions to QPC Chairman Ray Adams, W4CPA, 6702 Matterhorn Ct, Knoxville, TN 37918-6314. (A copy to Bart Jahnke, W9JJ, ARRL VEC, 225 Main St, Newington, CT 06111, would be appreciated.—*Ed*)

Cross said comments on Morse code testing standards "drew the most passionate responses." The League has suggested 5 WPM and 12 WPM testing tiers. Cross offered no crystal ball view of what the FCC might propose.

Cross also said the Universal Licensing System would go into effect for Amateur Radio later this year, and it will incorporate the vanity call sign program. The system will replace the venerable Form 610 series with a new, inclusive electronic document known as Form 605. ULS will permit amateurs to file applications, modifications or renewals via the Internet. Individual hams will not be required to file electronically, however.

Cross encouraged hams to register for the ULS. "So far, about 5800 of you have registered," he said. "We have another 745,000 of you to go."

For more information, visit the FCC's Amateur Radio page, **http://www.fcc.gov/wtb/amateur/**.

RICK LINDQUIST, N1RL

The FCC's Bill Cross, W3TN, addresses the FCC forum at Dayton Hamvention.

LEAGUE URGES FCC TO EXPEDITE RESTRUCTURING

The ARRL has urged the FCC to act "without delay" on Amateur Radio restructuring and has suggested that the Commission adopt the League's restructuring plan as its own in order to speed up the process. In a May 19 letter to the FCC, the League said that the state of limbo created by the current FCC Amateur Radio restructuring proceeding, WT Docket 98-143, is stifling Amateur Radio's growth, as current and prospective hams await an FCC Report and Order.

The League asked the FCC to adopt the League's restructuring plan in a Report and Order "at the earliest possible time."

The ARRL told the FCC that its comprehensive plan of four license classes and two Morse code testing tiers—5 WPM and 12 WPM—plus refarming of the Novice/Technician Plus HF CW subbands "constitutes a reasonable middle ground proposal." The ARRL's restructuring proposal formed the core of the League's comments to the FCC on WT 98-143, which the FCC refers to as the Part 97 Biennial Review.

Both the FCC and ARRL proposals would eliminate the Novice and Tech Plus licenses. The ARRL's letter stressed that "refarming" of the Novice class subbands was "the most critical portion of the League's comprehensive plan, or, indeed, of any license restructuring plan the Commission may adopt." The League said refarming was essential to make room for anticipated additional licensees using SSB HF subbands. In addition, the League said, refarming "is absolutely necessary to preserve and enhance the incentive self-training program" and to ensure more efficient use of limited HF allocations. Under the League's plan, General, Advanced, and Extra class licensees would get additional HF spectrum for phone operation.

The League said that adopting its restructuring plan *in toto* was "the best means of accomplishing increased growth in the Amateur Service" and of continuing Amateur Radio's value as a "cornerstone of telecommunications development."

The League also took the opportunity to express appreciation for the support for the Amateur Service by both FCC Chairman William Kennard and WTB Chief Thomas Sugrue and to thank the FCC for the renewed enforcement efforts of Compliance and Information Bureau Chief Richard Lee and CIB Legal Advisor Riley Hollingsworth, K4ZDH.

Killer Tornadoes: Ham Radio is There—Before, During, and After

Hams in Oklahoma and Kansas were ready and waiting in the hours before severe tornadoes devastated entire communities May 3. Severe weather also hit Tennessee a few days later. The most severe damage occurred south of Oklahoma City and in the Wichita, Kansas, area after a storm system developed in southwestern Oklahoma and moved to the northeast, spawning numerous tornadoes. The storms left dozens dead, hundreds injured, and thousands homeless. Oklahoma Public Information Coordinator Tom Webb, WA9AFM, said that because of the advance warning, "most of the victims appear to have left the disaster area prior to the strike."

Meteorologists now say the worst tornadoes were F5 storms packing record-

breaking winds of 318 mph! "It's like a nuclear bomb went off," Webb said of the devastation.

Dennis McCarthy, KC5EVH, the meteorologist in charge of the National Weather Service Forecast Office in Norman, Oklahoma, said forecasters got initial reports of tornado via ham radio. The NWS was in contact with various weather-spotting nets south and west of the Oklahoma City metropolitan area. "SKYWARN is a regular, everyday occurrence here, and hams are a vital part of the warning process," said Peter Laws, N5UWY, at the National Severe Storms Lab.

Oklahoma Section Emergency Coordinator Bennett Basore, W5ZTN, among those running emergency nets on both HF and VHF/UHF, said radio amateurs handled "tons of health and welfare traffic."

The Salvation Army Team Emergency Radio Network (SATERN) established an Amateur Radio link with Oklahoma City. The Salvation Army's Frank McCollum, N5FM, coordinated his organization's Amateur Radio activities. McCollum, who also organized the Salvation Army's Amateur Radio efforts following the Oklahoma City federal building bombing, said that ham radio was critical until cellular telephone service was restored. Ham volunteers subsequently were assigned to handle transport for meals. Some even volunteered to load and unload trucks and delivery vehicles. "We did good!" McCollum exulted.

Amateurs in the affected communities used VHF and UHF repeaters plus HF to coordinate health-and-welfare traffic inquiries, mobile canteens, shelters, and other emergency response activities. At the request of Oklahoma Section Manager Charlie Calhoun, K5TTT, the FCC on May 4 declared a communications emergency in the Oklahoma area, cordoning off net frequencies on 40 and 75 meters for emergency traffic only.

On May 6, the Salvation Army and the American Red Cross put out calls for additional Amateur Radio assistance. The Salvation Army needed hams to act as shadows and to handle transport units in addition to staffing the canteens, while the Red Cross requested hams for damage assessment.

TOM WEBB, WA9AFM

Claude Matchette, KD5RQ (left), of Lawton, Oklahoma, and Trish Scott, KC8KNR, of Newport, Ohio, begin unloading a few of the 300 meals being delivered to the Parkview elementary school used as a security force command post.

"This is kind of an odd situation," said Webb, who accompanied a damage assessment team. "Normally, amateur activity is front-loaded during an emergency." In this case, he said, more hams were needed as the recovery phase wore on.

Jim Volner, WA1VIB, reports that hams aided volunteers using heavy equipment to remove storm debris in the heavily-damaged village of Bridge Creek, 20 miles south of Oklahoma City. "I was very proud to be part of the situation where ham radio operators and the community all came together to provide a vital service," said Volner, who's retired from the New Hampshire State Police and was visiting in Oklahoma. "I have been involved in disasters, but nothing that approached the magnitude of what I saw at Bridge Creek."

By mid-May, Calhoun reported that Amateur Radio efforts were officially wrapped up. "Many times we think of those who helped after the incident, but I would also like to thank the weather spotters who helped warn of this storm," Calhoun said, "If it were not for them, we could have lost many more lives."

Kansas

In the Wichita, Kansas, area, ARES District 5 EC Bob Harder, W0BH, reports his ARES group was called up by the Red Cross shortly after the storm. "ARES members and other area hams worked all night and all next day providing communication for the Red Cross headquarters and later between three shelters set up in the south Wichita area," he said.

ARRL PIO Mike Afton, K0PY, of Wichita was on storm-spotting duty as part of RACES. "It was a very hectic evening," he said. "The twister hit Sedgwick County in the dark, so it was almost impossible to see."

The Salvation Army established a shelter in an elementary school in the Wichita area, and four mobile canteens served food and beverages for residents and emergency workers. The Red Cross set up a net control in Wichita, plus three shelters at different sites, Afton said. RACES assisted in the hard-hit City of Haysville, and the Wichita Amateur Radio Club handled shelter duty. Afton said hams there also assisted in cleanup activities.

Tennessee

With January's unusual tornadoes still fresh in their minds, Amateur Radio operators in Tennessee were ready to respond promptly when severe weather hit the Volunteer State May 5. At least four people died and several dozen were injured as a result of the storms. High winds blew down trees and power lines, tore roofs from buildings, and left rubble strewn about. Schools in metropolitan Nashville were closed May 6 because of the power outages.

A SKYWARN net was activated to provide weather information to the National Weather Service office in Nashville. Funnel clouds were reported in eight counties as two waves of storm activity traversed Middle Tennessee.

Hams in unaffected counties activated emergency nets just in case. Hams in Montgomery County were asked to have mobile units ready to go to specific areas to check on flooding. In addition, the Red Cross asked hams to stand by to assist. Nearly 50 hams took part in the storm response.

FCC SETS ASIDE MULTIPLE CLUB STATION GRANTS

The FCC in May set aside 14 recently granted club station call signs and 12 recently granted club vanity call signs held by an individual trustee. The FCC's Riley Hollingsworth, K4ZDH, took the action in a letter to Motoaki Uotome, W9BO, of Honolulu, Hawaii. Uotome is the trustee for 35 club station call signs in various cities in the continental US as well as in Hawaii, the Marianas, Guam, and Alaska.

The action was the first of several Hollingsworth said he expected to take, and it could have implications for other holders of multiple club station call signs. "They'd better have legitimate clubs or they're coming back to us," Hollingsworth told the ARRL. "We're getting a lot of complaints that people are scarfing up these call signs."

Hollingsworth said the FCC is not concerned about a single club station call sign used by a club or a DX or contesting group, but he emphasized that the FCC will not tolerate abuse of the system.

Hollingsworth has asked Uotome to justify his need for multiple club station call signs.

FCC SAYS NO TO EXPANDING SPECIAL EVENT CALL SIGN PROGRAM

The FCC has denied the ARRL's petition that sought to expand the Amateur Radio special event call sign program. The League had asked the FCC to amend its rules to permit the use of special event call sign formats that go beyond the current one-by-one (1×1) format now authorized. The petition also had asked the Commission to include within the special event program call signs denoting US territories and possessions having no mailing address.

ARRL Executive Vice President David Sumner, K1ZZ, called Terry's decision "somewhat disappointing."

In an April 21 letter to League, D'Wana Terry, chief of the Public Safety and Private Wireless Division within the Wireless Telecommunications Bureau said the FCC was "not persuaded that the requested changes to the system are warranted at this time." The League's petition was submitted May 18, 1998, but it was never assigned a rulemaking number or put out for public comment.

The special event call sign program is administered by several private sector coordinators, including the ARRL. Those wanting a special event call sign for a limited

period are able to reserve one via the Internet. Under current rules, 750 combinations of 1×1 format call signs are available for limited periods.

In its petition, the League said there has been significant demand for special event call signs outside of the 1×1 format and for DXpeditions to locations under US jurisdiction that lack US Postal Service addresses. The League also said that there has been "a great deal of interest" in additional special event call sign formats that would let the call sign symbolize a particular event.

Terry said the FCC has not received any indication from the Amateur Radio community that demand for special event call signs exceeded the number available. She also said the need to create additional formats was outweighed by the complexity of creating them. She advised more experience with the current system before deciding to change it, and she urged the League to continue to monitor demand for special event call signs. Sumner said he was encouraged that the FCC, while denying the petition, had invited the League to revisit the issue later.

HAMS HELP IN TRAGEDY'S WAKE

Ham radio had a role in the aftermath of two recent incidents of random violence—the Columbine High School killings in Littleton, Colorado, and the shootings in a Salt Lake City, Utah, library where three people died a few days earlier.

Following the mayhem April 20 that left 15 people dead at Columbine High School, the Salvation Army's Michael Gelski, KB0PVD, requested communication support from ARES East Slope District Emergency Coordinator Larry Cerney, K0ANI.

The Salvation Army set up two emergency relief stations, one at Columbine High School for police and investigation teams, the second at Clements Park—the site of a makeshift memorial for the victims—for the general public and the media. Both canteen stations provided food, drinks and comfort. Via ham radio, the two canteens were able to communicate with each other to deal with logistics, shift changes, food needs or other special requests. "Having radio communication at both sites helped in mitigating the chaos," Gelski said. "ARES members were a great asset to us." An autopatch also was made available for volunteers who needed to make local phone calls.

Cerney said other operators supported the American Red Cross. The Red Cross also set up mobile canteens. Amateur radio operators and Red Cross communicators worked in concert to provide logistical support. "It's still hard to look back over the last week or so," Cerney said. "This tragedy really has broken the hearts of this enlarged community."

Cerney said the support continued throughout the memorial services. "It seems that the local hams just had to help," he said. Some 40 ham radio operators and Red Cross communicators volunteered to cover the round-the-clock shifts for more than five days following the tragedy.

GERALYN QUINTANA, KC0DYN

"I know all disasters are devastating to those involved," Cerney said. "Hurricanes and tornadoes may kill people and destroy homes and property, but the killing of kids by kids is something that I just cannot comprehend."

Colorado Section Manager Tim Armagost, WB0TUB, expressed similar sentiments. "We Amateur Radio communicators like to believe we are prepared, but no one could be prepared for the tragic events at Columbine High School on April 20," he said. "The Colorado Section Amateur Radio operators join the community in expressing our shock, sorrow, and sympathy for those affected by this tragedy."

In Salt Lake City on April 15, a gunman walked into the Family History Library and started shooting, killing two and wounding five before police shot and killed the gunman. Two building employees and hams—Utah Amateur Radio Club member Spencer Wood, KB7KGE, and Davis County resident Dave Oswald, KD7DHO—put ham radio to use to help evacuate the building.

Wood, the assistant emergency coordinator for the library says he and Oswald—a floor emergency captain—spread the call to clear the building and used an amateur simplex channel to exchange information on the evacuation. After Wood had to leave the building, he relayed to police what he was hearing from Oswald inside the building. Wood credits ham radio with helping ensure an orderly evacuation.—*thanks to Geralyn Quintana, KC0DYN*

DONALD L. STONER, W6TNS, SK

The man who conceived of Project OSCAR, Don Stoner, W6TNS, of Clearwater, Florida died May 4. He was 67.

In 1960, Stoner, then living in Alta Loma, California, was the idea man behind Project OSCAR. Stoner outlined his concepts for an Amateur Radio space program in the February 1961 issue of QST (see "Project OSCAR—Something of the Future"). In his prophetic article, Stoner envisioned a two-phase project, the first to launch an orbiting VHF beacon transmitter into space, the second to launch an "orbital repeater." OSCAR 1 was launched December 12, 1961.

More recently, Stoner had become a guru for amateurs battling restrictive covenants to install antennas.

A Flint, Michigan, native, Stoner developed an early interest in electronics. Stoner's father, Lew, was W8IMS. Don Stoner went on to enjoy financial success in the commercial world. In the Citizens Band heyday, he was a manufacturer of CB transceivers. Later, he founded a company that developed systems to back up bank records and to telephone overdue accounts. He retired in 1989.

An ARRL member, Stoner also will be remembered as a *CQ* columnist—he served in several editorial capacities—and as founder of the unsuccessful National Amateur Radio Association. Stoner also wrote the "In Theory" column in *CQ VHF* magazine in 1996 and 1997.

Stoner's wife, Lucy, and two sons are among his survivors.

In Brief

• **FCC says to use e-mail or US mail:** The FCC says it now wants Amateur Radio enforcement complaints via e-mail or US mail and has discontinued its Amateur Enforcement Line (202-418-1184). The FCC requests that amateur-related complaints be sent via e-mail to **fccham@fcc.gov** or via the US Postal Service to Compliance & Information Bureau, ATTN Amateur Radio Complaints, 1270 Fairfield Rd, Gettysburg, PA 17325. Complaints already filed on the telephone service will be acted upon. Anyone who has left a message will receive a return call.

• **FAR solicits scholarship applicants:** The Foundation for Amateur Radio, a nonprofit organization headquartered in Washington, DC, and affiliated with the ARRL, plans to administer 66 scholarships to assist students who are also Amateur Radio operators, for the 1999-2000 academic year. FAR is composed of more than 75 local Amateur Radio clubs. It fully funds 10 of these scholarships with the income from grants and its annual hamfest. The remaining 56 are administered by the Foundation without cost to donors. Licensed radio amateurs may compete for these awards if they plan to pursue a fulltime course of studies beyond high school and are enrolled in or have been accepted for enrollment at an accredited university, college or technical school. For more information and an application form, send a letter or QSL card postmarked prior to April 30, 1999, to FAR Scholarships, PO Box 831, Riverdale, MD 20738. Visit the new FAR Web site at **http://www.amateurradio-far.org/**.

• **West Central Florida section petition filed:** The West Central Florida Section Committee has petitioned ARRL Headquarters to create a third section in the Sunshine State. The proposed West Central Florida Section would be created by carving nine counties out of the current Southern Florida Section. Counties proposed for inclusion are Charlotte, DeSoto, Hardee, Highlands, Hillsborough, Manatee, Pinellas, Polk, and Sarasota. (An earlier proposal to include Lee County has been dropped.) The ARRL By-laws provide that a new section may be created from one or more existing sections. The most recent new ARRL section created was Northern New York in 1996. At present, there are 70 ARRL sections. The initial petition, signed by at least ten full ARRL members, has been accepted for filing by League Headquarters. To be approved, however, the request still must overcome several procedural hurdles. As of press time, a review and a recommendation from Northern Florida Section Manager Rudy Hubbard, WA4PUP, Southern Florida Section Manager Kevin Bunin, K4PG, and Southeastern Division Director Frank Butler, W4RH, to accept or reject the request were due to ARRL Board Secretary and Executive Vice President David Sumner, K1ZZ, by May 31. The petition still faces review by the Executive Committee and the Board of Directors, plus a poll of full members in the proposed new section, if the Board approves, and a final Board review. Even if the petition is approved at every step, it likely would not become effective until sometime next year. The committee's Web site, **http://www.qsl.net/wcfla**, contains the full text of the petition and additional information.

• **New section managers take office:** New section managers have taken office as a result of elections and resignations. Ballots were counted May 17 at ARRL Headquarters in contested SM races in Rhode Island and Utah. In Rhode Island, Armand E. Lambert, K1FLD, of Woonsocket outpolled two other candidates to win the volunteer position. Lambert had 102 votes to 69 for Vincent Catalano, W1AOM, and 54 votes for Michael P. Deignan, KH6HZ. Lambert succeeded Rick Fairweather, K1KYI. In the Utah Section, Mel Parkes, N5UVP, of Layton, edged out Tom Schaefer, NY4I, 237 to 205. Parkes replaced Jim Rudnicki, NZ7T. Candidates in six other sections ran unopposed and were declared elected. All but one were incumbents. In the New Hampshire Section, Michael Graham, K7CTW, of Merrimack replaced Alan Shuman, N1FIK. Incumbents elected to new two-year terms were: William Howard, WB3V, Maryland/DC; Robert Davis, K7IY, Nevada; Jeffrey M. Friedman, K3JF, Northern New Jersey; Donald Costello, W7WN, San Joaquin Valley; and Charles Royall, WB5T, West Texas. Dale Bagley, K0KY, of Macon, Missouri, became Missouri's Section Manager June 1, replacing Charles Boyd, KE0K, who resigned. Don Michalski, W9IXG, became Wisconsin Section Manager July 1 after Roy Pedersen, K9FHI, stepped down.

• **E-mail forwarding service now available for ARRL affiliated clubs:** Clubs affiliated with the ARRL now can sign up for the League's new e-mail Forwarding Service. The forwarding—or alias—service is available at no additional charge for ARRL affiliated clubs. It will provide clubs with a uniform "**call sign@arrl.net**" e-mail address that remains the same even if the user changes e-mail service providers. To sign up: (1) Send an e-mail (no text required) to **subscribe@arrl.net**. In return, you'll get a form to complete; (2) Send the completed form to **clubregistration@arrl.net**. That will send the form to ARRL HQ for processing. Your club's alias will be available within a day or so after you send it. To change your club's address, simply repeat this two-step procedure. The service does not affect usability of your original e-mail address. If your club does not have a club call sign, the system will generate an address based on the club's initials and a random three-digit number. Address comments regarding this service to **clubs@arrl.org**.

Section Manager Election Notice

To all ARRL members in the Alabama, Alaska, Delaware, East Bay, Kansas, Michigan, New Mexico, Santa Barbara, Tennessee, and Western Massachusetts sections. You are hereby solicited for nominating petitions pursuant to an election for section manager (SM). Incumbents are listed on page 12 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are *not* acceptable. No petition is valid without at least five signatures, and it is advisable to have a few more than five signatures on each petition. Petition forms (FSD-129) are available on request from ARRL Headquarters but are not required. We suggest the following format:

(Place and Date)

Field Services Manager, ARRL
225 Main St
Newington, CT 06111

We, the undersigned full members of the _____ ARRL section of the _____ division, hereby nominate _____ as candidate for Section Manager for this section for the next two-year term of office.

(Signature ___ Call Sign ___ City __ ZIP ___)

Any candidate for the office of Section Manager must be a resident of the section, a licensed amateur of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination. Petitions must be received at Headquarters by 4 PM Eastern Time on September 10, 1999. Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before October 1, 1999, to full members of record as of September 10, 1999, which is the closing date for nominations. Returns will be counted November 23, 1999. Section managers elected as a result of the above procedure will take office January 1, 2000.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning January 1, 2000. If *no* petitions are received from a section by the specified closing date, such section will be resolicited in the January 2000 *QST*. A section manager elected through the resolicitation will serve a term of 18 months. Vacancies in any section manager's 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

Since no petitions were received for the North Texas and Wyoming section manager elections by the deadline of December 4, 1998, nominating petitions are herewith resolicited. See the above for details on how to nominate.

Nominees Sought for ARRL Board of Directors

If you're a full ARRL member in one of the following seven divisions and are interested in playing a part in the League's democratic organization, here's the opportunity. Nominations are open for the offices of director and vice director for the 2000-2001 term in the Pacific and Southeastern divisions, and for the 2000-2002 term in the Atlantic, Dakota, Delta, Great Lakes, and Midwest divisions.

ARRL Divisions

The policies of the League are established by 15 directors who are elected to the Board on a geographical basis to represent their divisions and constituents (see page 10 of any recent *QST* for a list of the divisions, directors and vice directors). As we make a transition to three-year terms for all directors starting with elections in the year 2000, these 15 directors serve for two or three-year terms, with seven or eight standing for election in alternate years.

Just as in national or state politics, ARRL voters/members have the privilege and responsibility to decide that they like the actions of their incumbent representatives and support them actively for reelection or to decide that other representatives could do a better job, and to work for the election of those persons. Vice directors, who succeed to director in the event of a midterm vacancy and serve as director at any Board meeting the director is unable to attend, are elected at the same time.

Call for Nominations

Nominations are open for director and vice director in the Pacific and Southeastern divisions for the two-year term beginning January 1, 2000. Nominations are open for director and vice director in the Atlantic, Dakota, Delta, Great Lakes, and Midwest divisions for the three-year term beginning January 1, 2000.

How to Nominate

1. *Obtain official nominating petition forms.* This package consists of a cover letter; a reprint of this election announcement; blank Official Nominating Petition forms and Candidate's Questionnaires for the offices of director and vice director; a copy of the ARRL Articles of Association and Bylaws; and an informational pamphlet for candidates.

Any full member residing in a division where there is an election may request an official nominating petition package. You don't need to be a candidate to request the forms. Your request for forms must be received by the Secretary *no later than noon Eastern Time on Friday, August 13, 1999*. There are separate forms for director and vice director nominations.

2. *Submit petition with statement of eligibility and willingness to serve.* Official forms bearing the *signatures of 10 full members of the division* and naming a full member of the division as a candidate for director or vice director, must be submitted, with a statement *signed by the candidat*e attesting to his or her eligibility, willingness to run and willingness to assume the office if elected. These documents must be filed with the secretary *no later than noon Eastern Time on Friday, August 20, 1999*. Only original documents can be accepted; *no facsimiles of any kind are acceptable.* On Monday, August 23, 1999, the secretary will notify each candidate of the names and call signs of each other candidate for the same office. Candidates will then have until Friday, September 3, 1999, to submit 300-word statements and photographs, if they desire these to accompany the ballot, in accordance with instructions that will be supplied.

3. *Election Committee to certify eligibility.* In accordance with the Bylaws, an Election Committee, composed of three directors not subject to election this year, is responsible for the conduct of the election. This year, the Election Committee consists of Edmond A. Metzger, W9PRN, (chair), Fried Heyn, WA6WZO, and Tom Frenaye, K1KI.

The nominee must hold at least a Technician amateur license, be at least 21 years of age and have been licensed and a full member of the League for a continuous term of at least four years immediately preceding nomination. No person is eligible whose business connections are of such nature that he or she could gain financially through the shaping of the affairs of the League, by the Board or by the improper exploitation of his or her office for the furtherance of his or her own aims or those of his or her employer. The primary test of eligibility is the candidate's freedom from commercial or governmental connections of such nature that his or her influence in the affairs of the League could be used for his or her private benefit. The idea behind these rules is to ensure that candidates: (1) possess a lasting interest in Amateur Radio and the League, (2) have the legal capacity to make decisions for the ARRL and (3) are free from conflicts of interest.

Balloting Will Follow

If there is only one eligible candidate for an office, he or she will be declared elected by the Election Committee. Otherwise, ballots will be sent to all full members of the League in that division who are in good standing as of September 10, 1999. (You must be a licensed radio amateur to be a full member.) The ballots will be mailed not later than October 1, 1999 and, to be valid, must be received at HQ by noon Eastern Time on Friday, November 19, 1999. A group of nominators can name a candidate for director or vice director, or both, but there are no "slates," as such. Each candidate appears on the ballot in alphabetical order. If a person is nominated for both director and vice director, the nomination for director will stand and that for vice director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for vice director if he or she wishes. Because all the powers of the director are transferred to the vice director in the event of the director's death, resignation, recall, removal outside the division or inability to serve, careful selection of candidates for vice director is just as important as for director.

Absentee Ballots

All ARRL members licensed by the FCC, but temporarily residing outside the US, are eligible for full membership. Members overseas who arrange to be listed as full members in an appropriate division prior to September 10, 1999, will be able to vote this year where elections are being held. Members with overseas military addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal addresses. Even within the US, full members temporarily living outside the ARRL division they consider home may have voting privileges by notifying the Secretary prior to September 10, 1999, giving their current *QST* address and the reason that another division is considered home. If your home is in the Atlantic, Dakota, Delta, Great Lakes, Midwest, Pacific or Southeastern division but your *QST* goes elsewhere, let the ARRL Secretary know as soon as possible, but no later than September 10, 1999, so you can receive a ballot from your home division.

The Incumbents

These people presently hold the offices of director and vice director, respectively, in the divisions conducting elections this year:

Atlantic—Kay C. Craigie, WT3P, and Bernie Fuller, N3EFN

Dakota—Tod Olson, K0TO, and Jay Bellows, K0QB

Delta—Rick Roderick, K5UR, and Henry R. Leggette, WD4Q

Great Lakes—Dave Coons, WT8W, and George Race, WB8BGY

*Midwes*t—Lew Gordon, K4VX, and Bruce Frahm, K0BJ

Pacific—Brad Wyatt, K6WR, and Jim Maxwell, W6CF

Southeastern—Frank M. Butler Jr, W4RH, and Evelyn Gauzens, W4WYR

For the Board of Directors:

May 15, 1999

David Sumner, KIZZ
Secretary

Rick Palm, K1CE • *Field Services Manager*

Hunting ELTs: A Role for Amateurs

By Pete Ostapchuk, N9SFX
59425 Apple Rd
Osceola, Indiana 46561
n9sfx@aol.com

When airplanes go down, radio direction finding (RDF) is often used to locate the crash sites by tracking the signals emitted by ELTs—emergency locator transmitters. These transmitters begin operating when they are subjected to the high G forces generated by a crash. Unfortunately, the typical RDF assets used by airport personnel and others to pinpoint ELTs are not on par with those possessed by many amateurs. This lack of skill can have tragic consequences.

When an ELT begins transmitting on the aviation VHF emergency frequency (121.5 MHz), a wild goose chase often ensues. Many of the alerts turn out to be false, but each must be investigated until its nature is known. Good tracking skills and equipment can reduce the time substantially. With this in mind I spoke to a supervisor at the South Bend, Indiana airport to offer assistance. To my astonishment his response was: "We do not want or need your help."

I then took the advice of renowned RDF expert Joe Moell, K0OV, and contacted the local Civil Air Patrol (CAP) unit. I attended a meeting and studied their literature. I was shocked to discover that the CAP unit had no RDF capabilities whatsoever. I quickly made contact with two of the CAP officers and began working with them to upgrade their capability. The upgrade didn't come in time for one hapless aircraft.

A Wakeup Call

It was January 22, 1999, and northern Indiana was recovering from a near record snowfall that occurred during the first week of the new year. As temperatures started to climb, the remaining snow created fog. At times visibility was reduced to only 50 feet. Denny, KA9WNR, had just left my house, which is on his way home from work. He later told me that the fog was so bad that his speed was limited to 15 miles per hour during the trip home.

As Denny was making his way through the murky streets, a small twin-engine aircraft was descending for a landing at the Elkhart airport. Despite the fact that the airport had a functioning instrument landing system, the aircraft, with three people on board, slammed into the ground some 200 yards short of the runway. The plane's path had taken it over thickly settled business and residential areas and it was good luck that kept the aircraft from hitting any buildings. It was poor luck and poor response capabilities that kept it from being discovered soon enough to save everyone aboard.

Airport officials had no idea where the aircraft was located, or even if it had crashed at all. They only knew that radio contact had been lost. Law enforcement and fire fighters were summoned to search, but the territory to be covered was enormous and visibility was not improving.

A ham passing through the area heard the commotion on his scanner and tuned a receiver to 121.5 MHz, where he picked up the ELT signal. He was able to give rescue workers a general idea of where to look for the wreckage. No one was at the scene with the necessary gear to track the signal to a precise location.

At the same time, 1st Lieutenant Dave Harsanyi, KB9QOH, of the Civil Air Patrol also heard the traffic on his scanner and called Major Steve Towne. Although they had not been officially "activated," Major Towne contacted me for possible RDF assistance. By now one hour and 55 minutes had elapsed.

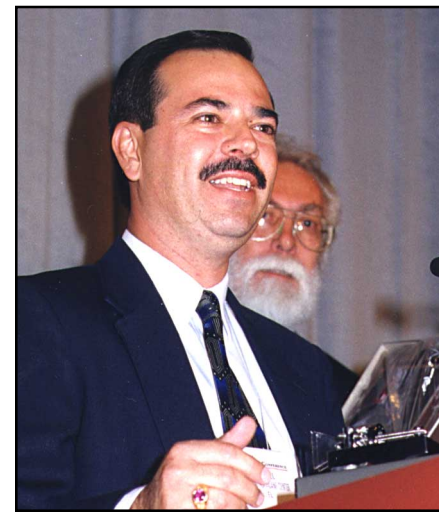
I live eight miles from the airport, but I was unable to pick up the ELT signal. I loaded my equipment into my van, but I was hardly out of the driveway when I heard the fire department announce that the aircraft had finally been located—two hours and ten minutes after the crash. Two of the three people aboard had perished while waiting for help to arrive. The survivor, who had a collapsed lung and numerous broken bones, barely made it.

After the incident the airport manager acquired a commercial ELT locator unit, but he still lacks skilled trackers. The ham who first heard the ELT signal from the downed aircraft solicited donations to buy another locator and demonstrated ELT finding techniques for the South Bend fire department. I met with the assistant fire chief, who is looking forward to any additional help he can get from the Amateur Radio community.

The message to recreational foxhunters is clear: Call your local CAP unit and offer your expertise. Attend a few CAP meetings and find out what to do (and what not to do) if you find a downed plane. Most CAP groups welcome new members, especially those with radio communication skills. Put your skills to good use. You can get more information on CAP by calling 1-800-FLY-2338, or by visiting their Web site at **http://www.cap.af.mil**.

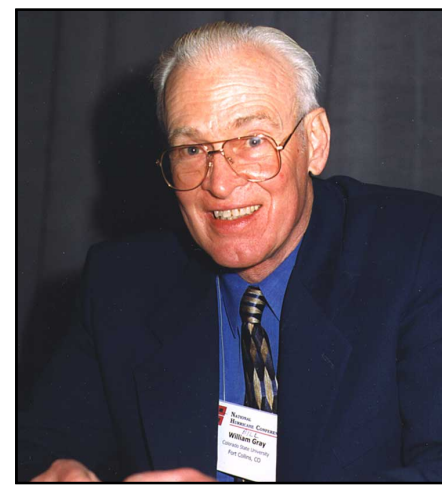
AMATEUR RADIO RECOGNIZED AT NATIONAL HURRICANE CONFERENCE

The Hurricane Watch Net and the W4EHW operators at the National Hurricane Center in Miami won Outstanding Achievement Awards at the National Hurricane Conference, Orlando, Florida, March 29 to April 2, 1999. The conference is the premier educational and training venue of its kind in the United States. The ARRL is a conference sponsor.



RICK PALM, K1CE

Upon receiving the Outstanding Achievement Award for the W4EHW operators, Julio Ripoll, WD4JNS, taps out his thanks in Morse code to the luncheon audience of 1500, as W4EHW Coordinator John McHugh, KU4GY, looks on.

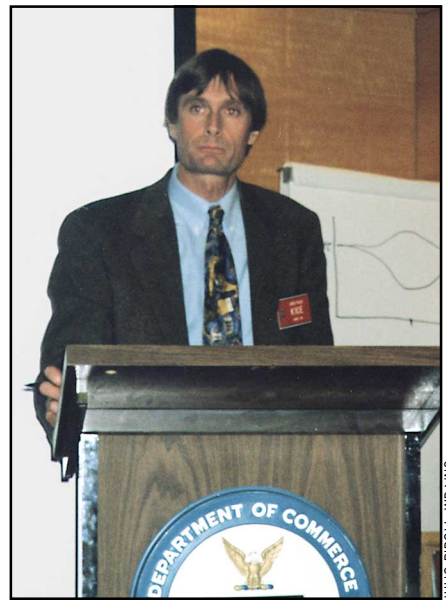


RICK PALM, K1CE

The highlight of the conference is always Dr. Bill Gray's forecast for the upcoming hurricane season. Gray is famous for his forecast, which is covered extensively by the national media. For the 1999 season, which started June 1, Gray, from Colorado State University at Fort Collins, is calling for 14 named storms, nine hurricanes and four category three or higher hurricanes, significantly higher than normal. Fasten your seatbelts!

RICK PALM, K1CE

Hurricane Watch Net Manager Jerry Herman, N3BDW, proudly displays the handsome plaque he picked up on behalf of his net members.



JULIO RIPOLL, WD4JNS

Field Services Manager Rick Palm, K1CE, takes a question during a presentation at the National Hurricane Center, Miami, Florida, last winter. Palm discussed the role of Amateur Radio and ARRL Headquarters support functions in hurricane disaster situations.

A session on Amateur Radio's role in hurricane disasters was held Tuesday afternoon, with ARRL and other officials on hand, including Rick Palm, K1CE, from ARRL Headquarters; Hurricane Watch Net Manager Jerry Herman, N3BDW; and John McHugh, KU4GY, coordinator of amateur operations at W4EHW. They were joined by Jeanie Schreiber, N4WFM, of the Waterway Net; Steve Richbourg, KO4TT, a DEC from the panhandle of Northern Florida; Red Cross disaster services communications coordinator Steve Hailey; Northern Florida Section Manager Rudy Hubbard, WA4PUP, and John Fleming, WD4FFX, with the Florida Division of Emergency Management. Dr. Mike Carter, N3PDK, Conference Vice Chairman, served as moderator. The achievement awards were conveyed at an Awards Banquet Thursday, which featured Governor Jeb Bush.

TENNESSEE REPEATER SYSTEM CATERS TO PUBLIC SERVICE

Devoted to public service and emergency communications, the Volnet repeater system first went on the air in December 1989 with one repeater sited in McNairy. Volnet is the brainchild of Andy Masters, NU5O, and his wife Carolyn, KD4HCW, who became interested in linked repeater systems when he lived in New Mexico, home of the extensive ZiaNet.

Today, the Volnet is a not-for-profit corporation governed by a board of directors. There are now eight 2-meter repeaters linked full time in Tennessee, Arkansas and Mississippi that cover approximately 250 miles of I-40, 280 miles of I-55 and portions of eastern Arkansas, southwestern Kentucky, western and middle Tennessee and northern Mississippi.

Volnet is supported by public service-minded amateurs serving multiple roles in local clubs. Support also comes from weather nets in the SKYWARN program, the Red Cross, emergency management agencies, RACES, ARES, hospital emergency communication services, and a host of other community oriented programs.

During severe weather SKYWARN personnel of the National Weather Service monitor the Volnet for ground reports from amateurs in the field. Reports from trained spotters are often the deciding factor as to whether the forecasters issue public warnings. QST

Strays

A QSL REPOSITORY

◊ The Committee to Preserve Radio Verifications was established in 1986 to provide a vehicle for the preservation of QSLs, both amateur and broadcast. Their collection of nearly 30,000 QSLs is presently housed at the Library of American Broadcasting on the campus of the University of Maryland in College Park, Maryland. Through their Registered Collections Program, hams and other radio hobbyists can place stickers on their QSL albums to indicate that the QSLs should be donated to the Committee when they can no longer enjoy them. To learn more about the CPRV contact Jerry Berg, 38 Eastern Ave, Lexington, MA 02421.

I would like to get in touch with...

◊ ...former employees of Zenith Radio Research Corporation, which was located in Menlo Park, California, from 1959 through 1974. Nichols Smith, 6965 El Camino Real, No. 105-670, La Costa, CA 92009; **nichols.smith2@gte.net**.

WANTED: *HOW TO BECOME A RADIO AMATEUR*

◊ I am searching for a 1958 printing of the ARRL's *How to Become a Radio Amateur* in good condition. Please e-mail John Mansfield at **http://www.cap.af.mil**.

INTERNATIONAL LIGHTHOUSE/ LIGHTSHIP WEEKEND

◊ Last August the International Lighthouse/ Lightship Weekend inspired activity from stations at more than 151 lighthouses, lightships or maritime lights in 38 countries. This year the International Lighthouse/ Lightship Weekend event will begin at 0001 UTC on August 21 and end at 2359 UTC on August 22. Concurrent with this event will be the Northern Lighthouse Weekend, with stations established at lighthouses in Scotland and the Isle of Man.

These events are not contests. The goal is for operators to enjoy themselves while making contact with as many stations as possible. Stations operating from lights, lighthouses or lightships are asked to add LIGHT, LIGHTHOUSE or LIGHTSHIP (respectively) after their call signs.

For more information e-mail Mike, GM4SUC, at **gm4suc@compuserve.com**.

Next Stray

New Products

4:1 BALUN BOX FROM LDG ELECTRONICS

◊ LDG Electronics now offers a BA-1 4:1 balun box designed for connecting ladder line fed and long wire antennas to transceivers requiring impedances between 50 and 75 Ω, or to the LDG AT-11 microprocessor controlled automatic antenna tuner.

The BA-1 covers 1.8 to 30 MHz and is rated at 200 W. The enclosure measures 4.7 × 6.1 × 1.2 inches and provides an SO-239 connector for your coax feedline and binding posts for antenna wire or ladder line connection. Both assembled and kit versions are available.

The BA-1 balun kit sells for $25 plus shipping. Assembled versions are $30 plus shipping.

For more information, contact LDG Electronics, 1445 Parran Rd, St Leonard, MD 20685; tel 410-586-2177; fax 410-586-8475; **ldg@ldgelectronics.com**; **http://www.ldgelectronics.com**.

Next New Product QST

Delta, Kilo, Lima, Mike: What Does It All Mean?

By Marcia Forde, KW1U, TCC Director, Eastern Area, Cycle 2

Some of you have seen or heard delta, kilo, lima or mike in traffic reports. Some have handled these reports with no clue as to what these phonetics are all about. In short, the phonetics refer to functions, or schedules, kept between two traffic handlers in different parts of the country. But let me back up a moment.

Traffic handlers on the local or section level are key players in the National Traffic System. Without you, traffic would not be originated or delivered, and NTS would wither on the vine. You are the contacts with the message recipients, the voice of Amateur Radio to the general public. You deserve applause for all the time and effort you put forth checking into the nets, receiving and delivering messages and taking replies to return to senders. I think I can safely say you enjoy what you do (or why would you be doing it?).

Some of us also take part in getting the messages beyond the local or section level and into the Region and Area Nets and across country through the Transcontinental Corps (more on this later). Without these folks, no messages would go beyond the local area (how dull). These folks enjoy what they do, and are to be applauded as well.

Region and Area traffic handlers usually start at the local level and work up from there. Many begin with 2-meter nets. They become excited about message handling, and having been trained by their Section Traffic Manager, Net Managers and net control stations, decide to broaden their sights. In the process they learn new skills in net operation, perhaps increasing their CW capabilities, and meet new friends from farther afield. At the region level, they meet traffic kin from surrounding states. As they continue to gain knowledge and operating abilities they move on to the Area Nets where they meet kindred spirits from approximately a third of the US and Canada (a third because the two countries are divided into three Areas for NTS purposes, and yes we are fortunate to have our Canadian friends as part of the NTS).

What about the Transcontinental Corps? This is a group of selected operators who have the skills, net savvy and station capability to meet on at least a weekly basis with someone from one of the other Areas of the two countries to get messages relayed across the continent. The names Delta, Kilo, Lima and Mike refer to these schedules that are met on a daily basis. And where did these ops acquire their talents? At the local and section level, of course. They have earned the prestige of being a Region or Area Net liaison or a TCC representative.

We need you to deliver and originate the traffic, but we also desperately need you to join us at the Region, Area and TCC levels. See what fun it can be, as I did and have been doing for 18 years now, and you will enjoy an even greater sense of satisfaction for a job well done.

Field Organization Reports

Public Service Honor Roll
April 1999

This listing is to recognize amateurs whose public service performance during the month indicated qualifies for 70 or more total points in the following 8 categories (as reported to their Section Managers). Please note the maximum points for each category: 1) Checking into a public service net, using any mode, 1 point each; maximum 60. 2) Performing as Net Control Station (NCS) for a public service net, using any mode, 3 points each; maximum 24. 3) Performing assigned liaison between public service nets, 3 points each; maximum 24. 4) Delivering a formal message to a third party, 1 point each; no limit. 5) Originating a formal message from a third party, 1 point each; no limit. 6) Serving as an ARRL field appointee or Section Manager, 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 messages; 30 points. Stations that qualify for PSHR 12 consecutive months, or 18 out of a 24-month period, will be awarded a certificate from HQ on written notification of qualifying months to the Public Service Branch at HQ

417
K9RTB
390
W9RCW
320
NM1K
298
N5JZ
264
K7BDU
260
NZ4O
259
WB8SIW
251
KA4FZI
230
WA4GQS
213
W4AC
210
WB5ZED
209
WA9VND
207
KA2ZNZ

202
WB5NKC
198
WB4GM
196
KB3AMO
190
N2LTC
W6DOB
189
N8FPN
K4SCL
181
N2YJZ
WX8Y
179
AF9FA
178
N5IKN
KA2GJV
175
K7VVC
N2OPJ
174
W4ZJY
N5NAV

173
W4EAT
171
KU4IJ
170
AD4DO
168
K9FHI
167
KR4MU
166
N2CCN
K6YR
165
KB8UEY
WA1TBY
164
N2JBA
163
W7VSE
161
W3YVQ
158
KC2ACL
W5YQZ
W6QZ

KB2VVB
157
WA1FNM
156
N3WAV
AA3GV
N8FWA
155
K4OAV
154
KC2AHS
153
NR2F
152
KC4TLG
AF4GF
N2RPI
KB5YAM
151
KF1L
NN7H
150
KB5W
WN0Y
149
WO0A
KD4GR

147
N1XP
WA4DOX
148
W4AET
W2EAG
146
KD2AJ
KC2ALG
W5ZX
KA4UIV
KF4TQX
145
K2DN
144
K4IWW
143
KA1GWE
142
K5DPG
N5OUJ
WB2ZCM
W7NWP
WA5I
141
N5XGI
N2XOJ

140
N1LKJ
K5AO
KC5OZT
KC4ZHF
139
KE1AI
W0LAW
W5GKH
K2BCL
W2MTA
N9BDL
138
N3WKE
KO6RZ
W7ZIW
137
WD4JJ
KB2ETO
KC6SKK
136
KA8FCC
KB9GGA
135
KC7ZZB
KB2KLH
W9YCV
KE4DNO
134
AF2K
N2XJ
133
N5JCG
W0GCB
N2AKZ
NN2H
132
W2RJL
131
KL7Q
130
KE4JHJ
K8GA
129
KJ3E
WA0TFC
W7LG
KF4NFP
128
WB4UHC
N3WK
WA2UKX
WB2QIX
KJ7SI

N7YSS
KD1LE
KB5TCH
WB2FGL
127
W1PEX
WX4H
126
KA9KLZ
125
KL5T
WB2GTG
AG9G
124
W4XI
N1SGL
NZ1D
123
NY2V
WA8DHB
122
KF4VDW
AA3SB
W1ALE
WA1JVV
KA1OTN
W7GHT
N1IST
121
KD5P
KI4YV
W1QU
W1JX
AF4NS
120
K6TQ
119
K4MTX
KG2D
WW4SC
118
W4CC
W3OKN
K0PIZ
W4CKS
W9ZY
KE4IFD
116
KO4A
N2GJ
KJ4N
115
K5VV

K8LEN
K4BEH
K9LGU
K5MXQ
AC5Z
114
N8DD
N5JUU
113
WB5NKD
WD0GUF
KC4PZA
KB2VVD
W2AKT
N4GMU
112
W3BBQ
KA4HHE
N2WDS
WA2GUP
111
K8IG
WI2G
W2JHO
N9KHD
N3RB
WA4EIC
W4MEN
110
WA8AHV
W4PIM
K1FP
KF6OIF
109
W2FR
K7MQF
W7TVA
108
K4YBX
W2MTO
KC5VLW
KT4SJ
107
KG6TU
106
W4DGH
KC4RNF
W2JG
105
N7DRP
KB4WBY
WA8SSI
104
K8QIP

NR9K
WD4MIS
103
AA4YW
AB5RV
K5VY
W4RRX
102
KE6MIW
KA4LRM
101
K5MC
100
K0IBS
KE3OX
99
KB2UQZ
K3UWO
KD5AHW
N7AIK
N9MN
98
KF8HJW
KC3Y
K2PB
97
WD9FLJ
N1TAT
96
KF5A
94
WB1GXM
WB2IJH
KA7TTY
AA8SN
93
K5DMC
KT4XA
KA2DBD
W9CBE
92
W1JTH
91
WR8F
90
AA4AT
KI0JO
KA1VAX
N4JAQ
89
KG5GE
KE0K
N1SGL

88
N3ZKP
AA2NX
W4ZBA
WB4PAM
87
W5XX
86
KD4HGU
85
KA0DBK
W2CC
84
WB7VYH
WB9GIU
83
KB8MUB
82
N1ZYD
KB2WII
KG0IV
K8ZJU
KD7ME
80
K5WOD
K5UCQ
WA5FXQ
79
KA9FVX
WI8K
K1SEC
78
W5DJW
75
AL7N
KD1SM
KC5VOG
N3KB
AA8PI
74
KK5GY
W7EP
N5HK
N7MPS
N4MM
73
WA4GLS
K4AIF
WA1QAA
KB2YUR
KE4WBI
70
K2VX

The following station qualified for PSHR in March, 1999, but the results did not appear last month: WA8AHV 108.

Section Traffic Manager Reports
April 1999

The following ARRL section traffic managers reported: AL, AZ, CO, CT, EMA, ENY, EWA, IA, ID, IL, IN, KS, KY, LA, MDC, ME, MI, MN, MS, NC, NFL, NH, NNJ, NTX, NV, OH, OK, OR, ORG, SB, SC, SD, SDG, SFL, STX, TN, VA, WI, WMA, WNY, WPA, WWA.

Section Emergency Coordinator Reports
April 1999

The following ARRL section emergency coordinators reported: AL, CT, IN, KY, MDC, MN, MO, NFL, OH, SD, SFL, SV, TN, VA, VT, WMA.

Brass Pounders League
April 1999

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 points or a sum of 100 or more origination and delivery points for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL radiogram format.

Call	*Orig*	*Rcvd*	*Sent*	*Dlvd*	*Total*
NM1K	813	274	1101	5	2193
WX4H	3	903	1071	11	1998
W1FYR	2	675	665	5	1347
N2LTC	0	505	537	22	1064
WA9VND	494	29	494	8	1025
W9RCW	0	495	55	319	869
W9IHW	2	467	67	290	826
W1PEX	0	643	137	13	793
K7BDU	44	337	339	52	772
KT6A	3	342	356	0	701
KF5A	0	336	349	0	685
W6DOB	2	298	304	50	654
K9JPS	0	369	39	238	646
K9RTB	0	316	69	259	644
K7VVC	11	284	336	6	637
KE4DNO	7	307	313	8	635
W5YQZ	0	297	321	0	618
KA4FZI	57	233	253	36	579
WB5NKC	57	116	363	7	543
N0KJ	47	218	256	9	530
W7AMM	27	159	307	28	521
KA2ZNZ	7	241	197	62	507
WB5ZED	29	220	229	0	501

BPL for 100 or more originations plus deliveries: NZ4O 190, N5IKN 135, K8LJG 121, KB3AMO 115.

Moved & Seconded

MINUTES OF EXECUTIVE COMMITTEE
Number 459
Irving, Texas – May 1, 1999

Agenda

1. Approval of minutes of January 14, 1999, Executive Committee meeting
2. FCC matters
3. Legislative matters
4. Antenna/RFI matters
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 Saturday, May 1, 1999, at the Dallas/Fort Worth Airport Marriott Hotel, Irving, Texas. Present were the following committee members: President Rodney Stafford, W6ROD, in the Chair; First Vice President Stephen A. Mendelsohn, W2ML; Executive Vice President David Sumner, K1ZZ; and Directors Kay Craigie, WT3P, Frank Fallon, N2FF, Fried Heyn, WA6WZO, and Tod Olson, K0TO. Also present were International Affairs Vice President Larry E. Price, W4RA, Directors Tom Frenaye, K1KI, Lew Gordon, K4VX, Jim Haynie, W5JBP, John C. Kanode, N4MM, and Edmond A. Metzger, W9PRN, and General Counsel Christopher D. Imlay, W3KD.

1. On motion of Mr. Heyn, the minutes of the January 14, 1999, Executive Committee meeting were approved in the form in which they had been distributed.

2. FCC matters were considered as follows:

2.1. Mr. Imlay reported on the status of ET Docket 98-95, an FCC rule making proceeding to implement an allocation at 5.850-5.925 GHz for the Dedicated Short Range Communication (DSRC) component of the Intelligent Transportation Systems. ITS America is interested in cooperating with the ARRL to conduct tests of compatibility between DSRC and amateur operations in the band. However, DSRC standards are not sufficiently developed for tests to be meaningful. On motion of Mr. Mendelsohn, it was voted that the Executive Committee endorses pursuing support from ITS America for the Board policy to seek an upgrade of the amateur allocations at 5.650-5.725 and 5.825-5.850 GHz to primary, to compensate for whatever diminished utility of the remainder of the 5.650-5.925 GHz band may result from the introduction of new sharing partners, including DSRC.

2.2. Mr. Imlay reported that the FCC was extremely unlikely to complete work before July, if then, on WT Docket 98-143, the biennial review proceeding in which a simplification of the Amateur Radio licensing structure has been proposed. Various means of encouraging the FCC to act quickly and to adopt the League's recommendations were discussed. On motion of Mr. Heyn, it was voted that the President and staff are instructed to communicate with each Commissioner, reiterating the League's positions and encouraging the Commission to go forward without delay.

2.3. Issues relating to the FCC's Universal Licensing System (ULS) were discussed as follows:

2.3.1. Mr. Imlay reviewed the slow pace of progress in implementing United States participation in the CEPT (European) licensing arrangements for short-term visitors. Some progress at the FCC has been noted in recent weeks. Staff was strongly encouraged to try to bring this matter to closure as soon as possible, preferably before the Dayton Hamvention. Mr. Imlay and Mr. Sumner confirmed that ARRL staff is ready to begin issuing International Amateur Radio Permit (IARP) documents very soon; however, the IARP presently applies only to a few countries in the Americas.

2.3.2. The Report and Order in WT Docket 98-20 leaves open the possibility that the FCC may stop issuing licenses on paper, and may rely entirely on a "license grant" having been made at the time the license is entered into its on-line database. In a Petition for Partial Reconsideration filed January 13, 1999, the ARRL gave several reasons why it was essential that the FCC continue to issue a paper license document to its amateur licensees. On motion of Mr. Mendelsohn, it was voted to reaffirm this position.

2.3.3. Through an oversight, when the Report and Order in WT Docket 98-20 was adopted by the FCC, Section 97.15(e) was deleted. Mr. Imlay has raised the matter with FCC staff and has been assured that the oversight will be corrected at the earliest opportunity. He will seek written confirmation.

2.4. FCC action is pending on ET Docket 98-153, a Notice of Inquiry on Ultra-Wideband (UWB) Transmission Systems. Comments by the ARRL and others expressed concerns about possible interference to existing systems and urged compatibility testing of the UWB devices.

2.5. The FCC received late comments from power utilities on our petition, RM-9404, seeking a low-frequency amateur allocation. The ARRL has objected to the late-filed comments on procedural grounds but also has responded to the substance of the comments in case the FCC sees fit to accept them despite their procedural flaws.

2.6. FCC action is pending on ET Docket 98-156, which proposes the use of 24.05-24.25 GHz for relatively high-power, point-to-point operation under Part 15 of the FCC Rules. We continue our efforts to oppose an increase in the interference potential of Part 15 devices in the 24-GHz band.

2.7. ARRL comments were filed on RM-9498, a Wireless Information Networks Forum (WINForum) proposal to modify the rules governing Unlicensed Personal Communications Services (U-PCS) in the 2390-2400 MHz band, where the Amateur Service is primary. WINForum's proposals are generally consistent with maintaining our interests in the band.

2.8. The Land Mobile Communications Council (LMCC) has submitted a supplemental filing on its petition for FCC rule making, RM-9267, in which it had sought access to, among other bands, 420-430 and 440-450 MHz for new Private Wireless facilities. Having encountered intense opposition to this proposal, LMCC is now turning its attention to other alternatives.

2.9. Increasing problems with interference to HF amateur operation from devices operating in residential areas under Part 15 of the FCC Rules were discussed. This subject was discussed in the February 1999 *QST* editorial. Mr. Imlay has been preparing a draft petition for rule making that would seek the addition of the amateur HF bands to the list of frequency bands in which the operation of Part 15 devices is subject to tight restrictions. Committee members were supportive of this initiative but noted Mr. Imlay's concerns that a similar request had been denied by the FCC in 1990. Committee members expressed the view that the petition must be thoroughly documented and must make a new and persuasive argument based on there being a high probability of interference between Part 15 devices and amateur stations because of their being co-located in residential areas. The Committee strongly encouraged staff to continue to gather evidence that there is a growing problem, to serve as the basis for action to alleviate the interference.

2.10. The Commission's Report and Order in ET Docket 98-76, concerning cellular intercept equipment regulations, was discussed. The FCC incorporated some, but not all, of the League's suggestions in its final rules. It was the consensus of the Committee that petitioning for partial reconsideration would not be fruitful.

2.11. The status of other FCC rule making and docket matters was discussed as follows:

2.11.1. WT Docket 97-12, spread spectrum rules changes: It is understood that a Report and Order has been drafted and is awaiting forwarding to the Commissioners.

2.11.2. RM-8763, an ARRL petition seeking favorable clarification of the Commission's limited preemption policy referred to as PRB-1: Concerns about the proliferation of cellular and PCS towers and new digital television broadcasting towers have created a negative climate toward federal preemption.

2.11.3. RM-9106, an ARRL petition seeking expansion of the 40-meter band in American Samoa: Favorable FCC action, unfortunately, is not expected.

2.11.4. ARRL petition seeking expansion of the special events call sign program: This petition, filed in May 1998, was never placed on public notice by the FCC as required by its own rules and the Administrative Procedure Act. Nonetheless, on April 21 it was dismissed by letter from the Chief, Public Safety and Private Wireless Division. The letter invites the ARRL to revisit the issue at some future time. After discussion, it was agreed that Mr. Imlay is to write to the FCC pointing out its procedural error. However, because the petition was dismissed without prejudice and because of the high priority of other items now pending before the Commission, reconsideration will not be sought at this time.

2.11.5. The FCC has granted a waiver request from Rockwell Collins to extend the upper frequency limit on two VHF aviation transceivers to 152 MHz. The ARRL and others had expressed concerns that the equipment might be used to transmit outside the allocated aeronautical mobile band, but the FCC concluded that there was minimal risk because the equipment is for use in commercial aviation, not general aviation.

2.11.6. There has been no FCC action on its Notice of Inquiry, ET Docket 98-80, with regard to conducted emission limits below 30 MHz for Part 15 and Part 18 equipment. The ARRL argued that there should be no relaxation of the limits.

2.12. The Enforcement Task Force met the previous weekend in Baltimore and had the opportunity to tour the Commission's nearby HF monitoring facility.

3. On behalf of Legislative and Public Affairs Manager Steve Mansfield, N1MZA, Mr. Sumner presented a report on legislative activities. There are 41 cosponsors for HR 783, The Amateur Radio Spectrum Protection Act introduced by Representative Bilirakis of Florida. The Congressional Budget Office reportedly is "scoring" the legislation for potential budgetary impact. A recent story in Roll Call, a newspaper widely read on Capitol Hill, reported the closing of club station W3USS on the retirement of Senate aide George Stephens, WB3DAC, whose diligent efforts did not identify someone to assume responsibility for the station; Mr. Mansfield has written to Roll Call to clarify some aspects of the article.

4. Mr. Imlay reported the status of several legal proceedings concerning amateur antennas.

5. Mr. Imlay reported briefly on the status of legal proceedings to which the ARRL is a party.

6. Mr. Price reported on international matters as follows:

6.1. Pat Doherty, VE3PD, has submitted his resignation as President of the Radio Amateurs of Canada. The ARRL Board members met Mr. Doherty when he attended our Board Meeting in Houston last January. First Vice President Doug Leach, VE3XK, is serving as Acting President until a new President is elected. Mr. Price suggested that the ARRL Board members who attend the Dayton Hamvention drop by the RAC booth to introduce themselves to the RAC volunteers and to wish RAC well.

6.1.1. Progress is being made toward the goal of exempting amateur satellites from fees related to ITU notification of satellite networks.

6.1.2. Voting by IARU member-societies to ratify the election of a new IARU President and Vice President is concluded, and the new officers (Larry Price, W4RA, and David Wardlaw, VK3ADW, respectively) will assume their posts on May 9.

6.1.3. Also discussed briefly were possible ITU co-sponsorship of Amateur Radio Administration courses in Africa, support within NASA for synthetic aperture radars in the 430-440 MHz band

contrary to our interests, international efforts to encourage technological development within Amateur Radio, and staffing of the League's Technical Relations Office in Washington.

6.2. Mr. Stafford observed that with the election of Mr. Price to serve as President of the International Amateur Radio Union, the ARRL is responsible for designating a new IARU Secretary.

6.2.1. The Committee first discussed the procedure that should be followed for designating the IARU Secretary whenever a vacancy occurs. On motion of Mr. Olson, it was voted that the following procedure is recommended to the Board: The ARRL President shall submit a proposal to the Executive Committee. If the Executive Committee is in agreement with the proposal, it shall be forwarded as a recommendation of the Executive Committee to the full Board for ratification by mail vote.

6.2.2. Mr. Stafford then proposed that Mr. Sumner be designated IARU Secretary. Following a discussion of the time and travel commitments that would be required, on motion of Mr. Heyn, it was voted that the Executive Committee recommends the designation of Mr. Sumner as IARU Secretary, effective May 9, 1999, and that this recommendation be submitted to the full Board for ratification by mail vote.

6.3. The recent controversy concerning the commercial sponsorship of a satellite designed to operate in an amateur band was reviewed briefly. Mr. Stafford commented that ARRL's response had been appropriate and proportional to the threat, and had resulted in a satisfactory outcome.

7. Organizational matters were considered as follows:

7.1. Mr. Mendelsohn led a discussion of Bylaws 1 - 20, continuing discussions that began via electronic mail.

7.1.1. On motion of Mrs. Craigie, it was voted to recommend to the Board the deletion of the phrase, "or within thirty days of return to the United States from military service in connection with Operation Desert Storm," from Bylaw 3, as the phrase no longer has any practical effect.

7.1.2. On motion of Mrs. Craigie, it was agreed to recommend to the Board the deletion of the phrase, "and a holder of at least a Technician Class Amateur License," from Bylaw 13. The bylaw would still require that an office holder be a Full member of the League, which requires the holding of an amateur license.

7.1.3. On motion of Mrs. Craigie, it was agreed to recommend to the Board the deletion of the third sentence of Bylaw 17, which reads as follows: "At least sixty days prior to each annual meeting of the Board of Directors each director shall file with the Secretary a written report on the status of the affairs of the League in his division, together with a statement of his recommendations as to any actions required for the effective administration of the objectives and affairs of the League."

The review of Bylaws 21 to 46 is continuing.

7.2. In January, the Board had tasked the Committee with developing a name change proposal for consideration by the Board at its July 1999 Meeting. Mr. Fallon was invited to begin discussion of the item. He stressed that an organization's name should make its purposes and objectives clear to those outside the organization. Following a discussion of various alternatives, on motion of Mr. Olson the following was recommended to the Board: (1) without changing the name of the organization, the abbreviation "ARRL" should be emphasized in conjunction with the tag line, "The National Association for Amateur Radio"; and (2) further discussion of a name change should be deferred until the Board receives Mr. Sumner's report on planning for Amateur Radio in 2010 and beyond.

7.3. On motion of Mr. Olson, it was voted that Michael Petruccelli is authorized as signatory on ARRL checking accounts at Fleet Bank.

7.4. Mr. Sumner reported that a petition had been received from members in Florida seeking the creation of a new West Central Florida Section made up of 10 counties that are presently a part of the Southern Florida Section. The petition is being processed in accordance with established policy.

7.5. Also discussed without formal action were the League's legislative relations program and the fundraising efforts of the ARRL and the ARRL Foundation.

8. On motion of Mr. Olson, 70 newly elected life members were recognized and the Secretary was instructed to list their names in *QST*.

9. On motion of Mrs. Craigie, the following clubs were declared affiliated or their earlier affiliation by mail vote was ratified:

Category 1

Alger Amateur Radio Club, Munising, MI
Algoma Chippewa ARES RACES Network, Sault Ste. Marie, MI
Arecibo Observatory Amateur Radio Club, Arecibo, PR
Bald Eagle Repeater Association, Muncy, PA
Breeze Shooters Amateur Radio Club, Pittsburgh, PA
CSRA Repeater Association, Augusta, GA
Ellwood City Amateur Radio Association, Ellwood City, PA
Hispanic American Amateur Radio Club, Pacoima, CA
Mid-Land Amateur Radio Club, Rock Rapids, ID
North Baldwin Amateur Radio Club, Bay Minette, AL
Oakland Radio Communication Association, Oakland, CA
Oconee Area Radio Club, Watkinsville, GA
Russell County Amateur Radio Club, Lebanon, VA
Sac County Radio Amateur's Association, Sac City, IA
Texas DX Club, Kemah, TX
VA Medical Radio Club, Green Acre, FL
Venture Out Amateur Radio Association, Mesa, AZ
Western Reserve Amateur Radio Association, Newton Falls, OH

Category 3

Comet Amateur Radio Club - K5UTD, Richardson, TX
Dunbar International Magnet Amateur Radio Club, Little Rock, AR
Rosen Elementary Amateur Radio Society, Fort Worth, TX

The ARRL now has the following numbers of active affiliated clubs: Category 1, 1837; Category 2, 18; Category 3, 141; Category 4, 16; Total, 2012.

10. On motion of Mr. Heyn, the holding of the following ARRL conventions was approved or their earlier approval by mail vote was ratified:

Arkansas State, April 23-24, 1999, Little Rock
Eastern New York Section, April 25, 1999, Poughkeepsie
Louisiana Section, April 30-May 1, 1999, Baton Rouge
Alabama Section, May 1-2, 1999, Birmingham
Wyoming State, May 29-30, 1999, Casper
Georgia State, June 5-6, 1999, Atlanta (Marietta)
Georgia Section, June 11-12, 1999, Albany
West Gulf Division, June 11-12, 1999, Arlington, TX
Pacific Northwest DX, July 30-August 1, 1999, Portland, OR
Colorado State, Aug. 15, 1999, Golden
Southeastern Division, Aug. 21-22, 1999, Huntsville, AL
New Mexico State, Aug. 21-22, 1999, Rio Rancho
Kansas State, Aug. 22, 1999, Salina
Eastern VHF/UHF Conference, Aug. 27-29, 1999, Enfield, CT (change in date)
West Virginia State, Aug. 28, 1999, Weston
Virginia State, Sept. 18-19, 1999, Virginia Beach
Michigan State, Sept. 24-26, 1999, Flint
Pacific Division, Oct. 15-17, 1999, Concord, CA
Alabama State, Nov. 13, 1999, Montgomery

11. It was agreed that the next meeting of the Executive Committee would be scheduled later. There being no further business, on motion of Mrs. Craigie, the meeting was adjourned at 6:22 PM.

Respectfully submitted,

David Sumner, K1ZZ
Secretary

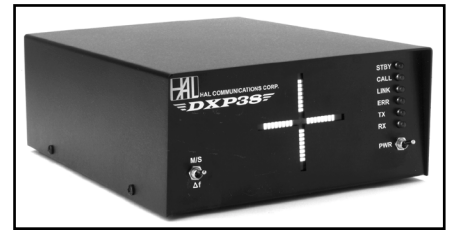
Life Members Elected May 1, 1999

◊ Diana C. Adams, K6MCE; Jerry E. Barbero, WE6E; Alexandra V. Beck Berendsen, KJ4TE; Bruce C. Beford, N1RX; Gregory V. Bowman, N4EN; David K. Brower, W4DKB; Sharon T. Brower, W4STB; Irene P. Brown, KF6RNX; Wayne C. Carlson, K2DT; Nikola Cimbur, AC6DD; John Evers, N8RVV; Dave W. Fant, WB5FEW; Jayson Ferron, N4GAA; Don C. Ford, KB9KNC; Joseph M. Grib, KI3B; Terry L. Hamacher, K8XH; Jerald L. Hanson, N9FNS; Gregory M. Hensas, K2GH; Anthony J. Hickey, AB5QR; C. T. Hoffman, K1KC; Donald K. Huey, KA4NDY; Robert L. Jernoske, WB2KII; Larry Jones, WB5KYK; John E. Keller, NF1N; Keith K. Kemper, N8KOL; Shuzo Kinoshita, KF6LEY; Kriss A. Kliegle, KA1GJU; Winston W. Kratz, KB0KK; John T. Langdon, N5CQ; Mary E. Lau, N7IAL; Frank P. Lee, W3PLP; William D. Leger, KD1UZ; Woody Linwood, W0UI; Donald Loose, KD7CWY; Ramah G. Martin, WB4UFB; Michael A. Mc Connell, N5GBL; John O. McDonald, WB4ZXS; Harold R. Millar, WA6GUP; Masahiro Miura, AJ3M; Michael W. Moreken, KA2BIQ; Lydia A. Morgan, KF4TPW; Robert M. Nagode, KB0RKX; Jose Ng Lee, W2JN; Timothy M. O'Hara, WE8P; Bill J. Papatheofanis, WD9CMS; Thomas W. Parkinson, KB8UUZ; Peggy R. Parkinson, KB8SZI; Raymond S. Phelps, AD4LX; James J. Pike, AA8SS; Jeffrey M. Reinhardt, AA6JR; Thomas W. Rodke, N6WLY; Jonathan Rose, N1RPK; Donald M. Ross, NL7CO; Stephan J. Sacco, NN4X; Robert G. Schaffrath, N2JTX; James A. Schulze, KE5GO; Maynard B. Skidmore, K7OY; Lloyd L. Smith, WA9NLA; Jeffrey D. Sykes, K5VU; Richard L. Tannehill, W7RT; Richard D. Thomas, KB7KPB; Louis T. Titus, N5QCR; James Todd, WA5HTT; Jose A. Vazquez, N6VUY; David H. Watt, WA8TT; Kenneth Week, AA7RV; W. Werner, W3EAO; Ben F. Worrell, KM5OT; Lisa M. Zeug, KA9UQT; Frederick E. Zoes, KE4LEX. QST

New Products

HAL COMMUNICATIONS DXP38 DSP HF RADIO MODEM

◊ HAL Communications Corp announces the all new DXP38. Combining the features of their P38 and the RTTY-1, this new model works in RTTY, AMTOR, P-Mode and CLOVER-II (including 8P2Aand 16P4A). A "Crossed X" tuning display, similar to the one on the RTTY-1, works in all the modes and can be switched to show M/S or zero-center frequency tuning error "on the fly" in any mode. You can select any Mark and Space tone between 500 and 3000 Hz and choose any of the four CLOVER-II channels.



Like the P38, all modem connections are made via phono connectors and a standard 9-pin serial cable. Software for *DOS* and *Windows 95/98/NT 4.0* is included, and the unit is compatible with any third-party programs that support the DSP-4100. Software upgrades are available on their Web site.

For additional information contact HAL Communications Corp, PO Box 365, Urbana, IL 61803; tel 217-367-7373; fax 217-367-1701; **halcomm@halcomm.com**; **http://www.halcomm.com**. QST

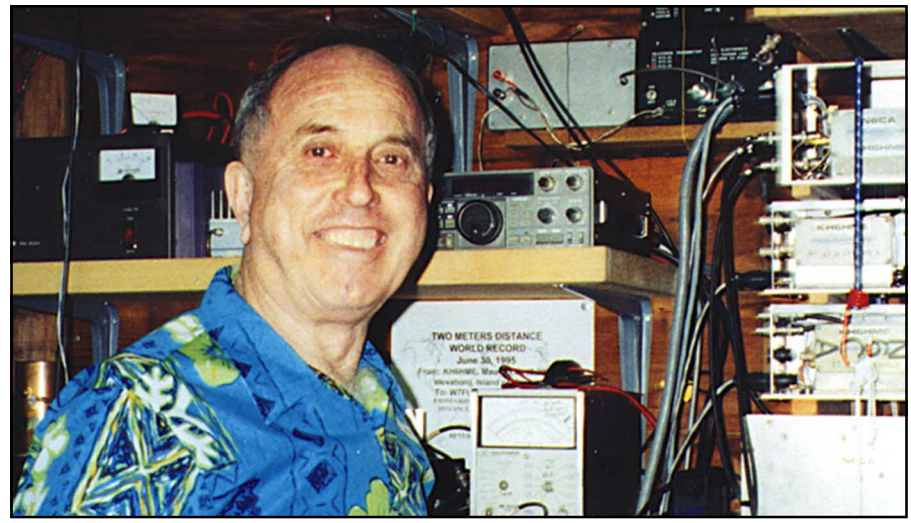
Next New Product

The World Above 50 MHz

*Emil Pocock, W3EP**

Paul Lieb, KH6HME—VHF/UHF Pioneer

The Dayton Hamvention honored Paul Lieb, KH6HME, on May 15 with its Special Achievement Award for his "pioneering and record-setting work in tropospheric ducting and VHF, UHF and microwave communications." He is best known for the many hundreds of contacts he has made from Hawaii to the mainland of North America on 144 MHz through 5.7 GHz over the past 20 years. As a consequence of his activities, Paul has been on one end of world tropospheric ducting distance records on eight different bands at 144 MHz and higher and made the initial Hawaii-to-North America contacts on six of them. So how did Paul Lieb get started on this pioneering work in the world above 50 MHz?



Paul Lieb, KH6HME, in his famous shack on the slopes of the Mauna Loa volcano at 8200 feet.

Young Radio Experimenter

Paul grew up in Anaheim, California. His father was an electrical contractor and sold RCA radios during the 1920s, when radio was the newest rage. Five-year old Paul built a crystal receiving set and was delighted to pick up nearby KFI from Los Angeles. By the time he was ten years old in 1937, Paul had added a tuned circuit that allowed him to explore the adjacent amateur band at 160 meters. There he heard his first Amateur Radio station, W6DYG, operated by his neighbor, Clarence Keilor. Paul became an occasional visitor to the W6DYG shack and eventually made his radio debut by speaking into the station microphone. Paul's own first transmitter, an unlicensed single #27 tube RF oscillator built from a *Radio Handbook* design, could be heard a short distance away on the broadcast band.

About the time the war broke out, Paul bought a used five-tube receiver for $4.25 from Western Auto. The money was saved from earnings of 15¢ an hour from mowing lawns and a newspaper route. With driver's license in hand when he turned 14, Paul expanded his newspaper delivery into a 250-subscriber route. Paul also repaired radios during the war years, learning mostly by reading and tinkering on his own. He graduated from Anaheim High School in 1945.

During the post-war years, Paul continued experimenting with radios and served in the Air Force during the Korean War. Although he hoped to get electronics training, a captain commandeered him to be his personal clerk, based on Paul's typing skills. The captain made sure Paul was promoted to master sergeant by the time he was mustered out two years later. Soon afterward, Paul lived for a time in St Louis, where he passed the exams for the new Novice and Technician class licenses. In 1953, Paul received his first call—W0NRI.

K6IZT and the Heady Years of VHF

Back in Anaheim a year later, Paul became K6IZT and was immediately thrown into the exploding world of VHF. His first rigs were modulated oscillators and superregenerative receivers, the easiest way to get started on the VHF and UHF bands during the 1940s and early 1950s. Those unstable wide-band rigs with their radiating receivers soon gave way to converted military gear, which was especially abundant on the surplus market in Southern California. No piece of equipment was more popular for getting on two meters than the SCR-522 set, which could put out a few watts of crystal controlled AM or CW.

Paul was soon on the air with his own converted SCR-522 rig. He operated almost exclusively from a portable location at Huntington Beach, where he installed Yagis on top of an abandoned oil-well derrick. Paul constructed coaxial feed line using $^1/_2$-inch pipe and $^1/_4$-inch tubing pipe to reach the top, later replaced with FAA surplus RG-17U. From that location, he could make regular contacts 125 miles north to Bakersfield. Paul also built a 100-W 9913 tube amplifier and was on 432 MHz with a tripler strip. He operated the VHF contests and sometimes W6WSQ joined him at the beachfront shack.

Paul was one of the founders of the San Bernardino Microwave Society in 1955. He also knew John Chambers, W6NLZ, before John began his famous series of experiments with Tommy Thomas (KH6UK) that led to the first Hawaii-to-California contact on 144 MHz in 1957. KH6UK and W6NLZ duplicated their feat on 220 MHz two years later, but they did not pursue the work at any higher frequencies. Paul long remembered those experiments, but it was many years later before he picked up where they had left off. Paul is now the custodian of the rack containing the two-meter equipment W6NLZ used to make the historic first trans-Pacific contact.

Mauna Loa

Paul's move to Hawaii came much later because of his work for an electrical contractor. In 1967, his employer sent him to Hawaii to fulfill a contract wiring a new hotel. Paul liked what he saw on the island paradise and decided to move there two years later. Paul finally traded in his California call for KH6HME by 1979, about the same time he put the first of a series of VHF and UHF beacons on the air from Hawaii.

This Month

June 7	Artieds Meteor Shower Peaks
June 12-14	ARRL June VHF QSO Party
June 19-20	SMIRK Contest

*Send reports to Emil Pocock, Box 100, Lebanon, CT 06249. Leave voice messages at 860-642-4347, or fax 860-594-0259 or e-mail w3ep@arrl.org.

Paul had been looking for a likely high spot for beacons that could be beamed toward California. By chance, he found a television relay station on the eastern side of Mauna Loa, at about 8200 feet. The peak soars to 13,680 feet, but the relay site seemed ideal for beacons. There was a short tower and a small shack, it had electricity and there was a dirt road (later paved) at least that far. After a few telephone calls and gentle persuasion, he got permission to install a low-power 432-MHz beacon at the relay site in April 1979. Over the years, his relations with the owners remained cordial, no doubt smoothed by the occasional electrical work Paul has done for his hosts.

Paul did not have to wait long for results. In mid-July, Louis Anciaux, WB6NMT, heard the 432-MHz signal from his San Diego home and alerted Paul on the telephone. Louis waited several agonizing hours before Paul drove up the slopes of Mauna Loa to his new beacon and operating location. Then with relative ease, the pair completed a historic 432 MHz contact on July 18, the first ever on that band to span the 2530 miles between Hawaii and the mainland. That made three bands on which contact had been made across the Pacific. Could the trans-Pacific duct support such extraordinary paths on even higher frequencies?

That became Paul's quest. The next year, he put up a beacon on 1296 MHz, but four years passed before he made a mainland contact on that band, this time with Chip Angle, N6CA. Chip soon provided Paul with complete home-brew stations on the microwave bands. Each in turn has yielded historic trans-Pacific contacts. Indeed, N6CA went on to make initial contacts with KH6HME on all the remaining bands through 5.7 GHz. See Table 1 for the complete list.

In 1981, Paul put up his third beacon from Mauna Loa on 144 MHz. Over the following years, this has become the most popular and often heard of the group. A telephone call from a mainland operator with news that the beacon was being heard on the West Coast sent Paul on the two- to three-hour drive up the mountain. On countless occasions, Paul packed up the car with food and water for stays that sometimes stretched into days. He typically worked all comers on 144 MHz so long as conditions lasted. Sometimes he has switched over to two-meter FM simplex to provide even more operators the chance to make an unusual contact across thousands of miles of ocean. Paul has even worked stations using nothing more than a hand-held rig.

KH6HME has never run more than 100 W on any band to make trans-Pacific ducting contacts. All the antennas are fixed on California. On 144 MHz, Paul has found just 60 W to two seven-element Yagis are quite sufficient for 2500-mile contacts. He has a single five-element Yagi on 222 MHz with similar power. The station on 432 MHz runs 100 W into two 22-element Yagis. There is an 18-element loop Yagi for 902 MHz. On 1296 MHz, Paul gets 10 W from a 2C39 amplifier and uses four 25-element loop Yagis stacked vertically. The 2.3, 5.7 and 10-GHz stations all run just a few watts and share a four-foot dish. The KH6HME (BK29go) 144.170 and 432.075 MHz beacons run continuously using the same equipment.

Table 1

Notable Hawaii to Mainland North America Contacts on 144 MHz through 5.7 GHz via Tropospheric Ducting

	First Contact		*Current Distance Record*		
MHz	*Date*	*Stations*	*Date*	*Stations*	*Km*
144	1957 July 8	KH6UK—W6NLZ	1995 July 1	KH6HME—W7FI	4333
222	1959 June 22	KH6UK—W6NLZ	1989 July 15	KH6HME—XE2/N6XQ	4142
432	1979 July 18	KH6HME—WB6NMT	1989 July 15	KH6HME—XE2/N6XQ	4142
903	1993 Aug 23	KH6HME—N6CA	1994 July 13	KH6HME—N6XQ	4061
1296	1984 June 24	KH6HME—N6CA	1989 July 15	KH6HME—XE2/N6XQ	4142
2304	1994 July 11	KH6HME—N6CA	1994 July 14	KH6HME—N6CA	3973
3456	1991 July 28	KH6HME—N6CA	1991 July 28	KH6HME—N6CA	3973
5760	1991 July 29	KH6HME—N6CA	1991 July 29	KH6HME—N6CA	3973

The distances spanned on the two more-popular bands have crept upward; 2-meter stations as far north as Washington state and south into Baja California made it to Hawaii. Jack Henry, N6XQ, has been among the most active in operating from portable locations along the Baja coast, but he has nearly run out of usable coastline. The single longest contact is currently 4333 km, made on 144 MHz, but there is good reason to believe this distance can be exceeded on several bands with contacts into British Columbia or further south along the coast of Mexico. There seems little chance that distances can be extended very far inland, because the duct is typically blocked by the coastal mountains.

What Else?

Paul is best known for his trans-Pacific VHF through microwave operating, but he also has other interests. For many years, Paul got on 40 meters for regular contacts with friends back in California and for chatting among the islands. He is also the second recorded member of the Hawaii QRP Club. Paul often gets on 50 MHz from his home station, which is closer to sea level. He has provided countless six-meter operators with their 49th or 50th state. His 50.061 MHz beacon has been heard around the world.

There are the further challenges on the trans-Pacific path. Paul has equipment for 10 GHz and turns on the 10-GHz beacon when he is on Mauna Loa, hoping that someone on the mainland will hear it. So far, no one has, but that seems to be only a matter of time. Distances on some of the higher bands will certainly be extended as a natural consequence of greater activity. Perhaps Paul can interest some Mexican stations or someone will make an optimally timed trip to the Mexican coast just for the fun of making a 5000-km contact across the Pacific.

More importantly, Paul has motivated a whole generation of VHF and UHF experimenters. Operators throughout the US, Europe, Australia and other places have sought to emulate and even exceed Paul's accomplishments. His pioneering work has inspired the current offer of the Brendan Cups for the first transatlantic contact on 144 MHz. If nothing else, Paul has given countless hams a great thrill of working across the Pacific. He has been willing to spend a day or two on a lonely mountain just for the fun of giving out contacts and spending time chatting with each new operator he worked. Many have thrilled to hear Paul's "Aloha from Hawaii" spanning the Pacific on VHF.

For more information and additional photographs from the KH6HME station on Mauna Loa, point your Web browser to **http://www.hiloweb.com/kh6hme**. If you want to read more about the possibilities of long-distance VHF and UHF ducting, see my article in March 1996 *QST*, "Transoceanic Ducting at VHF and Above."

ON THE BANDS

Activity perked up a bit in April. Six-meters continued to generate DX excitement around the world, and there were at least four days with sporadic E across the US. There was one good auroral event, and tropospheric ducting across the Gulf of Mexico provided some interest on at least two days. As always, dates and times are in UTC. Thanks to G4ICD (editor of *Internet Six News*), G4UPS, JA1VOK, SM7AED (editor of *Six Metre Info*), WA5IYX and W5UWB for their otherwise unacknowledged reports.

Six Meter DX

Worldwide DX continued along the familiar early-cycle spring paths, even as the solar flux continued to struggle upward through the low-100 range. Several new countries appeared in the DXers logs in April, including a few rare enough to create pileups had they appeared on the HF bands. Pickings continued to be slim for US and Canadian stations, mostly limited to LU, CX, PY and CE.

The Americas

US stations, primarily in Florida and Texas, worked the now familiar South American countries on at least 10 days during the month. A few operators in more northerly states were able to work an occasional LU or CX in the late afternoons. W0NRO (Colorado) found the Argentineans an April 2, N5JHV (New Mexico) worked PY5CC on April 4, K7RAT (Oregon) heard Argentina for about two minutes on April 6, and KA9CFD (Illinois) reported Argentina on the 27th.

The best day was undoubtedly April 28, when

a sporadic-E link into the F-layer allowed many stations scattered through Missouri, Illinois and Wisconsin to work the South Americans. Cliff Kellam, N9BJG (EM57), like many others who found the LU and CX stations that afternoon, worked CO2OJ via sporadic E at the same time, which suggested the responsible propagation mechanism. The opening provided Don Clements, VE3CDP/W9 in southern Illinois, with his first 6-meter contacts outside North America. Ralph Smith, W4UDH (EM52), worked CE3BZF for a new country.

Favorable conditions also continued during April for 6-meter contacts from Central and South America across the Atlantic and Pacific, especially during the first week of the month. Carlos Diez, TI5KD, logged A35RK (Tonga), VK8AH and VK8MS. HP2CWD also worked Tonga, along with 3D2TC and 3D2CM (Fiji). The April log of Jose Carbini, LU6DRV, included EH8 and Europeans EH, I and 9H. XQ6ET (Chile) worked as far east as 9H1EL on Malta in the Mediterranean Sea.

Africa and the Indian Ocean

Eric Van Offelen, who operates as EL2VO during his periodic business trips to Liberia, logged 130 contacts on 6 meters from February 13 to April 1, including 10 European, two North African and two South American countries. Several other unusual African and Indian Ocean stations were active during April. 5U7DG (Niger) worked Spain and Greece (and perhaps other countries in southern Europe) and provided SV1DH with country number 163. From the Indian Ocean, 3B9R (Rodriguez Island) worked into Europe as far north as Belgium and Germany during the first week of the month. Japanese stations in several call areas also found 3B9R on at least two days. Okinawans (JR6) logged 8Q7QQ (Maldives) on April 18 and 4S7SE (Sri Lanka) worked Japan on the fifth.

Europe and the Eastern Mediterranean

Southern Europeans continued to work into Africa on many days in April, but the more interesting contacts came from stations in the eastern Mediterranean. Israelis 4Z5JA and 4X1IF, along with 5B4AGN (Cyprus), worked Argentina and Brazil early in the month. On April 3, 5B4AGN also worked JR6BU for the first Cyprus-Japan contacts of the current cycle.

The Pacific

East-west paths across the Pacific continued to open during April. In addition to A35RK and 3D2TC, H40OO (Temotu) created a good deal of excitement on April 19, when he worked JA call areas 1 through 6. BV2DP (Taiwan) logged an impressive list of stations on 6 meters during April, including YB0ARA/9, P29PL, A61AH, T88WX, VQ9CV, 9M2NK and KH0XX.

Sporadic E

The first signs of the spring sporadic-E season made their appearance during the last few days of the month. WP4O reported working Georgia and South Carolina stations after 2250 on April 26 to start four consecutive days of openings somewhere across the US. The following afternoon, Paul Thurman, KA5TJI (EM20), found stations in Florida and nabbed ZF1DC (EK99). Later that same evening (after 0000 on April 28), Lance Collister, W7GJ (DN27), worked widely through Kansas, Missouri, Arkansas and Oklahoma, about the same time Bill LeBaron, W0MTK (DM79) reported Texans.

After 2130 on April 28, sporadic-E was widespread across the southern states. CO2OJ found eager takers in Texas, Louisiana, Mississippi and Tennessee. From south Florida, Tom Glaze, K4SUS, also found stations in Texas, while Bill Harrison, KK4XO, added Kansas to the list and heard XE2KIB/b (DL99), for what may be the first double-hop propagation of the season. After 0000 on April 29, VE3CDP/W9 worked into Arizona, while NN7K in Nevada discovered the band was open to Oklahoma.

Aurora

The aurora of April 17 affected southern Canada and the US at least as far south as northern Virginia, Missouri and Utah. Most of the activity seemed to be in the Midwest and West between 0000 and 0500. Chris Cox, N0UK (EN34) in Minnesota, worked widely scattered 2-meter stations from western New York and Ohio to the east and as far as K7TNT in Wyoming (for a new state) to the west. He noted the difficulties in making aurora contacts due to the crowding around 144.2 MHz. Larry Lambert, N0LL (EM09) in central Kansas, was one of the most southerly stations reporting auroral conditions. Larry found stations in Minnesota, Iowa and Wisconsin on 144 MHz and west into Montana and Idaho on 50 MHz.

W7GJ logged 2-meter stations in Utah and Colorado from his western Montana location, while Steve McDonald, VE7SL (CN88), reported 2-meter activity from Alberta, Washington and Idaho. Among Steve's catches on 6 meters were VE5UF (DO61)—a relatively rare report of VHF activity from Saskatchewan and WA0YSF (EN18) from North Dakota. After the aurora excitement began to die down around 0500, Bill Smith, W9VA (EN62), was surprised to hook up with KL7NO (BP54) on 50 MHz, apparently via auroral E.

Tropospheric Ducting

TV DXer Fernando Garcia, who monitors from Monterey, Mexico (DL95), thought April was one of the best months in some time for stateside UHF TV. He logged 109 different stations as far away as Tennessee and North Carolina on April 1, 3, 5, 7 to 14 and 20-25. In contrast, reports of 2-meter trans-Gulf contacts were sparse. On the evening and morning of April 4, CO2OJ worked north to WA4EWA (EM63), W4WTA and KE4SIX (EM83), KR4QO (FN03) and W4WRL (FM04) in South Carolina for his longest contact. On April 10, CO2OJ reported stations from south Georgia to Houston and San Antonio, while AJ4Y (EL97) in central Florida worked into EM50 and EL29 along the Mississippi and Texas coasts.

Microwaves

Brian Justin, WA1ZMS, claimed a new 75 GHz North American distance record of 34 km for a contact made with K2AD on April 5 in Virginia. The pair generated few milliwatts from a transmitter chain built with the help of University of Virginia graduate students. They began wit 12 GHz California Microwave phase-locked loop oscillators, tripled to 37 GHz and then doubled with GaAs diode mixers. Antennas were one-foot dishes.

The CW signals were just in and out of the noise. Brian calculated the total oxygen and water vapor absorption at about 0.24 dB per kilometer, or about 8 dB for the entire path. A drier day could have reduced atmospheric losses by a few decibels, but Brian also hopes to improve total system performance with a better receive system and try again. The listed world record is well over 100 km, made in 1995 by a Swiss and German team.

VHF/UHF/MICROWAVE NEWS

Lario Six-Meter Contest

The international Lario Six Meter Contest is set for 1400 July 10 to 1400 July 11. Operating is limited to a maximum of 18 of the 24 hours. Make one contact per station (either CW or SSB) only above 50.150 MHz. Exchange serial number (beginning with 001) and six-digit grid locator. Score one point per kilometer of each QSO. The final score is the sum of all distance-based points. Submit logs in standard form (with the distance of each contact) to A.R.I Como Six Meter Contest, PO Box 144, 22100 Como, Italy by August 15.

In past years, activity has been mostly limited to Europe, but the contest is open to all stations worldwide. In the 1998 running, IF9/I2ADN won the single-operator class with 879,025 points based on 527 QSOs. There were no North American entries, but G0/W4BVY (IO81) submitted the thirteenth-place log with 484 QSOs and 265,046 total points. Why not try it? The contest is scheduled near the peak of the sporadic-E season, and who knows, perhaps all of Europe will come roaring through on one of those mid-summer transatlantic openings.

FEEDBACK

Nick Leggett, N3NL, sent some interesting comments on the May column devoted to the micrometer bands. The high atmospheric attenuation in the region higher than 300 GHz seemed to make these frequencies unusable for long-distance communication, but Nick argued these frequencies were far from useless.

"They have the natural advantage that the absorption divides the usage into small coverage area cells. Each cell is conveniently isolated from other cells by the high absorption. Thus these micrometer frequencies may be quite useful for wireless connections within offices, short-range remote control applications, personal communications systems, cellular phones, automobile anti-collision radar, neighborhood broadcasting and wide channel citizens band operations.

"In order to use these frequencies, we have to change our thinking to view what seems to be a disadvantage (the very high absorption) as really an advantage for some types of radio communication. Naturally isolated radio coverage areas would be quite useful for many types of communications." QST

New Products

A POCKET-SIZE GUIDE TO YAESU'S VX-5R HAND-HELD

◊ Yaesu's VX-5R H-T is a compact transceiver loaded with an incredible range of features, but for those wishing to explore the more advanced capabilities frequent reference to the programming information in the manual is usually necessary. While the unit is certainly pocket-sized, the included Yaesu owner's manual is not.

Hugh McCully, VE3AYR, has put together a $2\frac{3}{4} \times 4\frac{1}{2}$ inch *Pocket Reference to the Yaesu VX-5R*. This small 120-page guide covers all the programming steps and includes additional tips gleaned from Internet users' groups and personal operating experience. You'll also find a complete table of contents, an index, conversion tables, frequency guides and a short list of VX-5R information sources on the web.

Price: $7.95 plus $2 shipping and handling. For information on Hugh's complete line of pocket manuals, contact VE3AYR, Janus Computer Services, 610 Barons Ct, Burlington, ON L7R 4E4 Canada; tel 905-333-0826, **janus@bigwave.ca**; **http://www.bigwave.ca/~janus/hrm/**. QST

Next New Product

Edited by **Bernie McClenny, W3UR***

Not In the Log!

By Wayne Mills, N7NG, DXAC Chairman

Just about all of us have suffered the frustrating experience of learning that our call sign doesn't appear in a DXpedition's final log. How could this have happened? "I heard my call sign 100%! The DXpedition operator must really be incompetent. I'll sue!" This unfortunate situation happens much more often than we would like to believe.

If you do find yourself "not in the log," can anything be done to reclaim credit for that potential QSO? The answer is a qualified "yes." Under certain circumstances, a log entry may be changed, but changes can only be justified in the face of substantial evidence. Developing this evidence may be a time-consuming process. The DX operator and his QSL manager must convince themselves that a QSO did take place. It is not enough for a DXer to say "I am 100% sure of my contact." Sometimes even a tape recording might not be sufficient to validate a QSO.

After any major DXpedition, the QSL manager and his helpers are faced with many requests for QSL cards that do not match the information in the DXpedition logs. Many operating awards depend on the QSLs for credit. If these awards are to be meaningful, all participants must strive to achieve the highest level of integrity in the confirmation processes. From the beginning, the League with its DXCC program has made strong efforts to maintain the highest level of integrity in crediting QSL cards. Lots of folks believe that it is this integrity which has sustained DXCC over six decades. Since the QSL manager is the person who controls the issuance of these confirmations, he must have a firm grasp of how to handle errors. No matter whether the expedition logged on paper or on a computer, errors can and do occur. It is important to realize that errors can and are made by either the operator, the DXer or the DXpeditioner.

So, how is it that your call sign is declared to be "not in the log?" There are several reasons, including the following:

(1) Nothing similar to the call sign of the claimant appears in the log.

(2) A vaguely similar call appears in the log.

(3) The call is logged incorrectly (one or two letters incorrect, for example)

(4) The call sign appears in the log correctly, but at the wrong time, date, band or mode.

(5) The correct call sign appears in a paper log, but is crossed out.

In each of these cases, no QSL card should be issued without further investigation. First of all, realize that a DXer has no "right" to a card if his call sign is not correct in the log. Changes can be made in the log, but care should be taken to make changes in the log only when justified. The integrity of various awards depends on the fact that the QSOs in question did actually take place. A few QSL managers and DX operators are, well, less than careful in issuing QSLs! Fortunately, their procedures are often well known in the DX community.

Let's consider each of these cases one by one. The first case is straightforward—there is simply no evidence of a contact present in the log. There are many possible reasons. The DX station may have been QRMed and the caller could not hear but "the timing was right." Perhaps the caller worked a pirate. Without some evidence of a QSO in the log, no card can be issued.

In the second case, there are only one or two characters in the log that are similar to those in the claimant's call sign. This is most likely a situation where the claimant heard part of the call sent by the DX station, but in fact his was not the station called. The claimant is merely hopeful that he made a contact. The timing is right, but the call sign is wrong. Again, no confirmation can be issued in this case.

The third case is probably the most common form of a broken call sign where just one or two letters/numbers are wrong. There are several possible causes: (1) The DX operator actually heard the claimant's signal, but because of QRM or poor conditions, he is unable to copy the call sign of the calling operator correctly, or (2) the calling opera-

GREETINGS FROM THE QSLING DESK IN FINLAND

WRONG CALLSIGN LOGGED AT H40AA

YOUR CALLSIGN FOR CLAIMED QSO 0804 10YY 3,5 CW

OUR LOGGED CALLSIGN AT H40AA W3UA

To maintain the highest possibly degree of integrity in H40AA QSLing operations, it is decided that a wrong callsing in the H40AA logs will not be changed without detailed consideration. Such consideration obviously involves a written proof verifying that the station logged will not claim this particular QSO.

To obtain such WRITTEN PROOF, we kindly ask you to contact the station logged and to provide Tim Totten, N4GN and/or Pekka Holstila, OH2TA with a copy of his response. The evidence will then be processed and a resultant QSL card will be released.

You may argue that the error was caused solely by the DXpedition operator and that it should therefore be resolved at the DX end. We strongly wish to emphasize that making a correct two-way DX contact is a shared responsibility of both parties. The H40AA Dxpedition repeated the callsign as heard at least once during the QSO and it was your responsibility to acknowledge and/or correct the H40AA operator in case of incorrect copy.

Since that procedure possibly did not work properly during an actual QSO, we are obliged to verify a log change after the fact. As a matter of policy, we will consider changing the log only for an error of one character. If a longer mismatch is experienced, we can only wish you a bettrer luck next time.

Your re-submitted QSL and associated evidence can be mailed directly to:

Pekka Holstila, OH2TA
Linnaistentie 7
01640 VANTAA
FINLAND

Here is a not-in-the-log notice received by W3UR for a claimed QSO with the H40AA DXpedition. Look closely and you'll see that W3UR's call was incorrectly logged as W3UA. Fortunately the situation was resolved when Gene, W3UA, sent a note to the QSL manager to report that he did not make contact with H40AA.

*3025 Hobbs Rd
Glenwood, MD 21738-9728
howsdx@dailydx.com

Bernie McClenny, W3UR (left) and Roger Balister, G3KMA (right), IOTA manager.

A QSL from an IOTA DXpedition to Pulau Langkawi.

tor did not send his call sign carefully. It is important for the caller to listen carefully to the call sign sent back by the DX station. Only in this way can he be sure his call sign is properly logged. Another possible cause (3) is that the DX operator made an entry error. In a paper log the error might be obvious. In a computer log, an adjacent key may have been depressed, but the thinking process is less clear.

In case–three situations it may be possible to issue a confirmation. The QSL manager should seek to determine if two-way communications did actually take place between the DX station and the claimant. He needs to be sure that no one else will claim the QSO. If the broken (wrong) call sign doesn't exist in any call sign databases, a QSL might be issued. The nature of the error often gives a clue. On CW, the error may be the omission of a dot, yielding a different letter. On phone, a similar sounding letter or phonetic can lead to an error. The greater the degree of the error, the less likely it is that a QSL will be issued. Usually, where errors involve more than one letter, a contact should not be confirmed. In some cases the claimant might be asked to contact the holder of the broken call sign to determine if he did or did not make a QSO. If he does not claim the contact, the manager can be more confident in resolving the error. The QSL manager must weigh all of the evidence and decide whether a contact was indeed made.

In the fourth case, the exact call sign is in the log, but the QSO is claimed with the wrong information. It appears that the claimant doesn't know when the contact was made, or other pertinent information. In a case like this, one wonders where the data came from. There are only two parties who should know all of this data, the caller and the callee! DX stations usually review their logs to locate and eliminate errors such as band and mode changes. These errors are usually fixed early on. With the advent of the Web-published logs there is an additional complication. There is the possibility that a QSL claim might be made based on Web-log data. There should be no need to check an on-line log to verify a contact. If alternative means are needed to verify a QSO, one or both parties failed in the QSO attempt. No one but the DX operators and QSL manager should have access to the complete data in a DX log. This is the reason that an Internet Web-log usually doesn't contain time and date information. The DXer must provide this information for a claim to be legitimate.

The last case usually arises out of difficult conditions, and can be confusing to the DXer. The DXpedition operator hears the DXer, and responds. The DXer hears the response and sends a report in reply. At this point, the DXpedition op doesn't hear the reply, and, in fact, hears nothing further. From the DXer's point of view, this might be a complete QSO, but from the point of view of the DXpedition op, the DXer may never have heard him. What is missing is a final confirmation from the DXpedition op to the DXer. The DX op should remove this QSO from the log. In the case of a paper log, a clear record remains—the correct call sign is crossed out. In the case of a computer log, there is usually no record at all. This is not a two-way QSO, and the QSL manager should not issue a confirmation.

DX operators and their QSL managers usually put rare DX on the air because they want to fill their logs with the correct call signs of "Deserving DXers." Their intent is to deliver the QSL cards. A DX contact is the result of cooperation between two operators. The DX operator probably has lots of experience in working the pileups. If you find yourself "not in the log" work with the QSL manager to see if enough evidence can be produced to justify a confirmation. The manager will weigh the evidence and try his best to confirm the contact. If you have continuing problems getting in the log you might wish to take a close look at your operating procedures. Alternatively, work with the QSL manager, and you might be surprised. You may learn even more about how to minimize your "not in the log" rate. Good luck!

JULY IS IOTA MONTH

Summertime in the Northern Hemisphere is the best time of the year to catch IOTA (Islands On The Air) DXpeditions. The IOTA program was originally started by Geoff Watts, a British short wave listener (SWL), in 1964 and later taken over by the Radio Society of Great Britain (RSGB) in 1985. The basic concept is to work island groups and, in some instances, individual islands all around the world. Each island or island group has its own unique IOTA reference designation. For example, the US Virgin Islands (KP2) are comprised of several islands which include St. Thomas, St. Croix, St. John and other smaller islands all of which count as NA-106. Reunion Island (FR) on the other hand is a single island and counts as AF-016.

The first two letters in the IOTA reference indicate the continent. Africa is AF and has over 80 different islands or groups. Antarctica is AN with only 18. Asia is AS with over 140. Europe is EU almost 170. North America is NA with 212. Oceania is OC has 228. South America is SA and has 86. More than 830 islands that have had Amateur Radio operations and only these have been assigned IOTA reference numbers. There are over 300 islands or groups of islands that have never been activated and will be assigned an IOTA reference number after a proper operation.

In July the RSGB sponsors the IOTA Contest, which takes place this year on July 24th and 25th (see "Contest Corral" in this issue). Each year more stations participate in this contest. Like most contests it's a great way to work lots of stations in a short amount of time. During this event many individuals and groups put on IOTA DXpeditions, some to new islands, others to rare locales and some just to run-of-the-mill island destinations. During last year's IOTA Contest it was possible to work over 200 different IOTA counters.

Each spring the *RSGB IOTA Directory & Yearbook* is produced. It is available from the ARRL for $15 (order no. 6079). It contains more than 100 pages of information including IOTA reference numbers, rules, changes, guidelines, Honor Roll, Annual Listing, results of the past years contest plus much more. For more information about the IOTA program, check out the RSGB Web page at **http://www.logiciel.co.uk/iota/iota.html** or write the RSGB, Lambda House, Cranborne Rd, Potters Bar, Herts EN6 3JE, United Kingdom.

THANKS

Special thanks to Wayne, N7NG, and all of those who are sending me their club newsletters. Keep those letters, pictures and comments coming. Until next month, see you in the pileups!—*Bernie, W3UR*

UK Announces Licensing Changes

The Radio Society of Great Britain and the Radiocommunications Agency of the United Kingdom have announced changes in Amateur Radio licensing to be implemented later this year.

For many years there were two classes of amateur license in Great Britain: Class B with privileges above 30 MHz, and Class A with full privileges. The only difference in the examinations for the two licenses was that there was a 12-WPM Morse code requirement for Class A and no Morse requirement for Class B.

In 1991, Novice licenses with simpler examinations were introduced. The Novice B license was restricted to 3 W output (or 5 W input) in the 6 meter and 70 cm, 23 cm and 3 cm bands. The Novice A license, with a 5-WPM Morse code requirement, also enjoyed access at the same power level to segments of the 160, 80, 30, 15 and 10 meter bands, including telephony on 160 and 10 meters. With the introduction of Novice licenses, the original Class B and Class A licenses became known as Full B and Full A respectively.

Beginning sometime this summer, Novice licensees will be permitted a maximum of 10 W output with more mode privileges in wider segments of the HF bands (see Table 1) and will be allowed to operate on 2 meters. In the autumn, a new class of license called "Full A/B" will be introduced. The written examination will be the same as for Class B or Class A; the Morse code requirement will be 5 WPM. In addition to full privileges above 30 MHz, the new class of license will convey full frequency and mode privileges below 30 MHz with a maximum output power of 100 W. A new series of call signs with the prefix M5 will be used.

The Full A/B license thus provides a logical intermediate upgrade route either for the Novice A licensee, who must only pass a written examination, or for the Full B licensee, who must only pass 5 WPM instead of 12 WPM.

The maximum output power normally permitted to amateur stations in the UK is 400 W. Amateurs with Full licenses will be able to apply for a Notice of Variation to run higher power; the applications will be assessed on a case by case basis.

A joint news release issued May 21 by the RSGB and the RA states, "It is expected that the World Radio Conference to be held in 2002 or 2003 will agree to the removal of mandatory Morse testing for access to frequencies below 30 MHz. Following that decision, the existing license structure will be replaced with an incentive-based system. In the meantime, discussions are under way to ensure that Morse and data subbands are safeguarded by incorporating them into license schedules."

Table 1
New Novice HF bands in the UK.

Frequencies	*Modes*
1950-2000 kHz	Morse, telephony, RTTY, data
3550-3600 kHz	Morse, data
3600-3650 kHz	Morse, RTTY, telephony
10.110-10.140 MHz	Morse
21.050-21.149 MHz	Morse, RTTY, data
28.050-28.190 MHz	Morse, RTTY, data
28.225-28.500 MHz	Morse, telephony

Further details may be found on the Web at **http://www.rsgb.org/news/extra3.htm**. The rules governing amateur operation in the UK are at **http://www.open.gov.uk/radiocom/**.

CEPT READY FOR US PARTICIPATION

The European Radiocommunications Office (ERO) has added the United States to the list of non-CEPT administrations that participate in the "CEPT Radio Amateur License" under the provisions of Recommendation T/R 61-01.

What this means for US citizens who are FCC amateur licensees is that the only documentation they need to have in their possession to operate in a participating CEPT country is their original license document (Form 660) issued by the FCC and a copy of an FCC Public Notice in English, French, and German entitled "Amateur Service Operation in CEPT Countries." At press time, release of the Public Notice was imminent and it should be available by the time you read this.

There are two classes of CEPT Radio Amateur License. Class 1 permits utilization of all frequency bands allocated to the Amateur Service and Amateur Satellite Service and authorized in the country where the amateur station is to be operated. It will be open only to those amateurs who have proved their competence with Morse code to their own Administration. The ERO has determined that for the purposes of Recommendation T/R 61-01, the FCC Amateur Extra, Advanced, General, and Technician Plus licenses are equivalent to CEPT Class 1. Class 2 permits utilization of all frequency bands allocated to the Amateur Service and Amateur Satellite Service above 30 MHz and authorized in the country where the amateur station is to be operated. The ERO has determined that for the purposes of Recommendation T/R 61-01, the FCC Technician license is equivalent to CEPT Class 2.

There is no CEPT equivalent to the FCC Novice license. Operation by Novices is not authorized under a CEPT Radio Amateur License.

The following conditions apply:

- On request the license holder shall present his or her CEPT Radio Amateur License to the appropriate authorities in the country visited.
- Authorization is granted for the utilization of a portable or mobile station only. A portable station shall, for the purposes of this Recommendation, include any station using mains electricity at a temporary location, e.g. a hotel or a camping site.
- Authorization is also granted for utilization of the station of a radio amateur holding a permanent license in the host country.
- The license holder shall observe the provisions of the ITU Radio Regulations, this Recommendation and the regulations in force in the country visited. Furthermore, any restrictions concerning national and local conditions of a technical nature or regarding the public authorities must be respected. Special attention should be paid to the difference in frequency allocations to the radio amateur services in the three ITU Regions.
- Operation from on board an aircraft is prohibited.
- When transmitting in the visited country the license holder must use his or her national call sign preceded by the CEPT call sign prefix. The CEPT call sign prefix and the national call sign must be separated by the character "/" (telegraphy) or the word "stroke" (telephony). For a mobile amateur radio station the national call sign must be followed by the characters "/M" (telegraphy) or the word "mobile" (telephony). For a portable amateur radio station the national call sign must be followed by the characters "/P" (telegraphy) or the word "portable" (telephony).
- The license holder cannot request protection against harmful interference.

Participating CEPT countries and their CEPT call sign prefixes are: Austria (OE), Belgium (ON), Bosnia and Herzegovina (T9), Bulgaria (LZ), Croatia (9A), Cyprus (5B), Czech Republic (OK), Denmark (OZ), Faroe Islands (OY), Greenland (OX), Estonia (ES plus numeral of Administrative District), Finland (OH), France (F), Corsica (TK), Guadeloupe (FG), Fr. Guiana (FY), Martinique (FM), St-Bartholomew (FJ), St-Pierre/Miquelon (FP), St-Martin (FS), Reunion (FR), Mayotte (FH), French Antarctica (FT), Germany (DL for Class 1, DC for Class 2), Greece (SV), Hungary (HA for Class 1, HG for Class 2), Iceland (TF), Ireland (EI), Italy (I), Latvia (YL), Liechtenstein (HB0), Lithuania (LY), Luxembourg (LX), Malta (9H), Monaco (3A), Netherlands (PA), Norway (LA for Class 1, LC for Class 2), Portugal (CT), Azores (CU), Madeira (CT), Romania (YO), Slovak Republic (OM), Spain (EA for Class 1, EB for Class 2), Sweden (SM), Switzerland (HB9), Turkey (TA), United Kingdom (G), Isle of Man (GD), N. Ireland (GI), Jersey (GJ), Scotland (GM), Guernsey (GU), and Wales (GW). Local permission is also required for: Glorieuse (FR), Jean de Nova (FR), Tromelin (FR), Crozet (FT), Kerguelen (FT), St. Paul & Amsterdam (FT), Terre Adelie (FT), French Polynesia (FO), Clipperton (FO), New Caledonia (FK), and Wallis & Futuna (FW).

For updates, check the Web site of the European Radiocommunications Office at **http://www.ero.dk**. Look for "ERC Recommendations" — T/R 61-01 (both English and French are available).

Digital Dimension

Stan Horzepa, WA1LOU*

Dayton in Ohio

My blue Rocket 88 was the vehicle of choice for the Wolcott-to-Dayton run this year. APRS-equipped, it left a trail of posits across Connecticut, New York, Pennsylvania and Ohio. After covering a lot of sparsely populated ground during that 718-mile run, I wondered, "When a tracker sends a posit, but no other station hears it, does it make a track?"

[What does "APRS-equipped" mean? Typically, this means I have a 2-meter radio connected to a TNC connected to a GPS. The GPS receives satellite data to determine my location, sends that information to the TNC and the TNC is configured to transmit that information in a format (a "posit") once per minute via 2 meters. Anyone receiving my posits and running APRS software can track my movement across maps displayed by the software. My APRS tracker was atypical because it used a Kenwood TH-D7, which combines the radio and TNC functions in one package.]

There is nothing like Dayton to restore your faith in "hamanity"! As the Interstates converge on Dayton during the afternoon of Hamvention Thursday, more and more vehicles begin sprouting unusual antennas and 146.52 MHz is buzzing. Then Friday morning, 30,000 members of the Ham Radio Nation have a big eyeball QSO at the arena called Hara. Checking the pulse at Hara, you realize that ham radio is alive, well and ready to get over the Y2K bump and into the 21st century.

New in Dayton

TAPR's PIC-E (peripheral interface controller encoder) kit was available for the first time. PIC-E interfaces the digital world (in the form of serial data streams) and the amateur packet-radio world (in the form of AX.25 packets). Its firmware is fully programmable by the user. For example, the user can program the PIC-E's micro to receive serial data from a GPS receiver or weather station and transmit that data as formatted packet frames at 1200 baud.

Applications that are available for the PIC-E include a program that automatically or manually transmits APRS posits, software routines for sending and receiving packet radio and a program for transmitting Peet Brothers Ultimeter 2000 weather station data via packet radio. These applications are downloadable from **http://www.tapr.org**.

*One Glen Ave
Wolcott, CT 06716-1442
wa1lou@arrl.net
http://www.tapr.org/~wa1lou

APRS is *hot* and this was very evident at Dayton. With the availability of the Kenwood TH-D7 hand-held APRS radio, ambulatory APRS (AAPRS) was the *mode du jour* at Hara. At any time, you could look at an APRS map and determine if AAPRS hams were in the flea market, at a forum, or back at the hotel catching Zs. TH-D7 sales were brisk and by the end of the convention, there were many new AAPRS operators on the air. The word on Shiloh Road was that other manufacturers are getting on the APRS radio bandwagon, so, you can expect new portable and mobile APRS radios in the near future.

On the software front, N0QBF promised to get *pocketAPRS* for the Palm PDA (personal digital assistant) out of beta by the time you read this. KB2ICI and WU2Z announced that their *Linux* version of APRS will be ready by summer's end. K4HG announced his development of XML (extensible markup language) Web software for APRS. And a *Windows CE* PDA version of APRS was reported to become available real soon now.

The APRS Working Group became a reality during Dayton. Its members agreed to publish and maintain a formal APRS protocol, publish procedures for assuring compliance with the protocol and establish an APRS certification program. This is all intended to improve the capabilities of APRS within Amateur Radio. The group is composed of the current APRS authors (WB4APR, KB2ICI, WU2Z, K4HG, KH2Z and N0QBF), a TAPR representative (currently WD5IVD), an administrative chairperson (N8UR) and a secretary (yours truly).

Dayton was great and there's more to come!

DCC in Arizona

The ARRL and TAPR Digital Communications Conference (DCC) is September 24-26 in Phoenix at the Holiday Inn Select–Airport. This annual international forum for amateur digital communications, networking and related technologies provides radio amateurs with the opportunity to publish and discuss new ideas, techniques, theories, experiments, applications and advances in hardware and software.

Anyone interested in digital communications is invited to submit a paper for publication in the conference proceedings. Presentation at the conference is not required for publication. Papers are due August 9 and should be submitted to Maty Weinberg, ARRL, 225 Main St, Newington, CT 06111; e-mail **lweinberg@arrl.org**.

Full-time students are invited to compete for two $500 student-paper travel awards: one for best technical/theory-oriented paper, and a second for best educational or community-oriented application paper. Papers co-authored by educators or telecommunications professionals are also eligible for this award as long as a student is the first author. Student papers are due July 10 and should be submitted to TAPR, 1418 Ridgecrest, Denton, TX 76205.

Submission guidelines for all papers are available on-line at **http://www.tapr.org/dcc**.

In addition to the presentation of papers on Saturday, there will be the Third APRS National Symposium and a technical seminar on Friday, a banquet Saturday evening and a PIC-development seminar Sunday morning.

Obtain full information about DCC from TAPR, 8987-309 E Tanque Verde Rd No. 337, Tucson, AZ 85749-9399; tel 940-383-0000, fax 940-566-2544; **tapr@tapr.org**, or **http://www.tapr.org/dcc**. QST

Strays

I'd like to get in touch with...

◊…American amateurs who are interested in homebrewing RF power amplifiers. Contact Serge, UA1OSM, at **ua1osm@mail.sts.ru**.

◊…hams who are interested joining Helihams —an association of amateurs who are also helicopter enthusiasts. Contact Marden Pride, WB1GGI, 23 Elm Park, Groveland, MA 01834, or post a message to me on the Pentucket Radio Association message board at **http://www.k1kkm.org**.

◊…any satellite-active hams who use Yaesu FT-847 transceivers with Kansas City Tracker/Tuners, Yaesu 5600 rotator controllers and *WiSP*. Winton Modin, W2NE, 5001 East Main St, Lot 121, Mesa, AZ 85205-8054; **slimodin@worldnet.att.net**.

◊…anyone who was in the Korean War in the 4th Signal Battalion, 10th Corp. Contact LaVern Smith, Rte 1 Box 368D, Poland, IN 47868.

WANTED: HORIZON TWO MANUAL

◊ I'm looking for a manual for a Standard "Horizon Two" 2-meter FM transceiver. Jay Hymen, WB2CSS, 1032 East 2nd St, Brooklyn, NY 11230; **wb2css@arrl.net**.

Edited by **Mary E. Lau, N7IAL** • Secretary, ARRL Foundation Inc

Helping Our Disabled Friends Become Hams

Hamming can be fun for anyone regardless of physical ability. Hams have always come in all shapes, sizes, colors, and *conditions*. A disability rarely prevents an eager prospect from doing whatever it takes to get a ham license and have fun on the air. Sensory or motor impairments may require a prospective ham to use adaptive learning materials or devices, or have instruction or testing provided in a specialized setting. Whatever is physically needed, motivation is rarely lacking in a prospective ham. *Your* motivation to assist may also be in large supply, but you may have questions about how to help your disabled friend get started. Let's see how individual and club efforts can make a difference.

Resources

By far the best known and most successful organization to help individual prospects with disabilities is Courage HANDI-HAM System of Golden Valley, Minnesota. By joining this fine organization, the prospective ham can have access to services that make the entire process of license study and upgrade and on-the-air operation easier. Only those with disabilities can receive these services, but nondisabled volunteers who want to assist students are always in demand. To learn more about HANDI-HAMS, visit their website at **http://www.mtn.org/handiham/** or call 612-520-0515.

The ARRL Program for the Disabled (PFTD) works in concert with HANDI-HAMS—most often by making referrals from disabled callers seeking a source for adapted license-study materials. A major emphasis of ARRL's PFTD is to find ways to make ARRL materials more accessible to those with disabilities. We work with ARRL products, study their ease of use and offer input, when possible, during the planning stages of new items. The ARRL Technical Department is consulted to discuss modifications and solutions for individuals encountering technical problems in operation of their ham stations. We also keep abreast of development in adaptive/assistive technologies that have an impact on consumer goods, learning aids, and electronic hobby applications.

Technology Levels the Playing Field

The Internet and Web revolution has spread across many sectors of society and disabled prospects often make as much use of these tools as the nondisabled. Computer and software developments have been the key. What's different is usually how information might be physically accessed (voice commands to a speech recognition device rather than using a keyboard, or using a track-ball when fine-motion efforts prove a problem). Output from computer sources can also be unique. Instead of a conventional printer, a blind ham might use synthesized speech output to "hear" what would appear on their computer screen. Braille output to a specialized Braille printer is also popular. Computer controllers can be used for tuning a radio or activating recording devices so that someone can study for an upgrade or log during a contest. Ask a disabled ham you know what they use in the shack. You might be surprised to realize how high-tech your friend's hamshack might be!

Be an Adaptive Elmer

For any new ham, effort is needed to study, learn, pass a test, and get on the air. An Elmer (an experienced ham who helps the newcomer) is often the most valuable contact a new ham could know. For disabled hams who already use adaptations in the home, the Elmer who has acquaintance with adaptive devices and materials can make the prospective ham's journey to on-the-air fun much easier. If you're assisting a disabled newcomer in their home or assisted living environment, learn as much as you can about the day-to-day devices your friend uses. This will suggest many ways to make hamming accessible in the unique setting your friend will call his or her hamshack.

The Crucial Club Connection

Often, a disabled prospective ham will arrive at a ham radio class ready to buckle down and earn their ticket. Depending on the disability, some change to specialized materials or physical accommodations may need to be made. A call to HANDI-HAMS can help, but so can contacting other clubs in your area and discussing their experiences in assisting a disabled newcomer. You might find your cross-county club has materials in Braille or other adaptive materials your club can borrow. Networking to find what's needed usually gets results and lets your new prospect feel acceptance in the club's willingness to help.

Your club also gains some valuable insights in how to help future disabled newcomers. Everybody wins!

Keeping Friends on the Air

Your prospect has passed and is having a ball on the air. Just as you enjoyed your soloing at the key or mike, you might figure the mentoring is over and your new ham won't need further help from you. In many cases, this is true—but some situations come to pass for every ham. The antenna blows down in a windstorm…the power supply in the transceiver gives out…the computer is now doing something *"it's never done before."* Just as nondisabled hams may try to troubleshoot or fix problems themselves, just as many call on friends who may possess patience or knowledge they lack. Troubleshooting can be a bit more challenging when you're disabled, and when you think about it, whatever was needed to help a disabled friend get set up initially may now be needed to get their station up and running again. Unfortunately, we hear from disabled callers who have difficulty locating a local source to help them overcome what might be a simple problem in the shack. We urge hams to remember those hams in their community who might need in-shack assistance. Make it a club effort. Again, everyone wins!

BACK TO SCHOOL, MOM OR DAD?

Armed with the family PC and a yearn to study for a career change, you may be hitting the books and treading campus steps alongside a son or daughter this fall. Like any student, you may be fretting about college expenses. We can help. If you're a ham, visit the Foundation Web site at **http://www.arrl.org/arrlf** and read about our scholarship program. You can download our application right from the site. Not online yet? No problem. Send a business-sized SASE with two first class stamps affixed to: The ARRL Foundation Scholarship Program, 225 Main St, Newington, CT 06111. We'll be happy to send our application package to you. Age is not a factor: Education, like hamming, is *ageless*! QST

Coming Conventions

*Edited by **Gail Iannone** • Convention Program Manager*

MONTANA STATE CONVENTION

July 16-18, 1999, East Glacier

The Montana State Convention, sponsored by the Glacier-Waterton International Peace Park Hamfest Committee, will be held at the Three Forks Campground, 16 miles W of East Glacier on Hwy 2, between milepost 191 and 192. Features include flea market, tailgating, vendors, special event station, dealer displays, junque auction, meetings (QCWA, ARES, annual hamfest), transmitter hunts, contests (high speed CW, QLF), seminars (ATV, QRP, repeater linking), VE sessions, BBQ supper (Sat eve, bring your plate, utensils, meat, meal tickets), camping (406-226-4479). Talk-in on 146.52. Admission is $10 in advance, $13 at the door. Contact Darrell Thomas, N7KOR, 743 33rd Ave NE, Great Falls, MT 59404-1254, 406-453-8574, **n7kor@mcn.net**; **http://www.tlatech.com/hamfest/**.

ARIZONA STATE CONVENTION

July 23-25, 1999, Flagstaff

The Arizona State Convention, sponsored by the Amateur Radio Council of Arizona, will be held at the Fort Tuthill Fairgrounds, 3 miles S of Flagstaff on I-17, Airport Exit 337. Features include huge swap, major manufacturers, dealers, exhibits, seminars and forums (ARRL, AMSAT, APRS, QRP, new hams), special guest speakers (Gordon West, WB6NOA, Ed Hare, W1RFI, Steve Katz, WB2WIK, Robert Symes, KO6ZL), VE sessions, camping, Saturday eve barbeque. Talk-in on 146.98 (100 Hz). Admission is free. Contact Norm Martin, KC7FNK, 1633 W Placita Montuoso, Oro Valley, AZ 85737-3677, 520-297-9562; **arcathill@aol.com**; **http://www.hamsrus.com**.

PACIFIC NORTHWEST DX CONVENTION

July 30-August 1, 1999, Portland, OR

The Pacific Northwest DX Convention, sponsored by the Willamette Valley DX Club, will be held at the Monarch Hotel, 12566 SE 93rd Ave, Clackamas; I-205 S to Sunnyside Rd Exit, follow Clackamas Promenade Exit to Monarch Hotel. Talk-in on 147.14. Admission is $55 in advance, $60 at the door. Contact Al Rovner, K7AR, 18809 NE 21st St, Vancouver, WA 98684, 360-256-7437; **alanr@pacifier.com**; **http://www.qsl.net/wvdxc**.

1999

July 10
Central Division, Indianapolis, IN*
Midwest Division, Kansas City, MO*

August 15
Colorado State, Golden

August 21-22
Southeastern Division, Huntsville, AL
New Mexico State, Rio Rancho

August 22
Kansas State, Salina

August 27-28
International DX, New Orleans, LA

August 27-29
Eastern VHF/UHF, Enfield, CT

August 28
West Virginia State, Weston

***See June *QST* for details.**

TEXAS STATE CONVENTION

August 6-7, 1999, Austin

The Texas State Convention, co-sponsored by the Austin ARC, the Austin Repeater Organization, and the Texas VHF-FM Society, will be held at the Red Lion Hotel in N Austin, at the intersection of IH 35 and US 290. Features include inside swapfest, dealers, exhibits, forums (ARRL, DX, packet radio, QRP, VHF/UHF FM Repeater), weather-related seminars, Texas VHF-FM Society summer meeting, VE sessions (all classes of licenses). Talk-in on 146.94. Admission is $8 in advance, $10 at the door. Contact Joe Makeever, W5HS, 8609 Tallwood Dr, Austin, TX 78759, 512-345-0800, **jomak@ibm.net**; **http://www.repeater.org/summerfest/**.

DAKOTA DIVISION CONVENTION

August 6-8, 1999, Watertown, SD

The Dakota Division Convention, sponsored by the Lake Area Radio Klub, will be held at the Best Western Ramkota Inn, 1901 9th Ave SW; W side of Watertown on Hwy 212, approximately 5 miles W of I-29. Features include VE sessions, free parking. Talk-in on 146.85. Admission is $6 in advance, $7 at the door. Tables are $10. Contact Jerry Hegg, N0JH, 4102 20th Ave SW, Watertown, SD 57201-7034, 605-886-7151; **n0jh@dailypost.com**.

EASTERN WASHINGTON SECTION CONVENTION

August 7-8, 1999, Spokane

The Eastern Washington Section Convention, co-sponsored by the NW Tri-State ARO, KBARA, Inland Empire VHF Club, Spokane Radio Amateurs, and the Palouse Hills ARC, will be held at University High School, 10212 E 9th Ave, Exit 287 off I-90. Doors are open for setup Friday 6-9 PM; public Saturday 9 AM to 5 PM, Sunday 8 AM to noon. Features include computer/electronics fair, dealers, free seminars, demos, special event station, VE sessions, foxhunts, auction, steak dinner (Saturday, 6 PM, $6.50), off-street parking for cars and RVs, refreshments. Talk-in on 147.38, 146.52. Admission is $5, under 12 free. Tables are $10. Contact Neil Gallup, N7LVO, 9806 E Crossbow Ct, Spokane, WA 99206, 509-928-7442; **n7lvo@cet.com**; **http://www.iea.com/~n7utg**.

Attention Hamfest and Convention Sponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be obtained by writing to or calling the ARRL convention program manager, tel 860-594-0262.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

Hamfest Calendar

*Edited by **Gail Iannone** • Convention Program Manager*

Attention: The deadline for receipt of items for this column is the **1st of the second month preceding publication date.** For example, your information must arrive at HQ by **July 1** to be listed in the **September** issue. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

(Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.)

Arizona (Flagstaff)—Jul 23-25, Arizona State Convention. See "Coming Conventions."

†**California (Chico)—Aug 7**, 8 AM to 4 PM. *Spr:* Golden Empire ARS. University Farm Pavilion, 311 Nicholas C. Schouten Ln; off 99E, take Park Ave W to third stop light, left to first light, then 3 miles to University Farm. Swapmeet, vendors, tailgating ($5), forums, special event station, VE sessions (3 sessions), refreshments. *TI:* 146.85. *Adm:* Free. Tables: $10. Muriel Pope, K6GSK, 5 Capistrano Pl, Chico, CA 95973, 530-342-4765, **k6gsk@w6rhc.org**; or Ray Watkins, KO6TW, 530-865-9623 (after 5 PM), **ko6tw@w6rhc.org**; **http://www.w6rhc.org**.

Colorado (Loveland)—Jul 17. Michael Robinson, N7MR, 970-225-7501 or 970-352-5304.

†**Florida (Milton)—Jul 23-24**; Friday 5-9 PM, Saturday 8 AM to 3 PM. *Spr:* Milton ARC. Santa Rosa County Auditorium, Old Bagdad Hwy and Avalon Blvd; I-10, Exit 7, go N for 5 miles, auditorium on right. Flea market, tailgating ($3 per spot), vendors, VE sessions (Saturday 8 AM, bring current license and copy, picture ID). *TI:* 145.49, 146.7. *Adm:* $3. Tables: $8. Walt Yarbrough, WA4TFR, 850-994-7335; or Dean Clark, WB6UKF,

†ARRL Hamfest

850-626-9752; **acordc@worldnet.att.net**.

Illinois (Carlinville)—Aug 7. Tim Jones, KA9VIV, 217-627-2355.

†**Illinois (Peotone)—Jul 11**; set up Saturday 6-8 PM, Sunday 6 AM; public 6 AM (flea market), 8 AM (main hall). *Spr:* Kankakee Area Radio Society. Will County Fairgrounds, I-57 to Exit 327, go E about 1 mile to Fairgrounds. Giant flea market with shelters, air-conditioned buildings for commercial vendors, electronics, computers, overnight parking ($10 with electric), free parking, handicapped accessible, refreshments. *TI:* 146.94. *Adm:* advance $4 (double stub), door $5 (single stub), under 12 free. Tables: $7. Make checks payable to KARS and send with SASE to Billie Kerouac, KF9IF, 6311 E Flora St, Kankakee, IL 60901, 815-939-7548, **dkbk@megsinet.net**; **http://www.w9az.com.**

†**Illinois (Peotone)—Aug 8**; set up Saturday eve; public Sunday 6 AM to 2:30 PM. *Spr:* Hamfesters RC. Will County Fairgrounds, I-57 to Peotone, Exit 327, E 1 mile to Fairgrounds. Flea market, air-conditioned atrium, acres of free parking. *TI:* 146.64 (107.2 Hz), 146.52. *Adm:* advance $4, door $5. Tables: $20. Dave Brasel, NF9N, 6933 W 110th St, Worth, IL 60482, 708-448-0580; **nf9n@aol.com**.

†**Illinois (Quincy)—Aug 7**, 8 AM to 2 PM. *Spr:* Western Illinois ARC. Eagles Alps Grounds, 3737 N 5th St, 4½ miles N of downtown Quincy. Card checking for ARRL awards, VE sessions, refreshments. *TI:* 147.03. *Adm:* advance $2.50, door $3. Jim Funk, N9JF, Box 3132, Quincy, IL 62305-3132, 217-336-4191; **jfunk@adams.net**; **http://www.qsl.net/w9awe**.

†**Illinois (Sugar Grove)—Jul 18**; set up Saturday 7 PM, Sunday 6-8 AM; public 8 AM. *Spr:* Fox River Radio League. Waubonsee Community College, Rte 47 at Harter Rd, 5 miles NW of Aurora. "75th Anniversary Hamfest," flea market, commercial dealers, computer vendors, VE sessions (10 AM, bring original and copy of license, photo ID, $6.45), free parking, refreshments. *TI:* 147.21 (103.5/107.2 Hz). *Adm:* advance $4, door $5. Tables: $12 (8-ft). James Von Olnhausen, N9UZC, c/o FRRL, Box 673, Batavia, IL 60510, 630-879-3042; **n9uzc@amsat.org**; **http://www.frrl.org/hamfest.html**.

Indiana (Angola)—Aug 1. Bill Brown, WD9DSN, 219-475-5897.

Indiana (Huntington)—Jul 31. Ray Tackett, KC9DZ, 219-786-0029 or 219-786-0057.

†**Iowa (Amana)—Aug 8**, 8 AM to 4 PM. *Spr:* Cedar Valley ARC. Amana Outdoor Convention Center, Hwy 151 to Amana, follow signs. Forums, VE sessions. *TI:* 146.745, 146.52. *Adm:* $5. Tables: $10. Wayne Kolosik, KI0FE, 1420 Sundance Dr, Marion, IA 52302, 319-373-7153; **ki0fe@usa.net**.

†**Kentucky (Bowling Green)—Jul 31**, 5 AM to 2 PM. *Spr:* Kentucky Colonels ARC. American Legion Hall (Post 23), 208 Dishman Ln; I-65 to Exit 20 (Natcher Parkway, formerly Green River Parkway), go W, exit on US Hwy 31-W, go N and take left on Dishman Ln, American Legion Hall on right. Forums (ARRL, ATV), 3960 kHz Group meeting, VE sessions. *TI:* 147.33. *Adm:* $5. Tables: $10 (includes 1 admission). Fred Painter, KA4CFW, 602 Greenlawn Ave, Bowling Green, KY 42103, 502-842-3193; **ka4cfw@mindspring.com**; **http://kcarc.premiernet.net**.

†**Louisiana (Slidell)—Jul 17**, 8 AM to 2:30 PM. *Spr:* Ozone ARC. Slidell City Auditorium, 2056 Second St. Flea market, commercial dealers, forums, QLF Contest, VE sessions. *TI:* 147.27 (114.8 Hz). *Adm:* $3. Tables: full $7, half $4 (limit of 2 tables per person or family; reserved on a first-come, first-served basis). Ronald Riviere, WB5CXJ, 504-882-5067; or Jerry Finnegan, KC5WLA, 504-639-9690.

†**Maryland (Brunswick)—Jul 10**, 8 AM. *Spr:* Mid-Atlantic DX and Repeater Assn. Railroad Square, downtown Brunswick, S turn MD Rte 17; N turn VA Rte 287, on the Potomac River. Swapfest including ham radio, computers, R/C models, and related items; tailgating. *Adm:* $5. Tables: $20. Roy Bates, N2CSQ, Box 128, Brunswick, MD 21716-0128, 301-834-9351; **MADRA@qsl.net**.

†**Maryland (Timonium)—Jul 25**; set up Saturday 2 PM; public Sunday 6 AM to 4 PM (tailgating), 8 AM to 4 PM (inside vendors). *Spr:* Baltimore RA Television Society. Timonium Fairgrounds, take I-695 (Baltimore Beltway) to Exit 24 (I-83 N); from I-83 take Exit 17 (Padonia Rd) E, turn right onto York Rd, (MD Rte 45), continue S on York Rd to Fairgrounds entrance. Hamfest/Computerfest, giant flea market, indoor/outdoor exhibit areas, tailgating ($10 per space; first-come, first-served), vendors, VE sessions (preregistration required, check-in 8:30 AM, free exams 9 AM in the Vista Room; call John Creel, WB3GXW, 301-572-5124 after 6 PM), handicapped accessible, refreshments. *TI:* 147.03, 224.96, 448.325. *Adm:* $5, under 12 free. Tables: call 410-461-0086. Mayer Zimmerman, W3GXK, c/o BRATS, Box 5915, Baltimore, MD 21282-5915, 410-467-4634, fax 410-461-0086; **brats@smart.net**; **http://www.smart.net/~brats**.

Massachusetts (Cambridge)—Jul 18. Nick Altenbernd, KA1MQX, 617-253-3776.

†**Michigan (Tawas)—Aug 7**, 8 AM to 2 PM. *Spr:* Iosco County AR Enthusiasts. Tawas Area High School, 255 M-55; US 23 to M-55, M-55 W for 1.4 miles. Trunk sales ($3), VE sessions. *TI:* 146.64. *Adm:* advance $4, door $5. Tables: $7. Bruce Summers, K8IBE, Box 24, Oscoda, MI 48750-0024, 517-739-3129; **k8ibekc8eym@i-star.com**; **http://www.oscoda.net/icare/**.

†**Missouri (Springfield)—Aug 7**, 8 AM to 3 PM. *Spr:* Southwest Missouri ARC. University Plaza Trade Center, 625 St Louis St; I-44 to Business 65 (Glenstone), S to St Louis St, turn right (W) to University Plaza. Forums, VE sessions. *TI:* 146.91. *Adm:* $5. Tables: $25. Karen Thorpe, N0TDW, 2516 S Brandon, Springfield, MO 65809, 417-889-6775; **n0tdw@juno.com**.

†**Missouri (Washington)—Jul 18**, 6 AM to 2 PM. *Spr:* Zero Beaters ARC. Washington City Park, off Grand Ave; Hwy 100 W from Washington, N on Pottery Rd, left on 5th St, right on Grand Ave. Flea market, vendors, exhibits, technical sessions, VE sessions, refreshments. *TI:* 147.24. *Adm:* Free. Tables: covered area $20 (advance reservations required), flea market $5 (no reservations). Dave Neal, N0PNG, 1917 Powderhorn Pass, Wildwood, MO 63011-1717, 314-532-2477 or 314-458-3254; **Dave_Neal@msn.com** or **Dave@AdvIndSys.com**; **http://zbarc.usmo.com/**.

Montana (East Glacier)—Jul 16-18, Montana State Convention. See "Coming Conventions."

†**Nevada (Reno)—Jul 31**; set up 6 AM; public 8 AM to 4 PM. *Spr:* Sierra Nevada ARS. International Game Technology Parking Lot and Exam Rooms, 9295 Prototype Dr; US 395 to S Meadows Parkway, E to Double R Blvd, N to Prototype Dr/Diamond Way, W on Prototype Dr to IGT. VE sessions (9 AM, all license elements, pre-registration requested; call Steve, W7VI, 775-972-3672; walk-ins accepted). *TI:* 146.61 (123.0 Hz). *Adm:* $1, under 16 free. Tables: vendors and sellers furnish their own; $10 per space. Bill Massie, K7NHP, 2 Grosh Ave, Dayton, NV 89403-9304, 775-246-3756; **kc7tck@arrl.net**.

†**New Jersey (Augusta)—Jul 18**, 8 AM. *Spr:* Sussex County ARC. Sussex County Fairgrounds, Rte 206 N to Plains Rd, turn right on Plains Rd, go approximately ½ mile to Fairgrounds on right. Flea market, tailgating ($10 per space). *TI:* 147.3. *Adm:* $5. Tables: $15. Dan Carter, N2ERH, 8 Carter Ln, Branchville, NJ 07826, 973-948-6999; **n2erh@email.com**; **http://www.scarcnj.org**.

New York (Auburn/Weedsport)—Aug 7. Joe Kahler, WA2NGX, 315-364-5135.

†**New York (Frankfort/Utica)—Jul 17**; set up 6 AM; public 8 AM to 2 PM. *Spr:* Utica ARC. Herkimer County Fairgrounds, Cemetery St; NYS Thruway to Exit 29 (Herkimer), follow signs to NYS 5S W, exit at Fairgrounds Exit (Frankfort). Flea market, VE sessions, refreshments. *TI:* 145.45. *Adm:* $4. Tables: $4 (6 ft). Bob Decker, AA2CU, 4 Forest Rd, Utica, NY 13501, 315-797-6614; **ktrnd@borg.com**.

†**New York (Patchogue)—Jul 11**, 9 AM to 2 PM. *Spr:* Mid-Island ARC. K of C, 9 Railroad Ave; LI Expressway to Exit 63 S, take right on Main St and then first left. Free tune-up clinic, VE sessions (noon). *TI:* 447.025 (91.5 Hz), 145.31 (118.8 Hz). *Adm:* $5. Tables: advance $15, door $20. Mike Grant, N2OX, 17 Whiskey Rd, Coram, NY 11727, 516-736-9126; **globalcm@erols.com**; **http://www.qsl.net/mid-islandarc/hamfest.html**.

†**New York (Plattsburgh)—Aug 7**, 8 AM to 3 PM. *Spr:* Champlain Valley ARC. Clinton County Fairgrounds; I-87 to Exit 37, Rte 3 W to 22B, ¼ mile on left. Forums (ARES/RACES, Skywarn), VE sessions (noon). *TI:* 147.15. *Adm:* $5. Bernhard Jakobetz, KC2ALG, 787 Clintonville Rd, Peru, NY 12972; 518-643-9657.

North Carolina (Cary)—Jul 17. Herb Lacey, W3HL, 919-467-9608.

†**North Carolina (Waynesville)—Jul 31**, 8 AM to 4 PM. *Spr:* Western Carolina ARS. Haywood County Fairgrounds, approximately 25 miles W of Asheville; I-40 to Exit 24, S on Hwy 209 for 3 miles. VE sessions. *TI:* 146.91. *Adm:* advance $4, door $5. Tables: $5. Carl Smith, N4AA, Box 249, Leicester, NC 28748, 828-683-4251; **wcars@dxpub.com**.

†**Ohio (Bowling Green)—Jul 11**, 8 AM to 1 PM. *Spr:* Wood County ARC. Wood County Fairgrounds, Poe Rd at SR 64; I-75 to Exit 181, go W through downtown, follow SR 64 to Poe Rd, turn right at entrance. VE sessions, handicapped parking, refreshments. *TI:* 147.18, 444.475 (77.0 Hz). *Adm:* Free. Tables: $5. Bob Boughton, N1RB, Box 534, Bowling Green, OH 43402, 419-354-1811; **boughton@bgnet.bgsu.edu**; **http://bravais.bgsu.edu/~boughton/wcarc.html**.

†**Ohio (Cincinnati)—Jul 24**, 7 AM. *Spr:* OH-KY-IN ARS. Diamond Oaks Career Development Campus, 6375 Harrison Ave, just E of I-275 and I-74; take I-74 to the Rybolt and Harrison Ave Exit, go E on Harrison Ave; Campus is located on the right side (S side of Harrison), less than 1 mile from the I-74 Exit. Technical seminars, transmitter hunt (noon), vendors, outdoor flea market (first 2 spaces free with admission, additional spaces $3 each), VE sessions, refreshments. *TI:* 146.67, 146.925. *Adm:* advance $4, door $5, under 13 free. Tables: $8 (6 ft, indoor with electricity). Dana Laurie, WA8M, 280 Hillcrest Dr, Cincinnati, OH 45215-2610, 513-761-7388; **wa8m@arrl.net**; **http://www.qsl.net/k8sch**.

†**Ohio (Columbus)—Aug 7**, 8 AM to 3 PM. *Spr:* Voice of Aladdin ARC. Aladdin Shrine Temple, 3850 Stelzer Rd; I-270, W on Morse Rd, S on Stelzer Rd. VE sessions. *TI:* 147.24. *Adm:* $5. James Morton, KB8KPJ, 6070 Northgap Dr, Columbus, OH 43229-1945; 614-846-7790.

Ohio (Lisbon)—Aug 8. Mike Mays, KB8JNM, 330-386-6021.

†**Ohio (Randolph)—Aug 1**, 8 AM to 4 PM. *Spr:* Portage ARC. Portage County Fairgrounds, between Akron and Youngstown on State Rte 44, 4 miles S of I-76. Forums, VE sessions, handicapped parking, free parking, restaurant on grounds. *TI:* 145.39. *Adm:* advance $4, door $5. Tables: $10. Joanne Solak, KJ3O, 9971 Diagonal Rd, Mantua, OH 44255, 330-274-8240; **ljsolak@apk.net**; **http://www.parc.portage.oh.us**.

†**Ohio (Van Wert)—Jul 18**, 8 AM to 3 PM. *Spr:* Van Wert ARC. Van Wert County Fairgrounds, US Rte 127 S. Radios, computers, software, new and used electronic parts, trunk sales (12 ft × 24 ft area, $5 plus admission), VE sessions (must preregister by Jul 11, Bob High, KA8IAF, 12838 Tomlinson Rd, Rockford, OH 45882; 419-795-5763), free parking, overnight parking ($10). *TI:* 146.85. *Adm:* $5. Tables: $10 (8-ft, includes 1 free ticket). Bob Barnes, WD8LPY, 419-238-1877; **barnesrl@bright.net**; **http://www.bright.net/~barnesrl/w8fy.html**.

†**Ohio (Wellington)—Jul 17**, 8 AM to 2 PM. *Spr:* Northern Ohio ARS. Lorain County Fairgrounds. Huge outdoor flea market, dealers, ample indoor commercial space, overnight parking for RVs and campers (no hookups), VE sessions (walk-ins, register 8-9 AM, exams 9 AM), DXCC card checking (cards in by 11 AM). *TI:* 146.7. *Adm:* $5, under 12 free. Tables: $15 (8 ft, plus admission). John Schaaf, KC8AOX, Box 432, Elyria, OH 44036-0432, 216-696-5709; **kc8aox@qsl.net**.

†**Oklahoma (Oklahoma City)—Jul 23-24**; Friday 5-8 PM, Saturday 8 AM to 5 PM. *Spr:* Central Oklahoma Radio Amateurs. Oklahoma State Fair

Park (Hobbies, Arts and Crafts Building), NE of the I-40 and I-44 intersection. Flea market, commercial dealers, manufacturers, forums (ARRL, ARES, MARS), technical and nontechnical programs, foxhunt, WAS card checking, VE sessions. *TI:* 146.82, 147.21. *Adm:* advance $7, door $9. Tables: advance $10, door $15 (if available), electrical hookup $5. Thomas Webb, WA9AFM, 10421 SE 55th St, Oklahoma City, OK 73150, 405-732-7110 or 405-737-6716; **tmwebb@telepath.net or n1lpn@swbell.net**; **http://www.geocities.com/heartland/7332**.

†**Oregon (Bandon)—Jul 31**, 9 AM to 3 PM. *Spr:* Coos County RC. Bandon Community Center, W 11th St; off Hwy 101. Flea market, vendors, speakers, VE sessions, refreshments. *TI:* 146.61. *Adm:* advance $4, door $5. Tables: $10. Brian Howard, W7MLT, 1107 Roseburg Rd, Myrtle Point, OR 97458; 541-572-5623; **w7mlt@usa.net**.

Oregon (Portland)—Jul 30-Aug 1, Pacific Northwest DX Convention. See "Coming Conventions."

†**Pennsylvania (Beach Haven)—Jul 17**; set up 6 AM; public 8 AM. *Spr:* Jonestown Mountain Repeater Assn. Salem Twp Fire Co; I-80, Exit 36 to Rte 11 N. Tailgating (free with paid admission), VE sessions (10 AM). *TI:* 145.13 (77.0 Hz), 146.52. *Adm:* $5. Tables: $10 (reserve). Charles Hooker, AD3L, Box 23, Huntington Mills, PA 18622, 570-864-2571, fax 570-864-2377; **chooker@epix.net**.

†**Pennsylvania (Kimberton/Valley Forge)—Jul 11**, 7 AM to 3 PM. *Spr:* Mid-Atlantic ARC. Kimberton Fire Company Fairgrounds, Rte 113, S of intersection with Rte 23. Computers and electronics, tailgating ($5, no reserved tailgate space). *TI:* 146.835, 443.8 (131.8 Hz). *Adm:* $5. Tables: with electricity $10 each (1-4 tables), $8 each (5 or more tables), plus admission. MARC, Box 352, Villanova, PA 19085; Bill Owen, W3KRB, 610-325-3995; **wb3joe@marc-radio.org**; **http://www.marc-radio.org/hamfest.html.**

Pennsylvania (Matamoras)—Aug 7. Dave, W2DRH, 914-856-2529.

†**Pennsylvania (Pittsburgh)—Jul 11**. *Spr:* North Hills ARC. Northland Public Library, 300 Cumberland Rd; from McKnight Rd, go W on Cumberland Rd to Library. Tailgating (first space free, additional spaces $10 each). *TI:* 147.09. *Adm:* Free. Tables: $15. H. Rey Whanger, W3BIS, 120 Cove Run Rd, Cheswick, PA 15024, 412-828-3694 (phone/fax); **w3bis@freewwweb.com**; **http://nharc.pgh.pa.us/**.

South Dakota (Clear Lake)—Jul 24-25. Don Clifford, N7AXW, 605-876-2671.

South Dakota (Watertown)—Aug 6-8, Dakota Division Convention. See "Coming Conventions."

Texas (Austin)—Aug 6-7, Texas State Convention. See "Coming Conventions."

Texas (Denison)—Jul 17. Wilmer Kinsey, WB5DCU, 903-893-5872

†**Virginia (Berryville)—Aug 1**. *Spr:* Shenandoah Valley ARC. Clarke Ruritan Club, 9 miles E of I-81 on Rte 7. VE sessions, barbeque dinners. *TI:* 146.82. *Adm:* $5. Tables: $12 and $20. Wayne Koehler, KE4PMS, 200 Settlers Way, Stephenson, VA 22656, 540-667-8629; **wkke4pms@vvalley.com**; **http://www.vvalley.com/svarc/hamfest/default.htm**.

Washington (Spokane)—Aug 7-8, Eastern Washington Section Convention. See "Coming Conventions."

Wisconsin (Oak Creek)—Jul 10. Verne Teske, W9RYA, 414-762-3235.

Attention All Hamfest Committees!

Get official ARRL sanction for your event and receive special benefits such as free prizes, handouts, and other support. If you are an affiliated club, you are also entitled to receive a 10% commission on sales of League publications!

It's easy to become sanctioned. Contact the Convention and Hamfest Branch at ARRL Headquarters, 225 Main St, Newington, CT 06111. Or send e-mail to **giannone@arrl.org**. QST

New Products

XT-4 CW MEMORY KEYER

◊ Unified Microsystems announces the release of the XT-4 CW Memory Keyer. Its small size and internal battery power source makes it a good choice for Field Day, DXpedition, mobile and portable operation.

The keyer is fully iambic with self completing characters. Each of the four memories hold up to 110 Morse characters in nonvolatile storage. Memories 1-2 and 3-4 can be chained together for even longer messages. A rotary control is provided for smooth and easy speed control between 8 and 45 WPM. Reverse paddle and tune features are also included.

The manufacturer indicates that the XT-4 will run for several hundred hours of heavy use on a single 9 V battery. Battery life is further extended by an automatic power down system that will shut the unit off after 30 minutes of inactivity.

Price, $79.95. Optional cable sets with wiring to connect your paddle and transceiver are available for $9.95. The XT-4 can be purchased directly from Unified Microsystems and through selected Amateur Radio equipment dealers. For more information, contact Unified Microsystems, PO Box 133, Slinger, WI 53086; tel 414-644-9036; **http://www.qth.com/w9xt/**. QST

Next New Product

W1AW SCHEDULE

Pacific	Mtn	Cent	East	Mon	Tue	Wed	Thu	Fri
6 AM	7 AM	8 AM	9 AM		Fast Code	Slow Code	Fast Code	Slow Code
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	Visiting Operator Time (12 PM - 1 PM closed for lunch)				
1 PM	2 PM	3 PM	4 PM	Fast Code	Slow Code	Fast Code	Slow Code	Fast 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	Slow Code	Fast Code	Slow Code	Fast Code	Slow 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	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code
8 PM	9 PM	10 PM	11 PM	Code Bulletin				

W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

♦ 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.

W1AW qualifying runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted on approximately 3.590 MHz by W6OWP, with K6YR as an alternate. At the beginning of each code practice session, the schedule for the next qualifying run is presented. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. Send a 9×12-inch SASE for a certificate, or a business-size SASE for an endorsement.

♦ Teleprinter transmissions:

Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent 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 Fridays 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:

On Fridays, UTC, a DX bulletin replaces the regular bulletins.

W1AW is open to visitors from 10 AM until noon and from 1 PM until 3:45 PM on Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy.

In a communication 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.

Silent Keys

By Kathy Capodicasa, N1GZO

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

N1BTU, David C. Lillibridge, Burlington, CT
K1BUZ, Dorothy J. Hutchins, Danielson, CT
K1EHG, Gurdon R. Abell, Woodstock, CT
WB1FWR, William W. Stone, South Burlington, VT
KA1GEN, Fred Rosebury, Natick, MA
K1OXJ, George Dykstra, Fort Myers, FL
W1RGM, George L. Clark, Desert Hot Springs, CA
KA1WLM, William C. Nakis, Rowley, MA
W2BF, Neil E. Handel, Blairstown, NJ
W2BQR, Jacob Rosenbaum, New York, NY
WA2BZE, Philip E. Grande, Beverly Hills, FL
WB2ERI, L. R. Schweizer, Riverton, NJ
KA2JTR, Phoebe L. Hopper, Dumont, NJ
*AC2P, Richard J. Tygar, Wheatley Heights, NY
W2ROO, J. R. Bradley, Delray Beach, FL
W2UMU, Arthur J. Herrmann, East Syracuse, NY
K2UVG, John H. Kahrs, Niceville, FL
WA2UZT, Robert C. Williams, Bedminster, NJ
N3ABB, John H. Klopp, New Smyrna Beach, FL
W3BNO, Emmett A. Smith, Baltimore, MD
W3CBQ, Jack H. Braun, Rockville, MD
K3CWK, Ralph Mullendore, Silver Spring, MD
WB3DBJ, Leonard M. Steinberg, Bethesda, MD
W3EUK, Edward B. Dack, Washington, DC
WA3HIT, Paul J. Rilling, Philadelphia, PA
W3JIW, Charles R. Sine, Romney, WV
W3JNT, Clyde D. Coulson, Hanover, PA
*K3KNH, Irwin Miller, Philadelphia, PA
W3KS, George R. Boring, Annapolis, MD
W3LMC, Howard W. Snyder, Baltimore, MD
*W3PT, Forrest D. Akers, Temple Hills, MD
W3PYZ, Frank W. Alling, Madeira, OH
W3RYI, Peter P. Talak, Grove City, PA
K3TNL, Elinor L. Wendland, Moscow, PA
W3TUX, William P. Moreland, Wilmington, NC
NY3Y, James A. Wingender, Boothwyn, PA
W4AJR, Stanley A. Jerzykowski, Winter Park, FL
K4AUN, Lance H. Strickland, Richmond, VA
W4BN, Henry F. Frick, Saint Petersburg, FL
W4CSC, Roy H. Collins, Christiansburg, VA
W4CXP, Kenneth L. Huntley, Fort Walton Beach, FL
WD4DIV, Kenneth E. Rogers, Philadelphia, TN
KC4EQG, Le Roy R. Conklin, Pine Bush, NY
WA4ERI, Arthur L. Lowry, Cynthiana, KY
KD4EZT, James A. Beckwith, Macclenny, FL
KC4FBS, Larry G. Hopper, Charlotte, NC
W4FVU, Walter C. Seese, Lehigh Acres, FL
KD4GEJ, Ted Duffus, Palm Bay, FL
WA4HSY, Cyril J. Petrick, Titusville, FL
KC4JK, T. L. Wilson, Louisville, KY
AB4KV, Henry H. Turner, Columbus, GA
NJ4M, W. C. Landolina, Burlington, NC
N4NNI, C. W. Martin, Sebring, FL
WB4NWR, William G. Ashley, Chattanooga, TN
W4OCY, Joseph Hudak, West Palm Beach, FL
WA4PNG, Paul R. Frank, Jacksonville, FL
WD4RGK, Calvin R. Mercer, Beulaville, NC
*W4SIG, Kenneth L. Joseph, Fremont, OH
W4UQH, Cecil R. Simpson, Gardendale, AL
WB4VIF, Patricia E. Anderson, Fort Walton Beach, FL
KC4VSD, Sanders R. Claussen, Easley, SC
W4ZDB, Richard W. Gardner, Ashland, KY
*W5EBO, Howard T. Bentley, Midland, TX
W5GVX, Hollis C. Zabriskie, Alamogordo, NM
*WB5HBN, Leroy E. Lunceford, Purvis, MS
N5HDQ, Curtis M. Lafon, Wichita Falls, TX
W5IXP, William A. Gresham, Covington, LA
WA5JQI, Robin D. Adair, Albuquerque, NM
W5LCW, Elvis D. Corbin, Norman, OK
*WB5NCM, Charles R. Waters, Wichita Falls, TX
KB5OGM, Tommy J. Jackson, Gulfport, MS
WA5PNM, Lawrence V. Wilson, Bartlesville, OK
*W5RM, Preston W. Simms, Santa Fe, NM
K5RZS, Joe C. Mugg, Tulsa, OK
W5WLC, R. V. Allison, Wall, TX
KF6DHB, James B. Dean, Santa Rosa, CA
KI6EM, Glenn G. Kramar, Escondido, CA
W6FWF, Verne S. Harrison, San Diego, CA
K6GHL, Marvin A. Stern, Encino, CA
W6ICG, William P. Boyer, Canoga Park, CA
W6JFV, Theodore Black, Davis, CA
W6KFT, Jack K. Grace, Manhattan Beach, CA
KB6KS, Harte E. Robertson, Jackson, CA
WB6LNL, David B. Osborne, La Mesa, CA
N6MXE, Helen Pierce, Sun Valley, CA
K6RST, Earl B. Whisenant, Cheyenne, WY
K6SKB, Forrest A. Bartlett, Spokane, WA
KE6WYI, John N. Phillips, San Marcos, CA
*W6ZRJ, Jean A. Gmelin, Los Osos, CA
W7AHK, Francis W. Sloat, Ridgefield, WA
W7AXN, Jerry W. Nichols, Eugene, OR
W7BOO, James M. Titus, Astoria, OR
*K7CLL, Ken Weber, Ridgefield, WA
N7DHX, Jack E. Andersen, Bellingham, WA
W7HEC, Anthony P. Grebenc, Vernonia, OR
KB7HNQ, Ray Bishop, College Place, WA
*KL7IR, Martin A. Cordes, Haines, AK
*W7PSO, James A. Masterson, Casper, WY
W7QME, Ruby Hoskin, Four Lakes, WA
KG7RM, Robert L. Soth, San Diego, CA
*WA7SCN, William C. Deatherage, Puyallup, WA
WA7SQU, Russell G. Hustad, Wolf Point, MT
W7VCB, Kenneth L. Bale, Raymond, WA
WD8BGN, Richard Newman, Waverly, OH
N8CK, Chester R. Meador, Jumping Branch, WV
WD8DCO, Waldo V. Cain, Leipsic, OH
N8DOS, Douglas B. Robeson, Winter Haven, FL
KC8FSN, John J. Krause, Lake Linden, MI
KB8JCE, Garrison F. Finzer, Sugarcreek, OH
W8QR, James A. Ford, Pleasant Hill, OR
K8SSK, Andrew B. Ledwith, Sidney, OH
W8UL, Eugene C. Sedberry, Crystal Falls, MI
AA8UV, Henry J. Fulk, Mansfield, OH
W8WBZ, Raymond J. Price, Bay City, MI
W8XV, Curtis R. Byrd, Ocala, FL
KB8YR, Irving D. Cole, Cleveland, OH
W9AGM, Donald C. Parsche, Chicago, IL
*W9BIN, Charles H. Perdew, Magnolia, IL
N9JFT, Wayne J. Linkhart, Fort Wayne, IN
W9MKL, William J. Toner, Chicago, IL
KB9TX, Joseph C. Wightman, Collinsville, IL
KE0CA, Charles I. Ciernia, Roseville, MN
*WD0DBZ, Charles W. Crawford, Muscatine, IA
N0EOR, Frank Claus, Pittsfield, IL
WD0GMT, Andy A. Neria, Santa Fe, NM
K0ITP, Bertha Swenson, Minot, ND
W0JHM, Durwood W. Hunt, Aurora, CO
WA0OQX, Roger E. Plantz, Sidney, NE
W0ULF, Charles G. Parker, Ozark, MO
WA0UZO, Robert D. Shriner, Pueblo, CO
K0ZYM, Everett H. Ayers, Saint Paul, MN
G3CRF, A. W. Jones, Kent, Great Britain
VE1GQ, Harry C. Fowlie, Hampton, NB, Canada
4X4RE, Egon Ron, Kiron, Israel

*Life Member, ARRL

‡Call sign has been re-issued through the vanity call sign program.

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or 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

July 1924

◊ This month's cover by Clyde Darr, 8ZZ, shows the poor overheated ham sitting in front of an electric fan in his "Static Room in the Attic," fighting the summer QRN. The editorial reports "The White Bill," which "reaffirms that the ether is the inalienable possession of the nation and its people." The League's efforts had resulted in the bill being amended in committee to specifically include Amateur Radio. The editor reports that the A.R.R.L. "has been requested by the governments of the United States, Canada, France and Italy to participate in short-wave tests."

A historic meeting of the League's Board of Directors in Hartford is reported: For the first time, each Director had been elected by the members of *his own* A.R.R.L. Division, as provided by the new A.R.R.L. Constitution.

"A South American Does It!", reports that "Argentine CB8 captures world's DX record by working New Zealand 2AC; also works three U.S. hams." The 6400-mile CB8-2AC contact, made on 121 meters without prearrangement, lasted for two hours! "The *Arctic* Sails," reports on the Canadian ship CGS *Arctic*, which will be used in the 120-meter short-wave tests described in the editorial.

QST's Technical Editor, S. Kruse, with input from a number of prominent hams and radio engineers, presents Part II of "Building Superheterodynes That Work." H. S. Shaw, of the General Radio corporation, discusses "Oscillating Crystals"— asking, "Can you imagine a transmitter that never shifts its wave even a hundredth of a meter?" "P R R," by the League's A. L. Budlong, reports on the good communication service provided by hams to the Pennsylvania Railroad System during a severe snowstorm in May.

July 1949

◊ Gil, W1CJD's, cartoon cover shows the Podunk Hollow Radio Club members heading home following Field Day—dog-tired and in needs of shaves. The editorial remembers the Board of Directors meeting of 25 years ago.

"A 10-Meter Handie-Talkie," by Donald Launer, W2SFX, describes the author's "self-contained transmitter-receiver of many uses"; the rig and batteries are housed in a $3^1/_4 \times 3^1/_4 \times 11^1/_2$ inch case with a built-in earpiece and mike. Sgt J. R. Hermann, W8TSF and ex-D4AVE, in "It's a Dog-4's Life," describes some of his ham exploits in Germany, such as a wire beam for 20 meters, built on a large kite-shaped wooden framework. When raised into the air on the ladder of a German fire department's ladder truck, it looked crazy but worked great! Amateur radioteletype history was reported in "Pacific-Hurdling Teletypers," which showed the stations that made the first US-Japan and US-Hawaii ham RTTY contacts—JA3RO, operated by three members of the US occupation forces in Japan; KH6LP, Schofield Barracks, Territory of Hawaii; well-known DXer Reg Tibbetts, W6ITH; and W7JCU, of Eugene, Oregon.

The results of the November Sweepstakes contest are reported: W2IOP won the top CW spot with an all-time record 183,690 points, a Clean Sweep and 1025 contacts. On the West Coast, W6QEU nailed a Sweep with 601 contacts for an all-time record phone score of 85,896 points.

July 1974

◊ The cover by Gil, W1CJD, shows hams arriving at New York City for the 1974 ARRL National Convention using every possible means of transportation. The editorial discusses "a major step forward for amateur radio," wherein "League officers and Directors, plus key HQ staffers were special guests of FCC for a day-long briefing in Washington." Earlier informal discussions between League President Harry Dannals, W2TUK, and FCC's Prose Walker, W4BW, led to this effort "to strengthen ARRL-FCC communications…."

QST Technical Editor Doug de Maw, W1CER, and Beginner and Novice Editor Lew McCoy, W1ICP, talk about "Learning to Work with Semiconductors," Part IV. Joseph Reisert, W6FZJ, discusses "EME Scheduling, When and Where," while Michael Klein, WA3UPX, covers a more down-to-earth subject, "A Fence Mount for Vertical Antennas." Irving Smith, WB2BCY, tells about "A Poor Man's Electronic Tower Hoist," which uses an electric drill for motive power! Bill Mann, WA1FCM, tells us about "Reviewing the 1974 Simulated Emergency Test." Rick Niswander, WA1PID, reports the "Results, 1st ARRL 10-Meter Contest." Rick reports that the logs submitted to HQ totaled over 700!—*Al Brogdon, W1AB* QST

Contest Corral

Edited by **George Fremin III, K5TR***

Feedback

The operator for **KG6OK** in the **1998 November CW Sweepstakes** in the Orange Section should have been shown as **N6RT. K4VX (op W9QA)** was omitted from the published results with a score of 1338 QSOs; 79 mults; 211,404 pts. He was the winner of the Missouri Section, Single Op, High Power. **K9TM** was also omitted with a score of 1008 QSOs; 78 mult; 157,248 pts. He was the winner of the Ohio section Single op, Low Power, and also 9th in the Low Power Top Ten.

In the **1998 September VHF QSO Party K6TJ** should have been listed in the SCV Section as a Single Op with a total score of 208 points on 26 QSOs and 8 mults.

In the **1998 IARU HF World Championships W7GG** scored 252,654 points on 725 QSOs and 102 multipliers/zones.

W1AW Qualifying Runs are 10 PM EDT Wednesday, July 7, and 7 AM EDT Thursday, July 22. The **West Coast Qualifying Run** will be at 9 PM PDT on Wednesday, July 7. Check the W1AW schedule for details.

July

1

Canada Day Contest, sponsored by the Radio Amateurs of Canada (RAC). 0000 to 2359 UTC July 1. 160, 80, 40, 20, 15, 10, 6 and 2 meters, CW and phone. (SSB, FM, AM, etc.) Stations in Canada send RS(T) and province or territory. VE0s and stations outside Canada send RS(T) and a serial number. Contacts with stations in Canada or VE0s are worth 10 points. Contacts with stations outside Canada are worth 2 points. Contacts with RAC official stations are worth 20 points each. RAC official stations are: VA2RAC, VA3RAC, VE1RAC, VE4RAC, VE5RAC, VE6RAC, VE7RAC, VE8RAC, VE9RAC, VO1RAC, VO2RAC, VY1RAC and VY2RAC. Multipliers: Canada's 10 provinces and two territories and may be counted once on each mode on each of the eight contest bands. Final score = total QSO points × total multiplier points. Categories: Single Operator, all bands; Single Operator Low Power (max. 100 W output); Single Operator QRP (max. 5 W output); Single Operator single band; Multioperator. Send entries to Radio Amateurs of Canada, 720 Belfast Road, Suite 217, Ottawa, ON K1G 0Z5 Canada by July 31. For more information see **http://www.rac.ca/CANDAY.htm**.

10-11

IARU HF World Championship. See April 1999 *QST*, page 104.

QRP ARCI Summer Homebrew Sprint, sponsored by QRP ARC International 2000-2400Z Jul 11, CW only. Entries may be single band, all band, high band or low band. Work stations once per band. Exchange signal report, state/province/country, and QRP ARCI number if member nonmembers send power output. Count 5 pts for members, 2 pts for nonmembers same continent, 4 pts for nonmembers different continent. Bonus points awarded for using homebrew (HB) equipment. 2000 pts for HB transmitter, 3000 pts for HB receiver, 5000 pts for HB transceiver. Final score is total of QSO points multiplied by total of states/provinces/countries times power multiplier (>5 W output, × 1; <5 W output, × 7; <1 W output, × 10; < 250 mW output, × 15) plus bonus points. Send logs by Aug. 11 to Joe Gervais, AB7TT (attn: ARCI HB Sprint), PO Box 322, Peoria, AZ 85380; **vole@primenet.com**.

*RR1, Box 322
Johnson City, TX 78636
k5tr@arrl.org

CQ WW VHF Contest, sponsored by *CQ Magazine*, from 1800Z Jul 10 to 2100Z Jul 11. Single op fixed/portable, multiop class I fixed/portable, class II fixed/portable, Rover, QRP (<25 W). Portable stations are defined as stations set up away from a regular QTH. Class II stations are defined as operating on less than four bands simultaneously. Send grid square. Score 1 pt/QSO on 50/70/144 MHz; 2 pts/QSO on 222/432 MHz; 4 pts/QSO on 903/1296 MHz; 6 pts/QSO on 2.3 GHz and above. Add 1 pt/two-way CW or MCW QSO. Work stations once/band, regardless of mode. Do not transmit on 146.52 MHz or repeater frequencies to either make or solicit contacts. Final score is QSO pts × grid squares worked/band. Awards. Send logs by Aug 31 to CQ VHF Contest, *CQ Magazine*, 25 Newbridge Rd, Hicksville, NY 11801.

17-18

Six Club Six Meter Sprint, sponsored by the Six Club, 2300Z July 17 to 0400Z July 18. Six meters only, count 1 point/QSO within your country; 2 points/QSO outside of your country (KH6 and KL7 count as countries). Final score is the total QSO points times the number of different grid squares worked. Awards. Mail logs by July 22 to Six Club, P O Box 307, Hatfield, AR 71945; **sixclub@6mt.com**; **http://6mt.com/contest.htm**.

Pacific 160 Meter Contest, sponsored by the Wireless Institute of Australia, 0700-2330Z July 17, 160 meters phone and CW. World works P2, ZL and VK only. Single operator and SWL. CW and SSB. 1825-1850 kHz. Exchange RST and serial number. Count 5 points for each P2, ZL or VK QSO. Multipliers are P2, ZL and VK call areas. Final score is total QSO points times total multipliers. To avoid QRM between modes, stations are asked to operate in 15 minute blocks: CW on the hour and half hour; SSB on the hour and 15 and 45 minutes past the hour. Send logs by Aug 31 to Ian Godsil VK3DID, 57 Nepean Highway, Aspendale, 3195, Australia; **vk3did@eudoramail.com**.

North American QSO Party, RTTY, sponsored by the *National Contest Journal*. 1800Z Jul 17 to 0600Z Jul 18. Single op and multi-two. Single Operator stations may operate 10 out of 12 hours. Off times must be at least 30 minutes in length and must be clearly marked in the log. Mode: RTTY only. 80 40 20 15 10 meters. You may work a station once per band. Exchange operator name and station location (state, province or country). One point for each valid contact. Multipliers include US states, including KH6 and KL7, Canadian Provinces and other North American countries. Do not count USA, Canada, KH6 or KL7 as countries. Non-North American countries do not count as multipliers but may be worked for QSO credit. Scoring: Multiply total valid contacts by the total number of multipliers worked on each band. Send logs to Ron Stailey, K5DJ, 504 Dove Haven Dr, Round Rock, TX 78664-5926; **k5dj@contesting.com**; **http://waterw.com/~ncj/**.

SEANET Contest, CW, sponsored by the Madras ARS, from 0001Z Jul 17 until 2359Z Jul 18 (phone is Aug 21-22). Single op, single/multi-band and multi-single. Use 160 80 40 20 15 10 meters. Send RS(T) and serial no. Non-SEANET stations work SEANET stations only. Final score is QSOs × mults (3 × each SEANET country worked). Awards. SEANET areas are: A4, A5, A6, A7, A9, AP, BV, BY, DU, EP, HL, HS, All JA call areas, JD1, JY, KH2, P29, S21, S79, VK, VQ9, VR, VU, V85, XU, XV/3W, XW, XX9, YB, ZK, ZL, 3B, 4S7, 4X, 8Q7, 9K2, 9M2, 9M6, 9M8, 9N1, 9V1. Send logs by Oct 31 to SEANET Contest Manager 1996, Eshee Razak, 9M2FK, Box 13, 10700 Penang, Malaysia.

Colombian Independence Day Contest, sponsored by Liga Colombiana de Radioaficionados. Phone, CW and RTTY, 0000-2359Z July 18, Single op (single band and all band), Multi op single transmitter and Multi-Multi, 80 40 20 15 10 meters. Work stations once per band. Exchange RST and serial number, Count 1 point for contacts within your own continent, 3 points outside your continent, 5 points for contacts with Colombian stations and 0 points for your own country (own country for multiplier credit). Multipliers are DXCC countries on each band including HK plus HK call areas per band. Final score is total QSO points times total multiplier. Awards. Send logs by Aug 31 to Liga Colombiana de Radioaficionados, Colombian Independence Day Contest, PO Box 584, Santafe de Bogota, Colombia.

24-25

RSGB Islands-on-the-Air Contest, sponsored by the RSGB, 1200Z Jul 24 to 1200Z Jul 25. 80 40 20 15 10 meters, phone and CW. Single op, phone/CW/mixed; single op limited, phone/CW/mixed; multi-single island stations. Single op limited stations may operate 12 hours max. Send RS(T), serial number and IOTA reference number. If applicable, island stations may send IOTA number. Work stations once per band and mode. Score 2 pts/QSO w/own country or IOTA reference, 15 pts/QSO w/IOTA stations, and 5 pts/QSO w/others. Final score is QSO points × IOTA numbers worked per band/mode. Awards. Send logs by Aug 31 to RSGB IOTA Contest, PO Box 9, Potters Bar, Herts EN6 3RH, England; **iota.contest.logs@rsgb.org.uk**; **http://www.sol.co.uk/w/wylie/**.

31- August 1

Georgia QSO Party, sponsored by SECC and SEDXC, two periods, from 1800Z July 31 to 0359Z Aug 1 and 1400Z Aug 1 to 2359Z Aug 1. All stations may operate the full 20 hours. Phone and CW. 80 40 20 15 10 meters. Single Op, Multi-sigle, multi-multi, rover and novice/tech in each of three power levels. QRP, Low power (150 W or less) and high power (more than 150 W). Rover requires operation from at least 6 GA counties. Mobiles and portables must move complete station including antennas at least 100 yards to change counties—no county line operations. Work stations once per band and per mode. Multipliers count on each mode. Exchange RST and GA county, state, province or "DX." Count 1 point per phone QSO; 2 points per CW QSO. Multipliers are GA counties; for GA stations 50 US states, 11 VE provinces. Awards. Mail logs by Aug 31 to Neal Sulmeyer, K4EA, 530 Old Doss Dr, Canton, GA 30114-8057; **k4ea@contesting.com**; **http://www.contesting.com/secc/**.

USI W/VE Islands Contest, sponsored by the US Islands Awards Program, 1600Z July 31 to 2359Z Aug 1, 160 80 40 20 15 10 meters, all modes. Categories: W or VE island station, nonisland station or island rover plus DX nonisland station. Non-island stations send signal report and state, province/territory or country. Island stations send signal report, island name and USI or CISA number. Score 5 points for each W/VE island station worked, 1 point for each nonisland station. Multipliers are states, provinces/territories and countries. Work stations once per island. Awards. Send logs by Sep 1 to Ray Phelps AD4LX, 1440 SW 53rd Terrace, Cape Coral, FL 33914; **ad4lx@usa.net**; **http://www.eng.mu.deu/~usi/**. QST

Special Events

Edited by **George Fremin III, K5TR***

Great Circus Train: W9R, 0000Z **July 2** to 0000Z **July 5**, operating from the Great Circus Train. 7.240 14.240 21.340 145.55. Certificate. James Romelfanger, K9ZZ, 412 1/2 Ash St, Baraboo, WI 53913.

San Francisco, CA: Historic Tall Ship *American Pride*, N6A, 0700Z **July 2** to 0700Z **July 17** for the 1999 California Gold Rush Race to Long Beach and San Diego. 7.049 7.249 14.049 14.249. Certificate. WB6SCV, 550 West Sixth St, No.11, Tustin, CA 92780-4335.

DeSmet, SD: Huron Amateur Radio Club/Lake Area Radio Club, W0NOZ, 1700Z **July 3** to 0100Z **July 5** commemorating Laura Ingalls Wilder, author of *Little House on the Prairie*. 7.265 14.265 28.465 50.165. Certificate. Huron Amateur Radio Club, PO Box 205, Huron, SD 57350.

Thompson, OH: Lake County Amateur Radio Association, N8GB, 1400Z **July 4** to 0100Z **July 5** celebrating Independence Day. 7.246 28.455. Certificate. George R. Bair, 386 Cedarbrook Dr, Painesville, OH 44077.

Austin, TX: Naturist Amateur Radio Club, NU5DE, 0000Z **July 5** to 2400Z **July 11**, during the 24th Annual North American Nude Awareness Celebration. 7.265 14.265 21.365 28.465. Certificate. Naturist Amateur Radio Club, PO Box 200812, Austin, TX 78720.

Barrien Springs, MI: Holiday Hams Chapter 435 HRRVC, N8N, 1200Z **July 7** to 2400Z **July 17**, operating from the 35th Annual Holiday Rambler RV Club International Rally. 14.085 14.250 21.085 21.350. QSL. Roy Maull, N8YYS, 151 Old River Rd, Williamstown, WV 26187.

Winnipeg, MB: Winnipeg Senior Citizens Radio Club, VX4PAG, 0000Z **July 9** to 0000Z **Aug 8**, operating from the Pan American Games. QSL. VX4PAG, 598 St Mary's Rd, Winnipeg, BM R2M 3L5 Canada.

Trenton, MI: Motor City Radio Club, W8MRM, 1400Z **July 9** to 2359Z **July 11**, for the 24th Annual Trenton Mid-Summer Festival. 7.044 7.244 14.044 14.244. Certificate. Motor City Radio Club, W8MRM, Trenton Mid-summer Festival, PO Box 337, Wyandotte, MI 48192.

Costa Mesa, CA: Orange County Council of Amateur Radio Organizations, W6F, 1700Z **July 10** to 0500Z **July 24**, celebrating the 150th Anniversary of the California Gold Rush. 7.250 14.250 21.375 28.375. Certificate. Allan Avnet AB6UB, 10549 Morning Glory Circle, Fountain Valley, CA 92708-1142.

Topeka, KS: Kaw Valley Amateur Radio Club, W0CET, 1400 to 2100Z **July 10**, celebrating the 50th anniversary of the renaming of Forbes Air Force Base. 14.250 21.250 28.350. Certificate. Steve Hamilton, KB0JYL, 3507 SW Kerry Ave, Topeka, KS 66611.

Copper Harbor, MI: Riverland Amateur Radio Club, KE9XQ, 1400Z **July 10** to 1400Z **July 11**, for the expedition to Copper Harbor to activate grid EN67. 14.026 28.400 50.125 146.52. QSL. Bill Wood KE9XQ, W2788 Birch Ln, LaCrosse, WI 54601.

Alexandria, VA: Alexandria Radio Club, W4HFH, 1500Z **July 11** to 2200Z **July 12**, commemorating the 250th anniversary of the City of Alexandria. 3.915 7.260 14.280 28.400. Certificate. Alexandria Radio Club, PO Box 30721, Alexandria, VA 22310.

*RR1, Box 322
Johnson City, TX 78636
k5tr@arrl.org

San Pedro, CA: Lane Victory ARC, W6LV, 1600Z **July 17** to 2359Z **July 18**, honoring Merchant Marine seamen whose lives were lost defending our country. 7.245 14.250 21.350 28.380. Certificate. Lane Victory ARC, W6LV, Attn: QSL Manager, PO Box 629, San Pedro, CA 90733.

Beardstown, IL: Space Age Radio Society, W3O, 0000Z **July 16** to 2400Z **July 24**, commemorating the 30th anniversary of the Apollo 11 Moon landing. 7.245 14.245 28.145 28.445. Certificate. Bruce Boston KD9UL, 815 E. Third St, Beardstown, IL 62618.

Palatine, IL: Palatine RACES, W9P, 1700Z **July 16** to 0000Z **July 19**, operating from the 16th Annual Taste and Touch of Palatine. 3.850 7.230 14.230 28.350. Certificate. Keith Thomas, KB9LNE, 1236 Thurston Dr, Palatine, IL 60067.

Kane, PA: Kane Amateur Radio Operators, AA3GM, 2200Z **July 16** to 2000Z **July 18**, celebrating the annual Kane Black Cherry Festival. 7.045 7.255 14.255 21.355. Certificate. Kenneth T. Frankenbery, 78-B Fraley St, Kane, PA 16735.

Coast Guard Auxiliary 60th Anniversary: Stations will be operating from all 16 districts of the Coast Guard Auxiliary from 1400Z **July 17** to 0600Z **July 18.** 80-10 meters. Certificate. Charles Redmon, KK6SY, 693 Ocean View Ave, Upland, CA 91784-1188.

Sault Ste. Marie, MI: American Archives Amateur Radio Club, N8C, 1300Z **July 17** to 1700Z **July 18**, celebrating the 60th anniversary of the US Coast Guard from the USCG cutter *Katmai Bay*. 7.270 14.270. Certificate. Dave Langston, KB8RAP, 1000 Town Center, Suite 1200, Southfield, MI 48075.

St. Charles, MO: St. Charles County ARES, N0PNP, 0000-2359Z **July 17**, commemorating the Portage Des Sioux Bicentennial. 80 40 20 10 meters. Certificate. N0PNP, 3376 Clemens Dr, St. Charles, MO 63301-4440.

Quincy, MA: USS *Salem* Radio Club, K1USN, 1330Z **July 17** to 1900Z **July 18**, to celebrate Museum Ships Weekend. 3.895 7.230 14.230 28.490. Certificate. Robert Callahan, 56 Acorn St, Scituate, MA 02066.

Charleston, SC: Charleston Amateur Radio Society, WA4USN, 1300Z **July 17** to 2100Z **July 18**, operating from the USS *Yorktown* CV-10 during Museum Ships Weekend. 14.265 21.265 28.465. QSL. Charleston Amateur Radio Club, 744 Norfolk Dr, Charleston, SC 29412.

Charleston, SC: Charleston Amateur Radio Society, WA4USN, 1300Z **July 17** to 2100Z **July 18**, operating from the USS *Laffey* DD7 during Museum Ships Weekend. 14.265 21.265 28.465. QSL. Charleston Amateur Radio Society, 744 Norfolk Dr, Charleston, SC 29412.

Laramie, WY: University Amateur Radio Club, N7UW, 1500Z **July 17** to 2200Z **July 18**, operating from Ames Monument—highest point on the Old Transcontinental Railroad. 40 20 15 10 meters. QSL. University Amateur Radio Club, Box 3625, Laramie, WY 82071.

Greensburg, PA: Foothills Amateur Radio Club, W3LWW, 1300Z **July 17** to 0100Z **July 19**, celebrating the 40th anniversary of the Foothills Amateur Radio Club. 7.259 14.259 21.359 28.359. Certificate. Robert Livrone, N3WAV, 116 Arizona Dr, Lower Burrell, PA 15068.

Stratford, NY: Fulton County Dr Mahlon Loomis Committee, W2ZZJ, 1300-2000Z **July 18**, commemorating the 173rd anniversary of the birth of American radio pioneer Mahlon Loomis. 80 40 20 10 meters. Certificate. George P. Sadlon, W2ZZJ, 5738 State Hwy 29A, Stratford, NY 13470.

Wapakoneta, OH: Reservoir ARA, K8QYL, 1400-2000Z **July 18**, commemorating the Apollo 11 Moon landing from astronaut Neil Armstrong's home town. 7.255 14.230 52.525 147.330. Certificate. John Prendergast, WB8PEW, 1005 Linden Ave, St. Marys, OH 45885-1327.

Boerne, TX: Kendall Amateur Radio Society, K5B, 1300-2300Z **July 24**, celebrating the 150th anniversary of the founding of Boerne, Texas. 7.225 14.250. Certificate. David McDaniel, KARS, 412 Cedar Place, Boerne, TX 78006.

Burnet, TX: Highland Lakes ARC, K5T, 1500-2200Z **July 24**, celebrating the Hill Country Flyer Steam Train birthday party. 7.280 14.260 21.400 28.475. Certificate. Hightland Lakes Amateur Radio Club, PO Box 856, Kingsland, TX 78639.

Waterford, MI: Oakland County Amateur Radio Society, W8TNO, 1600Z **July 24** to 0500Z **July 25**, operating from the Waterford Summer Festival. 14.240 21.350 28.460. Certificate. John Shearer Sr, KC8CMQ, PO Box 66, Goodrich, MI 48438.

Gilroy, CA: Garlic Balley Amateur Radio Club, W6GGF, 1600Z **July 24** to 2300Z **July 25**, commemorating the 21st annual Gilroy Garlic Festival. 14.260 21.300 28.450. QSL. Randall Fox, W6JZE, 13346 Colony Ave, San Martin, CA 95046.

Bonney Lake, WA: The City of Bonney Lake, KF0LZ, 1700-2400Z **July 31**, celebrating the 50th anniversary of Bonney Lake, WA. 7.239 14.272 21.372. Certificate. KF0LZ, Bonney Lake City Hall, PO Box 7380, Bonney Lake, WA 98390-0944.

Canton, OH: Canton Amateur Radio Club, W8AL, 1300Z **July 30** to 2400Z **Aug 1**, for the annual Pro Football Hall of Fame Festival. 7.265 14.265 21.350 28.350. Certificate. Donald E. Perry, WQ8J, 968 Culverne Ave NW, Massillon, OH 44647.

Appleton, WI: Fox Cities ARC, W9ZL, 1400Z **July 30** to 2100Z **Aug 1**, operating from the EAA Airventure fly-in at Oshkosh, WI. 40 20 15 10 meters. Certificate. Wayne Pennings, WD9FLJ, 913 N. Mason, Appleton, WI 54914.

Squam Lake, NH: TESARO Amateur Radio Club, W1G, 1600Z **July 31** to 1600Z **Aug 1**, celebrating the filming of *On Golden Pond*. 14.025 14.255 21.255 28.325. Certificate. Darrel Daley, K1KU, PO Box 445, Putney, VT 05346.

Ogdensburg, NY: Ogdensburg Amateur Radio Club, K2RWK, 1800Z **July 31** to 0200Z **Aug 1**, celebrating the 250th anniversary of the settlement of Ogdensburg. 7.272 14.272. Certificate. Walt Brady, N2YMY, 17 Birch Hts, Edwards, NY 13635.

Special Events Announcements: For items to be listed in this column, you must be an Amateur Radio club, and use the ARRL Special Events Listing Form. Copies of this form are available via Internet (**info@arrl.org**), or for a SASE (send to Special Requests, ARRL, 225 Main St, Newington, CT 06111, and write "Special Requests Form" in the lower left-hand corner. You can also submit your special event information on-line at **http://www.arrl.org/contests/spevform.html**. Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; ie, a special event listing for **Dec** *QST* would have to be received by **Oct 1**. Submissions may be mailed to George Fremin III, K5TR, 913 Ramona St, Austin, TX 78704; faxed to ARRL HQ at 860-594-0259; or e-mailed to **events @arrl.org**.

By **Ken Widelitz, K6LA**

Contesting as Performance Art—The 1998 Phone Sweepstakes

What comes to mind when you think of "performance art?" A theatrical piece mixing dance with gymnastics and circus acrobatics? A happening that uses slides, video, props, wigs and music in conjunction with the reading of poems and prose? How about 5,200 people throughout the US, Canada, the Caribbean and parts of the Pacific trying to exchange some numbers and letters with each other by shouting into a microphone for 24 out of 30 hours?

Performance art stresses spontaneity, evanescence, and originality; and often exhibits a keen sense of absurdity. Each Sweepstakes QSO is spontaneous, radio communications are ephemeral and, since dupes are not permitted, each QSO is original. Old Sol contributed to the sense of the absurd with a dramatic outburst at about 1620Z Sunday that caused 10, 15 and 20 meters to become absurdly quiet.

From the Internet's *Free Concise Encyclopedia*: "All performance art shares two elements: First, the various parts of the performance function disharmoniously; second it must be performed live." I would call 20 meters during the phone Sweepstakes live and disharmonious!

To further quote from the *Encyclopedia*, "Often performance art includes audience participation." Contesting certainly requires audience participation. In fact, the guy with the biggest overall audience is the winner! The award-winning contester *is* a performance artist. He knows where to perform (what band) and when (off-time strategy). He tailors his performance to the audience. It's a different audience on 10 meters late Sunday morning than was present on 15 meters early Saturday afternoon.

Not all performances must be winners to be enjoyed and appreciated. There is an elite group that measures success by the ability to achieve a Clean Sweep (working all 79 US and Canadian sections) with just 79 QSOs! The *79ers* during the 1998 phone Sweepstakes included K9CAN, K8BL, WB2ZTH, K4UK, K6CT, W3DA, K4BNC and N2BIM. More tried, but were not perfect in their performance. They were booed off the stage by the log checkers. An attempt such as this is not a performance art decision to be made lightly. If everyone

Top Ten Phone

Single Operator, QRP

N7VY	135,252
W7YAQ	122,304
N4RZ	106,548
K0RI	103,964
K7MM	102,858
K3CR (KB3AFT,op)	90,376
N6MI (at N6NB)	86,424
KX9X	80,738
K1VUT	75,840
K2FF	75,840

Single Operator, Low Power

VE4GV	266,072
K4WX	230,680
K7UP (W5FX,op)	228,310
K5KA	222,464
W4OC	218,672
VE5SF	215,986
K6LA	198,764
W8MJ	196,394
N0AT (N0KK,op)	193,392
VE6JO	193,234

Single Operator, High Power

WP3R (KE3Q,op)	410,326
WP2Z (K8MJZ,op)	348,390
VE7SZ (VE7NTT,op)	333,854
VE6JY (VE5MX,op)	327,692
KH7R (KH6ND,op)	327,218
N7TR	323,268
K6LL	321,688
N7ML	311,576
W6GO (N6IG,op)	309,048
W0SD (WD0T,op)	308,574

Multioperator

KW8N	287,718
K8CC	272,708
KT0R	263,640
K5NZ	257,856
N6RO	251,694
W5WW	251,378
W6EEN	250,272
W3GH	247,270
KY2J	238,896
K6AW	238,836

Top 10 CW

When transferring data from the November Sweepstakes CW results, a character mismatch occurred. As a result, call signs containing the numeral "0" were not updated in the master Sweepstakes database. We are reprinting the corrected CW Sweepstakes Top Ten Box. The complete corrected CW Sweepstakes scores may be found on-line at the Contest Branch home page at **http://www.arrl.org/contests**.

Single Operator, QRP

W4PA	125,736
KG5U	120,588
K1TR	117,936
N6MU (at N6NB)	116,220
N0AX	109,802
N9CIQ	107,124
K3CR (KB3AFT op)	106,080
W1MJ (at K1TTT)	101,556
AC5K	97,636
W8RU	95,004

Single Operator, Low Power

N5TJ	208,244
K0EU	190,390
K4WX	180,804
K6LA	170,352
K7UP	169,884
KY7M	164,162
K9IG	159,580
N0NR	158,474
K9TM	157,248
NA4K	157,248

Single Operator, High Power

K1TO	240,792
WP3R (KE3Q,op)	232,260
W5WMU (N6TR,op)	232,102
K5GN (at W5KU)	222,938
N2IC	221,674
N5KO	216,618
N0NI (AG9A,op)	216,302
W4AN (K4BAI,op)	214,722
N2NT (N2NC,op)	213,616
WX0B (K5GA,op)	212,194

Multioperator

K4OJ	202,398
K0RF	201,552
K2TW	179,014
W2PV	177,750
KO7X	177,528
K4LT	171,904
W3GH	169,218
W4MYA	166,690
K0VBU	166,532
W2RE	163,688

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)

K3CR (KB3AFT,op)	90,376	Q
K1VUT	75,480	Q
W1EAT	64,064	Q
K2WK	51,034	Q
WA3DUR	47,268	Q
K1HTV	188,336	A
KZ1M	183,280	A
WA1LJD	176,170	A
WA3HAE	147,572	A
K1PY	134,134	A
KQ2M	273,814	B
K3MM	269,074	B
WB1GQR (W1SJ,op)	238,992	B
K3ZO	236,684	B
W2RE	230,680	B
W3GH	247,270	M
KY2J	238,896	M
KI1G	212,668	M
K2NNY	187,512	M
K2KV	183,280	M

Southeast Region (Delta, Roanoke and Southeastern Divisions)

K2FF	75,840	Q
K5IID	71,916	Q
W5JAY	66,150	Q
W4DEC	21,580	Q
N4DD	14,560	Q
K4WX	230,680	A
W4OC	218,672	A
K5OY (at AB5SE)	166,296	A
KD3GC	148,302	A
WO4O	135,406	A
WP3R (KE3Q,op)	410,326	B
WP2Z (K8MJZ,op)	348,390	B
WC4E(K9PG, op)	294,986	B
K4VUD	254,538	B
W5XX	254,380	B
NP2E	205,874	M
WD4AHZ	202,398	M
K8WT	185,808	M
W4CAT	148,362	M
KG5VK	148,046	M

Central Region (Central and Great Lakes Divisions; Ontario Section)

N4RZ	106,548	Q
KX9X	80,738	Q
WA8RJF	53,246	Q
N9DHX	34,164	Q
N9CIQ	30,360	Q
W8MJ	196,394	A
AJ9C	191,100	A
KK9A	177,592	A
K9UIY (at WB9Z)	135,564	A
N9VVV	133,224	A
WB9Z	234,468	B
K9BGL	233,050	B
W0CG	181,068	B
K9PW	174,906	B
KE8GG	168,744	B
KW8N	287,718	M
K8CC	272,708	M
W0AIH	222,780	M
KE9I	207,454	M
KG8CW	192,760	M

Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)

K0RI	103,964	Q
K5ED	57,084	Q
N0UR	56,940	Q
WA8ZBT	48,516	Q
K6EIL	47,158	Q
VE4GV	266,072	A
K7UP (W5FX,op)	228,310	A
K5KA	222,464	A
VE5SF	215,986	A
N0AT (N0KK,op)	193,392	A
W0SD (WD0T,op)	308,574	B
WB0O	291,352	B
K5TR (at W5KFT)	291,194	B
K0KE	277,132	B
K7CF	225,308	B
KT0R	263,640	M
K5NZ	257,856	M
W5WW	251,378	M
K0RWL	237,158	M
W0GG	235,716	M

West Coast Region (Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT/Yukon Sections)

N7VY	135,252	Q
W7YAQ	122,304	Q
K7MM	102,858	Q
N6MI (at N6NB)	86,424	Q
W6LPW	40,500	Q
	198,764	A
VE6JO	193,234	A
K7QQ	188,020	A
K4XU/7	178,856	A
K6RO	176,124	A
VE7SZ (VE7NTT,op)	333,854	B
VE6JY (VE5MX,op)	327,692	B
KH7R (KH6ND,op)	327,218	B
N7TR	323,268	B
K6LL	321,688	B
N6RO	251,694	M
W6EEN	250,272	M
K6AW	238,836	M
K6NO	236,210	M
N6ZS	230,206	M

(Q = QRP, A = Low Power, B = High Power, M = Multioperator)

tried this at once, it wouldn't be fun for anybody.

Not all participants even realize they are performance artists. Take Brian, ND3F. Operating 75 meters at N3IQ, Brian describes his piece of contesting performance art: "A station called me, and gave the full exchange with the serial number 001. We completed and logged the contact. He then informed me that he was the net control for a net that normally used the frequency that I was on, and that the net started in about a half-hour. He asked that I keep the frequency open for them until the time for the net to start.

"I ran the frequency for another half hour, picking up some 40 stations during the period and, when the moment arrived, I gladly gave up the frequency to the friendly, skilled net control. He thanked us, and said he thought the net business would take about 10 minutes at which time we could have the frequency back if we wanted!"

In the more traditional performance of the art of contesting, Rich, KE3Q, using WP3R as his stage, took the *Hiram* (my hypothetical Oscar!) for Best Performance by a Single Operator in a High Power Role. Rich's total audience of 2597 included one from each section for a sweep. Rich made his Caribbean-theme Sweepstakes performances a resounding success (Rich was number 2 overall in CW at WP3R).

Following Rich in both the both overall and in the Southeast Region with the Hiram for Best Supporting Operator in a High Power Role was Stan, K8MJZ headlining the renowned WP2Z Windward Theater to number 2. In a venue about as far away as possible from Rich and Stan, Gary, VE7NTT, using the facilities at VE7SZ was number 3 overall and got top billing in the West Coast Region.

Todd, VE5MX, did a limited engagement at VE6JY for number 4 while Mike, KH6ND, played a one nighter at KH7R for number 5. The lower 48 didn't break into the Top Ten High Power Box until the number 6 spot which was taken by Rich, N7TR, with Dave, K6LL, hot on Rich's heels at number 7. Craig, N7ML was number 8 with Jim, N6IG, at the venerable antenna playhouse of W6GO, number 9. Todd, WD0T, playing W0SD at number 10, was the eastern-most Top Ten finisher (outside of the Caribbean) and took a bow as the Midwest Region leader. Headliners east of the Mississippi were KQ2M in the Northeast Region and WB9Z in the Central Region.

The Hiram for Best Performance by a Single Operator in a Low Power Role went to Bob, VE4GV, in the Midwest Region. When the final curtain fell the number 2 position was held by Ed, K4WX, the Southeast Region leader. Also in the spotlight at number 3 was Mike, W5FX, on stage at K7UP. Ken, K5KA finished 4th ahead of W4OC, number 5. Four of the top five finishers hailed from the Midwest Region.

VE5SF was number 6 overall while Ken, K6LA, operating from a QTH in the shadows of Hollywood, was number 7. Ken, W8MJ, got a standing ovation for his Central Region performance, good for number 8 overall. Kirk, N0KK, operating at N0AT got rave reviews for his number 9 finish. Just behind was Vitaly, VE6JO rounding out the Low Power Top Ten. While no one from the Northeast Region made the Top Ten box, the closest was Rich, K1HTV.

Playing the most intimate of venues, the coffee house circuit, the Hiram for Best Performance by a Single Operator in a QRP Power Role goes to Gordon, N7VY, whose shtick brought down the house from the West Coast. Playing second fiddle overall—and in the region—was Bob, W7YAQ. Out of the Central Region came Fred, N4RZ, in the third spot. Fourth was Larry, K0RI, who stole the show in the Midwest Region. Dan, K7MM, at number 5 gave the West Coast three of the top-five kudos. The only two Northeast Region Top Ten performances by single ops were credited to Jim, KB3AFT, at K3CR at number 6 and Dave, K1VUT, at number 9. Scott, N6MI took his show on the road to N6NB for number 7. Sean, KX9X got an audience share good for number 8. Tied for number 9 and rounding out the Top Ten was Glenn, K2FF, the Southeast Region leader.

The Hiram for Best Multioperator Performance was grabbed by the Central Region leading crew at KW8N, followed by the group at K8CC. The repertoire company at KT0R was number 3 overall and number 1 in the Midwest Region followed by the gang at K5NZ. West Coast Region bows were taken by the crowd at number 5 N6RO. The mob at W5WW was number 6. Appearing in the number 7 slot were the actors at W6EEN. The number 8 slot was held by those outrageous guys at W3GH, the Northeast Region conquerors. The horde at KY2J was ninth with the cast of K6AW taking the last spot in the coveted multi-op Top Ten box. Not to be forgotten were the efforts of NP2E's cast, who garnered the biggest audience in the Southeast Region.

To roundout the 1998 November

Affiliated Club Competition

	Score	Entries
Unlimited Category		
Potomac Valley Radio Club	11,953,728	149
Northern California Contest Club	9,742,508	103
Society of Midwest Contesters	6,624,648	76
Yankee Clipper Contest Club	5,554,448	82
Minnesota Wireless Assn	4,924,488	65
Medium Category		
Southern California Contest Club	4,982,582	42
Frankford Radio Club	4,194,260	49
Tennessee Contest Group	3,397,098	36
North Texas Contest Club	3,090,736	34
Mad River Radio Club	2,829,042	33
Florida Contest Group	2,660,742	26
Texas DX Society	2,288,000	22
North Coast Contesters	2,009,490	26
Rochester (NY) DX Assn	1,626,758	25
South East Contest Club	1,530,624	14
Western Washington DX Club	1,424,898	20
Kentucky Contest Group	1,190,522	21
Oklahoma DX Assn	1,162,556	10
Central Texas DX and Contest Club	1,100,308	10
Mile High DX Assn	975,150	11
Salt City DX Assn	967,956	7
Kansas City DX Club	840,160	9
Grand Mesa Contesters	835,164	13
Central Arizona DX Assn	798,052	8
Radio Amateurs of Northern Vermont	652,428	7
Woodbridge Wireless	646,174	14
South Jersey Radio Assn	558,312	21
Motor City Radio Club	540,308	17
AK-SAR-BEN	539,234	13
Rip Van Winkle ARS	538,900	10
Weekend Warriors	535,880	7
Lincoln ARC	510,048	8
Willamette Valley DX Club	459,408	5
Hazel Park ARC	456,372	21
Western New York DX Assn	405,188	7
Northern Arizona DX Assn	362,418	9
Schenectady ARA	359,228	5
Florida Contest Club	341,080	3
West Park Radiops	335,566	11
Order of Boiled Owls of New York	320,260	3
Murgas ARC	265,286	4
Long Island Mobile ARC	249,294	4
Murphy's Marauders	246,222	3
Central Michigan ARC	220,244	8
Southwest Ohio DX Assn	209,152	4
Northrop Grumman Radio Club	191,888	3
OH-KY-IN ARS	134,970	3
Highland ARA	113,908	4
Valley Radio Club of Eugene	109,882	3
Franklin County ARC	108,048	4
Northwest ARS	98,004	3
Carolina DX Assn	92,300	5
Newington Amateur Radio League	91,328	6
Mother Lode DX/Contest Club	78,844	3
Eastern Iowa DX Assn	72,342	5
Lebanon Valley Society of Radio	68,756	4
Kettle Moraine Radio Amateurs	67,110	3
Six Meter Club of Chicago	36,196	3
Capital City ARS	3,726	3
Local Category		
River City Contesters	1,872,648	10
Hudson Valley Contesters and DXers	1,487,846	10
Federation of Amateur Radio	707,162	8
Eastern Connecticut ARA	335,276	3
Green River Valley ARS	311,624	7
Vicksburg ARC	305,294	3
Magnolia DX Assn	278,602	3
Pocatello ARC	237,430	4
Great Falls Area ARC	225,370	3
Sturdy Memorial Hospital ARC	205,066	4
County Line ARA	203,898	7
Worldradio Staff ARC	194,372	4
CT RI Contest Group	183,112	4
American Red Cross Emergency	177,222	5
Northern New York Contest Club	147,818	6
Williamsburg Area ARC	137,946	3
Hamfesters Radio Club	131,164	5
Alcatel ARC	109,102	3
Sterling Park ARC	107,058	5
Baton Rouge ARC	106,566	4
Norwood ARC	102,888	3
West Essex ARC	99,916	5
Garden State ARA	84,262	3
Redwood Empire DX Assn	75,870	3
Poinsettia ARC	68,982	5
10-70 Repeater Assn	51,614	3

1998 Sweepstakes Collegiate Championship Final Standings

Call	Total score	School	Call	Total score	School
W6UE	428,812	Cal Tech	VE2CUA	80,964	Concordia University
W6YX	376,678	Stanford University	N1JJ	77,376	Forest Ridge Academy
N5XU	269,786	ARC U of Texas	W8KW	66,768	Eastern Michigan University
W1YK	243,546	Worcester Poly Tech Institute	WA5BU	62,662	Baylor University
W5YM	227,184	ARC U of Arkansas	N6CP/W6BHZ	59,204	Cal Poly – San Luis Obispo
W4ATC	203,086	NC State University	W8LT	58,650	Ohio State University
WD8DQA	179,624	Muskingum Area Tech College	W7ISU	50,876	Idaho State University
K4KDJ	162,684	Virginia Tech	W7UQ	28,320	U of Idaho
W4AQL	154,740	Georgia Institute of Technology	W9YB	17,694	Purdue University
W0EEE	135,848	U of Missouri - Rolla	WB4TOP	16,920	Wake Technical College
W2CXM	94,224	Cornell University	W3AJ	12,760	Swarthmore College
KC7KFF	90,060	Carl Hayden Community H.S.	W9NAA	1,440	Rose Technical College

Sweepstakes, there are a few overall category awards to be mentioned. In the Collegiate Championships, W6UE, the Cal Tech Amateur Radio Club, beat out W6YX the Stanford Amateur Radio club, to claim the Collegiate Championship for 1998.

Congratulations are in order for the contesting ensemble groups known as the Potomac Valley Radio Club (unlimited), the Southern California Contest Club (medium), and the River City Contesters (local) for taking home the coveted Hiram for Best Performance by a group in their individual Affiliated Club Competition categories.

The 1999 Sweepstakes are but a few months down the road (CW, November 6-8, and phone, November 20-22). Now is the time to start preparing the theatre for another blockbuster performance. Who will be the surprise stars in 1999? Will the grizzled veterans of Sweepstakes performances past be able to stand up to another onslaught from the new "young guns?" Who will be left standing when the log checkers open that magic envelope next year and utter those magic words, "And the winner is…"?

ARRL November Sweepstakes Plaque Winners

Listed below are all of the plaque winners in the phone category. Only plaques with sponsors will be awarded. If you have won a plaque that is not sponsored, you may purchase your own plaque. The cost is $60 per plaque. If you, your club, or business is interested in sponsoring any of the unsponsored plaques call Dan Henderson, N1ND at ARRL HQ.

Overall	*Winner*	*Sponsor*
QRP Phone	N7VY	QRP-ARCI
Low Power Phone	VE4GV	Ken Adams K5KA
High Power Phone	WP3R (KE3Q,op)	Carl Cook, AI6V
Multioperator Phone	KW8N	Central Texas DX & Contest Club
Atlantic Division		
QRP Phone	K3CR (KB3AFT,op)	Maryland Milliwatt Club
Low Power Phone	K1HTV	Potomac Valley Radio Club
High Power Phone	K3MM	North Coast Contesters
Multioperator Phone	W3GH	Mark Sickmeyer, KB3GJ, Memorial
Central Division		
QRP Phone	KX9X	Don Haney, W9WW
Low Power Phone	AJ9C	Society of Midwest Contesters
High Power Phone	WB9Z	Society of Midwest Contesters
Multioperator Phone	W0AIH	Don Haney, W9WW
Dakota Division		
QRP Phone	N0UR	Tod Olson, K0TO
Low Power Phone	K0VX	Minnesota Wireless Assn, W0AA
High Power Phone	W0SD (WD0T,op)	Minnesota Wireless Assn, W0AA
Multioperator Phone	KT0R	Minnesota Wireless Assn, W0AA
Delta Division		
QRP Phone	K2FF	Pat Sonnier, W5WMU
Low Power Phone	K4WX	Pat Sonnier, W5WMU
High Power Phone	K5XX	Pat Sonnier, W5WMU
Multioperator Phone	W4CAT	Twin City Ham Club
Great Lakes Division		
QRP Phone	N4RZ	
Low Power Phone	W8MJ	Mad River Radio Club
High Power Phone	W0CG	North Coast Contesters
Multioperator Phone	KW8N	Hazel Park ARC
Hudson Division		
QRP Phone	K2KW	NJ-QRP Club
Low Power Phone	K2UF	Troy ARA, N2TY
High Power Phone	K2RE	John Hults, K2WJ
Multioperator Phone	KY2J	
Midwest Division		
QRP Phone	K0JGH	
Low Power Phone	WN0G	
High Power Phone	KI0MB	
Multioperator Phone	K0RWL	
New England Division		
QRP Phone	K1VUT	QRP Club of New England
Low Power Phone	KZ1M	Mitch Stern, W1SJ
High Power Phone	KQ2M	Ed Parsons, K1TR
Multioperator Phone	KI1G	John Olsen, K1NG

Northwestern Division	*Winner*	*Sponsor*
QRP Phone	W7YAQ	Steve Morris, K7LXC and Tower Tech
Low Power Phone	K7QQ	
High Power Phone	N7ML	
Multioperator Phone	K7IR	
Pacific Division		
QRP Phone	N6MI (at N6NB)	UHM Ham Club
Low Power Phone	K6UM	Jim Hollenback, NK6L
High Power Phone	KH7R (KH6ND,op)	Richard Hallman, N7TR
Multioperator Phone	N6RO	
Roanoke Division		
QRP Phone	K5IID	
Low Power Phone	W4OC	Jim Stevens. K4MA
High Power Phone	W4MYA	Potomac Valley Radio Club
Multioperator Phone	K8WT	Shenandoah Valley ARC
Rocky Mountain Division		
QRP Phone	K0RI	Ron Stark, KU7Y
Low Power Phone	K7UP (W5FX,op)	
High Power Phone	K0KE	
Multioperator Phone	W0GG	
Southeastern Division		
QRP Phone	W4DEC	
Low Power Phone	KD3GC	
High Power Phone	WP3R (KE3Q,op)	
Multioperator Phone	NP2E	
Southwestern Division		
QRP Phone	N7VY	Ray Day, N6HE and Donna Day, N6HTH
Low Power Phone	K6LA	
High Power Phone	K6LL	
Multioperator Phone	W6EEN	
West Gulf Division		
QRP Phone	K5ED	
Low Power Phone	K5KA	D. Craig Boyer, AH9B
High Power Phone	K5TR (at W5KFT)	Leo E. Oyler, Jr, W0GOW—W5RO Memorial
Multioperator Phone	K5NZ	Oklahoma DX Assn
Canada		
QRP Phone	VE5QRP	
Low Power Phone	VE4GV	
High Power Phone	VE7SZ (VE7NTT,op)	D. Craig Boyer, AH9B
Multioperator Phone	VE6AO	

Scores

Within each Section, scores are listed in descending order, by power categories, followed by multioperators. Line scores list call sign, score QSOs, multipliers, hours, class (Q = QRP, A = Low Power, B = High Power, M = Multioperator).

1

Connecticut

N1TM	38,480	260	74	24 Q
W1PG	37,100	265	70	15 Q
NM1K	23,232	176	66	8 Q
KA1MWX	78,000	500	78	22 A
NX1Q	63,200	400	79	10 A
W1CTN	62,524	406	77	24 A
W1RPG	60,800	400	76	17 A
N1QDA	45,216	314	72	20 A
WB8IMY	41,652	267	79	16 A
N1ND	24,048	167	72	24 A
N1VIM	23,852	178	67	15 A
WA1ZEK	23,532	159	74	15 A
KC1JV	16,704	144	58	8 A
KE1AU	12,896	104	62	7 A
K3UFG	11,200	112	50	24 A
K3EIN	7,470	83	45	5 A
WB1CZX	700	25	14	3 A
KQ2M	273,814	1733	79	24 B
N1XYS (at KB1H)	132,878	841	79	24 B
N1HRA	76,156	482	79	12 B
K1WB	46,926	297	79	9 B
W1SAM	25,944	188	69	9 B
K1DII	8,080	101	40	2 B
W1QK (+KA1SYG)	108,888	698	78	14 M
N1NQD (+NET)	100,464	644	78	22 M
K1JN (+NET)	31,668	203	78	8 M
W1WEF (+NET)	22,330	145	77	5 M
N1KWJ (+NET)	15,640	115	68	15 M
N1MD (+NET)	14,040	130	54	24 M

Eastern Massachusetts

K1VUT	75,840	480	79	22 Q
K1EP	101,752	644	79	19 A
WG1Z	86,736	556	78	24 A
KU4BP	74,100	475	78	24 A
K1HT	68,888	436	79	10 A
KC1SQ	46,508	302	77	13 A
N1IUN	39,500	250	79	20 A
W1EM	30,800	200	77	7 A
W1SBD	27,664	182	76	13 A
W1TI	23,660	182	65	6 A
K1JE	22,770	165	69	13 A
WA1OLV	22,176	176	63	6 A
K5MA	173,168	1096	79	17 B
KA1UQ	120,870	765	79	24 B
N1DD	99,224	628	79	20 B
K1LU	76,788	486	79	13 B
W1OHM	42,048	288	73	13 B
W1LP	38,850	259	75	17 B
W1RY	31,600	200	79	13 B
K1SM	11,340	105	54	3 B
W1XS (+NET)	76,908	493	78	20 M
K1TH (+NET)	58,188	373	78	8 M
WZ1K (+N1DPY,KA1EZH)	26,784	186	72	22 M
N1OEF (+ops)	21,252	161	66	11 M
K1FV (+K1SM)	15,120	135	56	3 M
AE1M (+NET)	14,100	94	75	20 M

Maine

K1NI	102,804	659	78	23 A
KT1W	74,936	493	76	22 A
KD1O	64,296	423	76	24 A
K1YCS	24,180	186	65	11 A
N1MHB	19,592	158	62	9 A
NY1E	15,252	123	62	24 A
K1MY (+NET)	94,484	598	79	24 M
N1ZPC (+NET)	78,684	498	79	20 M
N1NUA (+W1DLC)	44,148	283	78	20 M
KT4NT (+KF4IHS)	40,004	274	73	16 M
W1AO (+NET)	35,708	226	79	8 M
WE1J (+K1CZ,K1DTW,KB1CQQ, N1XMQ)	12,760	110	58	24 M

New Hampshire

W1XV	19,140	145	66	7 Q
WA1LJD	176,170	1115	79	22 A
K1TR	31,980	246	65	5 A
N1FOJ	27,600	200	69	10 A
WB1FLD	15,982	131	61	6 A
AC1J	15,812	134	59	4 A
K1DG	112,654	713	79	10 B
WB1GEX	71,604	459	78	20 B
W1AB	6,300	75	42	4 B
K1BV	14	7	1	1 B
AF1T (+N1IIC,WA1VKO)	119,132	754	79	16 M
N1HKO	111,390	705	79	24 M
WK1P (+WA1ZYX,WA1WJE)	82,680	530	78	24 M
K1OZ (+NET)	63,358	401	79	24 M
KC1F (+NET)	28,416	192	74	4 B
KZ1O (+N1TMZ)	18,696	164	57	24 A
KD1LZ (+N1SBN)	7,650	85	45	24 A

Rhode Island

K1VSJ	63,358	401	79	13 A
K2MN	7,802	83	47	3 A
K1AM	163,056	1032	79	16 B
KI1G (+K1NG,K1SD)	212,668	1346	79	22 B
W1OP (K1PLX,KA1KWE,ops)	115,182	729	79	18 B
AA1II (KE1JA,N1KRU,ops)	65,728	416	79	19 A

Vermont

W1EAT	64,064	416	77	18 Q
N0ICI	65,604	462	71	22 A
AA1SU	58,350	389	75	22 A
W1ZN	35,866	227	79	14 A
N1RUI	27,566	179	77	24 A
WB1GQR (W1SJ,op)	238,992	1532	78	24 B
K1CN	74,752	512	73	10 B
N1MEZ	58,934	373	79	17 B

Western Massachusetts

KZ1M	183,280	1160	79	24 A

K5ZD 59,280 380 78 7 A
KX1X 21,450 165 65 24 A
K1KBU 13,860 110 63 19 A
W1TO 10,368 96 54 5 A
N1FUS 5,880 105 28 9 A
KT1M (+NET)
53,720 340 79 12 M
W1YK (K1GRS,KA1YTR,KB2SBS, KM1P,N1FIY,N1LSH,N1PFC, N2YHK,N3VUN,W1NT,ops)
183,754 1163 79 24 C

2

Eastern New York

K2UF 101,910 645 79 23 A
AA2QR 64,064 416 77 20 A
KF2SC 42,350 275 77 23 A
KA2VBI 37,296 252 74 14 A
WD2K 25,896 166 78 14 A
N2MTG 24,888 183 68 11 A
K2RI 21,350 175 61 9 A
KB2VNA 20,672 152 68 18 A
KF2WA 15,660 135 58 8 A
N2ER 11,520 120 48 7 A
WB2BTJ 9,434 89 53 8 A
W2NRD 2,880 40 36 6 A
KC2AGM 750 25 15 4 A
KC2CRO 90 9 5 1 A
W2RE 230,680 1460 79 24 B
KE2DX 188,292 1207 78 22 B
W2PS 158,316 1002 79 22 B
W2ENY 135,722 859 79 24 B
KD2NE 118,404 759 78 17 B
K2SX 33,726 219 77 6 B
KY2J (+NA2N)
238,896 1512 79 24 M
K2DS (+WA2JQK,KC2AGL)
172,536 1092 79 24 M
N2LH (+NET)
145,518 921 79 24 M
N2POS (+N2PEN,N2QIP,WB2FOB)
127,980 810 79 20 M
N2SA (+KE2SD)
120,870 765 79 24 M
NO2X (+NN2V)
90,376 572 79 20 M
W2GDJ (+NET)
74,100 475 78 11 M
N2SQW (+KC2DMI)
65,096 412 79 20 M
AA2DY (+NET)
49,920 320 78 24 M
W2WC (+ops)
12,430 113 55 8 M
KB2KDY (+KB2SRC)
12,320 110 56 11 M

Northern New Jersey

K2WK 51,034 323 79 12 Q
W2AZK 20,252 166 61 15 Q
K2WA 50,388 323 78 21 A
WA2LXE 45,000 300 75 23 A
W2HCA 33,654 213 79 11 A
N2USN 33,184 244 68 13 A
KB2D 32,544 226 72 12 A
N2ULW 32,072 211 76 14 A
KG2CN 27,594 189 73 14 A
WA2ASQ 26,400 200 66 14 A
N2TH 26,240 205 64 17 A
N2ST 24,444 194 63 20 A
W2BD 24,124 163 74 6 B
KB2UTD 18,960 120 79 17 A
WA2QHL 18,088 133 68 24 A
N2NYR 11,880 108 55 5 A
K2BOG 11,660 110 53 7 A
N3RB 11,648 112 52 8 A
WA2BKN 5,208 84 31 11 A
KB2WNU 598 23 13 24 A
NU3E 8 2 2 1 A
N7UN 61,500 410 75 12 B
W2UDT 47,124 306 77 8 B
WA2YBI 30,222 207 73 18 B
W2XI 27,334 173 79 24 B
K1QQ 20,720 140 74 13 B
N2ROM 17,940 130 69 11 B
N2ZAQ 14,396 118 61 9 B
K4BNC 12,482 79 79 9 B
K2XR (+K2OWR,N2YFH)
180,960 1160 78 24 M
K5KG (+NET)
73,320 470 78 8 M
N2KJM (+N2TTP,AJ2U)
71,574 453 79 17 M
KB2POP (+NET)
68,400 450 76 13 M
AB2DE (KC2AVE,N2KPB,KB2IZB, N2ZAS,K2WK,KB2YJT,ops)
60,514 383 79 22 M
W2YR (+NET)
50,856 326 78 18 M
N2ED (+NET)
48,664 308 79 10 M
N2TTT (+N2NHN,KC2LDD)
39,026 247 79 23 M
N2WM (+NET)
38,532 247 78 18 M
AD2P (+N2HMM,KB2YCE,KB2YJT)
37,398 271 69 16 M
KD2PM (+KB2ECR)
32,706 237 69 24 M
W2FN (+NET)
25,840 170 76 20 M
W2KD (+NET)
19,304 127 76 10 M
NN2T (+NO2T)
19,278 153 63 24 M
K2GQ (+ops)
16,416 144 57 13 M
N2BIM (+NET)
12,482 79 79 5 M
N2NYP (+N2ZAI)
7,056 84 42 24 M

Northern New York

WZ2T 40,588 278 73 15 Q
N2JNZ 1,904 56 17 10 Q
N2UUX 67,606 439 77 24 A
WA2AEA 13,068 121 54 5 A
WB2BAU 10,682 109 49 12 A
KB2NGK 3,000 75 20 10 A
NA2A (at W2DES)
56,848 374 76 16 B
K2NNY (+NET)
187,512 1202 78 24 M

NYC-Long Island

AA2VK 32,976 229 72 18 Q
N2TO 23,600 200 59 10 Q
KS2G 87,216 552 79 16 A
WB2AYQ 49,770 315 79 21 A
KG2BI 31,968 222 72 13 A
WA2CNV 25,116 161 78 15 A
W2GL 19,886 163 61 14 A
WB2KSK 18,486 117 79 11 A
W2BZH 16,786 109 77 15 A
WB2ZTH 12,482 79 79 8 A
N2KYP 11,978 113 53 6 A
K2OVS 11,552 76 76 8 A
WA2RXS 10,400 104 50 5 A
WA2RF 9,328 106 44 10 A
K2TV 4,100 82 25 3 A
K2LJH 1,840 40 23 2 A
K2DL 1,150 25 23 3 A
N2NB 104,280 660 79 13 B
N2AUK 88,704 576 77 17 B
AD2S 60,048 417 72 12 B
W2LK 49,764 319 78 11 B
N2FF 29,304 198 74 9 B
K2KV (+WM2V)
183,280 1160 79 24 M
KG2M (+N2OX,N2ZN,KC2CGX, KC2BPS,KC2ACL,ops)
100,172 634 79 20 M
K2DO (+N2GA)
78,842 499 79 15 M
N2JIX (+KF2ER)
47,400 300 79 16 M
K2QMF (+NET)
23,244 149 78 5 M
N2NVU (+KC2EFR,N2SJ)
8,200 100 41 23 M

Southern New Jersey

W2CE 32,688 227 72 12 Q
N2OO 80,738 511 79 24 A
KB2MMI 38,550 257 75 22 A
KF2YX 34,050 227 75 11 A
KC2AZU 28,566 207 69 23 A
KR2G 26,064 181 72 11 A
W2TV 24,332 154 79 9 A
KE2G 20,286 147 69 24 A
W2FGY 15,162 133 57 13 A
K5VG 14,732 127 58 6 A
W2ORA 12,566 103 61 6 A
KA2YKN 10,080 105 48 24 A
W5KI 5,576 68 41 3 A
N2LGH 3,510 45 39 6 A
N2XYZ 2,420 55 22 9 A
N2QWR 1,596 42 19 3 A
KC2DPV 868 31 14 6 A
KC2AZT 72 6 6 1 A
AB2E 217,092 1374 79 24 B
K2UT 146,376 963 76 21 B
K2WB 48,506 307 79 20 B
KD2KS 36,814 233 79 11 B
W2GE 25,216 197 64 7 B
W2BE 20,066 127 79 9 B
K2VS (+K2VT)
43,946 301 73 23 M
K2TCK (+NET)
35,234 223 79 16 M
KD2P (+NET)
8,740 95 46 5 M

Western New York

NQ2RP 26,796 203 66 10 Q
K2FR 19,800 165 60 5 B
K1PY 134,134 871 77 24 A
KG2AU 96,222 609 79 24 A
W2TZ 94,642 599 79 20 A
AE2T 69,678 441 79 16 A
WV2B 67,466 427 79 24 A
W2KA 64,464 408 79 13 A
KU2X 52,930 335 79 12 A
W2AD 40,734 279 73 10 A
W2FE 38,332 259 74 18 A
N2CU 38,160 265 72 6 A
KF2VX 29,250 195 75 12 A
K2SKO 28,684 202 71 4 A
W8JW 27,192 206 66 11 A
WK2V 21,970 169 65 9 A
N2LQQ 21,700 175 62 12 A
AA2WS 21,240 177 60 24 A
KA2CNG 13,250 125 53 8 A
WB2WPM 12,792 123 52 24 A
W1TY 11,388 78 73 9 A
N2MF 218,830 1385 79 24 B
W2LC 201,450 1275 79 24 B
WA1KID (KB2MTI,op)
66,518 421 79 24 B
W2OMV 32,112 223 72 14 B
W2EZ 27,600 200 69 23 B
W2OP 23,852 178 67 13 B
W2YRH 13,392 93 72 7 B
K2ZT (+W2GR)
141,726 897 79 20 M
AA2MU (+NET)
104,754 663 79 20 M
K2FU (+NET)
80,580 510 79 16 M
W2SEX (+ops)
69,520 440 79 24 M
W2RW (+WB2KAO)
50,400 350 72 7 M
AA2AD (+KC2AKT)
29,520 205 72 15 M
W2CM (WA2ISC,K2YGF,W2WRH, KB2SWB,KB2TLD,ops)
23,684 191 62 12 M
N2ZVN (+N2PRS)
14,238 113 63 13 M
K2ZQ (+N2NEP)
13,832 91 76 10 M
W2CXM (KC2EAL,N2IKR,N2WLG,ops)
94,224 604 78 22 C

3

Delaware

N8NA 46,620 315 74 8 A
KZ3X 16,640 130 64 6 A
W3DA 12,482 79 79 10 A
W3PP 214,722 1359 79 24 B
KE3ZR 125,452 794 79 24 B
NY3C 32,718 399 41 7 B
N3KRX (+KA3JCA,N3WCB)
50,400 336 75 24 M
KB3DAU (K3LT,KE3UY,K0UWO, N3FZP,N3YVT,NS3E,ops)
40,328 284 71 24 M

Eastern Pennsylvania

K3AN 46,488 298 78 11 Q
WX3TAZ 20,368 152 67 12 Q
NY3A 110,200 725 76 21 A
K3MQH 101,278 641 79 13 A
KE3MX 50,688 352 72 8 A
W3RJ 37,772 266 71 24 A
W3NTD 34,342 223 77 24 A
W3SSS 32,558 223 73 14 A
N3RM 23,068 146 79 7 A
K3BFD 20,636 134 77 15 A
K2CD 19,908 126 79 24 A
WB3IZF 18,910 155 61 10 A
N3MLV 15,958 101 79 24 A
KE3TC 10,848 113 48 11 A
AG3G 10,100 101 50 12 A
W3KM 1,218 29 21 1 A
KC3TL 85,350 569 75 15 B
K3SV 80,896 512 79 24 B
N3FA 80,580 510 79 11 B
K3AR 36,340 230 79 5 B
N3TA 30,576 196 78 16 B
W3JRY 11,130 105 53 24 B
W3IZ (+NET)
103,740 665 78 12 M
KA3QLF (+NET)
93,288 598 78 24 M
K3WW (+NET)
54,984 348 79 6 M
WY3T (+NET)
22,932 147 78 11 M
KQ3F (+NET)
18,012 114 79 8 M
K3TL (+NET)
16,590 105 79 9 M
W3AJ (AC3V,AA2KV,KB3DDV, KB3DDW,ops)
12,760 110 58 11 C

Maryland-DC

WA3DUR 47,268 303 78 19 Q
W3IKE 18,612 141 66 7 Q
K1HTV 188,336 1192 79 24 A
WR3Z 93,756 601 78 21 A
N1WR 91,200 600 76 20 A
W3SY 85,932 558 77 24 A
W3UJ 50,078 343 73 12 A
K3HH 48,664 316 77 12 A
NV3V 47,880 315 76 24 A
W3CB 34,780 235 74 12 A
N3UN 33,150 221 75 16 A
WA3YSW 30,380 217 70 12 A
WD3A 25,806 187 69 8 A
KF3BN 17,892 142 63 15 A
N8ECG 17,160 130 66 9 A
N3EYB 9,604 98 49 7 A
KA3TCC 8,580 78 55 11 A
N3TGB 4,920 82 30 16 A
N3GPU 3,162 51 31 2 A
N3KTV 3,074 53 29 4 A
KA3DOF 2,886 39 37 4 A
W3AMY 1,520 40 19 3 A
N3WIZ 1,404 39 18 8 A
K3UAL 600 20 15 3 A
WB3KIC 240 12 10 2 A
K3YJP 8 2 2 1 A
K3MM 269,074 1703 79 24 B
K3ZO 236,684 1498 79 23 B
N3HBX 155,532 997 78 24 B
W3HVQ 99,840 640 78 24 B
K3UT 85,162 539 79 24 B
W3ZZ 78,000 500 78 24 B
K3IXD 67,150 425 79 14 B
N3II 60,830 385 79 24 B
KF3BE 38,608 254 76 21 B
W7CAV 38,400 256 75 22 B
W3AZ 35,712 248 72 15 B
WR3L (+K3FT,N3YHC)
162,864 1044 78 24 M
N3RR (+W6HZW,K4VV)
162,424 1028 79 24 M
K3PZN (N3SOK,WX3F,N3YIM,WX3B, N3SB,KB3CAW,N3MNM,KB3CDE, KB3BVZ,N3XLT,ops)
89,544 574 78 24 M
K3DI (+W3ICM)
71,136 456 78 15 M
N3NT (+NET)
65,254 413 79 24 M
N3OC (+NET)
57,252 367 78 10 M
W2GG (+NET)
55,300 350 79 24 M
N3HUV (+NET)
31,600 200 79 13 M
W3LJ (+K3NCO)
10,920 105 52 24 M

Western Pennsylvania

K3CR (KB3AFT,op)
90,376 572 79 24 Q
KA1NDY 14,632 124 59 10 Q
AA3GM 11,628 114 51 7 Q
WB0IWG 2,016 56 18 16 Q
WA3HAE 147,572 934 79 24 A
K3C (NI3S,op)
130,666 827 79 24 A
WA3SES 112,944 724 78 20 A
AD8J 70,044 449 78 10 A
W3TWI 48,818 317 77 19 A
KD3QQ 41,440 280 74 14 A
AA3ML 36,778 259 71 12 A
KA3POA 27,216 189 72 15 A
N3YEA 24,816 188 66 18 A
KE3KD 20,252 166 61 24 A
WA3RBK 15,640 115 68 24 A
K3TG 14,396 122 59 24 A
WB3AVD 10,980 122 45 24 A
N3ZGT 1,386 33 21 3 A
KA3WIK 14,820 130 57 9 B
W3GH (+ND8L,W9XR)
247,270 1565 79 24 M
AA3LX (+AA3CE)
118,816 752 79 23 M

4

Alabama

W4DEC 21,580 166 65 13 Q
K2RUE 44,660 319 70 24 A
KT4XA 35,242 263 67 10 A
W5DLM 16,800 150 56 8 A
KC4TEO 13,908 122 57 3 A
WA4WQK 9,348 123 38 13 A
K4JYO 60,514 383 79 10 B
KV4T (+KS4YT)
138,882 879 79 22 M

Georgia

KD3GC 148,302 963 77 22 A
NJ8J 53,508 343 78 22 A
K4PK 50,920 335 76 15 A
K4OGG 48,488 319 76 24 A
N4NFI 42,624 288 74 18 A
KW4E 38,400 256 75 11 A
N4VMD 36,480 240 76 19 A
N4MNA 34,456 236 73 15 A
N4CT 25,740 165 78 12 A
K4GZZ 24,056 194 62 24 A
KU4OH 19,370 149 65 10 A
KF4KMV 9,100 91 50 10 A
W4AN (N9HZQ,op)
244,268 1546 79 24 B
K4BAI 156,624 1004 78 20 B
W4ASM 49,136 332 74 24 B
W5SS 37,920 240 79 9 B
W4TM 25,232 166 76 7 B
K0HT (+N4XGW)
15,006 123 61 11 M
W4AQL 151,680 960 79 24 C

Kentucky

N4RZ 106,548 683 78 21 Q
KT4ZX 120,712 764 79 16 A
W4LC 113,256 726 78 18 A
AA2GS 85,332 547 78 19 A
KD4LHA 70,518 511 69 24 A
AC4PY 69,836 442 79 22 A
K4IE 64,622 409 79 24 A
WA4VOC 63,832 404 79 19 A
KD4HXT 53,562 339 79 18 A
KC4DWT 50,086 317 79 15 A
AE4GH 41,554 263 79 21 A
KF8VS 37,596 241 78 12 A
KD4SN 31,376 212 74 18 A
W4DHE 21,168 147 72 18 A
KO4OL 21,120 160 66 9 A
K4WW 60,040 380 79 8 B
K8TW 49,704 327 76 11 B
W4MWH 27,594 219 63 10 B
N4XM 10,028 109 46 3 B
N4GN 4,674 57 41 24 B
N4OKX (+KB9THR)
90,324 579 78 22 M

North Carolina

N4ZAK 2,254 49 23 10 Q
K4HA 57,038 361 79 12 A
N4CW 51,900 346 75 10 A
W4IDX 49,956 362 69 11 A
W4SI 45,406 311 73 14 A
WN2R/4 43,992 282 78 21 A
K4QPL 31,104 216 72 24 A
K4WES 30,960 215 72 18 A
N4WYR 23,184 161 72 15 A
WA4AIW 20,400 136 75 18 A
KS4ZZ 17,112 138 62 15 A
W4WS (N4VHK,op)
15,042 109 69 7 A
AE4EC 14,592 128 57 12 A
KF4OAD 13,216 118 56 14 A
KT4AN 11,448 106 54 24 A
W8FIL 10,100 101 50 7 A
KZ2I 9,240 110 42 6 A
KS4S 8,536 97 44 9 A
K4IJK 8,256 86 48 11 A
WA4LEF 7,140 105 34 6 A
K4MA 203,978 1291 79 24 B
W4MR (AA4NC,op)
145,518 921 79 12 B
N4AF 117,344 772 76 14 B
NX9T 115,498 731 79 13 B
KS4XG 70,994 461 77 10 B
K3KO 27,010 185 73 5 B
W4LN 22,120 140 79 12 B
W4YDY 12,100 110 55 7 B
NT4D (+NET)
147,732 947 78 21 M
W4BFB (AD4IE,AE4PU,AE4XV,W4CC, W4WNT,WO4G,ops)
57,000 375 76 24 M
AA4R (+NET)
21,488 136 79 10 M
W4ATC (N3QYE,KF4ARS,KE4LSU, KO4PY,ops)
122,122 793 77 23 C
WB4TOP (W4FMN,KB4VTJ,WD4BMA, ops) 16,920 141 60 13 C

Northern Florida

KX5U 13,216 112 59 17 Q
AB4KL 12,544 98 64 13 Q
KQ4YY 11,564 118 49 24 Q
W8MZ 3,744 52 36 6 Q
WB4OMM 86,900 550 79 14 A
K8WK 84,552 542 78 24 A
W4SDE 28,280 202 70 9 A
K4LDR 25,024 184 68 8 A
WB4IHI 24,640 176 70 10 A
KB4FOS 21,780 165 66 17 A
AE4TA 2,904 44 33 2 A
W9CNF 750 25 15 3 A
WC4E(K9PG, op)
294,986 1867 79 24 B
K4VUD 254,538 1611 79 24 B
W7QF 31,724 206 77 11 B
W1LR 13,176 108 61 12 B
N4EC 9,632 112 43 4 B
NU4Y 5,772 78 37 2 B
W4UEA 4,480 56 40 5 B

Puerto Rico

KP4CQ 27,500 250 55 24 A
WP4LNY 26,078 221 59 24 A
WP4KOE 3,604 53 34 24 A
WP3R (KE3Q,op)
410,326 2597 79 24 B

South Carolina

W4OC 218,672 1384 79 22 A
N4GJ 29,120 208 70 18 A
W8PC 16,432 104 79 9 A
N4EE 2 1 1 1 A
KC4MVZ (+KE4MHO,KE4NNS,W4WIY, KF4HMK,KF4MTE,KF4LZK)
42,450 283 75 24 M

Southern Florida

KS4GW 2,162 47 23 10 Q
KR4YL 336 14 12 1 Q
NA4CW 53,562 339 79 15 A
KR4ZA 21,252 161 66 18 A
N2EGO 16,120 124 65 12 A
W3DHN 11,016 102 54 9 A
KB4XE 11,000 100 55 24 A
KF4KSN 8,296 122 34 11 A
W8RTU/4 1,904 34 28 11 A
N4BP 222,780 1410 79 19 B
AE4MH 187,230 1185 79 24 B
AF4DE 3,400 50 34 7 B
WD4AHZ (+K1TO,K1KNQ)
202,398 1281 79 24 M
AA0BA (+WA3NKO)
105,456 676 78 16 M
AD4TR (+NET)
60,988 386 79 23 M
W2DO (+K4BH,W4BUG,KB4COO, KE4IDW,AB4SZ,KE4ZOG)
35,964 243 74 19 M

Tennessee

N4DD 14,560 104 70 24 Q
AC4HF 11,880 99 60 4 Q
K4WX 230,680 1460 79 24 A
WO4O 135,406 857 79 22 A
KE4OAR 50,402 319 79 16 A
NA4K 50,076 321 78 6 A
KF4ZTJ 36,112 244 74 24 A
KU4AW 30,816 214 72 20 A
KB4BHY 24,140 170 71 19 A
W4NI 19,152 152 63 6 A
KT4OR 18,200 140 65 10 A
N4USG 16,128 144 56 10 A
AD4F 11,960 130 46 7 A
N4LT 11,232 108 52 6 A
KA4MRR 10,290 105 49 6 A
K4RO 9,090 101 45 24 A
KC4URW 4,644 54 43 24 A
W4TDB 4,200 60 35 3 A
WB9BSH 3,060 45 34 6 A
KD4RHT 2,068 47 22 8 A
K0EJ 167,954 1063 79 16 B
KF4ZR 127,032 804 79 18 B
W4PA 65,886 417 79 24 B
WD4K 56,316 361 78 24 B
W4CAT (K4KH,KF4VOW,K1KY,ops)
148,362 939 79 24 M
K4FUN (NY4T,KF4GNV,KE4KMG, KF4GKN,KD4BAM,KF4GFZ,ops)
92,904 588 79 24 M
KU4LL (+KF4VCM)
41,550 277 75 16 M
KA4OTB (+KF4BBH)
37,872 263 72 13 M
WB4PHW (+KD4LIF)
17,080 140 61 24 M
KG4ABM (+KJ4TJE)
3,792 79 24 15 M

Virgin Islands

NP2DJ 16,740 135 62 15 A
WP2Z (K8MJZ,op)
348,390 2205 79 23 B
NP2B 22,120 140 79 6 B
NP2E (+KL7A)
205,874 1303 79 24 M

Virginia

W3MGL 14,518 119 61 10 Q
N4EUK 704 22 16 2 Q
K5OF 120,120 770 78 24 A
W4YE 104,754 663 79 18 A
N4MO 93,132 597 78 21 A
N4GU 69,008 454 76 13 A
N4MM 53,246 337 79 18 A
K4BAM 46,970 305 77 18 A
AD4DG 45,298 319 71 15 A
W4VG 42,966 279 77 14 A
KU4FP 38,252 262 73 20 A
WK4Y 36,984 268 69 13 A
AE4EW 32,400 225 72 10 A
KD4IBI 30,240 210 72 12 A
AF4CD 29,704 188 79 15 A
WA0DYJ 28,842 209 69 14 A
KS4UW 28,832 212 68 13 A
K4RET 28,408 212 67 21 A
K1SO 27,202 203 67 14 A
KB3APN 19,154 157 61 11 A
W4VC 18,360 135 68 8 A
KE4MIL 14,688 102 72 13 A
W6IHG 14,136 114 62 10 A
N3TG 14,040 117 60 5 A
N4CWP 13,932 129 54 9 A
KT4AD 13,688 116 59 9 A
W4FCR 13,090 119 55 8 A
K4UK 12,482 79 79 11 A
KT4FJ 10,290 105 49 7 A
KR4KF 8,742 93 47 9 A
KU4SX 8,112 104 39 9 A
AF4MO 4,674 57 41 24 A
KK4R 180 10 9 1 A
W4MYA 223,728 1416 79 24 B
W0CN 210,140 1330 79 23 B
K4IQ 197,342 1249 79 22 B
W4DC 191,654 1213 79 24 B
K4GE 125,736 806 78 12 B
W4NYY 85,176 546 78 14 B
K4SO 84,846 537 79 24 B
W2YE 50,008 329 76 15 B
K3OSX 45,978 291 79 24 B
W4YCZ 30,300 202 75 24 B
AE4IX 20,670 159 65 10 B
N6MW 11,096 73 76 9 B
N4SR (+NET)
94,642 599 79 13 M
W4HZ (+NET)
81,054 513 79 24 M
K1GG (+NET)
75,050 475 79 15 M
N3RC (+NET)
70,468 446 79 9 M

W4DF (+WA4RTS)
64,780 410 79 15 M
KC4GIA (+KR4DO,N4TRX,KF4LGS)
59,904 384 78 24 M
KE4VA (+WY2V)
57,152 376 76 23 M
W4IM (+KC4DCL)
47,894 311 77 17 M
WA4QDM (+NET)
37,392 246 76 14 M
KR4XM (+K4FPF)
33,572 218 77 10 M
N4RV (+KT4W)
19,840 160 62 3 M
K4KDJ (K4EP,5B4AFM,KF4ZLX,ops)
150,258 951 79 24 C

5

Arkansas

W5JAY 66,150 441 75 22 Q
K5OY (at AB5SE)
166,296 1066 78 22 A
N5EPU 81,528 516 79 21 A
AC5DK 39,500 250 79 17 A
N5KG 34,790 245 71 17 A
N3UQE 23,700 150 79 13 A
KA5QOF 19,832 134 74 19 A
KC5DUI 9,936 108 46 24 A
AB5SE (at N5ZS)
245,532 1554 79 24 B
KC5BRY 30,420 234 65 24 B
N5ZM (+AB5RQ)
70,152 444 79 24 M
W5YM (KB5ZYC,AC5RR,KB5YMO, KJ5YD,N5UWY,KC5TTQ,KC5LDC, ops) 200,344 1268 79 24 C

Louisiana

W5CTV 5,952 96 31 8 Q
N5SMQ 70,468 446 79 15 A
N5MYH 60,830 395 77 24 A
K1DW/5 51,224 337 76 10 A
W5ZDW 23,322 169 69 14 A
N0KWA 18,360 135 68 11 A
W5WMU 241,956 1551 78 24 B
KG5VK (+KB5VKJ,K5RV)
148,046 937 79 24 M
W5GAD (+ops)
137,904 884 78 24 M
AE5T (+N5PIT)
133,668 846 79 22 M
KI5EE (+WB5TUG)
82,634 523 79 23 M
WM9M (+NET)
12,320 88 70 24 M

Mississippi

K2FF 75,840 480 79 13 Q
KB5FET 39,274 269 73 17 A
AB5YY 39,156 251 78 18 A
N5QDE 31,350 209 75 24 A
KK5PM 13,100 131 50 8 A
W5XX 254,380 1610 79 24 B
KB5IXI (+KB5RQL,KB5VLA,KM5NQ, KC5YDR) 29,100 194 75 14 M
KB5VCC (+KC5ZJA)
25,350 169 75 15 M

New Mexico

K5OI 20,700 150 69 24 Q
K7UP (W5FX,op)
228,310 1445 79 24 A
W5GZ 47,268 303 78 21 A
W5IV 34,200 228 75 20 A
W5IL 28,832 212 68 14 A
K5TEE 26,934 201 67 15 A
K2EI 222,780 1410 79 24 B
K5AM 96,720 620 78 7 B
W6PU 92,594 691 67 24 B
W5JOV 10,710 105 51 4 B
KC5TBT (K5EMT,KD5EXE,K6ZDL,KB5TTS, KA5BAT,KC5KKX,KC5KKY,KD5FKX, N2HLJ,ops)
22,862 161 71 24 M
KK5OV (+KB5ZSK)
12,720 120 53 15 M

North Texas

WA8ZBT 48,516 311 78 24 Q
WQ5W 21,106 173 61 14 Q
N5BGZ 3,038 49 31 10 Q
WD5K 173,316 1111 78 24 A
N5WD 66,924 429 78 24 A
KC5KDM 52,592 346 76 18 A
WK5K 47,550 317 75 21 A
W0CO 45,140 305 74 23 A
W5WB 37,288 236 79 20 A
K5PN 36,480 240 76 24 A
W5ZQ 34,286 217 79 21 A
N5LS 31,350 209 75 8 A
KT4CB 28,152 207 68 24 A
N5YY (N5NJ,op)
15,960 133 60 4 A
KM5SS 15,960 133 60 11 A
N5KM 15,222 129 59 4 A
NN5T 13,924 118 59 7 A
NT5V 13,430 85 79 8 A
WA0GNC 13,420 122 55 6 A
KD5S 13,356 126 53 6 A
KM5HE 12,900 129 50 9 A
WA5VKS 7,412 109 34 12 A
K5KJ 3,658 59 31 1 A
KC5OZT 1,000 25 20 4 A
K5RA 193,708 1226 79 24 B
N5TY 138,250 875 79 21 B
AA5NT 131,614 833 79 19 B
W5MYA 119,132 754 79 13 B
WB0TEV 12,324 79 78 12 B
K6AZA 1,218 29 21 24 B
W5WW (+K5MR)
251,378 1591 79 24 M
N5CMI (+K5WO,KD5DBL,WB2LMA, KB5SSV)
147,256 932 79 24 M
N5TJ (+NET)
101,120 640 79 9 M
W5LM (KM5EW,N2HNU,KD5ABQ, KD5AWS,W5WRE,KF4MND,ops)
67,308 426 79 22 M
N5KB (+KD5ETC)
61,146 387 79 18 M
K5RAC (KK5NA,KK5QA,KM5IH,W5GVP,ops)
35,420 230 77 24 M
KC5WUG (+KD5BVK,KC5VPZ,KD5BAH, WA5NHI) 29,250 225 65 22 M
WA5BU (KC5AMA,KK5KN,AC5QQ, N5VHO,KD5CAA,ops)
55,774 353 79 20 C

Oklahoma

K5KA 222,464 1408 79 24 A
N5RXF 137,522 893 77 21 A
N5SAM 33,040 236 70 18 A
N5PMP 26,264 196 67 13 A
W5WYN 17,538 111 79 20 A
WB5GMK 13,064 92 71 17 A
K5YAA 96,252 617 78 14 B
K2BA 61,138 397 77 8 B
WD0GTY (+WB0ZWW,N5PJ)
90,218 571 79 20 M
KB1ZQ (N1LPN,N1XSF,ops)
29,172 187 78 24 M
NJ5S (+KA7GLA)
17,100 114 75 18 M

South Texas

KG5U 12,000 120 50 4 Q
KZ5MM 125,926 797 79 17 A
N5RP 66,202 419 79 24 A
K5OE 58,500 390 75 22 A
WA5IYX 56,628 363 78 21 A
K4NR 54,750 365 75 11 A
N5DU 50,370 365 69 24 A
KK5LO 42,186 267 79 24 A
K5CWR 39,816 252 79 24 A
K5IX 38,710 245 79 14 A
KK5CA 34,848 242 72 13 A
N5RLQ 22,512 168 67 13 A
N5KAE 18,802 119 79 13 A
K5WNO 18,330 141 65 24 A
WD5GNI 18,018 143 63 10 A
W5KNZ 16,748 106 79 13 A
N5XUS 11,954 139 43 5 A
N5AF 5,698 77 37 4 A
K5TR (at W5KFT)
291,194 1843 79 24 B
W5ASP 178,224 1128 79 17 B
W5MN 143,938 911 79 18 B
K5GA 114,464 784 73 24 B
W5XD 85,320 540 79 14 B
K5DX 69,454 451 77 24 B
N5TU 68,256 432 79 24 B
K1TU 55,152 383 72 10 B
WA5AA 30,646 199 77 15 B
AB5SS 23,712 152 78 10 B
K5DJ 8,694 63 69 10 B
W5NR 5,920 74 40 4 B
KK5DO 30 5 3 24 B
K5NZ (+W5BAK,DL3YEH)
257,856 1632 79 24 M
NN5AA (K5NA,K5DU,ops)
108,230 685 79 14 M
K5LZO (+WB5RUS)
46,472 314 74 19 M
KZ5E (+NET)
37,800 252 75 24 M
W5AJ (+NET)
12,750 85 75 24 M
NJ1V (+N5RJM)
11,552 76 76 8 M
N5XU (KA5WSS,KM5FA,KT5I,ops)
175,538 1111 79 24 C

West Texas

K5ED 57,084 402 71 16 Q
N5ZC 167,796 1062 79 24 A
W5RQ 126,874 803 79 19 A
N5DO (+K5FD)
216,144 1368 79 24 M
KJ5BX (+KM5SI,KB5KYJ,KC5HNI, KC5OBX,KC5OGT,KC5MVT, KC5VKA,KC5VKB,KC5YPY)
163,530 1035 79 24 M
N5ZMP (+N5XXD)
48,972 318 77 16 M

6

East Bay

K6XV 121,186 767 79 16 A
KG6HM 572 22 13 7 A
W6BSY 127,920 820 78 21 B
W6QK (NH7A,op)
108,528 714 76 16 B
K6ZM 88,396 574 77 24 B
W6RJ 47,268 303 78 24 B
N6UUG 42,328 286 74 6 B
WB6DSV 40,108 271 74 6 B
KF6BIR 7,888 68 58 24 B
N6RO (+K3EST)
251,694 1593 79 24 M
K6AW (+KX7M)
238,836 1531 78 24 M
W6DI (+WX6M)
150,920 980 77 15 M
W6RGG (+NET)
111,072 712 78 16 M
W6ATV (+NET)
48,032 304 79 24 M

Los Angeles

K6LA 198,764 1258 79 24 A
K6RO 176,124 1129 78 24 A
K0DI 128,076 821 78 19 A
W6KC 123,714 783 79 20 A
WB6NFO 61,138 397 77 18 A
KF6SWI 37,950 253 75 22 A
K6ZCL 33,592 247 68 20 A
KD6KHJ 28,424 209 68 19 A
AB6YQ 23,712 156 76 23 A
WB6CGZ 20,664 164 63 13 A
KQ6ES 20,580 147 70 24 A
KB6ATT 20,016 139 72 24 A
KQ6TI 13,108 113 58 24 A
WA6HXF 12,688 104 61 15 A
W3SE 9,296 83 56 3 A
N6TCV 1,232 28 22 4 A
N5BF 41,328 287 72 15 B
N6IC 26,070 165 79 14 B
KR6DX 12,012 78 77 8 B
WA6URY 4,218 57 37 3 B
N6XTT (+N6RMJ,KE6CTI,KQ6RM, KE6TZA)
180,960 1160 78 23 M
KQ6YN (+WA6R,KG6MO)
53,048 349 76 24 M
K6TSG (WB6JBL,W6KAT)
47,472 344 69 24 M
W6G (WA6BIL,WB6JCD,ops)
41,040 285 72 19 M
WA6DLM (+W6OYA)
38,016 264 72 24 M
AE6YL (+KC6G)
16,464 147 56 16 M
W6UE (KA6SAR,N6VI,N7UE,W1EEL, W4EF) 266,546 1687 79 24 C

Orange

K6HRT 119,764 758 79 20 A
WA6JZQ 29,748 222 67 13 A
KO6XB 23,552 184 64 9 A
KF6HAM 19,272 146 66 12 A
WA6GFR 19,008 144 66 13 A
AC6WD 13,680 152 45 24 A
W6NT 11,040 115 48 12 A
K6PB 9,996 102 49 7 A
KE6GUQ 4,070 55 37 6 A
KC6OKU 720 30 12 3 A
N6HC 194,376 1246 78 21 B
W6TKV 91,656 603 76 17 B
W6HT 6,552 126 26 3 B
W6EEN (+K6XC,KI7WX)
250,272 1584 79 24 M
KG6OK (+KB6FYG,KF6HVO,W1HIJ, KD6SBI) 120,712 764 79 20 M
WM7D (+NET)
65,364 419 78 24 M
N6RT (+NET)
16,380 105 78 7 M

Pacific

KH7Q (WE9V,op)
12,348 126 49 5 Q
KH6/WB6FZH
1,500 30 25 24 Q
KH7FX 11,328 118 48 6 A
KH7L 4,824 67 36 16 A
WH6CZU 3,100 50 31 5 A
KH7R (KH6ND,op)
327,218 2071 79 24 B
KH6/K2PLF
193,128 1238 78 23 B

Sacramento Valley

KO6CX 25,856 202 64 22 Q
WO3B 56 7 4 1 Q
W6QEU 115,440 740 78 24 A
W6DQ 55,458 351 79 10 A
N6WR 52,416 336 78 22 A
K6FO 24,124 163 74 13 A
WA6HHN 9,568 104 46 6 A
KF6OBS 2,392 46 26 9 A
N6IFW 2,310 35 33 24 A
K6BPB 140 10 7 2 A
W6GO (N6IG,op)
309,048 1956 79 24 B
W6LP (K7BV,op)
231,786 1467 79 23 B
N6KD 160,054 1013 79 20 B
K6UT 118,658 751 79 24 b
K6BZ 79,632 504 79 8 B
W6EU 45,890 353 65 6 B
KS6A 43,924 278 79 24 B
W3FF 15,800 100 79 8 B
K6NO (+K6RC,N6IYS)
236,210 1495 79 24 M
N6ZS (+N6SNO)
230,206 1457 79 24 M
W6UT (+N6AFI,K6OM)
197,500 1250 79 24 M
WM6A (K6KAY,K6DB,ops)
167,954 1063 79 20 M
K6GV (+K6RC)
152,154 963 79 24 M
K6SG (+K6NO)
127,980 810 79 19 M

San Diego

W6CN 30,660 210 73 20 Q
WN6K 150,384 964 78 24 A
W6JVA 24,424 172 71 8 A
AA6EE 16,080 134 60 6 A
K6ZEC 12,896 104 62 15 A
K6VWL 11,000 110 50 14 A
N6IDU 5,934 69 43 18 A
N6VH 51,984 342 76 16 B
N6KI (+K6AM,WB6NBU,KE6EKW)
203,030 1285 79 24 M
K6CT (+NET)
12,482 79 79 6 M

San Francisco

WN6W 39,150 261 75 19 Q
K6UM 128,296 812 79 19 A
W6ESJ 27,720 180 77 17 A
WA6QCL 21,924 174 63 12 A
K6CTA 27,170 209 65 3 B
K6RIM (+NET)
129,718 821 79 14 M

San Joaquin Valley

N6MI (at N6NB)
86,424 554 78 23 Q
WA6YEE 79,248 508 78 24 A
N6YMM 50,400 350 72 14 A
KE6JTH 12,936 98 66 12 A
KI6PG 12,480 120 52 10 A
W6RU (N6ED,op)
267,178 1691 79 24 B
WC6H 203,112 1302 78 24 B
W6UC 50,976 354 72 5 B
W6UDX 23,852 178 67 12 B
KG6F 836 22 19 24 B
NT6K (+KA6BIM)
218,356 1382 79 24 M
NN6NN (W6XK,N6EE,NR6N,W7MH,ops)
190,944 1224 78 24 M
N6TNX (+N6TNW)
115,908 743 78 21 M
KD6WW (+NET)
70,824 454 78 9 M
N6EE (+NET)
10,480 131 40 2 M

Santa Barbara

KF6NNX 1,760 40 22 8 Q
WA6FGV 109,440 720 76 17 A
W6VM 80,104 527 76 13 A
KQ6XL 27,520 215 64 24 A
W6BKY 21,924 174 63 15 A
KQ6NO 16,520 140 59 13 A
KI6OQ 11,330 103 55 24 A
KC6GRY 2,900 50 29 8 A
W6TK 188,494 1193 79 17 B
W6NK 97,960 620 79 9 B
W6HU (W6GL,KF6KQL,W6LX,ops)
64,148 406 79 19 M
W6BHZ (N6NL,KE6SYA,KF6PKU, KD6CVS,ops)
29,252 206 71 13 C

Santa Clara Valley

W6LPW 40,500 270 75 20 Q
N6CY 93,852 594 79 21 A
N6ZB 57,150 381 75 15 A
W6PLJ 46,650 311 75 18 A
W6WS 30,530 215 71 15 A
AD6CH 25,404 174 73 18 A
KQ6OT 23,496 178 66 14 A
W6RYI 19,630 151 65 8 A
K6VGW 10,404 102 51 4 A
N6YD 10,094 103 49 15 A
N6MNZ 6,724 82 41 9 A
W6NL 283,768 1796 79 14 B
W0YK 263,228 1666 79 24 B
K6HNZ 208,718 1321 79 24 B
AE6Y 152,786 967 79 24 B
N6NZ (at N6XI)
141,726 897 79 24 B
AD6E 122,134 773 79 18 B
W6ISO 120,238 761 79 20 B
K6GT 109,968 696 79 23 B
N6BZA 79,632 504 79 8 B
K6XN 57,288 372 77 15 B
AA6W 54,264 399 68 12 B
AJ6V 52,540 355 74 10 B
K6EP 50,160 330 76 22 B
K6RB 45,560 340 67 4 B
W6CF 11,956 122 49 2 B
K6III (+NET)
111,864 708 79 17 M
N6DE (+K6ENT,N2ALE)
105,600 704 75 22 M
W6OAT (+NET)
105,456 676 78 11 M
N6IJ (AA6EG,AE0M,N0BBS,AH6KL,ops)
96,252 617 78 20 M
AK6L (+NET)
53,720 340 79 13 M
K6XX (+NET)
43,050 287 75 10 M
K6PUD (+NET)
34,894 239 73 8 M
W6ISQ (+NET)
1,440 30 24 1 M
W6YX (W6LD,WZ6E,AE6C,ops)
249,166 1577 79 24 C

7

Alaska

KL7FAP 54,312 372 73 16 A
KL7WP 40,608 282 72 15 A
KL7J 25,912 164 79 19 A
KL7Y (WA2GO,op)
280,608 1776 79 24 B
KL1V (+NET)
165,742 1049 79 16 M
KL5T (+KL7TS)
125,268 803 78 16 M

Arizona

N7VY 135,252 867 78 24 Q
W0YHE 37,668 258 73 11 Q
NQ7X 23,184 168 69 24 Q
KI7MN 12,276 99 62 24 Q
KC7GHP 1,200 30 20 4 Q
WA0KDS 128,744 836 77 19 A
NF7E 74,250 495 75 21 A
AA6TY 46,800 312 75 17 A
W7YS 45,600 304 75 24 A
KK6IF 40,950 273 75 24 A
KC7ZRH 40,176 279 72 24 A
W7ZMD 38,760 285 68 10 A
WU9B 26,064 181 72 24 A
KA7AKJ 19,832 148 67 7 A
KK7LU 19,520 160 61 11 A
W7ZT 15,240 127 60 13 A
KA7TDH 11,342 107 53 7 A
K7TR 8,772 86 51 7 A
KC7ZUX 5,880 98 30 24 A
K6LL 321,688 2036 79 24 B
W7WW 175,188 1123 78 23 B
KE7RQ 26,780 206 65 16 B
K6TIM 21,736 143 76 23 B
KI7LS 9,898 101 49 24 B
NM7I (NU7I,K7ON,ops)
110,758 701 79 24 M
W7ON (+N7NFX)
43,680 280 78 17 M
N7LR (+KC7FWM,W9CF)
41,800 275 76 24 M
K7MPM (+K7RFM)
26,358 191 69 20 M
KC7KFF (KC7MOD,KC7RZR,KC7WJE, KC7TNQ,KC7TZJ,N7UJJ,KC7MOC, WA7ZPU,ops)
90,060 570 79 24 C

Eastern Washington

K7MM 102,858 651 79 24 Q
K7FR 12,208 109 56 2 Q
WS7V 131,298 831 79 24 A
W7WMO 66,360 420 79 14 A
KI7AO 20,212 163 62 24 A
K7IR (K7XS,W7AGV,N7CGW,ops)
213,458 1351 79 24 M
W3AS (+ops)
108,420 695 78 12 M

Idaho

K7ZO 105,860 670 79 18 A
KK7A 84,846 537 79 9 A
AA7UN 68,796 441 78 24 A
WO7Y 50,310 387 65 5 A
KW7N 42,104 277 76 21 A
KE7RT 38,252 262 73 24 A
W4TVI 9,540 106 45 24 A
KC7ESB 7,844 106 37 11 A
WB7CYO 6,400 100 32 5 A
W7ZRC 77,220 495 78 7 B
KJ7TH 75,524 478 79 24 B
WA0DYU 43,736 284 77 12 B
W7UQ (KI7RO,AB7YB,KD7DIG,ops)
115,656 732 79 24 M
W7ISU (N7LQY,W7II,N7LB, KD7AKN,ops)
50,876 322 79 22 C

Montana

AB7CE 32,100 214 75 24 Q
K7PGL 107,440 680 79 16 A
K7BG 42,624 296 72 8 Q
KG7VQ 34,018 233 73 21 A
KC7MZT 15,222 129 59 16 A
N7ML 311,576 1972 79 24 B

Nevada

KJ7RF 30,646 199 77 15 A
N7TR 323,268 2046 79 24 B
K5RC 121,680 780 78 9 B
WA7UTM 18,486 117 79 7 B
W7UNR (W7PW,KB7IWT,KC7TCK, K7NHP,WA2FDK,ops)
33,654 237 71 21 M

Oregon

W7YAQ 122,304 784 78 24 Q
K4XU/7 178,856 1132 79 22 A
K7KJ 95,160 610 78 18 A
KJ7CY 48,190 305 79 18 A
KI7Y 44,992 296 76 11 A
KC7Q 31,724 206 77 23 A
KK1A/7 14,224 127 56 4 A
K7ZM 13,588 86 79 24 A
WB7TIR 7,490 107 35 24 A
W7GG 254,380 1610 79 24 B
AG7M 160,314 1041 77 13 B
KA7A 54,132 347 78 13 B
K7VIT 19,964 161 62 7 B
W7IMP 12,168 78 78 11 B
N7HV (N7ATM,N7EAT,K7EW,ops)
208,876 1322 79 24 M
N7SG (+K7FD)
96,222 609 79 20 M
K7ZUM (+KD7BSW,KC7TWZ)
91,872 638 72 15 M
KT7S (+K7GDN)
57,152 376 76 15 M
W7PXL (AA7LE,WJ7R,KK7NJ,KC7VWQ, KC7VWN,AA7OJ,KA7SDW,N7NU, NG7E,ops)
42,048 292 72 24 M
KK6WF (+KC7WWS)
36,120 258 70 24 M
W7SIR (+W7PAT)
13,340 115 58 13 M

Utah

K6EIL 47,158 323 73 16 Q
NT7Y 19,564 146 67 16 A
W7HS 6,020 70 43 7 A
K7BYU 1,196 26 23 4 A
K7CF 225,308 1426 79 24 B
K8EI (+NET)
38,190 285 67 6 M

Western Washington

KB7UXP 36,540 261 70 18 Q
K7QQ 188,020 1190 79 22 A
W7QN 79,862 547 73 16 A
AB7RW 52,206 339 77 17 A
KB7PKC 51,450 343 75 23 A
NX7K 40,950 273 75 5 A
NR7RR 38,038 247 77 20 A
AD7U 34,944 273 64 9 A
N7MOK 34,650 231 75 17 A
KE7SW 33,000 220 75 21 A
N7FL 31,536 219 72 24 A
AB7PX 27,740 190 73 12 A
KK7GW 26,130 195 67 10 A
W7JED 25,944 188 69 16 A
W7WIA 24,400 200 61 14 A
N7OZN 21,320 164 65 17 A
W7LRD 20,984 172 61 7 A
KC7SSN 16,874 143 59 12 A
ND7P 12,880 115 56 6 A
AA7VT 11,550 105 55 15 A
N7WA 10,976 112 49 24 A
KD7LJ 9,696 101 48 7 A
W7OVJ 9,400 100 47 9 A
W7POE 8,832 96 46 6 A
N7CKP 640 20 16 24 A
W7WA 285,190 1805 79 22 B
W7TI 49,612 314 79 10 B
WQ7A 39,156 251 78 24 B
N7DOE 26,536 214 62 2 B
N7RVD 3,328 52 32 4 A
N7PP (W7BUN,K8RN,N7DOE,WB7DFQ, KB7QOP,ops)
167,544 1074 78 24 M
W7NWA (+ops)
71,484 483 74 24 M
N0AX (+KD7BUQ,KC7IXZ)
70,200 450 78 24 M
K7PAR (KD7E,K7UK,KD7DEY,ops)
20,216 133 76 23 M

Wyoming

N0AH 154,000 1000 77 24 A
N6KL 61,350 409 75 24 A
N7QAX 23,800 170 70 15 A
KC7WXW 23,100 210 55 19 A
WB7S 22,512 168 67 24 A
NQ7Q 11,600 116 50 8 A
WB0TCZ 7,392 84 44 4 A
KS7WY 5,320 70 38 8 A
KJ7IM 91,798 581 79 15 B
N7JT 57,456 378 76 18 B

8

Michigan

K8LJQ 29,680 212 70 22 Q
KD8WV 5,920 74 40 4 Q
N8PVZ 4,810 65 37 10 Q
W8MJ 196,394 1243 79 24 A
AA8VG 99,912 724 69 23 A
K8RDJ 74,100 475 78 22 A
WA8RD 54,668 346 79 15 A
K8SB 49,296 312 79 14 A
W8JJ 49,296 312 79 12 A
AB8CI 46,816 308 76 16 A
WA8FRD 44,162 311 71 18 A
WB8GUS 40,200 268 75 20 A
N8EN 40,044 282 71 14 A

N8NX 40,040 286 70 8 A
K8IR 39,024 271 72 13 A
N8YEL 35,392 224 79 24 A
NX8K 33,180 237 70 18 A
W8TJQ 31,682 217 73 11 A
K8CV 28,810 215 67 24 A
N8BEE 26,860 170 79 15 A
N8TDE 21,420 170 63 18 A
W8EGI 19,800 150 66 9 A
KC8FXR 19,096 154 62 10 A
KE8UM 18,432 128 72 12 A
KC8GMT 17,514 139 63 17 A
KC8JUZ 17,100 190 45 6 A
W8EO 16,800 140 60 24 A
K8JN 16,750 125 67 17 A
WB8AFO 16,170 147 55 8 A
KE7UA 15,232 119 64 9 A
W8PDI 14,580 135 54 8 A
N8VEN 14,364 126 57 12 A
KB8UMT 13,688 118 58 24 A
K8BZ 13,674 129 53 5 A
K8GA 12,600 126 50 7 A
WD8DJB 12,432 111 56 10 A
N8KCG 11,760 105 56 11 A
N8MG 11,000 110 50 7 A
WD8R 10,812 102 53 7 A
WB8HBJ 10,710 105 51 7 A
N8UUS 10,560 110 48 24 A
W8WQ 10,080 105 48 10 A
KE8FO 10,000 100 50 6 A
W8JBA 9,680 110 44 6 A
AA8UU 6,348 69 46 6 A
AA8WB 5,360 67 40 8 A
KB8QO 4,514 61 37 5 A
KC8IHP 3,650 73 25 10 A
KC8JYG 1,360 40 17 7 A
W8UE 1,044 29 18 1 A
KB8TWM 720 24 15 7 A
KI8HA 468 18 13 4 A
KE8GG 168,744 1068 79 24 B
KB8VCK 98,118 621 79 22 B
KG8HZ 71,100 450 79 20 B
AA8PA 60,672 384 79 13 B
WB8CLX 32,060 229 70 11 B
KG8OU 30,030 195 77 15 B
WA8OLD 23,400 180 65 24 B
K8IKW 11,024 104 53 11 B
K8CC (+K9TM,KT8X,N8KR,WD8S, WR8W) 272,708 1726 79 24 M
KG8CW (+KC8HLD) 192,760 1220 79 24 M
W8TNO (WD8PLE,N8SNM,K8ZZU, N8RGZ,ops) 158,158 1001 79 22 M
NT8V (+AC8W,K8DD,N8CQA,W8XI, KB8WMW) 92,272 584 79 24 M
N5XHT (+WA1LRL) 72,206 457 79 18 M
WB8RNY (+WA8TJA,N8MDD,N8FZT, N8GYK,K8MIO,WA8OOH) 61,152 392 78 24 M
N8WTH (+N8DEF,N8DEH) 40,740 291 70 24 M
AA8KR (+N8WIQ) 34,848 242 72 23 M
ND5S (+NET) 34,602 219 79 13 M
KA8NDY (+KG8WG) 28,684 202 71 17 M
N8MR (+ops) 27,360 180 76 14 M
KB8HGM (+KC8FVS) 23,184 184 63 14 M
KD8FS (+NET) 22,800 152 75 13 M
KF8YC (+KB8UBK) 19,200 150 64 8 M
KI8GR (+N8RWK,WD8KZP,N8IVW, N8ZLQ,KC8JAE,KC8KNU,KD4DLA, KB8TOO,ops) 15,340 130 59 6 M
KG8ZD (+NET) 14,500 145 50 9 M
KC8ELY (N8ESW,N8MMF,N8ZDW, N8NJE,ops) 14,136 124 57 24 M
AA8U (+NET) 12,636 81 78 6 M
K8RO (+W8BAK,N8REZ) 12,584 121 52 18 M
W8KW (KE8RA,W8UE,ops) 66,768 428 78 24 C

Ohio

WA8RJF 53,246 337 79 15 Q
N8IE 19,880 142 70 15 Q
K8OUA 17,284 149 58 8 Q
N8MWK 5,808 66 44 24 Q
W8SA 126,360 810 78 24 A
N6WLX/8 124,978 791 79 20 A
W4NTI 99,540 630 79 22 A
W8UPH 71,416 452 79 23 A
N8FWA 63,492 407 78 24 A
W8KN 62,726 397 79 18 A
K8KR 46,956 301 78 13 A
N8YGG 45,504 288 79 24 A
WA8KIW 41,250 275 75 13 A
N8FSP 40,464 281 72 17 A
WD8AJF 39,220 265 74 13 A
KJ8F 39,000 250 78 24 A
W8BD (K8NQC,op) 34,500 230 75 24 A
N8EW 31,392 218 72 24 A
W8TTS 27,740 190 73 11 A
WD8B 27,470 205 67 24 A
K8VUS 26,910 195 69 16 A
KB8SHE 26,004 197 66 15 A
KC8BZV 24,426 177 69 13 A
WA8RCN 23,100 175 66 8 A
W8RHR 22,650 151 75 24 A
W8NHO 21,476 182 59 20 A
KI8CS 21,442 151 71 24 A
W8IDM 19,564 134 73 8 A
N8FSQ 18,944 148 64 9 A
WX8U 18,744 142 66 10 A
AB8AG 17,980 155 58 18 A
N8ATT 17,272 127 68 8 A
WJ8C 16,116 102 79 13 A
N8JP 14,160 120 59 7 A
KD8UC 13,250 125 53 14 A
W8DYF 12,980 110 59 8 A
K8BL 12,482 79 79 5 A
KC8HWV 12,240 120 51 10 A
KB8WDX 12,190 115 53 9 A
KI8CZ 11,340 105 54 6 A
KC8BTA 9,048 78 58 24 A
KC8IOR 6,324 62 51 12 A
K8LN 5,550 75 37 24 A
WA8NVW 2,880 60 24 4 A
N8RPA 2,668 58 23 5 A
N8WS 468 18 13 1 A
N8RVR 378 9 21 12 A
W0CG 181,068 1146 79 24 B
AC8E 106,018 671 79 19 B
K8MR 88,200 588 75 7 B
N8BJQ 52,298 331 79 12 B
NW4G 36,000 240 75 10 B
K8NIA 31,044 199 78 19 B
W8SJU 26,412 186 71 24 B
W8KEN 25,428 163 78 15 B
N8BC (K8BL,op) 16,800 150 56 2 B
KW8N (+K9NW,KF8TY) 287,718 1821 79 24 M
W8BHA (+K8LAW,WB8AMY,N8PCN, KC8BGI) 108,546 687 79 24 M
W8VM (K8ME,AF8C,W8IDM,K8VUS, N8OSM,ops) 103,490 655 79 24 M
K8SCH (+ops) 71,100 450 79 22 M
K8CX (+NET) 57,876 371 78 10 M
KG8DH (+NET) 41,040 270 76 18 M
WT8C (+NET) 38,552 244 79 8 M
N8TR (+NET) 31,356 201 78 9 M
KI8AK (+KC8AYH) 30,368 208 73 24 M
W8XS (+KI8GG,KC8IXG) 24,016 158 76 19 M
W8NP (KF8UN,KI0DE,W8SSB,KC8IHR, ops) 23,384 148 79 18 M
W8MBI (KC8BOM,KB8NPA,KB8VYB, WA1FXT,ops) 21,608 146 74 20 M
AA8BV (+KB8VXJ,WB8PIY) 17,214 151 57 8 M
WD8DQA (N8WCU,KC8BEW,KC8LCT, N8OFK,KE8YP,WN8C,WZ8P,WX8J, ops) 150,384 964 78 24 C

West Virginia

K5IID 71,916 461 78 23 Q
K8OQL 140,756 914 77 24 B
W8ZA 104,988 673 78 24 B
K2UOP 86,584 548 79 24 B
N4ZR 39,888 277 72 6 B
N8II 19,140 165 58 3 B
K8WT (+N8YYS,KV8S) 185,808 1176 79 23 M
KB3AUG/8 (+NET) 121,660 770 79 18 M
WA8ZDL (+N8HTT) 20,540 130 79 20 M

9

Illinois

KX9X 80,738 511 79 24 Q
KK9A 177,592 1124 79 24 A
K9UIY (at WB9Z) 135,564 858 79 24 A
N9VVV 133,224 854 78 23 A
WO9S 130,192 824 79 21 A
K9ZO 115,024 728 79 16 A
W9YK 97,486 617 79 18 A
WD9CIR 69,994 443 79 13 A
N9MSG 58,656 376 78 18 A
WX9U 53,088 336 79 9 A
WV9T 42,480 295 72 5 A
KC9MZ 41,800 275 76 20 A
K9JE 41,610 285 73 10 A
W9UIH (W0TPO,op) 41,496 273 76 22 A
K9BF 38,776 262 74 24 A
W9YS 36,814 233 79 24 A
KB9CYL 35,000 250 70 14 A
N0EPT 32,430 235 69 17 A
K9HUH 31,980 205 78 15 A
W9LNQ 31,600 200 79 11 A
W9HL 29,808 207 72 14 A
WA9CCQ 26,800 200 67 9 A
N9JFW 26,000 200 65 19 A
AA9F 23,798 163 73 9 A
WD9EJK 22,800 150 76 12 A
NA9DX 22,780 170 67 24 A
N9ZUT 22,072 178 62 24 A
KG9GK 20,590 145 71 14 A
AA9DM 20,160 160 63 24 A
W9BZP 20,100 150 67 24 A
N9NT 18,492 138 67 12 A
K9NA 16,896 128 66 11 A
W0HED 16,200 108 75 20 A
WI9B 16,112 106 76 19 A
W9SZ 13,970 127 55 5 A
K9YO 13,916 142 49 24 A
W9LYN 12,650 115 55 8 A
KA9FAJ 12,036 102 59 24 A
WD9HBC 11,040 115 48 11 A
N9KDJ 10,584 108 49 10 A
AA9SK 10,400 104 50 24 A
K9KJ 9,898 101 49 24 A
N9NW 8,100 81 50 24 A
N9TUQ 7,740 90 43 13 A
N9MBK 7,488 144 26 24 A
K9KM 3,498 53 33 1 A
KB9JLW 3,450 75 23 24 A
AA9VT 3,200 50 32 5 A
W9NHX 1,656 46 18 4 A
KG9OT 198 11 9 1 A
K9GY 16 4 2 1 A
WB9Z 234,468 1503 78 24 B
K9BGL 233,050 1475 79 24 B
K9PW 174,906 1107 79 24 B
KI9A 156,420 990 79 22 B
WA9TPQ 135,090 855 79 15 B
N9STL 108,704 688 79 22 B
K9CC 84,240 540 78 14 B
K9LU 49,928 316 79 12 B
W9GIG 36,328 239 76 11 B
WE9A 34,128 237 72 4 B
WA9DRE 32,400 216 75 24 B
KC9IL 22,080 160 69 4 B
N9CO 20,832 168 62 3 B
W9YH (N4OGW,op) 17,202 141 61 3 B
N9YCT 14,964 129 58 16 B
KG9N 8,436 111 38 1 B
K9MOT (K9UQN,N9EP,AA9AE,N9KNS, N9MUC,WA9DLB,K9RR,K9QI, WB9PFM,ops) 102,700 650 79 23 M
W9GKA (+K9ZA) 87,532 554 79 24 M
W9EM (+KB9LPM,AA9QT) 82,992 532 78 24 M
N9THC (+N9TZQ) 82,544 536 77 24 M
W9SMC (+N9JF) 74,328 489 76 24 M
NN9K (+K9WA,KB9IUA) 45,662 289 79 16 M
NW9V (+N9PGO) 40,348 262 77 19 M
K9BAR (N9LJY,N9GH,N9WJJ, K9JO,ops) 22,776 146 78 18 M
KB9JIZ (+ops) 4,930 85 29 24 M

Indiana

N9DHX 34,164 234 73 17 Q
K9DIY 21,450 165 65 13 Q
W9UR 18,000 150 60 5 Q
AJ9C 191,100 1225 78 24 A
W9AU 99,066 627 79 19 A
AC4HI 57,564 369 78 19 A
K9WX 54,600 350 78 16 A
W9ZP 44,616 286 78 20 A
WA1MKE 39,312 273 72 21 A
W9SN 37,200 248 75 24 A
WB9LRK 33,258 241 69 12 A
NX9B 31,390 215 73 21 A
K9MI 24,552 198 62 9 A
N9FD 19,584 144 68 12 A
K9FT 11,832 116 51 9 A
KF9YH 11,128 107 52 24 A
WD4IXL 10,560 110 48 9 A
KB9ORH 7,770 105 37 9 A
N9RV 112,788 723 78 9 B
W9RE 44,148 283 78 6 B
K9RU 20,860 149 70 5 B
KE9I (+N9QX) 207,454 1313 79 24 M
K9WJU (KA1LXG,N1LL,KB9MOH, WB9ZEZ,KB9NTY,KB9BBI,KB9SDU, KB9HKF,ops) 45,750 305 75 24 M
KB9THU (+K9IG) 15,552 243 32 6 M
W9YB (AD4OS,NP3JG,ops) 7,600 100 38 6 C
W9NAA (N9JBY,WB9Q,ops) 1,440 30 24 2 C

Wisconsin

N9CIQ 30,360 220 69 24 Q
AF9J 7,290 81 45 12 Q
W9FZ 88,616 583 76 23 A
KA9FOX 65,728 416 79 24 A
WA1UJU 62,400 416 75 11 A
KB9AMG 39,812 269 74 12 A
K9ARF 29,722 193 77 24 A
WB9BWP 13,920 120 58 6 A
KB9LIE 12,636 117 54 15 A
K9CAN 12,482 79 79 8 A
WD9GWH 10,246 109 47 7 A
N0ZBN 9,898 101 49 8 A
N9WNU 8,772 102 43 7 A
W9FBC 6,370 65 49 7 A
KB9ARA 870 29 15 3 A
N6NKO/9 816 34 12 5 A
KB0LGB 480 24 10 2 A
W9XT 100,962 639 79 24 B
N9FH 74,102 469 79 7 B
N9NE 34,160 280 61 4 B
NE9U 20,880 174 60 2 B
WI9WI 12,400 124 50 3 B
W0AIH (+KF0UK,WR0DK,KI0F,KB9S, K0TG) 222,780 1410 79 24 M
KC9GG (+KE9NJ) 116,220 745 78 24 M
N9PQU (+NET) 21,714 141 77 8 M
K9OSH (+NET) 11,024 106 52 8 M

0

Colorado

K0RI 103,964 658 79 20 Q
KI0II 41,648 274 76 24 Q
KI0G 9,800 98 50 9 Q
WB0HZL 8,820 105 42 7 Q
N4VI 140,556 901 78 23 A
W0ZA 47,400 300 79 15 A
KR0U 41,184 286 72 6 A
WA0ZTI 21,728 194 56 11 A
W6NIZ 19,152 126 76 14 A
KC0COP 17,110 145 59 11 A
W0CBH 14,884 122 61 24 A
N0UVR 12,852 119 54 6 A
N0LER 7,968 83 48 8 A
KI0ND 2,700 45 30 4 A
N5ZR 1,344 32 21 2 A
K0KE 277,132 1754 79 24 B
KG0ZI 215,446 1399 77 21 B
K0GAS 128,544 824 78 10 B
WO0SK 123,084 789 78 15 B
KT0DX 91,166 577 79 24 B
KF0LA 16,274 103 79 13 B
W0ZP 13,248 138 48 24 B
W0GG (+WB7VHR) 235,716 1511 78 23 M
K0DU (+K0UK,N0ZA) 191,022 1209 79 24 M
N0RAB (+NET) 15,642 99 79 10 M
N0LM (+ops) 14,586 143 51 7 M

Iowa

K0JGH 38,220 245 78 24 Q
KC0AYG 32 4 3 Q Q
WN0G 167,480 1060 79 24 A
NU0Q 65,520 420 78 24 A
KA5NWB 39,848 293 68 18 A
N0RKX 38,152 251 76 18 A
N0HD 33,320 238 70 13 A
KB0RYH 29,536 208 71 24 A
KB0MRE 22,400 200 56 14 A
N0AC 18,972 153 62 24 A
WA9LKD 16,992 144 59 7 A
N0HPP 14,884 122 61 18 A
K0RX 10,952 74 74 5 A
N0IXY 10,904 116 47 10 A
WB0B 10,710 105 51 5 A
K0EVC 8,888 101 44 18 A
W0OF 598 23 13 1 A
K0FG 74,880 480 78 16 B
W0PPF 2,244 51 22 3 B
KE0FT (+KB9LFA,KB9SKP) 43,056 276 78 19 M

Kansas

W0MW 109,592 721 76 14 A
K0FJ 55,626 381 73 10 A
WB0YJT 46,664 307 76 19 A
N0WFN 38,500 250 77 15 A
KA0ITA 31,824 234 68 21 A
KB0WPY 24,190 205 59 21 A
KC0GL 21,320 164 65 10 A
KG0UA 20,590 145 71 10 A
N0ZCU 14,762 121 61 24 A
N0JJO 10,918 103 53 5 A
KA0EIC 6,808 74 46 7 A
KC0ADP 682 31 11 3 A
W0CEM (+K0WA,AB0S,NJ8M) 224,070 1455 77 24 M
KK0SS (+KC0DQ,KA0RNY) 171,600 1100 78 24 M
WX0U (+KB0NZO) 90,692 574 79 13 M
WW0H (+N0TYS) 58,968 378 78 14 M
K0KU (KB9ODS,N9PKN,N0BI,ops) 20,160 160 63 24 M
KA0BHO (+KA0BAT) 12,138 119 51 9 M

Minnesota

N0UR 56,940 390 73 14 Q
WA0VBW 42,300 282 75 17 Q
N0AT (N0KK,op) 193,392 1224 79 24 A
N0IJ 168,270 1065 79 24 A
AC0W 154,682 979 79 24 A
N0HJZ 117,552 744 79 20 A
K3WT 74,100 475 78 10 A
K0QB 57,760 380 76 19 A
W0UC 53,960 355 76 9 A
K0PC 48,692 329 74 9 A
WB0YUC 43,056 299 72 11 A
W0ZQ 42,600 300 71 7 A
WA0RBW 40,500 270 75 10 A
NA0N 39,168 272 72 8 A
KB0JDJ 27,820 214 65 14 A
K0MPH 18,704 167 56 6 A
WA0OTO 16,074 141 57 7 A
N0BM 14,868 126 59 4 A
K0QC 12,000 100 60 3 A
KB0UKI 11,336 109 52 5 A
WA0WOV 11,118 109 51 8 A
WA0WW 10,200 100 51 3 A
W0OR 8,736 91 48 2 A
K0HB 176,802 1119 79 24 B
WA2HFI 66,300 442 75 12 B
K0KX 56,784 364 78 4 B
K0COM 55,648 376 74 12 B
K0AD 43,800 300 73 4 B
AB0BF 31,070 239 65 11 B
K0CAT (K9WIE,op) 28,800 225 64 3 B
KB0VCV 9,312 97 48 4 B
KT0R (+K0OB,K0XQ,K0MX) 263,640 1690 78 24 M
KR0B (+N0BKL,KS0T,KJ0B,AE0F,AF9T, KB0KQA) 205,242 1299 79 24 M
K0JA (+K0JE) 63,200 400 79 23 M
N0WE (+KB0SAA,K0NY,KB0THN) 62,410 395 79 23 M
W0EF (+ops) 39,468 286 69 16 M
W0SW (AA0PL,K0ZRF,KB0RMS,N0ZHJ, W0AB,W0WUG,WA0AXM,WA0NQH, WD0HXW,ops) 36,040 265 68 18 M
W0SV (+WB0TRA) 23,424 183 64 10 M
N1JJ (KB0NLC,N0YPC,KL7YL,W0GJ, ops) 77,376 496 78 10 C

Missouri

KI0LO 86,336 568 76 23 A
K0HOF 64,904 427 76 16 A
KB0PTE 62,094 393 79 18 A
KK2G 57,096 366 78 17 A
WB0QLU 41,550 277 75 17 A
K0DAT 24,282 213 57 7 A
KE0K 23,450 175 67 12 A
K0LWV 19,140 165 58 12 A
AD9P 17,080 140 61 7 A
AA0RT 16,240 140 58 7 A
K0MLH 10,700 107 50 11 A
WA0IYY 5,244 69 38 3 A
KI0MB 173,800 1100 79 18 B
N6TDM 169,218 1071 79 21 B
W3DW 20,618 169 61 8 B
K0RWL (+K0VBU,KM0L) 237,158 1501 79 24 M
KB0VVT (+KG0US) 18,348 139 66 24 M
W5CBC (KB1AHR,KB9NIQ,KC0DKL, ops) 8,648 92 47 4 M
W0EEE (KB0QQF,KB0VLG,KI0MI,KI5LT, KI0HA,KC0DOD,KB0LYI,KB0SXW,ops) 96,408 618 78 24 C

Nebraska

K0IL 83,006 539 77 21 A
KK0DX 54,352 344 79 15 A
KA0T 47,808 332 72 23 A
K0NC 42,450 283 75 14 A
K0PFV 32,428 242 67 11 A
WA0YPY 26,004 197 66 9 A
W0UVC 16,274 103 79 20 A
KA0TKU 15,800 100 79 18 A
N0UVP 5,920 80 37 4 A
AB0FX 4,988 58 43 12 A
KB0RZP 1,404 39 18 6 A
AA0W 1,260 30 21 1 A
K0DG 74,724 479 78 23 B
K0GND (+WD0EGK,K0NC,WA0WRI) 148,362 939 79 21 M
N0GVK (+KE0BZ) 70,668 453 78 18 M

North Dakota

N0ND 36,480 240 76 7 A
K0VX 31,680 220 72 24 A
N0RDJ 24,684 187 66 24 A
WB0O 291,352 1844 79 24 B
KE0A (+N0FW,KB0YRK) 157,526 997 79 21 M
N0FBA (+NY0C) 7,904 104 38 3 M

South Dakota

W0VQC 11,592 126 46 10 A
WB0ULX 3,782 61 31 13 A
KE0Z 520 20 13 1 A
W0SD (WD0T,op) 308,574 1953 79 24 B

Maritime-Newfoundland

VE9FX 46,354 301 77 24 A
VE9AA 65,728 416 79 24 B
VE9XA 42,340 290 73 12 B
VE9HF (+NET) 22,638 147 77 9 M

Newfounldland-Labrador

VO1IMB 62,196 438 71 19 A
VO1RE 70 7 5 1 A
VO1MP 49,608 318 78 8 B
VO1WET 39,848 293 68 18 B
VO1AA (W4SD,W4ZYT,VO1HE,VO1MX, ops) 79,310 515 77 24 M

Quebec

VE2AWR 64,740 415 78 20 A
VE2SAI 20,306 143 71 9 A
VE2GWL 4,514 61 37 24 A
VE2CRL (VA2CL,VA2JTR,VE2DIV, VE2DX,VE2LHR,VE2XID,ops) 71,288 469 76 21 M
VE2MAB (VE3VMF,VA2SH,VE2MPD, VE2ESP,VE2BRT,VE2AAL,VA2SMF, VE2SJA,ops) 46,766 349 67 21 M
VE2UFO (+NET) 24,648 156 79 24 M
VE2CUA (AG8L,VE2HFX,ops) 80,964 519 78 24 C

Ontario

VA3SB 21,960 180 61 16 Q
VA3NR 83,898 531 79 16 A
VE3SRE 67,144 436 77 16 A
VE3BUC 56,160 360 78 23 A
VE3FU 36,656 232 79 9 A
VE3UZ 32,706 237 69 9 A
VE3RZ 27,580 197 70 6 A
VE3GD 27,048 196 69 11 A
VE3KPP 25,830 205 63 24 A
VE3WZ 23,040 180 64 11 A
VE3IOS 17,854 113 79 17 A
VE3EJ 15,620 142 55 3 A
VE3VET 18,328 116 79 8 B
VE3XA (+VE3WG,VE3LHS) 131,936 868 76 15 M
VE3DBF (+VA3DEN,VE3JGR,VA3RJT) 93,940 610 77 23 M
VE3VSM (+NET) 80,264 508 79 24 M

Manitoba

VE4VV 31,070 239 65 8 Q
VE4GV 266,072 1684 79 24 A
VE4AQ 66,992 424 79 14 A
VE4JOP 4,128 43 48 22 A

Saskatchewan

VE5QRP 36,900 246 75 18 Q
VE5SF 215,986 1367 79 24 A
VE5CMA 116,446 737 79 21 A
VE5AAD 47,428 334 71 9 A
VE5CPU 128,232 822 78 23 B

Alberta

VE6JO 193,234 1223 79 21 A
VE6ATT 130,548 946 69 14 A
VE6FU 66,528 432 77 24 A
VE6BF 24,050 185 65 15 A
VE6IM (VE6LDX,op) 18,886 133 71 24 A
VE6JY (VE5MX,op) 327,692 2074 79 24 B
VE6AO (VE6EX,VE6KC,VE6SI,VE6JKZ, VE6RTL,VE6TC,ops) 153,660 985 78 24 M
VE6NN (+VE6II) 32,390 205 79 15 M

British Columbia

VE7IN 158,620 1030 77 22 A
VE7NF 117,000 750 78 23 A
VE7CFD 115,654 751 77 24 A
VE7TLK 114,422 743 77 21 A
VE7XB 42,712 281 76 24 A
VE7SZ (VE7NTT,op) 333,854 2113 79 24 B
VE7AGJ 197,028 1263 78 24 B
VE7NA 33,726 231 73 23 M
VE7KLX (+VE7ASY) 25,872 196 66 17 M

Yukon

VY1A (VY1JA,op) 215,986 1367 79 24 B

By **Steve Ewald, WV1X**

1998 Simulated Emergency Test Results

Radio amateurs throughout the nation put their emergency communication skills to the test last October.

The 1998 ARRL Simulated Emergency Test (SET) challenged the ARRL Field Organization and the entire Amateur Radio community to take stock of their abilities to perform in emergency situations. On the weekend of October 3 and 4, 1998, members of the Amateur Radio Emergency Service (ARES), the National Traffic System (NTS), the Radio Amateur Civil Emergency Service (RACES), and many other participants practiced their communication skills and tested their equipment under simulated emergency conditions. The results and summaries that follow represent hard work, planning and cooperation with public service agencies. Congratulations to everyone that took on the challenge to better prepare themselves for emergencies.

The following excerpts from the report by Alan Croswell, N2YGK, captures the essence of what the Simulated Emergency Test is all about. Alan is the ARRL Emergency Coordinator for the Westchester County (New York) ARES and the Assistant Radio Officer for RACES.

When is the Next SET?

The SET is an annual event and you're encouraged to go another round this year, or get into the ring for the first time! The 1999 SET weekend will be October 2-3. Please check with your ARRL Section Manager and/or Field Organization leaders for local SET details in your area.

LEE WALTER, WD0HEO AND ERNIE MARTIN, WA0AUU

The Tri-State Amateur Radio Club, based in Cresco, Iowa, has worked long and hard on their communications vehicle—a refurbished van that needed a lot of attention. It is now equipped with a 15 kW generator and can operate on HF frequencies, 6 and 2 meters, 440 MHz, amateur television and packet radio. There is also equipment for Citizens Band, GPS and two programmable public service bands. It will really come in handy during an emergency or simulated emergency exercise.

Westchester County Activates in SET

By Alan Croswell, N2YGK

On the weekend of October 3 and 4, 1998, and the days that preceded it, the Westchester County ARES/RACES group provided mutual aid communication for a joint Duchess and Putnam County simulated response. The hypothetical emergency was an ice storm that had caused many accidents and stranded motorists on I-84 east of the Beacon-Newburgh bridge. Our main role in the exercise was to provide communication between the regional National Disaster Medical System (NDMS) Emergency Operations Center at Castle Point and several Westchester hospitals.

Appropriate Roles for Amateurs

There are some misconceptions—both among amateurs and emergency service officials—about the appropriate roles and abilities of Amateur Radio operators in emergency situations. Amateur Radio operators *supplement* rather than replace existing public safety and commercial communications facilities. They are volunteers who have jobs, personal lives and varied levels of technical and operating expertise. They are not professional communicators or emergency responders, but they do strive to approach their volunteer service with a high level of professionalism.

Amateurs generally have the skills and personally owned radio equipment necessary to provide effective backup or supplemental communications at times when normal public safety and commercial communications systems are overloaded or otherwise busy with mission-critical traffic. With proper training the typical technically oriented Amateur Radio operator can prove to be a useful asset in filling the gaps in normal communication systems. Such amateurs excel in their abilities to respond to changing communication conditions and needs.

The annual ARRL SET is one of many opportunities to train Westchester's local Amateur Radio operators. Thanks to the strong support of the Office of Disaster and Emergency Services, many other training opportunities are presented throughout the year.

The Local Drill

The 1998 exercise was driven primarily by the Duchess/Putnam SET drill. As such, we are indebted to Lloyd Frink, K2KJ, Duchess County Emergency Coordinator (EC) and Mel Penner, K2MEL, Putnam County EC. Westchester ARES/RACES acted solely in a supporting role, responding to drill stimuli from Duchess/Putnam.

The Westchester portion of the drill started Thursday night with an "all hands" call-out using the WECA 147.06 MHz repeater and a telephone call-up tree. During the call-up, members were asked to volunteer for one of four four-hour shifts to take place Saturday and Sunday with the majority of activity anticipated for Sunday morning. About 18 operators made themselves available for one of the shifts.

For the first shift on Saturday, communicators were dispatched to six hospitals. Two operators acted as net control stations; two established contacts on 80 meters and one made a RTTY contact on 10 meters. Traffic was passed between the hospitals and the Castle Point Veterans Administration hospital, location of the regional NDMS Emergency Operations Center. The traffic consisted of bed availability inquiries and simulated patient-in-route notifications (and confirmations of their arrivals). The remaining shifts consisted primarily of operators checking into various NTS nets including New York Public Operations, New York Phone, New York State Phone Traffic and Emergency, New York State CW and the Second Region Net. Traffic from the Duchess American Red Cross chapter was received, relayed and acknowledged by the Westchester chapter.

Lessons were drawn from this experience, and they will be beneficial. For example, a facilities information database has been established to document the locations and characteristics of the hospital antennas and operating positions. The SET deadline helps push along the process a little more each year. Field experience at the hospitals identifies changes that have been made and documentation corrections that are needed.

1998 SET Top Ten

Section	*Points*
ARES Activity	
Michigan	9969
North Carolina	9889
Western Pennsylvania	4447
Ohio	2809
Arkansas	2496
Eastern Pennsylvania	1954
South Texas	1800
Western New York	1640
Western Washington	1581
Orange	1291
Section/Local Nets	
North Carolina	6003
Michigan	4092
Ohio	1921
Western Pennsylvania	1774
Western New York	1345
Mississippi	760
Eastern Pennsylvania	717
Western Washington	622
Maine	552
West Virginia	523

SET Scorecard

The points for ARES activity were awarded in the following manner:

Category	*Points*
(A) Number of amateurs participating	2 (each)
(B) Number of new amateurs (licensed since 1995)	3 (each)
(C) Number of formal third party messages originated on behalf of served agencies	1 (each)
(D) Tactical communication was conducted on behalf of served agencies: (<0.5 hour, 5 points; 0.5-1 hour, 10 points, >1 hour, 20 points)	
(E) Number of stations on emergency power during test	2 (each)
(F) Number of emergency-powered repeaters used in test	10 (each)
(G) Dual membership in ARES and RACES is encouraged	10
(H) Liaison was maintained with an NTS section/local net	10
(I) Digital modes were used during test	10
(J) Number of different agencies for which communication was provided.	5 (each)
(K) Number of communities in which agencies were contacted	10 (each)
(L) Press release was submitted	10

The points for net activity were awarded in the following manner:

(A) Total number of messages handled.	1 (each)
(B) Number of different stations participating	2 (each)
(C) Number of different stations checking in on emergency power	2 (each)
(D) Number of new amateurs (licensed since 1995) in test	3 (each)
(E) Number of net control stations	5 (each)
(F) Number of different stations performing NTS liaison	5 (each)

ARES Activity

Area	*Reporter*	*Points*	*Section Points*
Atlantic Division			
Eastern Pennsylvania			**1954**
Montgomery Co	W3ZQN	708	
Lancaster Co	WB3FQY	359	
Monroe Co	N3ZQJ	268	
York Co	N3GKP	196	
Chester Co	KC3XL	154	
Montour Co	N3IRN	140	
Wayne Co	N3SIN	129	
Maryland-DC			**364**
Anne Arundel Co	N3QXW	130	
Frederick Co	N8AAY	92	
Carroll Co	N3JIA	72	
Kent Co	WA3UJE	70	
Northern New York			**268**
Clinton Co	KB2LML	214	
Lewis Co	N2OYQ	54	
Southern New Jersey			**116**
Ocean Co	WX2NJ	116	
Western New York			**1640**
Oswego Co	KY2F	516	
Tompkins Co	N2WRC	311	
Chenango Co	WA2EYH	232	
Oneida, Madison Co	K2DYB	205	
Onondaga Co	WA2PUU	190	
Herkimer Co	N2ZWO	111	
Delaware Co	WB2JOW	75	
Western Pennsylvania			**4447**
Erie Co	N3HPR	987	
Butler Co	N3XCD	781	
Beaver Co	K3NPX	647	
Westmoreland Co	N3WAV	428	
Allegheny Co	N3DOK	355	
Venango Co	N3QCR	320	
Indiana Co	N3PHF	294	
Fayette Co	K3FQI	215	
Coreen	AA3KC	147	
Forest Co	N3HJU	113	
Blair Co	KA3EJV	94	
Crawford Co	N3OJI	66	
Central Division			
Illinois			**593**
Lake Co	K9DRW	367	
Williamson Co	WA9APQ	226	
Wabash Co	AI9H	199	
DeKalb Co	W9ICU	173	
LaSalle Co	KF9NZ	145	
McLean Co	K9ORP	87	
Kane Co	WB9PPK	85	
Indiana			**1082**
Vigo Co	N9YNF	223	
Whitley Co	WB9UNL	179	
Decatur Co	KA9ZOP	160	
Pike Co	WB9NCE	159	
LaPorte Co	K9ET	124	
Owen Co	WD9BKA	92	
Howard Co	N9LRO	54	
Elkhart Co	KA1LXG	44	
Dearborn Co	KB9OBE	32	
Boone Co	KG9LX	15	
Wisconsin			**676**
Ozaukee Co	WB9RQR	150	
Marquette Co	KB9PCU	131	
Calumet Co	KN9P	118	
Racine Co	KA9RZL	102	
Adams Co	WA9SZH	96	
Rock Co	KB9JQV	79	
Dakota Division			
Minnesota			**525**
Washington/ Dakota Co	K0BTE	175	
Redwood Co	KA0ISD	144	
Lyon & Lincoln Co	WD0BZU	142	
St Cloud	W0MBD	64	
Delta Division			
Arkansas			**2496**
Yell Co	KC5WJW	606	
Sectionwide	KC5ARS	361	
Howard Co	N5THS	287	
Pulaski	KC5NPU	201	
Little River	KC5MLC	168	
Boone Co	N5QYC	165	
Miller Co	KC5TLW	147	
Columbia Co	KB5RYP	131	
Lafayette Co	KB5RYP	126	
Sevier Co	KC5DOR	120	
Pope Co	W5RZ	91	
Central Arkansas	W5RXU	51	
Emmet	K5YSL	25	
Hempstead Co	KB5SSW	17	
Louisiana			**160**
Lafourche Parish	N5PZJ	160	
Mississippi			**684**
Forrest Co	KK5BY	180	
Jackson Co	N5XGI	180	
Vicksburg	KB5WJJ	154	
Lamar Co	KC5TYL	147	
Stone Co	KB5DZJ	23	
Tennessee			**801**
Sullivan Co	WD4PIW	297	
Rhea Co	KN4VY	147	
Carter Co	KD5INB	125	
Meigs Co	KE4MBR	120	
Grainger Co	KU4LV	112	
Great Lakes Division			
Kentucky			**634**
Scott Co	WD4KYD	162	
Calloway Co	KU4GR	106	
Leslie Co	KR4YP	104	
Meade Co	KA4MAP	103	
McCracken Co	KC6GNV	81	
Madison Co	KF4EBC	78	
Michigan			**9969**
Kent Co	K8SG	1907	
Wayne Co	WB8RNY	1818	
Genesee Co	N8MMF	860	
Ionia Co	WB8VKL	633	
Oakland Co	W8HIU	558	
Iosco Co	KB8ZYY	394	
Alcona Co	WD8OWM	305	
Muskegon	N8YJT	301	
Tuscola Co	N8XTN	285	
Arenac Co	KB8ZDX	267	
Lenawee Co	K8YZA	243	
Jackson Co	N8RDP	233	
Ottawa Co	N8GGO	230	
Benzie Co	W8VWY	224	
Monroe Co	KB8AIZ	223	
Livingston Co	N8WWX	149	
Chippewa Co	VE3EHI	185	
Clare Co	KB8VVE	164	
Saginaw Co	N8VDG	162	
West Central MI	KB4CCE	156	
Newaygo Co	KC8FUV	136	
Ogemaw	K5EKP	127	
Mason Co	WZ8T	124	
Branch Co	KI8BM	117	
Macomb Co	N8HZL	97	
Montgomery Co	WA8SCO	71	
Ohio			**2809**
Clermont Co	K8EC	407	
Shelby Co	N8KZL	325	
Erie Co	K8HIH	314	
Sandusky Co	WB8KWD	291	
Adams Co	N8HIA	236	
Montgomery Co	KI8O	189	
Portage Co	N8IIQ	189	
Summit Co	K8EIO	174	
Jefferson Co	N8MGW	159	
Tiffin/Seneca Co	KB8PPU	151	
Fayette Co	WD8PHL	91	
Wayne Co	WD8BVV	83	
Hancock Co	N8SNG	57	
Preble Co	N8YP	70	
Warren Co	N8GE	61	
Jackson Co	WB8LDB	12	
Hudson Division			
Eastern New York			**560**
Westchester Co	N2YGK	288	
Dutchess/PutnumCo	KC2AGL	240	
Greene Co	KC2AGM	32	
New York City/Long Island			**570**
New York City	WB2DWC	315	
Southold Township	N2HQV	255	
Northern New Jersey			**164**
Chatham Borough, Township	W2UH	121	
Englewood	W2CC	43	
Midwest Division			
Iowa			**249**
Des Moines Co	N0EJD	136	
Boone Co	K0CY	113	
Kansas			**44**
District 4, Zone 3	KB0WEQ	44	
Missouri			**424**
Greene Co	KG0IV	156	
Taney Co	NA9X	137	
St Charles Co	N0PNP	131	
Nebraska			**262**
Lancaster Co	K0GND	135	
Buffalo Co	KA0DBK	127	
New England Division			
Connecticut			**547**
Enfield	NM1K	316	
Bethel	KD1YV	126	
Area 2	N1HAX	105	
Eastern Massachusetts			**156**
New Bedford	KD1CY	97	
Cape Cod	WQ1O	59	
New Hampshire			**316**
W Rockingham Co	K1FDH	245	
Merrimack	N1SKZ	71	
Vermont			**174**
District 8	KA1ZQX	104	
Windsor Co	N5IEP	70	
Western Massachusetts			**589**
Sectionwide	N1MUV	455	
N Worcester Co	NZ1D	134	
Northwestern Division			
Oregon			**409**
Josephine Co	KK7BF	144	
Oregon Emergency Mgmt	N7IFJ	143	
Clackamas Co	KA7IJK	122	
Western Washington			**1581**
Clark Co	K7CLL	472	
Distrtict 6	N7LSL	409	
Lewis Co	KC7AXW	157	
Spokane Co	WA7LNC	145	
Clallam Co ARES	KI7ZC	140	
Grays Harbor	N7UJK	127	
Jefferson Co	KC7KCL	67	
Pacific Co	KA6INC	64	
Pacific Division			
East Bay			**454**
Alameda Co	WA6TGF	299	
Alameda Co	WB6NER	155	
Nevada			**315**
W Central District	KA7AJQ	223	
Elko Co	N7JEH	92	
Pacific			**284**
Oahu Civil Defense	AH6NF	195	
Maui Co	KH6H	89	
Sacramento Valley			**525**
Siskiyou Co	KC6HOY	283	
San Lorenzo Valley	KD6YKL	157	
Shasta Co	KC6KZX	85	
San Francisco			**147**
Humboldt	KE6JQW	147	
San Joaquin Valley			**267**
Stanislaus Co	KC6YCH	267	
Santa Clara Valley			**491**
Salinas	N6IBO	215	
Millbrae	KB6TR	119	
Roanoke Division			
North Carolina			**9889**
Guilford Co	KE4IAM	1895	
Buncombe Co	K4BNP	852	

Pitt Co	K4ROK	737	
Eastern Branch 1&2	WD4JPQ	575	
Dare Co	K4UOR	432	
North Central NC	KB1G	426	
Orange Co	KZ1X	412	
Johnston Co	KD4BJD	400	
Area 9	KE4JHJ	350	
McDowell Co	N4YYY	316	
Durham Co	KB4WGA	297	
Lincoln Co	KU4KM	289	
Graham Co	KF4LJV	281	
Wilson Co	KE4OFP	275	
Forsyth Co	KF4KYD	271	
Gates Co	WA4MOK	240	
Haywood Co	N2JLE	237	
Cumberland Co	N4ERM	213	
Lynchburg	K4YCR	195	
Alamance Co	W4VU	168	
Mecklenburg Co	W4CC	162	
Eastern Branch 2	KF4CUI	157	
Carteret Co	AE4ON	155	
Caldwell Co	KD4YTU	148	
Stanly Co	KD4OZI	148	
Nash/EdgecombeCo	KF4NOV	138	
Currituck Co	KD4ATK	120	
South Carolina			**139**
Northwest	KE4EAN	139	
Virginia			**1099**
Chesterfield Co	KA4CBB	276	
Virginia Beach	WA4TCJ	211	
James City Co	KC4CMR	145	
Portsmouth	KE4PAP	131	
Gloucester	KE4NBX	196	
York/Poquoson Co	WB4UHC	84	
Newport News	N4ZBV	56	
West Virginia			**1091**
Mingo Co	KB8KDR	383	
Randolph Co	KB8EIR	241	
Fayette Co	WB8WKO	176	
Kanawha Co	W8XF	162	
Hancock Co	K8QEW	129	
Rocky Mountain Division			
Colorado			**531**
PikesPeak,District14	N9HSW	227	
District 22	KB0UBZ	191	
District 6 ARES	W0WPD	113	
New Mexico			**95**
Farmington	KA0LCD	95	
Southeastern Division			
Alabama			**220**
Central Alabama	KB4JHU	220	
Georgia			**918**
Carroll Co	K4DEY	210	
Muscogee Co	KF4NCV	194	
Gwinnett Co #1	KM4Z	143	
Gwinnett Co #2	KM4Z	127	
SouthwesternGeorgia	AA4P	126	
Spalding Co	N4RDM	94	
Jones Co	WU4C	24	
Northern Florida			**384**
Seminole Co	K4FUY	209	
Citrus Co	W4MCF	175	
Southern Florida			**557**
Highlands Co	W4WDK	222	
Sarasota Co	WD4AHZ	199	
Manatee Co	KE4MPQ	136	
Southwestern Division			
Arizona			**978**
Maricopa Co	KC7AYX	605	
Cochise Co	N7INK	290	
Yavapai Co	WA6ZZJ	83	
Orange			**1291**
Hospitals	WA6OPS	384	
Hemet/San Jacinto	N6PLV	365	
Coachella Valley	K6NET	338	
Riverside Co	N6FJX	225	
Redlands City	N6CMF	183	
Santa Barbara			**385**
N Santa Barbara Co	KF6BNC	167	
Simi Valley	W6OVH	130	
Oxnard Co	W6HWK	88	
West Gulf Division			
North Texas			**720**
Wichita Co	W5GPO	424	
Irving	KA5OZC	190	
Nacogdoches Co	KK5BE	156	
South Texas			**1800**
Travis Co #3	KB5VYT	748	
Travis Co #2	KB5VYT	404	
Hays Co	WA5AA	292	
Travis Co #1	KB5VYT	203	
Brazos Co	KK5NY	153	
West Texas			**427**
District 5	KJ5EO	244	
Brewster Co	WA4ROE	183	

Net Activity

Area/Net Name	*Net Manager*	*Points*	*Section Points*
NTS Area and Region Nets			
Second Region, Cycle 2	W2MTA	95	
Second Region, Cycle 3	W2MTA	73	
Section/Local Nets			
Atlantic Division			
Eastern Pennsylvania			**717**
Westmoreland Co ARES	N3MRU	168	
MCARES	N3ZQJ	163	
District 8 ARES	N3KYZ	118	
Wayne Co ARES	N3SIN	99	
SKYWARN SET	N3KYZ	95	
CCAR	W3QT	74	
Maryland-DC			**368**
CARET	N3JIA	98	
Anne Arundel Co ARES	W4ATN	80	
MDD	WJ3K	79	
MarylandSlowNet	KC3Y	72	
Kent Co ARES	WA3UJE	39	
Western New York			**1345**
OCTEN	KA2ZNZ	380	
WesternDistrictNet	AF2K, N2JRS, KB2UQZ	259	
CNYTN	WA2PUU	172	
Herkimer Co ARES/RACES	KB2WII	108	
New York Phone	N2LTC	105	
Oneida-Madison Emerg	K2DYB	85	
Chenango ARES	WA2EYH	79	
NYS/M	KA2GJV	74	
NYSEMO	N2AGO	43	
TIGARDS	W2MTA	24	
NYSR	W2MTA	16	
Western Pennsylvania			**1774**
SW PA District 1	N3LWQ	531	
Erie Co ARES	N3HPR	367	
Beaver Co Public Service	K3NPX	257	
Butler Co Public Service	N3XCD	193	
WPA PTN	N3QCR	145	
Indiana Co	N3SJR	114	
Blair Co ARES	KA3EJV	70	
Greene Co ARA	AA3KC	62	
Ft Venango Club	N3HJU	35	
Central Division			
Illinois			**432**
Lake Co ARES/RACES	K9DRW	165	
DeKalb Co Emerg	W9ICU	113	
RADIO	WA9THM	85	
VARA	KA9FCF	69	
Indiana			**474**
Wabash Valley ARES	N9YNF	198	
Whitley Co ARES	WB9UNL	74	
Pike Co ARC	WB9NCE	64	
OwenCoARESNet	WD9BKA	53	
Elkhart Co	KA9SYE	45	
Boone Co ARES	KG9LX	40	
Wisconsin			**261**
Marquette ARES	KB9PCU	91	
Racine/Kenosha Wx Net	KA9RZL	67	
Adams Co ARES	WA9SZH	56	
Calumet ARES	KN9P	47	
Dakota Division			
Minnesota			**188**
Marshall Area	WD0BZU	117	
RedwoodAreaARA	KA0ISD	71	
Delta Division			
Arkansas			**507**
Tri-States Emerg	N5THS	132	
Arkansas SET	KC5ARS	131	
Little River Emerg	KC5MLC	53	
Four States ARNet	KC5TLW	47	
Columbia	KB5RYP	36	
Lafayette	KB5RYP	31	
SW Arkansas/ARC	WA5LTA	30	
Emmett ARES	K5YSL	25	
Hempstead/ Nevada Co	KC5FFN	22	
Louisiana			**29**
Lafourche	N5PZJ	29	
Mississippi			**760**
Section-wide Net	W5XX	655	
Jackson Co ARES/RACES	N5XGI	105	
Tennessee			**168**
Lakaway Area	KU4LV	168	
Great Lakes Division			
Kentucky			**472**
Kentucky Emerg	KD4PWK	248	
Purchase Area Emerg	KC6GNV	64	
Meade Co ARES	KA4MAP	63	
CallowayCoARES	KU4GR	61	
Madison Co	KF4EBC	36	
Michigan			**4092**
Wayne Co ARPSC	N8WAQ	1203	
Oakland Co ARPSC	N8SMV	380	
UP Net	WA8DHB	310	
ICARES	K8ILN	298	
MACS	W8RNQ	232	
LenaweeCoARES	KB8SUA	188	
MonroeCoARPSC	KB8AIZ	184	
Ottawa Co ARES	N8GGO	156	
Iosco Emerg	KB8ZYY	155	
QMN	WB8SIW	144	
SEMTN	WI8K	134	
Macomb ARES/RACES	N8HZL	113	
Jackson Co ARES/RACES	N8RDP	96	
ScottCoARESNet	WA4QAK	90	
5-County ARES	KB4CCE	83	
Newaygo Co	KC8FUV	72	
Branch Co	KI8BM	71	
Blair Co ARES	KA3EJV	70	
ClareCoTorchRun	KB8VEE	69	
SaginawCoARES	N8VDG	44	
Ohio			**1921**
Ohio SSB Net	KF8DO	592	
Central OH Traffic	KB8TIA	444	
Shelby Co ARES	N8DIX	235	
SCARES Weekly	WB8KWD	201	
DeForest ARC	N8HIA	119	
Sandusky	K8HLH	114	
Tiffin/Seneca Co	KE8UP	73	
HEARS	N8SNG	47	
PortageEmergency	WB8CXP	42	
Fayette ARA	WD8PHL	33	
Jackson Co	KD8XL	21	
Hudson Division			
Eastern New York			**361**
Hudson Valley Net	N2JBA	361	
Northern New Jersey			**55**
NewJerseyPhone Net	W2CC	55	
Midwest Division			
Iowa			**59**
Boone Co ARES	K0CY	59	
Kansas			**248**
Kansas Sideband	N0KFS	169	
QKS	WB0ZNY	79	
Missouri			**214**
SW MO SKYWARN	N0UAM	124	
Taney Co ARES	NA9X	90	
Nebraska			**70**
E Nebraska ARES	N0FYE	70	
New England Division			
Connecticut			**436**
BEARS of Manchester	NM1K	349	
CT Phone Net	N1DIO	87	
Maine			**552**
Twelve Co Emerg	KA1RFD	515	
Pine Tree Net	W1KX	37	
New Hampshire			**136**
W Rockingham ARES	N1UVU	85	
Merrimack Co ARES	N1SKZ	51	
Vermont			**119**
Brattleboro ARES	KA1ZQX	69	
Windsor Co	N5IEP	50	
Western Massachusetts			**69**
Montachusett Emerg	NZ1D	69	
Northwestern Division			
Western Washington			**622**
Clark Co ARES	K7SUQ	287	
Lewis Co ARES	KC7AXW	99	
JeffersonCoARES	KC7KCL	88	
Auxiliary Emerg Comm	KB7EQW	63	
Pacific Co ARES	KA6INC	45	
Clallam Co ARES	KE7XX	40	
Pacific Division			
Nevada			**153**
Nevada ARES	W6SXX	153	
Sacramento Valley			**85**
Shasta Co	KC6KZX	85	
San Francisco			**116**
Eel River Valley	KE6JQW	116	
San Joaquin Valley			**197**
StanislausCoARES	KF6FIR	197	
Roanoke Division			
North Carolina			**6003**
Guilford Co ARES	KE4AIM	2215	
JARS Emerg	KC4CIZ	450	
Triad SKYWARN	KB1G	416	
Pitt Co	K4CWZ	364	
Buncombe Co	K4BNP	297	
Area 9 ARES	KE4JHJ	239	
Bike Ride Net	KD4YTU	232	
Forsyth Co ARES	KF4KYD	191	
McDowell ARES	AF4HX	191	
Dare Co	K4UOR	171	
Orange Co ARES	W4EZ	150	
Mecklenburg SET	W4CC	143	
Nash/Edgecombe	KF4NOV	138	
GrahamCoARES	KF4LJV	108	
Tar Heel Emerg	K4CWZ	105	
Stanly Co ARES	KD4OZI	102	
BeaufortCoEmerg	KF4CUI	100	
Lincoln Co RACES/ARES	W4SY	99	
HaywoodCoARES	KE4JMH	92	
Wilson ARA	KF4OFP	97	
Alamance ARES	N4MIO	73	
Currituck ARES	KD4ATK	30	
Virginia			**367**
Middle Peninsula ARES	KE4NBX	179	
PARC/PARES	KF4ERI	76	
WilliamsburgARES	KC4CMR	60	
Newport News ARES	N4ZBV	52	
West Virginia			**523**
NightlyTalkAround	KG8GDF	341	
Randolph Co ARES/RACES	KB8EIR	116	
Fayette Co ARES	WB8WKO	66	
Rocky Mountain Division			
Colorado			**164**
ParkCo/MtnARCs	KC7IVB	164	
Southeastern Division			
Alabama			**110**
AENG	KR4JY	110	
Georgia			**274**
Chattahoochie Valley	KF4NCV	144	
Colquitt Co	AA4P	86	
Spalding Co	N4RDM	44	
Northern Florida			**308**
Seminole Co ARES/RACES	KF4BYA	238	
Citrus Co ARES	W4MCF	70	
Southern Florida			**258**
Sarasota Co	WD4AHZ	131	
Highlands Co	W4WDK	127	
Southwestern Division			
Orange			**374**
Coachella Valley	K6NET	183	
Redlands Emerg	W6DZO	110	
Riverside Co RACES/ARES	N6FJX	81	
Santa Barbara			**36**
Oxnard ARES/RACES	W6HWK	36	
West Gulf Division			
North Texas			**213**
Irving RACES/ARES	KA5OZC	115	
Nadogdoches	KK5BE	98	
South Texas			**207**
Hays Co ARES	WA5AA	207	
West Texas			**445**
West Texas nets	KB5HPT	129	
Big Bend Emerg	WA5ROE	103	

1999 ARRL UHF Contest Rules

1. Object: To work as many amateur stations in as many 2° × 1° grid squares as possible using authorized amateur frequencies above 222 MHz and all authorized modes of emission.

2. Date and Contest Period: First full weekend of August. Begins 1800 UTC Saturday, ends 1800 UTC Sunday (August 7-8, 1999). Entrants may use as much of this time as they wish.

3. Entry Categories:

3.1. Single Operator.

3.2. Rover.

3.3. Multioperator.

4. Exchange: Grid-square locator (see April 1994 *QST*, page 86).

4.1. Exchange of signal report is optional.

5. Scoring:

5.1. QSO points:

5.1.1. Count three points for each complete 222- or 432-MHz QSO.

5.1.2. Count six points for each complete 902- or 1296-MHz QSO.

5.1.3. Count 12 points for each 2.3-GHz (or higher) QSO.

5.2. Multiplier: The total number of different grid squares worked per band. Each 2 degrees by 1 degree grid square counts as one multiplier on each band it is worked.

5.3. Final score: Multiply the total number of QSO points from all bands operated by the total number of multipliers for final score. Example: W1AW works W3CCX in FN20 on 222, 432 and 1296 MHz. This gives W1AW 12 QSO points (3 + 3 + 6) and also three grid-square multipliers. Final score is 12 QSO points x 3 multipliers, or 36.

5.4. Rovers only: The final score consists of the total number of QSO points from all bands times the sum of unique multipliers (grid squares) worked per band (regardless of which grid square they were made in) plus one additional multiplier for every grid square activated (made a contact from).

5.4.1. Rovers are listed in the contest score listings under the Division from which the most QSOs were made.

6. Miscellaneous:

6.1. Partial QSOs do not count. Both callsigns, full exchanges and acknowledgment must be sent and received.

6.2. A transmitter, receiver or antenna used to contact one or more stations under one call sign may not be used subsequently during the contest period under any other call sign (with the exception of family stations). The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

6.3. All equipment and antennas used by entrants must be owned and operated by amateurs. Use of non-amateur owned gear is not prohibited, but use of such equipment places the entrant in a separate category, ineligible for awards.

6.4. Contacts made by retransmitting either or both stations, whether by satellite or terrestrial means, are prohibited. Frequencies regularly occupied by a repeater in a locality may not be used for contest work, even if the repeater is turned off.

7. Awards: Certificates will be awarded in the following categories:

7.1. Top single-operator score in each ARRL Division.

7.2. Top single operator on each band (222, 432, 902, 1296 and 2304-and-up categories) in each ARRL Division where significant effort or competition is evidenced. (Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers.) For example, if K2SMN has the highest single-operator multi-band score in the Atlantic Division and his 432-MHz score is higher than any other Atlantic Division single-operator's, he will earn both a certificate for being the single-operator Division leader and an endorsement sticker for 432 MHz.

7.3. Top multioperator score in each ARRL Division where significant effort or competition is evidenced. (Multioperator entries are not eligible for single-band awards.)

Additional certificates may be awarded where significant effort or competition is evidenced.

8. Submission: Deadline for submission of entries for this contest is Tuesday September 7, 1999. Logs and properly completed summary sheets should either be e-mailed to **AugustUHF@arrl.org,** or should be sent to August UHF Contest, ARRL 225 Main St, Newington, CT 06111. Entries postmarked or email dated after the deadline will only be considered checklogs. **If log files are generated using a computer, the entrant is to submit the proper log files to the Contest Branch in acceptable electronic format.**

9. Other: See "General Rules for All ARRL Contests" and "General Rules for ARRL Contests on bands above 50 MHz (VHF)" November 1998 *QST*. These are also available at the Contest Branch Website at: **http://www.arrl.org/contests**. Questions regarding this contest should be emailed to **n1nd@arrl.org**. Only use the contest-name email for submission of entries. All contest forms and rules may be downloaded at **http://www.arrl.org/contests/forms/**. QST

1999 UHF Contest Pins

Again this year, anyone making at least five contacts is eligible to purchase the official 1999 August UHF contest pin. This attractive pin, featuring the contest year, has become a popular piece of memorabilia for the ardent UHF operators. The pins feature a microwave dish incorporated into the design and sell for $5 each. To order a pin attach a check or money order to your official summary sheet when you mail in your entry. For those submitting entries via e-mail, you may order your pins by sending a copy of your summary sheet along with your check or money order to: UHF Contest Pins, ARRL, 225 Main St, Newington, CT 06111. The pins will be shipped after your contacts have been entered into the database and the results have been prepared for publication in *QST*.

A Renaissance for UHF on the Horizon?

When painting the Sistine Chapel during the Renaissance, Michelangelo took the bold step of rethinking much of his original plan. As we approach the millennium, it is time to assess the plans and purposes of the August UHF Contest. Participation is dropping off, as evidenced by our only reliable measure—the number of logs we receive. What can be done to revitalize interest and spur activity in this contest? The first step is easy. *If you make contacts during the contest, send your log to the League.*

We want you to give serious consideration to what you and the ARRL can do to increase participation in UHF and microwave activity. In particular, the ARRL Contest Branch is actively soliciting comments and proposals from you concerning the future of the August UHF Contest. Your participation in 1999, and your suggestions for bringing the UHF Contest to the forefront of VHF/UHF activity, are a *must*. Please direct your comments by e-mail to **n1nd@arrl.org**, or by postal mail to the Contest Branch Manager, ARRL, 225 Main St, Newington, CT 06111. Your comments will be compiled and shared with the appropriate committees as they explore ways to promote UHF/microwave activity.—*Dan Henderson, N1ND, Contest Branch Manager*

New Products

1999 *POLICE CALL* EDITIONS NOW AVAILABLE

◊ The 1999 editions of these popular scanner listener frequency guides are now available. Nine different regional volumes total over 350,000 listings. These list frequencies for police and fire agencies and 18 addition categories of mobile radio users. Also covered are radio codes, maps, frequency allocation tables and more.

Price $12.99 each. The 1999 editions of *Police Call* are sold by selected retail electronics dealers, mail order firms and all RadioShack stores. Publisher: Hollins Radio Data, PO Box 35002, Los Angeles, CA 90035. QST

By **Dan Henderson, N1ND**
Contest Manager

ARRL 10-GHz And Up Cumulative Contest Rules

1. Object: North American amateurs work as many amateur stations in as many different locations as possible in North America on bands from 10 GHz through light.

2. Date and Contest Period: Third full weekend of August and September. For 1999 the contest dates are August 21-22 and September 18-19. Operations may take place for 24 total hours during each contest weekend. Each weekend begins at 6:00 AM local Saturday and runs through 12:00 midnight local Sunday. Listening time counts as operating time. Times off must be clearly indicated in the log.

3. Entry Categories:

3.1. 10 GHz only.

3.2. 10 GHz and up.

4. Exchange: Six-character Maidenhead Locator (see April 1994 *QST*, p 86).

4.1. Signal report is optional.

5. Miscellaneous:

5.1. Scheduling contacts is both permissible and encouraged.

5.2. Stations are encouraged to operate from more than a single location. For purposes of the contest, a change of location is defined as a move of at least 16 km (10 miles). A station may be reworked on each band for additional credit by either end of the contact moving to a new location.

5.3. Contacts may not be duplicated on the second weekend (that is at least one end of the QSO must be from a different location).

5.4. Contacts must be made over a minimum distance of 1 km.

5.5. A transmitter used to contact one or more stations may not be used subsequently under any other call sign during the contest period. The intent of this rule is to prohibit "manufactured" contacts.

5.6. Contacts with aeronautical mobiles do not count.

6. Scoring:

Changes for 1999

There have been changes in Rule 2 which change the contest hours from 6:00 AM local Saturday through midnight local Sunday, with a total of 24 hours of total operation each weekend. There is also a contest-specific e-mail address for submission of entries *only*: **10GHZ@arrl.org**. All inquiries should be sent to **contest@arrl.org**.

6.1. Distance points: The distance in km between stations for each successfully completed QSO is calculated. Distance = distance in km.

6.2. QSO points: Count 100 QSO points for each unique call sign worked per band. Portable indicators added to a call sign are not considered as making the call sign unique.

6.3. Total Score: Equals distance points plus QSO points.

6.4. There are no multipliers.

6.5. In making the distance calculations, a string (or ruler) and map may be used. However, calculations by computer program are preferred. Several such programs are available in the commercial market, including a basic program listing in *The ARRL World Grid Locator Atlas* ($5). For purposes of making calculations, stations are defined as being located in the center of the 6-character locator sub-square (most computer programs make this assumption).

6.6. Scoring example: On the first weekend, W9JJ operating from Mt Greylock, MA works W1VD (distance 97 km) and W1LJ/1 (distance 107 km) on 10 GHz; and W1LJ/1 (distance 107 km) on 24 GHz. On the second weekend, W9JJ operating from Pack Monadnock, NH works the following stations: W1VD (154 km), W1VT (205 km), W1LJ (157 km), and K1RO (147 km) on 10 GHz; and K1RO (147 km) on 24 GHz.

Distance points = 97 + 107 + 107 + 154 + 205 + 157 + 147 + 147 = 1121

QSO points = 100 × 6 = 600 (10 GHz: W1VD, W1LJ, W1VT, K1RO; 24 GHz: W1LJ, K1RO)

Final Score = 1121 + 600 = 1721

7. Schedules:

7.1. Schedules may be set up by use of the HF calling frequency of 3818 kHz on the evenings of Tuesday, Wednesday and Thursday before the contest weekends starting at 7 PM local. Also, 144.230 and 146.55 MHz can be monitored during the contest to arrange schedules with other stations. Paired stations should move off these frequencies once contact has been made.

8. Reporting:

8.1. Official forms are at the ARRL Contest Web page at **http://www.arrl.org/contests**.

8.2. Logs should indicate band, date, time, call sign, the exchange information plus distance of contacts in km.

8.3. Logs must be submitted no later than 30 days after the end of the contest (October 19, 1999) to ARRL Contest Branch, 225 Main St, Newington, CT 06111.

8.4. Electronic entries consisting of the required summary sheet and an ARRL format electronic file format log should be submitted to: **10GHZ@arrl.org**. Files may also be uploaded to the anonymous FTP server.

9. Awards: Suitable awards will be presented as designated by the Awards Committee

10. Other: See General Rules for All ARRL Contests and General Rules for ARRL Contests on bands above 50 MHz (November 1998 *QST* or on-line at **http://www.arrl.org/contests**). QST

New Books

ON THE SHORT WAVES, 1923-1945

By Jerome S. Berg

Published by McFarland & Company, Box 611, Jefferson, NC 28640; tel 800-253-2187; **http://www.mcfarlandpub.com**. *1999, hardcover, 7×10, 280 pages, B&W illustrations. $46.50 postpaid.*

Reviewed by Steve Ford, WB8IMY
QST *Managing Editor*

On the Short Waves chronicles the rise of short wave broadcasting in the first half of the 20th century. This may seem like a dry subject for a book, but Jerome Berg turns a historical outline into a sweeping epic. He begins at the earliest days of wireless and devotes considerable discussion to the pioneering role that Amateur Radio played in the discovery of long-distance propagation on short-wave frequencies.

Jerome Berg's excellent writing and research notwithstanding, part of the appeal of *On the Short Waves* is its numerous illustrations. Almost every other page contains a photograph, QSL, program guide, magazine cover or other similar artifact from the era. Before I actually read the book, I spent an evening just thumbing through the pages and marveling at the graphics. One ham/broadcast QSL reproduced in *On the Short Waves* carried this poem:

From my very own radio station,
I am sending a message to say,
Good morning to you, and how do you do?
Much better I hope, today.
And isn't it fine to think,
That regardless of pen or ink,
A message straight to your heart from mine,
Can go like a flash on our own private line?

Such sentiments about an electronic medium seem foreign and quaint to most people today. As hams we are among the minority who understand the emotions that would give rise to poems like these. And it is that early romance of radio that permeates *On the Short Waves*. It is rare for a historical work to capture the fundamental spirit of the era it describes, but Berg has managed to do so. *On the Short Waves* is a fast-paced, richly illustrated tour of a time when radio was young and the public was still deeply in love with its magical ability to bring the world to their homes. I sincerely hope that Jerome Berg is working on the next edition to span 1945 to the present!

*Edited by **Steve Ewald, WV1X** • Assistant Field Services Manager*

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
DXFR	DX Field Representative
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—email: wb0jjx@arrl.org. The section web page is at **http://gographics.com/RANDALL/secpage.htm.** Through all the years that I have been in Amateur Radio, I have always felt that Amateur Radio is something special, as are the operators that participate in it. I think no small part of this is because of Amateur Radio's long standing tradition of using our skills and talents for the public good. I sometimes wonder when, and where, was the first public service event run by amateurs? After all, there had to be a first time. What type of event was it? What type of challenges did they face? I suspect these facts like so many others are consigned to the ages. However, I do chuckle a little bit at the thought of our predecessors trying to plan communications for a March of Dimes walk using Spark Gap transmitters. Then I stop and think. They would have found a way, and they would have done the best job they could with what was available to work with. After all that's what hams do. That's what they do best, and that's what makes them special. 73 Randall.

EASTERN PENNSYLVANIA: SM, Allen R. Breiner, W3TI—SEC: Eric Olena, WB3FPL. STM: Harry Thomas, W3KOD. PIC/BM: Max Peters, KI6NJ. OOC: Alan Maslin, W3DZI. TC: Cully Phillips, N3HTZ. ACC: Steve Maslin, N3ORH. SGL: Allen R. Breiner, Jr, W3ZRQ. ASMs: Dave Heller, K3TX, J. Yogi Bear, WB3FQY, Bill Dale, WY3K, George Law, N3KYZ. In order for the continuance of state and section level official matters, a few changes were made in our Section Cabinet positions at the April meeting. Max Peters, KI6NJ, resigned as the State Government liaison and volunteered to chair the positions of Public Information Coordinator and Bulletin Manager. He indicated in his resignation, the recommendation of Local Government Liaison W3ZRQ, should be appointed the State Government Liasion because of his 20 years experience in zoning rules and direct contact with local government matters. W3ZRQ accepted the appointment. Steve Maslin, N3ORH, stepped forth and accepted the appointment as the section's Affiliated Club Coordinator. Welcome to the Bald Eagle River Repeater Association for joining with our 70 other clubs becoming League affiliated. Call change N3XL is now W3XL. VE teams throughout the nation have noticed a decline in upgrades and new license applications, but a special congratulations go to the new Technician class father, mother and son team: KB3DBX, KB3DBY, and KB3DBZ. Upgrades go to KB3CAI for Tech Plus. N3UZA, KB3CVC, and N3NQX are now General Class. N3BAM made it to Advanced class. Special congrats to KB3BPS and N1FJW for making it the Big "X." Wyoming Co EMA officials were greatly impressed by numerous emergency drills sponsored by N3SIN and the Wyoming Co ARES. The State Severe Weather exercise brought forth the following ARES, RACES and SKYWARN volunteers: N3WTV K3CWH KB3DJJ W3MEL N3JRS N3YMX WB3FPL W3LOU W3KQL WY3T N3JRX KG3Q WY3K WX3C KC2ZA W3AMC KA3MOB KA3ONZ AA3IX K4MMG N3NVA N3IYX WX3TAZ KA3JWE KA3MOU N3THJ. The Lancaster EXPO show gave the SPARC an opportunity to display their new emergency field support van to the public. They received a Public Service Communications Citation from the PA House of representatives. W3BRU serving many years as net manager for SE PA Traffic Training Net has stepped down, and is replaced by K3LNV. Our thanks and appreciation to the clubs who have continued to send us a copy of their bulletin. When writing about your club activities, please list the call letters of those who participated. Did you change QTH lately? When you inform the League, drop us a line so we can up-date your address. Tfc: W3KOD 459, N3DRM 402, W3IVS 171, N3SIN 90, N3YSI 81, N3EFW 79, W3IPX 75, NR9K 60, W3HK 48, WA3EHD 335, N3AT 28, N3HR 27, W3JKX 26, W3TWV 17, W3ZQN 16, WA3JOE 16, N3AO 15, W3DP 15, K3ARR 11, KA3LVP 11, W3TI 11, K3TX 10, AD3X 9, N3AS 7, N3IRN 5, N3KYZ 5, KA3KMH 3, WA3CKA 2, N3NNH 1. Nets: EPA 146, PFN 93, PTTN 36, WAREC 12, D3ARES 11, LCARES 6, SEPTN 7, EPAS 1, D4ARES 1.

MARYLAND/DC: SM, Bill Howard, WB3V, wb3v@arrl.org—MDC Section web homepage **http://www.erols.com/wb3v/mdc/**. ANAR EC N3QXW reports 4 net sessions on 147.805 with liaison to EPA, NCAC, MEPN, WVA, BTN & MDD. OES reports received from: N3QXW NU3D W3VVN KO4A. Brian also says that a copy of a Self Evaluation Primer of Disaster Communications is available from the Web at http://www.hamradio-online.com/1997/apr/cap.html. STMA new EC KB3AMO reports: The St. Mary's Net and Bottom County Net maintain NTS liaison with Third Region Net and Maryland Emergency Phone Net. They conducted two training sessions and 2 public service events in April. PRGE EC KA3PVS reports the Prince George's County OEP was activated in observance of the NATO 50th Anniversary meeting in Washington, DC MONT EC K3XO reports that Montgomery County ARES provided comms for the MS Walkathon. Two courses finished at Glen Echo Park above the Potomac River outside of Washington DC. They covered nearly 20 miles along the Potomac River. Communications for the annual Pikes Peek 10K Run through Rockville, MD were provided. The effort was organized by NK3I for MARC, which also provided the use of the excellent 146.955 repeater. The 12 ops were: NK3I K3XO N3JEY N3SRR N3HSA N3PRZ K3CSX N3PXK WB4AEJ N3NFS N3VOL and AA3AC. FRED EC N8AAY reports 4 net sessions on 147.06 K3MAD. ARES participated in two events: Multiple Sclerosis Walk-A-Thon and the Mountain Club of Maryland HIKE ACROSS MARYLAND. The ops: N3HTA KB3PK N3WVA N3MVV W3HSO KA3VLH N3TCR N3ZBO WA3KHE and N2CSQ. The communications were conducted on the ARA 146.94 club repeater. Congratulations to Jack, WB3JJL on his recent marriage. 73 - Bill and with the nets: NET/NET MGR/QND/QTC/QNI: MSN/KC3Y/30/40/317, MEPN/KE3OX/30/60/630, MDD/WJ3K/60/239/746, MDD TOP BRASS/KJ3E/280/K3JL/149/AA3GV/147, BTN/AA3LN/30/33/376, SMN/KE3OX/0/0/0. Traffic: KB3AMO 230, KJ3E 210, N3WKE 163, AA3GV 153, W3YVQ 97, KO4A 77, KK3F 73, AA3SB 58, N3WK 56, KC3Y 52, KE3OX 48, WJ3K 35, N3ZKP 29, N3EGF 14, WA1QAA 9, K3CSX 7, WA3WRT 5, W3YD 5, KG6TU 3. PSHR: KB3AMO 196, W3YVQ 161, AA3GV 156, N3WKE 138, KJ3E 129, N3WK 128, AA3SB 122, KO4A 116, KG6TU 107, KC3Y 97. N3ZKP 88, WA1QAA 73.

NORTHERN NEW YORK: SM, Les Schmarder, WA2AEA—Web: <http://www.northnet.org/nnyham>. Reformatted column by popular demand. Appointees occasionally listed, net info will migrate to the Website. WalkAmerica went well with 9 hams@Plbgh, 6@Port Henry. Tupper Lake Tinman Triathalon is July 17; a good warmup for the Ironman in Lake Placid Aug 15. Blackfly ARC was renamed Tri Lakes ARC in Apr. Officers: W2AFN, WA2RP, AA2JO, KB2ZIE, KC2CZW. My July travel sked includes NCARC club meeting at Potsdam and the OARC Special Event - 250th anniversary of Ogdensburg: July 31, 1400-2200 local, 7.272 & 14.272. May 1 ARRL Exec Committee minutes noted FCC work on Restructuring is likely to continue at least into July. Meanwhile, we'll just keep holding exam sessions, such as at the Plattsburgh Hamfest on Aug 7. If you don't catch us real-time, FD msgs can come to WA2AEA@KD2AJ packet, or @arrl.org e-mail. 73, Les, WA2AEA.

SOUTHERN NEW JERSEY: SM, Jean Priestley, KA2YK—(@K2AA) e-mail:ka2ykn@arrl.org. ASM: W2BE, K2WB, W2OB, N2OO, KB2TME. SEC: KB2TME. STM: WB2UVB. ACC: KB2ADL. TC: W2EKB. SGL: KB2WKY. OOC: K2PSC. PIC: N2YAJ. TS: W2PAU, W2BE, AB2Y, K2JF, WB2MNF, KD4HZW, WA2NBL. Thinking "Y2K," SJRA took a new slant on FD and got back to basics. They had a Y2K Preparedness Day. The rules were much the same but the mindset was different. It was fun and they learned real meanings of Preparedness. Kids, traffic? Sure! At Rice Elementary School in Marlton, 34 Mother's Day messages where generated by kids sending messages to their moms. K2WB, shows Amateur Radio to kids and has touched the lives of over 4000 children. Ask about going into your elementary schools and talking about the hobby that gives YOU so much. Aug 7-8 will be the National International Lighthouse. Day. 40th Annual NJ QSO Party August 21-22. Lighthouses http://www.waterw.com/~weidner/ld.htm. Tfc (April 99): WB2UVB 180, AA2SV 118, K2UL-4 83, N2WFN 52, W2AZ 41, KA2CQX 24, K2UL 21, KB2RTZ 14, N2VQA 11, KA2YKN 9, N2ZMI N2AYK 3 KB2CDB 3, N2WXF 3, N2FHJ. 1 each: KB2VSR KB2YBM KB2ETU KB2VSD N2FHK KB2HJJ N2SOE NN2Y KB2RHI N2MSM N2WXE N2WXG.

WESTERN NEW YORK: SM, William Thompson, W2MTA—See Section info http://www.dreamscape.com/phaedrus/WNY. CLUB NEWS: Section clubs' years of affiliation are: 1981 TCARC, Yates; 1982 Salt City; 1984 Liverpool; 1985 WNYDXA; 1986 RRRA; 1987 Lancaster; 1988 Margaretville, PROS, and STARC; 1989 MOARC, XARC; 1992 Midlakes; 1993 Brockport, Snowbelt; 1995 CNYARC; 1996 GDXG, UAB; 1997 CCRA. CLUB OFFICERS: STARS KB2YJ KD2QV KB2ESM N2TEZ WA2TVT; Walton RA N2WDV WB2JOW K2EZK KB2OSX. HAMFESTS: Cortland @Fairgrounds June 12, Batavia@Fairgrounds July 10, Utica@ Frankfort Fairgrounds July 17, New York State Traffic Handlers' Picnic@W2MTA Newark Valley July 30-31, Auburn @Weedsport Aug 7, Rome@Stanwix Heights Aug 14, Lancaster@Depew Aug 15, Finger Lakes at Tompkins Co Airport Aug 21, WNY Section Convention at Hamburg Sep18, Elmira@Horseheads Sep 25, NTS Eastern Area Traffic Handlers Picnic near Annapolis MD Oct. 1-2, Radio Amateurs of Greater Syracuse@Pompey Hills Oct 2. APPOINTMENTS: (EC) KB2UQZ Genesee Co, N2HQW Yates Co. Many thanks to K2ZUT for his service to ARES. SILENT KEY: MOARC, Central NY and Alice KF2HG lost a good friend and companion with the passing of Don, N2DO.

Net	*QNI*	*QSP*	*QND*
Early Bird - WB2IJZ	560	000	22
NYSRACES-N2AGO	051	008	04
NYSR-W2MTA	017	004	04
#NYS/M-KA2GJV	220	095	30
CHN-SSB W2EAG	144	036	29
#WDN/M-AF2K	535	057	30
#NY PHONE-N2LTC	228	325	30
#NYPON-N2YJZ	297	186	30
ESS-CW W2WSS	272	091	30
NYSPTEN-WB3CUF	332	035	30
#NYS/L-W2YGW	272	193	30
OCTEN/E-KA2ZNZ	1257	219	30

Traffic (Apr): N2LTC*1064, KA2ZNZ*507, W2MTA*368, KF1L*437, WB2IJH*310, KA2GJV*308, NN2H*203, K2BCL*199, W2PII*162, W2FR*117, WI2G*109, WB2QIX* 96, KB2VVD*83, AF2K*80, N2CCN*75, NY2V*65, KB2ETO*39, KB2UQZ*36, N2WDS*32, K2DN*29, KG2D* 28, WA2GUP* 26, KA2DBD*22, W2RH 13, KB2WII*13, WA2UKX*10. (Mar) KA2QIK 36, W4BNY 41. DATALINK (Apr): K2DN R5/S1, KA2GJV R34/S0, N2LTC R239/S137, NY2V R0/S4. BPL (Apr): KA2ZNZ, N2LTC. A recent survey for active ARES nets in WNY indicated the following counties: Allegany, Broome, Chemung, Chenango, Erie, Herkimer, Madison/Oneida, Niagara, Onondaga, Orleans, Otsego, Steuben, Tioga and Yates. Fifteen other counties may have ARES nets, if so, please inform your Section Manager, W2MTA, via the most expeditious means — are you ready to support the Y2K time period? The NTS folks are planning to celebrate the October 1949 50th anniversary of the National Traffic System at the ARRL National Convention in May 2000 at Dayton Ohio. Come join us! 73 to all. w2mta@juno.com.

WESTERN PENNSYLVANIA: SM, Bill Edgar, N3LLR—ASM: N3MSE. ACC: N3SJR. ASM-ARES: WB3KGT. SEC: N3SRJ. ASM-Packet: KE3ED. ASM-Youth & Education: KE3EE. PIC: W3CG. STM: N3WAV. TC/OOC: WR4W. DEC-SO: KD3OH. DEC-N1: N3QCR. DEC-N2: KA3UVC. DEC-S1: KA3HUK. DEC-S2: KB3AQA. DEC-Rapid Response: N3HJY. Congratulations to the Breezeshooters Amateur Radio Club and to the Ellwood City Amateur Radio Association for receiving their ARRL Affiliated club status. The WPA Section Staff is working on a contest for increasing club membership and for getting new hams. Details will be announced later this summer. Keep an eye open for the announcement! Have you had a chance to check into at least one of the nets in Western PA? Our Section Traffic Manager, Bob Livrone N3WAV, is looking for more people to join in on the nets. If you have a club net or other type of net, check with Bob to see how to get it involved with the National Traffic System. Now with warmer weather permitting us to get more active with public service events, please keep in mind that while tactical calls signs are very helpful, using your own call sign within the 10 minute limitation and at the end of your conversation/report is still required by Part 97. April traffic reports: W3OKN 137, W3NGO 109,

Continued on page 108.

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- Easy intuitive operation
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- Tone Squelch with Pocket Beep

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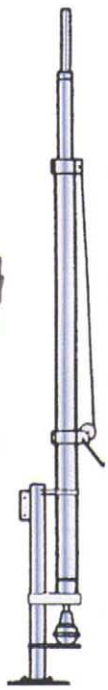

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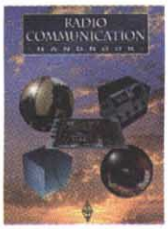

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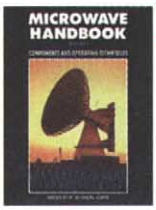

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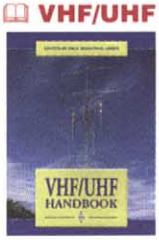

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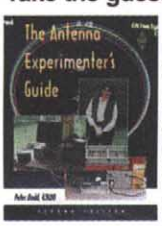

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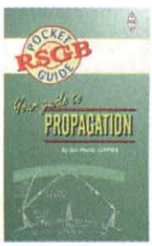

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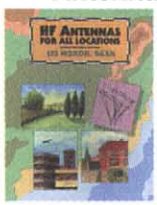

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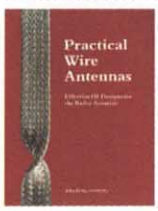

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Dive into the practical aspects of HF wire antennas: how the various types work, and how to buy or build one that's right for you. Marconis, Windoms, loops, dipoles and even underground antennas—they're all covered! The final chapter covers matching systems. 100 pages. **ARRL Order No. R878—$14**

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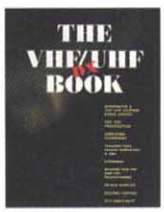
Operating



The VHF/UHF DX Book

Assemble a VHF/UHF station, and learn about VHF/UHF propagation, operating techniques, transmitters, power amplifiers and EMC. Includes designs for VHF and UHF transverters, power supplies, test equipment and much more. 448 pages. **Order No. 5668—$28**

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RSGB Prefix Guide

DXCC listings by prefix, useful data such as CQ/ITU Zones, hours +/- on UTC and latitude/longitude. Ed 4, October 1998. **Order No. 7237—$12.95**

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N3ON 105, WA3UNX 78, WA3QNT 74, N3WAV 72, N3KB 48, W3GJ 33, KC3NY 32, N3HBB 28, AA3ML 13, N3IBT 10, N3RDV 3, WB3ING 2. April Net Reports: Net name, Sessions, Traffic, Check-ins, Mgr; WPAPTN 30, 107, 481 N3KB; NWPA2MTN 26, 38, 854 WA3ZSC; WPA2MTN 30, 34, 215 KA3BGC; EAMB 18, 7, 113 N3PBD; WPACWTN 30, 111, 176 WA3QNT. April Public Service Honor Roll: N3KB 75, N3WAV 156, W3OKN 118.

CENTRAL DIVISION

ILLINOIS: SM, Bruce Boston, KD9UL—SEC: W9QBH. SGL: WA9AQN. ACC: N9KP. STM: K9CNP. PIC: N9EWA. TC: N9RF. OOC: KB9FBI. DEC-Central N9FNP. Congratulations to the Peoria Area ARC which marked its 80th anniversary in May. Madison Co EC KB9AIL reports that both radio clubs in Madison County are supporting the Solar Car Group at Principia College both financially and with material skills. Several amateurs have been actively involved. During the 1997 Race Amateurs from both Egyptian & Lewis and Clark Radio Clubs provided chase car communications and APRS tracking. This year due to the course being down the East Coast that will not be practical as it is a ten-day race. According to the e-mail version of *Static*, the newsletter of the Starved Rock RC, packet is active on 147.555. Also, 145.550 is being monitored as a possible Northern Illinois multi-county emergency packet frequency. The Metro ARC reports it had to move its repeater from Winston Towers. At last report the club was searching for a new site in the north or northwest side of Chicago, or near north or northwest suburbs. Contact trustee W9FO if you can help. The Western Illinois ARC reports its Novice/Technician class is nearing completion. There are still over a dozen students attending and hopefully all will pass their license exams. N9LIN, writing in the WCRA *Hamletter* mentioned that the Smithsonian Institution has a working amateur station in the American History building. Hams visiting the Washington DC museum can make arrangements to operate NN3SI by calling 202-357-2700 to make an appointment. The STARS newsletter reports the club has donated a two meter radio to Jerling Junior High School in Orland Park to help the school build a club station. STARS plans to donate an HF radio as well. The equipment came from the station of KC9SL/sk. If you would like to help get the school's club off the ground contact Bob WF9V at 708-403-3721. According to *QRV*, the newsletter of the 9-0-4 ARC, Sandy Webster, Red Cross Regional Manager of the Little Eygpt Network, spoke to the club about disaster planning and emergency operations. If you have news or information of interest to amateurs send it to your section manager. Contact information is listed on page 12 of every issue. April traffic: K9CNP 157, W9HLX 100, WB9TVD 35, NC9T 18, W9FIF 10, WA9RUM 6. ILN Report de K9CNP QTC 15, Sessions-30. ISN report de WB9TVD QNI 236, QTC 125, Sessions 30. D9RN report via AF9FA Sessions 53, QTC 176, QNI 311, QTR 598 min. Average 3.32, rate 0.29. Percent 95. IL QNI 48. W9VEY Memorial Net de K9AXS 6 with 220 check-ins. Ninth region report de W9FC—traffic 253, sessions 60, time 395 min, average 4.21, rate .640, rep 97%, QNI—ILN K9CNP, KF9ME, NS9F.

INDIANA: SM, Peggy Coulter, W9JUJ – SEC: K9ZBM. ASEC: WA9ZCE. STM: AA9HN. OOC: KA9RNY. SGL: WA9VQO. TC: W9MWY. BM: KA9QWC. ACC: N9RG. Sympathy extended to the families and friends of Silent Key 5/5, Thomas Haley, K9BGU, Seymour. He will be missed. The Jay Co. ARC assisted the boys club with communications for their Bike-A-thon. The course covered 31 miles. Assisting were N9ZTS, N9XRA, KB9SCA, KB9KFG, KB9MVJ, KB9SBZ and K9UO. The Lake Co. ARC furnished communications for WalkAmerica. Melissa from the March of Dimes was thankful for the help from WB9VRG, KB9NSD, WN9Z, W9JEA, KB9THY, K9MNQ and W9ZRO with KB9ODN and KB9MUZ operating bicycle mobile. Congrats to Mac, W9CM, for 60 years a member of ARRL. One or two individual hams in the Indy Area are making operations of the Central IN SKYWARN net difficult. N9GDR, Central IN SKYWARN EC is seriously considering moving this net from the 146.70 wide-area rptr if those individuals continued to cause difficulties to this most valuable SKYWARN net for Central IN and the Indy NWS. We all need to cooperate with each other. If you have ever heard this net, you know how valuable it is in severe wx. Congrats to newly appointed EC for Dearborn Co. Randy Baugh, KB9NZE. Thanks to the ECs who took the time to fill out the PSAR forms. They help prove the worth of Amateur Radio to Public Service. NMs ITN/W9ZY, QIN/N9PF, ICN/AA9HN, WN/AB9AA, VHF/AA9HN.

Net	Freq	Time/Daily/ITC	QNI	QTC	QTR	Sess
ITN	3910	1330/2130/2300	2734	469	1512	90
QIN	3656	1430/0000/	883	75	664	43
ICN	3705	2315	no report			
IWN	3910	1310	2111	—	300	30
IWN VHF Bloomington		480	—	450	30	
IWN VHF Kokomo		601	—	150	30	
IWN VHF Northeast		908	—	600	30	
Hoosier VHF nets(7 nets)			339	10	426	27

D9RN held 53 sessions total QTC 176 IN 87% by K9GBR, KB9NPU, WB9QPA, W9UEM, KA9DIG and N9ZZD. 9RN held 60 sessions total QTC 253 IN QNI by KJ9J, KO9D, WB9UYU, N9PF, WA9QCF, K9PUI, AA9HN and W9FC. Tfc (Apr) W9FC 281, W9ZY 135, KO9D 100, K9GBR 98, WB9QPA 83, N9ZZD 77, N9PF 67, K9PUI 67, AB9AA 61, WA9QCF 52, W9JUJ 42, KJ9J 41, W9UEM 39, KB9NPU 34, AA9HN 20, KA9EIV 18, W9CSJ 15, K9RPZ 10, K8LEN 8, W9EHY 8, WB9NCE 7, W9RTH 7, N9JAI 5, AB9A 4, K9CUN 4, K9DIY 3, W9KT 1.

WISCONSIN: SM, Roy Pedersen, K9FHI—SEC: WB9RQR. STM: K9LGU. ACC: KF9ZU. SGL: W9RYA. OOC: W9RCW. PIC: K9ZZ. TC: K9GDF. ASM: W9CBE, K9UTQ. BM: WB9NRK. There are a number of counties in Wisconsin that do not have an EC, perhaps you know of someone that would be a candidate for such appointment, maybe take care of two counties. I regret to inform you that NX9K passed away March 15. He was editor of *Smoke Signals*, and his name was Duane Brummel. Thanks to all the stations who participate in the Ninth Region Net, Cycles 1 & 2.

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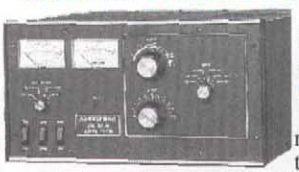

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Those stations who hold an ARRL appointment, let's hear from you on the Wisconsin nets. Maybe in the future, you may be asked for information on your station and location. K9GDF had a nice write-up, "The Year 2000." Very interesting. Sure makes one think. KB9UAV is now W9TSH. It's nice to get newsletters from the various clubs. Very interesting reading material. RRRC had test session April 11 and had 6 new Techs, and 1 general. The new Techs are as follows: KB9UNY, KB9UNZ, KB9UNA, KB9UOB, KB9UOC, KB9UOD, and KB9RMU as General. Congratulations. Sorry to report N9TSO's son passed away. Condolences to the family. Racine Megacyle Club swapfest October 1, 1999. Cedarburg swapfest has 3 generals, 1 Tech+, 1 Extra and 5 new Techs, congratulations. Reports from Don W9IXG that they have 9 new Techs and 3 Techs+. Nice going. Tfc: W9RCW 869, W9IHW 826, K9JPS 646, K9RTB 644, W9YPY 486, K9LGU 128, AF9FA 125, W9UW 113, K9GU 99, N9BDL 97, AG9G 94, N9KHD 84, N9CK 67, N9CK 67, W9YCV 55, KE9VU 51, K9FHI 49, AA9BB 39, W9CBE 38, KA9FVX 30, KG9B 29, W9ODV 27, W9BHL 25, WB9ICH 24, KA9KLZ 23, WD9FLJ 21, K9HDF 16, W9PVD 8, K9UTQ 6.

DAKOTA DIVISION

MINNESOTA: SM, Randy "Max" Wendel, N0FKU—A few new ARES EC appointments have been issued. Please welcome aboard Gary Mayer, N0ZHJ, will represent Kandiyohi County. Zane Thayer, KB0YCC, will be ARES EC for Northern Washington County, and Dean Anderson, N0EN, for Carver County. Welcome to the field organization! Remember to support your ARES EC and become an ARES member. To be an ARES member, register with your ARES EC and you will be issued an ID card. An effective ARES organization is based upon the leadership of the EC and the dedication by the members that raise their hands high showing their interest toward an organization that plans and trains for the various communications needs that ARES serves when called upon. We have some really great ARES groups that really define the word MOTIVATED, and I would love nothing more than to see that enthusiasm spread around. If you have what ARES needs, speak up! We're always looking for folks who can help lead ARES in the direction it needs to go. ARES not only serves local government but also is part of an organization that reaches out beyond county borders. ARES members in one county may be needed in another and ARES helps facilitate that. Would you be willing to help your fellow ARES members whom you may not even know? 73 de **n0fku@arrl.org**.

Net	*Freq*	*Time*	*QNI/QTC/Sess*	*Mgr*
MSPN/E	3870	5:15 P	701/62/30	W0WVO
MSPN/N	3860	12 P	436/112/30	WA0TFC
MSSN	3710	6 P	N/A	vacant
MSN/1	3605	6:30 P	230/100/30	W0HPD
MSN/2	3605	10 P	128/46/30	K0PIZ
PAW	3925	9A-5P	2837/116/100	KA0IZA

Tfc: KB0AII, W0LAW, WA0TFC, W0GRW, W0HPD, WO0A, K0PIZ, KB0AIJ, KN9U, W3FAF, K0WPK, W0GDB, W0WVO, KA0IZA, N0BM, K0OGI, N0JP.

NORTH DAKOTA: SM, Bill Kurtti, WC0M—Peace Garden Hamfest July 9-11 at the International Peace Gardens. Great campout for the entire family. Regret to report that N0SDB is a Silent Key. Tim was past President of CDARC publisher of the Noiseletter and had a keen interest in old radios. KB0CQK was presented with a well deserved plaque for her work as treasurer of CDARC for 11 years. How time flies; thanks Dee. CDARC also provided communications for the MS walk along with K0GRM & others testifying at the state legislature in support of the bill giving time off to State employees when helping in emergencies. FORX hams have been active providing communications for MS A MS walk, then provided 160 hours in the flood fight this spring and the Ice storm on April 3 when the power lines went down all over town along with technical help restoring emergency communications when technical services were overwhelmed. Traffic: N0RDJ 1. Net Sess/QNI/QTC. Goose River 4/53 /0, DATA 28/589/17. WX Nets 30/964/35.

SOUTH DAKOTA: SM, R.L. Cory, W0YMB—Regret to report Silent Key, W0PEX, Al Smith. His QTH was in Sioux City, IA. He was a member of Dakota Chapter 102 QCWA and will be missed by many South Dakota hams. Northern Hills ARC at Lead has several classes on SKYWARN. They were conducted by Lawrence Co Emergency Management and National Weather Service personnel from Rapid City. Lake Area ARC at Watertown has also been holding severe weather seminars. Dakota Division ARRL 1999 Convention Chairman Jerry, N0JH, had to resign due to a heart attack. We hope he has completely recovered by the time you read this. He hopes to be able to help with the convention. Sympathy goes out to Glenn, W6IVV, on the passing of his son. South Dakota Novice Net needs help. Join them Sunday evening at 7 PM CST on 3700 kHz. I hope that everyone has made their plans to attend the Dakota Division convention at Watertown on Aug 6-8. Total April traffic reported: 511.

DELTA DIVISION

ARKANSAS: SM, Roger Gray, N5QS, e-mail **n5qs@arrl.org** - Summer and Field Day are with us and the temperature is rising. Be careful and don't get too hot this year while setting up or taking down your Field Day setups. I attended the hamfest in Little Rock in April and had a very good time while visiting with old friends and making new ones. I really enjoyed the talk by Bill Kennamer, K5FUV, at the ADXA meeting. We are rebuilding our OO program in Arkansas, and I have had many calls about malicious interference, out of license class operation, and other infractions. One thing to remember is to gather facts. Don't just say that you heard someone doing something illegal. Get facts that can be supported. The kids will be out of school for summer and it is a good time to get them interested in our hobby while they have some free time. Tfc: K7ZQR 86, K5BOC 64, AB5AU 20, W5HDN 11, KA5MGL 10, W9YCE 8, W5QIZ 8, N5SAN 7, AB5ZU 5, WA5MWI 5, KD5TR 4, W5TUM 3, KC5UEW 3. Traffic net totals: APN 24; ARN 83; MERD 31.

LOUISIANA: SM, Lionel A. "Al" Oubre, K5DPG, e-mail

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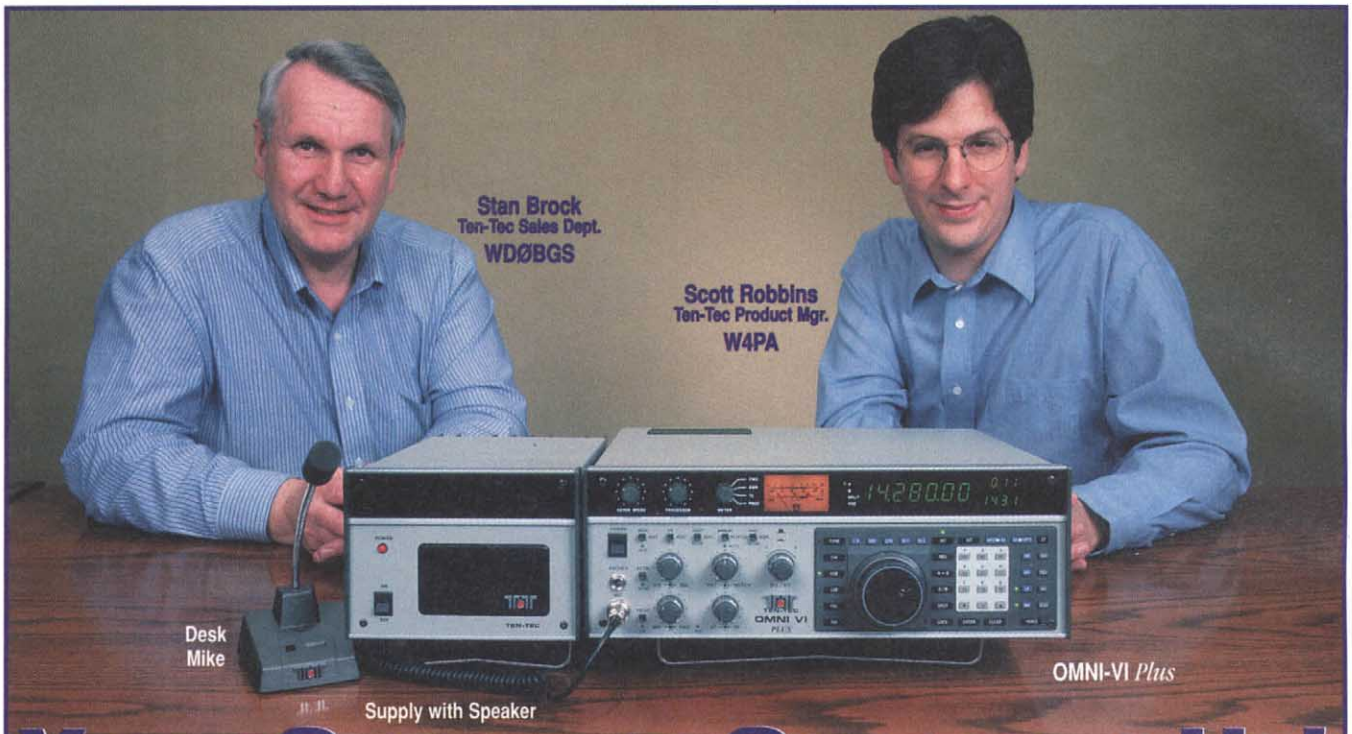

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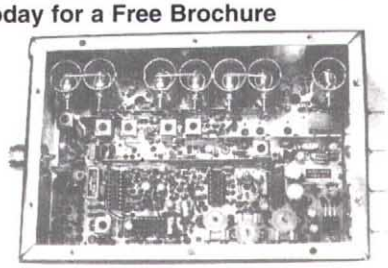

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k5dpg@arrl.org. Web Page **www.aisp.net/k5dpg**—ASM: KB5CX, K5MC. ACC: KA5IJU. BM: K5AR. TC: KE5FZ. SEC: N5MYH. OOC:WB5CXJ. PRC: KB5QVI. STM KG5GE, NM LTN WB5ZED, NM LCW W4DLZ. It is my pleasure to announce that Leon, WB5ZED, the LTN NM, has earned the BPL Medallion. This is only the second time this achievement has been attained during the past seven years. The other Medallion went to Mickey, K5MC, the ASM. Congratulations to Leon on his significant achievement. Thanks also to all those that participate daily on the Section and Regional nets. The nets can use additional coverage especially in the Baton Rouge, Houma, Morgan City and Shreveport areas. Of course, the net welcomes everyone regardless of where they are located. By now many of you know that I will not be running for re-election as your SM. I feel that it is time to pass the baton to a fresh runner. I will continue my duties to the completion of my term. Thanks to all, especially Carolyn KA5IJU, who have made these past seven years great. Coming Hamfests: Slidell July 17; Shreveport August 7; August 27-28 New Orleans International DX Convention. Go out and support our area hamfest events. Don't forget to update your affiliated club records on the ARRL Web site. Louisiana Section Section Nets Louisiana Section Net Schedule: LTN 6:30 PM local 3910 kHz nightly WB5ZED mgr. LCW 6:45 PM. local 3673 kHz nightly W4DLZ mgr. Reports for March 1999: LTN QNI 344 QTC 345 in 31 Sessions. LCW QNI 186 QTC 55 in 28 Sessions. PSHR K5WOD 80, KG5GE 89, K5MC 101, K5IQZ 120, K5DPG 142, WB5ZED 210. Tfc: K5WOD 11, KG5GE 26, K5DPG 63, K5MC 88, K5IQZ 127, WB6ZED 501 BPL 3rd.

MISSISSIPPI: SM, Malcolm Keown, W5XX—DEC: K5IMT, N5XGI. EC: KK5BY, W5DJW, K5DMC, KB5DZJ, KM5GT, WD5IMP, WB5OCD, KC5TVI, WA5TEF, KC5TYL, KB5WJJ, N5XGI, N5XXX, KB5ZEA. Field Day is here again! Don't forget to send a message to W5XX to earn that extra 100 points! WB5OCD and N5XXX coordinated a very well attended SKYWARN training session in Meridian. KC5DNY reports that the Vicksburg ARC again provided communications for the "Run Through History." Those helping were N5JGK, K5NRK, N5KWT, WB5YKU, K5IMT, WB5RKT, WB5OWY, KC5GIB, KC5OEO, KC5QZW, KB5WJJ, WB5YKR, and KC5VTN. EC Report: N5XXX, KB5ZEA, K5DMC. Net Reports: sessions/QNI/QTC. MSPN: 30/2604/42, MTN: 30/194/74, MSN: 30/1032/10, PBRA: 30/813/0, Jackson Co ARES: 30/535/31; MSSN: 24/114/5, MLEN: 5/95/0, MBHN: 4/26/0, Stone Co ARES 4/46/0, MCARA: 4/53/0, Hancock Co ARES 12/62/3. PSHR: KB5W 150, N5XGI 141, N5JCG 133, KD5P 121, K5VV 115, K5DMC 93, W5XX 87, W5DJW 78. Traffic: KB5W 387, KD5P 106, N5XGI 72, K5DMC 28, N5JCG 28, K5VV 21, W5XX 7, W5DJW 5, W5EPW 1.

TENNESSEE: SM, O.D. Keaton, WA4GLS—ACC: WA4GLS. ASM: WB4DYJ. STM: WA4HKU. OOC: AD4LO. TC: KB4LJV. From QST, 1949, Sept issue. Harry Chandler, W4FLW, was showing pictures of the past Field Day that was held in Portland. Charlie Green, being a good friend of Harry, attended that Field Day. Charlie did not have his ham ticket, but was interested. "How about that ticket, Charlie?" Dec issue: "Charlie Green of Portland is now PSN." This was the beginning of Charlie's W4PSN, ham radio career. He became a regular participant on the traffic nets for the years ahead. In 1951, during the ice storm or shortly after, Charlie became Friday morning NCS for the TN Phone Net. There have been numerous changes in the net operations during this time, and he has handled them admirably, not to effect the coherence of net operations. 48 years later, at the age of 91, Charlie is still the Friday morning NCS. He still writes down each individual call sign as the participants check into the net and keeps the log like hams were required to do in the early days. I believe by this testimony, it can be said that Charlie is certainly a pioneer in Tennessee's traffic system. On behalf of ARRL, TN phone net members, and all TN hams, I take this opportunity to say thanks for a job well done thus far; and also to say keep up the good work. I am happy to report that the Dayton, TN, hamfest was very successful. Tom Wolfe, K4CMY, DEC, called an EC meeting after the hamfest to discuss future plans for District 7. UCARS donated an ARRL Handbook to the new Unicoi Co High School library at its March meeting. DRN-5 report: 826 msg, 60 sess, TN rep 87% by W4OGG and WB4GIJ. Net sess/QTC/QNI: TCWN 28/24/283; TEMPN 22/36/654; TEPN 26/137/2640; TSCWN 21/9/108. Tfc: NZ4O 305, N4PU 189, WB4GIJ 162, WB4DYJ 84, WA4HKU 58, N4LA 47, W4SQE 25, W4SYE 20, KA5KDB 19, W4HZD 10, WD4JJ 8,KI4V 8, WA4GLS 7, W4PSN 4, W4IKK 3.

GREAT LAKES DIVISION

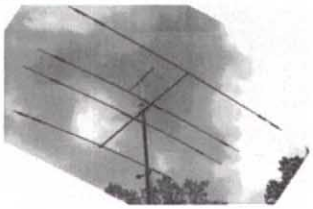
KENTUCKY: SM, Bill Uschan, K4MIS—ASM: Tom Lykins, K4LID. SEC: Ron Dodson, KA4MAP. STM: John Farler, K4AVX. PIC: Steve McCallum, W2ZBY. ACC: Todd Schrader, KF4WFZ. TC: Scotty Thompson, KI4AT. BM: Ernie Pridemore, KC4IVG. The Section Manager made it to the Louisa Hamfest and it was a fun trip. Hamfests dates: June 13, 1999, Northern KY Hamfest in Independence, KY. July 31, 1999 Bowling Green Hamfest, at a new location; August 22, 1999, Central KY Hamfest, at a new location, not held in Frankfort this year; September 11-12, 1999, Greater Louisville Hamfest, at a new location, Bullet County I beleive. It is with deep regret that we mention that on April 23, 1999, KC4SSO, Don Huddelston became an SK. Also we mention that on April 5, 1999, Mary Lou McAskill sister of Bill Fuqua, WA4LAV, became an SK. Hamfest crowds seem to be down from what I observed at the few that I have attended. We have a new ACC, Tod Schrader, K44WFZ. Net QNI/QTC/Sess/NM: KRN 719/22/22/N4AFP; MKPN 1238/46/30/K4LID; KTN 1261/46/30/K4LID. KYN 308/63/30/K4AVX. KSN 208/99/30/KO4OL; NKEN 51/1/4/WD4PBF; 4ARES 531/6/30/WA4RRR. Tfc: KF4RBK 106, KO4OL 80, K4AVX,42, KU4UO 40, AE4NW 22, K4YKI 16, KC0CEG 14. N4GD 5.

MICHIGAN: SM, Dick Mondro, W8FQT (w8fqt@arrl.org)—ASM: Roger Edwards, WB8WJV (wb8wjv@centuryinter.net). ASM: John Freeman, N8ZE (n8ze@arrl.net). SEC: Deborah Kirkbride, KA8YKK (ka8ykk@concentric.net). STM: James Wades, WB8SIWI (wb8siw@aol.com); ACC: Sandra Mondro, KG8HM (kg8hm@arrl.net); OOC: Donald Sefcik, N8NJE (n8nje@arrl.net); PIC/SNE: David Colangelo, KB8RJI (dcolangelo@ameritech.net) SGL: Ed Hude, WA8QJE (edhude@juno.com); TC: Dave Smith (DSmith@smithassoc.com) QRV Bulletin Editor: Mike Pearsall, N8MP (n8mp@concentric.net). I would like to thank the Oakland County Amateur Radio Society and their President, Roy Minuth, for inviting me to attend their May meeting. I met a lot of very nice people and had an opportunity to add two new public information officers to our Section roster. They are John, KC8CMQ, and Shari, KC8CUC, Shearer of Goodrich. Congratulations and success to both of you. I would like to thank the UP Net Members for inviting me to their meeting in Cadillac. I had a great time meeting with so many of you and sharing some ideas. My thanks also to the MACS Net Members for inviting me to their meeting on the same day. It really is nice to see so many dedicated traffic handlers out there doing such a fine job in moving the traffic for the NTS. Many of you are preparing for a lot of good summertime activities this year. I might suggest that as you travel you may want to monitor 146.52, the national 2-meter calling frequency when you are not using a repeater. I have done this in my travels, and have met a lot of nice people with good stories to tell. It is especially useful to gather information on road construction ahead of you, and you might even get some good tips on getting around some of the slow moving traffic. By all means, be careful and remember that safety comes first. Thanks also to all the folks in District 8, the entire UP, for attending the first district meeting in May. Thanks to Lyle, AB8CB, their District Emergency Coordinator for pulling it all together for a great event. I would also like to thank Roger, WB8WJV, Debbie, KA8YKK, John, N8ZE, and Jim, WB8SIW, for taking time out of their busy schedules to attend this meeting and represent our Section Leadership. Traffic reports for April 1999: KB8ZYY 244, WX8Y 174, K8LJG 160, N8FPN 130, K8GA 130, W8RTN 128, AA8PI 121, WB8SIW 103, WA8DHB 62, W8RNQ 50, N8JGS 50, WR8F 37, K8UPE 36, AA8SN 34, WI8K 33; K8ZJU 31, K3UWO 28, K8AI 27, N8OSC 26, W8YIQ 23, KC8GMT 18, W8YZ 3 (Reports by 5th of the month please) Net QNI/QTC/Sess/NM: QMN 619/311/60/WB8SIW. MACS 349/101/30/W8RNQ. MITN 437/161/30/KA9EIZ. UPN 1041/60/31/WA8DHB. GLETN 491/81/30/VE3SCY. SEMTN/258/49/30/WI8K. WSSBN/825/49/30. ARAHH/35/4/K8LAT. VHF Nets 198/15/31/KB8ZYY.

OHIO: SM, Joe Phillips, K8QOE, Fairfield, (to contact me and other Cabinet members, see page 12). ASM-NE Ohio: Bob Winston, W2THU, Cleveland. ASM-NW Ohio: Ron Griffin, N8AEH, Findlay. ASM-Central Ohio: Mary Carpenter, N8OAM, Columbus. ASM-SW Ohio: John Haungs, W8STX, Cincinnati. ASM-SE Ohio: Bill Creighton, K8TUT, Athens. SEC: Larry Solak, WD8MPV, Mantua. STM: Jack Wagoner, WB8FSV, Hilliard. ACC: Joanne Solak, KJ3O, Mantua. TC: Mike Brown, W8DJY, Middletown. PIC: Beverly Priest, N8VZV, Dayton. OOC: Carl Morgan, K8CM, Middletown. SGL: Jeff Ferriell, K8ZDA, Columbus. During the summer time, we have a few local clubs who collect dues. Please support your local clubs; ham clubs are the backbone of the Ohio Section. And while we are on the subject, why not check into the Members Only Web Site of the ARRL and check out services available because of your ARRL dues (see Page 10). The latest ham radio news, product reviews from past *QST*s, and new member services are always featured. As I read your newsletters, I see an increasing number of ham radio participations in local charity events and city marathons. Great! Numerous opportunities to be visible to the public and prove our worth to local civic officials. In May, some 68 Queen City Emergency Net (QCEN) members organized communications for the 1st Annual Cincinnati Charity Flying Pig Marathon. Officials from Franklin County (Columbus) ARES were on hand to see how the Cincinnati hams did because the QCEN members got organization ideas from watching the Columbus Marathon last year. Newsletter editors - please make sure the SM, the ACC and your area ASM is on your newsletter mailing list. It is to your advantage to get your news out. OHIO SECTION CONGRATS to (1) Jodi Harrington, KF8WD, for her many years of service to the Inter City ARC of Mansfield as secretary and PIO. She has moved to KS. (2) Shelby County ARES members (Troy) who are showing off their recently completed new Communications Van -pictures are available on their web site. (3) Jason Stroll, KC8LIN, age 13, whose school project - a report on the history of wireless communications - was reprinted in the Massillion ARC FEEDLINE newsletter and (4) Bob Johnson, K3RC, of Stony Ridge who continues after many years of faithful service to maintain the Amateur Radio Exams List of Ohio. The current list for all of 1999 is on Packet (K3RC@K8VXH) and e-mail (johnson@wcnet.org) and every edition of the Ohio Section Journal. Mark your calendars for the following dates - August 28 when All Ohio ECs meet with the SEC at the Franklin County (Columbus) Red Cross Center and September 18 for the Annual Ohio Section Conference at the State EMA Center (Columbus). All are invited to participate at our Section Conference. Ham Radio's responsibilities during the Y2K situation will be Topic Number One at both sessions. July Ohio hamfests are; (17) at Elyria; Northern Ohio ARS; (18) at Van Wert, the Van Wert ARC; (24) at Cincinnati, OHKYIN ARS; and (25) at Lisbon, the Triangle ARC. de K8QOE. . Now for our April traffic reports. Net QNI/QTC/QTR/sess/time/freq/mgr: BNR 121/52/907/28/1800/3.605/W8LDQ; OSSN 176/50/562/30/1810/3.708/WB8KQJ. OSSBN 1785/556/2385/90/1030,1615,1845/3.9725/KF8DO. Tfc: W8PBX 150, KD8HB 144, KF8DO 143, NS8C 125, W8STX 123, N8FWA 111, WA8HED 94, WD8MIO 94, WA8SSI 93, KA8FCC 88, W8RG 85, K8OUA 80, N8DD 69, N8TNV 68, WB8FSV 66, W8LDQ 60, K8WOQ 60, KA8VWE 51, N8RRB 50, K8IG 45, W8BO 42, KC8JPP 41, KI8O 39, KB8MUB 38, N8GP 37, KB8VXB 35, KB8VYB 35, KB9GGA 30, K8JA 29, NY8V 29, KC8DWM 26, KC8FWU 26, K8QIP 26, N8YWV 24, N8CW 24, KD9K 23, KC8KYP 19, N8ZBW 18, N8OIF 16, KB8ESU 15, N8PAI 15, KB8SBK 15, N8YXL 15, KF8FE 14, KB8UEY 14, WB8KWD 13, N8WLE 11, KC8HFV 10, W8GAC 7, WB8HHZ 6, N8VES 6, KI8GW 5, WB8IOW 5, KE8FK 2.

Mosley TA-53-M

For 10, 12, 15, 17, 20



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CQ CQ CQ!

Some of you might be aware of an attack on Mosley by one of our competitors. For 60 years, Mosley has had a reputation for design experience and a tradition of quality that is continuing at its new Ham facility in Union. Missouri.

They have unscientific backyard tests being conducted by people who give the impression that they are independent testers.

An example of this is from their recent test of our PRO-57-B. They give our antenna a negative gain figure and give the impression that owning anything else would be better, especially their antenna. What they don't tell you is that under the conditions they used, which is wrong to begin with, is that if the PRO-57-B has an inherent low takeoff angle, they would have to have had their test antenna at 500 feet or higher to see its gain. The fact that it showed a low gain or negative gain at the low height is actually a positive of the antenna rather than a negative. However, the average ham will get a negative opinion of the PRO-57-B from their conclusions.

The test was between two hams that have an affiliation with the competing company and have controlled the results to trash Mosley. Last year at Dayton, their attack was more direct and personal. This year at Dayton, they presented their misinformation in a more subtle way where if you are not knowledgeable about antenna testing and conditions, their information comes off as somewhat believable.

Mosley has been contacted by an engineer that these "backyard testers" tried to get to verify their findings to try and give them credibility. The engineer told these individuals that their tests were invalid and that their results were false, and wouldn't sign off to their conclusions. Even with this knowledge, they proceeded in attacking Mosley with their incorrect testing.

We have known about these attacks for quite awhile. As time goes on, their attacks are becoming more obvious, more exaggerated, and more frequent. This company has very clearly devised a network of "good Ol'boys" to try to give their results some credibility. Do not always believe what you hear, especially when "investigative studies" are not independent or scientifically accurate. Our competitor's company continues to muddy the waters with half truths and misleading conclusions. They are aiming for the new or nontechnical ham with this misinformation.

We have not responded to our problem with this company until now, because we believe in the ability of the ham community to see through these attacks, however, with no mention by the testers of their affiliation with our competitor, and the aggressive and direct attacks on Mosley, we now feel this can no longer be ignored.

Mosley has never said a negative word against our competitors, and we are not going to start now. However, we must defend ourselves and the ham community from this type of activity. Our best defense is our 60 years history of inventing and creating new designs of quality products in use around the world by thousands of satisfied customers. By providing replacement parts going back 50 years and being of service to those customers for all this time.

Anyone who has ever owned a Mosley would never doubt that we make the ***BEST*** quality and designed antennas. It has been Mosley's innovation that has spurred on innovations and competition in the marketplace. Mosley has developed many of the "firsts" that exist in the ham radio industry. We have hundreds of antenna designs that the average ham doesn't even know about. We can build a trapless full size antenna, or a linear-loaded antenna, or any other kind you can imagine. However, since the invention of the first single, metal-enclosed trap, our scientific tests and experience have shown our design, construction, and reliability is what the majority of the hams are wanting. We believe that you, the ham, will look to the thousands of hams that are using Mosley products day after day for years on end, with the knowledge that they are using the best system for their situation that they can own. Our tradition guarantees that ***Mosley is "A Better Antenna"!***

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HUDSON DIVISION

EASTERN NEW YORK: SM, Rob Leiden, KR2L— STM: Pete Cecere, N2YJZ. SEC: Ken Akasofu, KL7JCQ. ACC: Shirley Dahlgren, N2SKP. SGL: Herb Sweet, K2GBH. PIC: John Farina, WA2QCY. BM: Ed Rubin, N2JBA. OOC: Hal Post, AK2E. TC: Elmer Sharp, WA2YSM. ASM: Tom Raffaelli, WB2NHC. ASM: Bob Chamberlain, N2KBC. ASM: Andrew Schmidt, N2FTR. ASM: Richard Sandell, WK6R. Net Reports (Apr 1999) Check-ins (QNI)/Traffic handled (QTC+QSP): AES 27/4 CDN 342/138 CGESN 43/4 ESS No Rpt HVN 540/201 NYPHONE 228/653 NYPON 297/373 NYS/E 308/280 NYS/M 220/199 NYS/L 272/392 SDN 322/129. Thanks to KL7JCQ and N2SKP for a great ENY Convention! Congrats to new SGL Herb K2GBH and new LGL Ray, KA2DVM. Thanks to Phil, KB2HQ, for his years of dedicated service. See you at Field Day! PSHR: N2YJZ 181, N2JBA 164, WB2ZCM 142, W2AKT 113, W2JHO 111, KB2YUR 73. Tfc: N2YJZ 464, N2JBA 96, N2TWN 77, WB2ZCM 45, W2JHO 29, W2CJO 15, KB2YUR 10, KC2DAA 8, W2AKT 8, N2MCS 6, N2AWI 5, N2YGK 5, WA2BSS 5, NM2M 4, KL7JCQ 1, KC2CCY 1.

NEW YORK CITY/LONG ISLAND: SM, George Tranos, N2GA. ASM: KA2D, N1XL, K2YEW, W2FX, KB2SCS. SGL: N2TX. SEC: KA2D. ACC: K2EJ. PIC-East: N2RBU. PIC-West: K2DO. TC: K2LJH. BM: KG2M. OOC: N1XL. STM: WA2YOW. Don't forget Field Day is June 25, 26 and 27. The NLI section picnic is Sunday, July 18 from 8 AM until 6 PM at Bethpage State Park. Come join the many participating radio clubs for a great social event! Talk in on 147.375. Call Rob, N1XL, at 718-763-5021 for more information. Look for the special event station N2L from the picnic grounds on 14.060 and 7.040 QRP CW. Also, look for the 60th anniversary of the Coast Guard Auxiliary special event station N2Y on Saturday, July 17 from 9 AM until 6 PM operating from USCG Group Moriches. Empire State Games are July 21 through 25. Contact Diane, K2DO, at 516-286-7562 to help out. NYC/LI VE exam list follows: Islip ARES, 1st Sat 9 AM, Slip Town Hall West 401 Main St. Slip, Len Battista, W2FX, 516-277-0893. Bears VE: ABC Bldg Cafeteria, 125 West End Ave at 66th St. Call Hotline 212-456-5224 for exact dates & times, Jerry Cudmore, K2JRC. Grumman ARC (W5YI) 2nd Tues 5 PM. Northrop-Grumman Plant 5 S Oyster Bay Rd via, Hazel St Bethpage, NY. Bob Wexelbaum, W2ILP, 516-499-2214, LIMARC, 2nd Sat 9 AM NY Inst of Tech, 400 Bldg Rm 409, Northern Blvd. Old Westbury, Al Bender, W2QZ, 516-623-6449. East Village ARC, 2nd Friday 7 PM, Laguardia HS, Amsterdam Ave and West 65 Street, Manhattan. Robina Asti, KD2IZ, 212-838-5995. Great South Bay ARC, 4th Sun 12 PM, Babylon Town Hall, ARES/RACES Rm 200 E Sunrise Hwy N Lindenhurst, Michael Grant, N2OX, 516-736-9126. Hellenic ARA: 4th Tues 6:30 PM; Pontion Society, 31-25 23rd Ave, Astoria, NY, George Anastasiadis, KF2PG, 516-937-0775. Larkfield ARC: 3rd Sat 9 AM, Huntington Town Hall, 100 Main St, Huntington, NY, Joe Coffield, W2DDZ, 516-266-3192, Columbia U VE Team: 3rd Mon 6:30 PM, Watson Lab 6th.floor 612 W 115th St NY, Alan Crosswell, N2YGK, 212-854-3754 PARC: exams held every three months at Southold School Oaklawn Ave, Southold, NY, on next to last Friday of the month.6:30 PM all classes of licenses. For info contact Ralph Williams/N3BT 516-323-3646. Mid-Island ARC, Last Tue. 7 PM, Brookhaven Rec Ctr, 20 Wireless Rd, Centereach, NY. Mike Christopher, KG2M, 516-736-9126. Report all changes to N2GA before the 12th of the month. Tfc: WB2GTG 213, N2AKZ 114, W2RJL 104, KC2ACL 71, WB2KLH 54, N2XOJ 54, WA2YOW 21, AA2NX 14.

NORTHERN NEW JERSEY: SM, Jeffrey Freidman, K3JF— Warren County ARES/RACES is conducting its Y2K Drill June 19. Purpose of the Drill is to simulate the potential Y2K situations which may occur at the turn of the millennium. All Warren County Depts – Government, Police, and Fire are going to participate. The activities begin at 9AM. If you wish to participate contact **K2WJ@arrl.net**. The weekend of April 24 awakened the Radio Room of the USS Ling, a vintage submarine docked in the Hackensack River. Members of the 10-70 Repeater Association have been diligently working to prepare the ship's radio room for this historic event. They have been repairing the vintage radios and antennas to original condition. Possibly you can make a contact with this sub when they are on the air. The museum is open from 10 AM to 5 PM Wednesday through Sunday. Vernon Township ARES/RACES supported the first annual 15K Mountain Challenge event on April 18. The event had 500 participants running over a 9.3-mile mountainous course in Vernon Township. Finally, Field Day is upon us. I intend to visit several sites over the 2-day weekend event. I would like to meet as many of the Northern New Jersey sites as time will permit. Please e-mail your site location to me at k3jf@arrl.org, and I will try to visit your site and get acquainted. I hope all who participate in this event enjoy and most of all have fun. Let's hope Mother Nature and propagation cooperate. Tfc: N2XJ 143, KC2AHS 60, N2GJ 59, N2OPJ 51, W2MTO 49, N2RPI 37, N3RB 34, KB2VVB 15, K2VX 14, W2CC 14, K2PB 13, N2QAE 10, N2TTT 2.

MIDWEST DIVISION

IOWA: SM, Jim Lasley, N0JL@KE0BX. ASM: N0LDD. SEC: NA0R. ACC. N0IJP@KE0BX. BM: K0IIR@W0CXX. SGL: K0KD. TC: W0DIA. TSARC keeps making more improvements to their comm van. I received a picture and info on a planned new paint job. Seems to work very well for them. Look for more info in *QST*. Hey!Note that Sac County RAA is a newly affiliated club. Congrats, gang! When does tractor=ham gear? Ask N0WK how the trip worked out. FMARC joined the Family Preparedness Fair at the local HS in April. An operating station and handouts. Good job, gang! OARC had an enjoyable monthly breakfast in May. AOB treated! Have you noted that FCC is calling people in for retesting? It pays not to be part of the problem! I must be about old. I knew most of the Silent Keys this month. I regret to report that W0RJZ, W0PEX, and K0KYR have joined the Silent Keys this month. TSARC is getting the van painted. It looks good. Check *QST*! Des Moines Co had an ARES drill with ten participating. TIDXC has a member that tested the Elecraft K2 from Belize! If I miss your hamfest, I may be because I am on call and can't leave the area. I

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wish I could make all of them. I have been working long hours, so if this seems disorganized, it probably is! I didn't even get my own traffic total this month! Oh, well. 73 de N0JL Newsletters were received from TSARC, CAARC, FMARC, TSARC, TIDXC, DMRAA, NIRAA, SARA, SEITS, NIARC. April Traffic: (Mar) KA0ADF 126.

KANSAS: SM, Orlan Cook, W0OYH— ASM/ACC/OCC: Robert Summers, K0BXF. SEC: Joseph Plankinton, WD0DMV. SGL: Marshall Reese, AA0GL. Hi gang, Aug 22 ARRL State convention at Salina. Welcome to OO Frank Neal, N8FN, to the Official Observers. Thanks, Larry, W0AIB, for Apr KS WalkAmerica. No emergency msg W/ KC0DHL WB0EJJ WA0PFS WA2ALN KC0AKD W0AIB. As most of you know from the TV news, we had a bad tornado disaster in the Wichita area. I find I need Wichita HF stn to be active in our KS nets especially on 3920 at 6:30 PM. We are receiving Health & Welfare messages from out of state from people wanting to hear from their relatives in the disaster area. So far I have had to call long distance to get the messages into Wichita. Please let me hear from you to "volunteer" to serve your neighbors in this way with HR. Thanks to our 7 net mgrs for active nets. Mar Kansas Nets: sessions/QNI/QTC, KSBN31/1193/121 KPN22/ 220/6 KMWN31/644/599 KWN 31/992/640 CSTN 27/1965/85 QKS 61/343/91 QKS-SS11/31/7 SEC15/897/24 QNS KB0AMY WD0DDG WD0DMV AA0HJ AA0IQ KF4LM W0PBV KB0PQP WA0SSR W0UXG KB0WEQ KB0YQV. TEN 62/?/414 KS 73% W/AC0E AA0FO KB0GUS KX0I K0PY NB0Z WB0ZNY W0SS mgr. DTRN KS 100% W/N0KFS AA0OM W0FE N0KJ/mgr. BBS reports: W1AW Bul/Per/NTS AA0HJ 52 /478/6 N0OMB 25/229/1. Ks Stns tfc N0KJ 530, AA0OM 121, WB0ZNY 111, K0PY 109, W0OYH 98, KB0DTI 37, NB0Z 9 N0NIZ 8, KB0GUS 9, K0BJ 6, K0RY 5.

MISSOURI: SM, Charles Boyd, KE0K—Come June 1, Dale Bagley will be your new Section Manager. I have resigned as your Section Manager for several personal reasons. Please give your cooperation to Dale, K0KY as you have me. 73, KE0K, Charles. Nets: PAUL REVERE 4/515/0 N0IWA; WAARCI 4/101/0 KB0VZP; HAMBUTCHERS 22/861/41 KD4NK; MOTN 30/566/179 K0IPM; QCWA#35 5/82/0 K0YML; MON 1&2 60/178/52 W0WFF; CARL NET 3/30/0 KC0MV; AUDRAIN ARC 5/43/0 WB0SEN; ROLLABILLBOARD 4/333/5 NA0V. Tfc: KI0JO 750, KE0K 82, KG0IV 28. PSHR: KI0JO 90, KE0K 89, KG0IV 82.

NEBRASKA: SM, Bill McCollum, KE0XQ—ASMs: W0KVM, N0MT, WB0ULH, WY0F & WB0YWO. It is with deep regret to inform you of the passing of Leonard Miller, W0VAS. He was 92 and a member of the Lincoln ARC. I am pleased to announce the following appointments: Joe, N2DLY, as LGL and Ron, W0WHY as OES. N2DLY is the Emergency Program Manager for Sarpy County. W0WHY is the EC for Kearney, Franklin, Adams and Webster Counties. A few weeks, ago there was a stuck microphone on the 145.45 MHz repeater in Omaha. It was an accident and several people were involved in tracking down the transmitter. Incidents like this can be prevented if only the owner of the radio used a microphone hanger. If you have one, please use it, don't leave your microphone lying loose. WA0YPY & WA0ASM have been involved in conducting twice weekly Y2K nets. The purpose of these nets is to determine what HF frequencies will be used if amateurs are called upon. I want to take this time to thank them for their hard work. Net reports: NMPN: QNI 1552, QTC 8 & 30 sessions. MID NE ARES: QNI 386, QTC 4 & 30 sessions. NESN: QNI 790, 38 QTC & 30 sessions. W0IRZ Memorial Net: QNI 33 & 2 sessions. Lincoln/Logan ARES: QNI 175 & 13 sessions. Tfc: K0PTK 126, W0AP 26, KE0XQ 20, WY0F 8, WD0EGK 4, KA0DOC 2, K0AEM 2, W0EXK 2. PSHR: KA0DBK 85, KB0YTO 32 KB0YTM 17.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Betsey Doane, K1EIC—Asst SMs: N1API, NK1J, K1STM, KZ1Z. BM: KD1YV. OOC: WA1TJT. PIC: W1FXQ. SEC: WA1D. SGL: K1AH. STM: K1HEJ. TC: W1FAI. Special commendation goes to two of our CT ops—Ed, WA1UJT, and Jim, KD1LD. Ed has been appointed Communications Officer for the Area 4 Office of Emergency Management and Jim has recently been given the post of Deputy Communications Officer Area 4. This is a real achievement, one we can all be proud of. This is yet another example of two operators extending their skill and talent to new public leadership positions. ARES in Area 4 is indeed fortunate to have WA1UJT and KD1LD at the helm. Congratulations Ed and Jim! Rusty, NM1K was delighted to receive a crystal paper weight with gold engraving from The Handi Hams for 500 hours of volunteer service. Rusty continues to originate traffic on behalf of the Handi Hams encouraging members to upgrade, study for new licenses, get on the air and share news for their newsletter. Good work Rusty—congratulations! Several clubs held license classes this Spring. One such club was The Shoreline ARC which reported 6 newly-licensed operators and a seventh to be licensed soon. Novice and Tech theory as well as 5 WPM CW were taught. For some SARC members, it was their first time teaching a class. The VEs and teachers really enjoyed the experience, as it has been a while since SARC ran a class. Participating were: N1DIO, N1KHB, N1QQV, WA1D, WW1L, N1QLF and N1KLB. Thanks! Attention club presidents: Director Frenaye will be holding his cabinet meeting on Sunday, July 11, in Connecticut. Watch for your invitation, and please plan to attend. It is your chance to give input to your director. Those of you who are members of clubs, please encourage your president to attend. Hope to see many of you there. Traffic handlers should give your input about a picnic this summer to STM K1HEJ or ASM K1STM as soon as possible so that appropriate plans can be made. Net/sess/QNI/QTC/NM: WESCON 3/295/175/KA1GWE. NVTN 30/256/139/K1STM. ECTN 30/ 229/26/WA4QXT. CPN 30/177/68/N1DIO. CN 24/60/26/N1AEH. BEARS of Manchester 26/398/418/NM1K. Tfc: NM1K 2193, KA1VEC 498, K1STM 214, KA1GWE 191, N1VXP 118, KE1AI 97, WA4QXT 55, N1ZYD 34, W1GPS 11.

EASTERN MASSACHUSETTS: SM, Larry Ober, W1MW—ASMs: WA1IDA, KB1BCF, N1GTB, N1UGA, N1SGL. ACC: N1AKG. BM: N1IST. OOC: K1LJN. PIC: N1PBA. SEC:

W3EVE: K3HI. STM: WA1TBY. TC: Open. EMA ARRL: voice: 978 567-0942. Packet bulletins: ARRL@EMABBS. e-mail: w1mw@arrl.org. e-mail list:**ema-arrl@netcom.com**. Web: **ttp://www.qsl.net/ema-arrl**. We have a vacancy in the Section for a Technical Coordinator. Thanks to Tony Bean, W1SVU (ex-W5SVU), for his work in this position. Amateur Radio once again supported the Boston Marathon. Bob Salow, WA1IDA, reports that with the able assistance of K1EP, N1HLK and others he coordinated 145 hams in providing communications along the April 19th Marathon course for the Boston Athletic Association, sponsors of the event. Support was provided for the BAA, Red Cross first aid stations, water stations, Elite Runner stations and other administrative needs. Ten VHF and UHF repeaters were used. Scott Ginsburg, K1OA will be teaching a Novice course to fourth graders. The Whitman ARC is looking to support a bike-a-thon on June 26-27. Contact Jeff, N1SOM, for info. Members of the Norwood ARC were scheduled to assist with the grand re-opening of the Blue Hills Observatory on May 1st. The Mystic Valley ARG was to operate a special event station, W1XW, during this activity. The Capeway RC had a Spring Fling dinner event in late April. Field Day preparations are well underway at most clubs. The Boston ARC will be at Larz Anderson Park in Brookline once again this year. On Earth Day, the Sturdy Memorial Hospital ARC helped clean up the WWII Memorial Park in North Attleboro where they hold Field Day each year. The Wellesley ARS has a full head count to operate the VHF contest from Mt. Equinox in Vermont. The Framingham ARA reports a successful flea market. They will be supporting the Framingham Flag Day road race on June 3rd. The Southeastern Massachusetts ARA has made substantial progress in readying the site for their new repeater tower. The Genesis ARS is preparing for their flea market and Field Day. That's it for now. 73 de W1MW. Tfc:W2EAG 245, WA1TBY 165, NZ1D 162, WA1FNM 132, WA1LPM 118, N1LKJ 110, K1SEC 51, N1TAT 48, N1SGL 43, KA1VAX 40, N1AJJ 32, N1IST 27, N1LAH 26, KD1LE 23, K1BZD 22, KB1EB 22, N1TDF 10.

MAINE: SM, Bill Woodhead, N1KAT—ASMs: WA1YNZ, KA1TKS. STM: NX1A. BM: W1JTH. SGL: W1AO. ACC: KA1RFD. OOC: KA1WRC. PIC: KD1OW. SEC: N1KGS. Asst Dirs: W1KX, KA1TKS, K1NIT. Web Site: N1WFO. The great spring weather brought out record numbers of participants for events around the state, and to ensure their safety, hams were there offering their time and expertise. Tnx to from Skowhegan: N1ULR, N1STL, N1STK, N1NX, N1MNJ and NR1W, from Andy ARC: N1OXA, N1OXE, N1WFO, N1RGO, N1ZRL, WA1SCQ. From Portland area: N1GRO, N1TKE, KB1DIH, KA4ATI, N3TCT, WA1DRL, N1UOG, W1ZW, N1BDY, K1GAX, W1IF, W9WBA, K1FXR, K1VRQ, KC1UX, KE1BB, WA1YZV, and KA1VQQ. Events such as these walk-a-thons are a great way to keep Amateur Radio in the public's eye and to advertise the hobby to recruit new members. Tnx to all who helped in the May 1 emergency exercise. It went well and will be repeated in Sept. with hopefully an even larger participation. 73, Bill, N1KAT.

NEW HAMPSHIRE: SM, Mike Graham, K7CTW—ASMs: W1NH, N3CLZ, N1FIL, N1KIM. TC: WA1HOG. STM: WA1JVV. PIC: KA1GOZ. OOC: W1GTA. SGL: K1KM. BM: KH6GR. ACC: NA1E. SEC: N3CLZ. Website www.nh.arrl.org. As this is my first column as your new SM, I wish to thank all who have prepped me these past months, especially past SM Al Shuman, N1FIK. New Section Staff appointments are nearly complete and will be announced early July. Rochester was a resounding success. Ditto for the VE Session there; 47 applicants, 22 new or upgraded licensees (6 Tech, 3 Tech+, 2 Gen'l, 6 Adv'd, 5 Extra). Congrats to Glenn, W1FI and his VE crew. Mort, KH6GR, Bulletin Manager, reminds all that advertising your event by bulletin gets the word out to everyone. Send your material to him and he will do the rest. I regret to inform you that Bill Twining, K1KFP, passed away March 30 after a lengthy illness. Bill was a member of the Nashua Area Radio Club and was active until just recently. NHARA is being revitalized. Stay tuned for details. To receive info faster, get your email registered on the NH ARRL Reflector. Send your name, call, e-mail addr to: Reese Fowler, N1KIM, e-mail **n1kim@nh.arrl.org**. 73 de K7CTW. Net sess/QNI/QTC/time: GSFM 30/235/49/432; GSPN 34/125/48/261; N1VFM 4/46/5; VTNH 30/148/138/454. Tfc: W1FYR 1347, W1PEX 793, K1TQY 243, WA1JVV 90, K1ZO 79, W1ALE 61, KA1OTN 61, WB1GXM 51, N1NH 50, N1CPX 40.

WESTERN MASSACHUSETTS: SM, William C. Voedisch, W1UD—w1ud@juno.com. ASM: N1LZC. ASM (digital): KD1SM. STM: W1SJV. SEG: K1VSG. OOC: WT1W. According to all club newsletters, planning has been completed for Field Day. Propagation is on the rise and should result with many contacts on 10, 15, and 20 meters. These bands will be active for extended times, so plan on extensive operation on them. Time to consider operating in the QRP mode. Five watts will go a long way, especially on 10 meters. Most of the present generation of transceivers with superior receivers are capable of easily reducing power. With the new battery charging regulations, the 100-watt level can be maintained for the duration of Field Day if so desired. Have you tried the new PSK digital mode? For 5 dollars and a computer, you can operate on a superior digital mode. While setting up the output levels, I glanced up at the screen and found a QSO in progress. Near perfect copy, but only noise from the loudspeaker. Waited for them to end and to my surprise, one came back to my call. Never did hear anything but background noise, but didn't miss any printing! Tfc: W1ZPB 67, KD1SM 12, W1SJV 18, W1UD 193.

NORTHWESTERN DIVISION

ALASKA: SM, David Stevens, KL7EB—OOC: KL7IKX. SEC: NL7DL. DEC: WL7JBV. DEC: WL7GK. TC: AL7CE. TS: KL7CC, AST: WL7BJ. ASM: KL5T. Snipers Net 3920 Daily 1900 AST, Bush Net 7087 daily 2000 AST, Motley Group 3933 Daily 2100 AST, and Alaska Pacific Net 14.292 M-F 0830 AST. Arctic ARC needs help with the Yukon 800 Boat race. South Central Radio Club has several races they support. Contact KL7TS, T J Sheffield. The propagation was better them usual for Field Day with a lot of contacts for all. The Motley Group had a good picnic and eye-

ICOM

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EASTERN WASHINGTON: SM, Kyle Pugh, KA7CSP—47 ham operators helped with communications for 45,114 runners at the 23rd annual Bloomsday Run in Spokane on May 2nd. Gordon Grove, WA7LNC is heading up 40 hams to help with Spokane's Lilac Parade on May 15th. Thanks to Craig Wentz, KC7MVF, and his crew for communications in Wenatchee's annual Apple Blossom Festival. It's with sadness to report that Gene Westfall, K7EUA, of Spokane is a Silent Key. Gene was always at many hamfests with his table of fine used gear; he had a lot of friends and will be missed. Gordon, WA7LNC, Don K7BFL, and Harvey, K7GXZ, were at Wallace, ID, for "Wallace Days" with the American Morse Telegrapher's Club and relayed CW traffic at a public demonstration. Net Activity (for April.): WSN: QNI 889, tfc 247; Noontime Net: QNI 8479, tfc 392; WARTS: QNI 3083, tfc 167. Tfc: W7GB 228, K7GXZ 219, KA7EKL 71, KK7T 46, K7BFL 44. PSHR: W7GB 138, K7GXZ 120.

IDAHO: SM, M.P. Elliott, KF7ZQ — OOC: N7GHV, SEC: AA7VR, STM: W7GHT. CW demos are being held at Wallace Depot Days and the Western Idaho State Fair. A unique Idaho event is the HP International Women's Challenge bike race (6/9 thru 6/20). It involved professional cyclists ($125K in prizes) and 13 different stages (693.5 miles). The HP-Boise ARC provided communications for the entire route. Primary mode was packet and included the use of airborne (2000 to 8700 ft.) digipeaters! The HP effort was led by Gary Holland, N7DHL. Others involved were N7MTZ, N7KJQ, KD6GCL, K2SKI, N7UBO and KC7NJB. Summertime is ham radio fun time - get involved! 73 — Mike, KF7ZQ. Tfc: W7GHT 467, KB7GZU 75, N7MPS 41, and WB7VYH 33. PSHR: W7GHT 122, WB7VYH 84, and N7MPS 74. Net (SESS/QNI/QTC/ Mgr.): FARM - 30/ 2237/24/ W7WJH; NWTN - 30/1594/70/ KC7RNT; IDACD 22/558/23/ K7UBC; IMN 30/389/369/ N7MPS.

MONTANA: SM, Darrell Thomas, N7KOR—Two clubs in the Montana Section have been successful in reversing city ordinances which placed severe limitations on antenna heights and installations. The Great Falls Area Amateur Radio Club in Great Falls were surprised last year when the city passed a telecommunications ordinance which limited antenna structures to 35 feet and only one structure or support per lot. A committee was formed and under the direction of Lynn Baker, K7LUH, wrote an amendment and then took it to all of the neighborhood council meetings, planning board and city commission. At a public hearing recently they were able to get the ordinance amended to allow Amateur Radio towers and antenna support up to 80 feet with a total of 3 support structures per lot. In Billings, Montana, the Yellowstone Radio Club have been successful in recent weeks to get their ordinance amended to allow 100 foot towers and unlimited support structures. A great victory for the hams in those areas. Net/QNI/QTC/NM MSN 112/1 W7OW; MTN 1849/52 N7AIK. PSHR: N7AIK 99. Tfc: WA7PRD 4 points.

OREGON: SM, Bill Sawders, K7ZM—ASM: KK7CW. ASM: KG7OK. SEC: WB7NML. STM: W7IZ. SGL: N7QQU. OOC: NB7J. STC: AB7HB. ACC: K7SQ. I am happy to announce two new appointments to the Oregon Section management team. Appointed to Section Traffic Manager is Scott Gray, W7IZ, of Clatskanie. The new Section Government Liaison is Ken Wilhelmi, N7QQU, of Portland. Appointed to ORS status is Karl, KK1A. Hugh, AB7QN is the new EC for Lincoln County, and Ray, KK7OF, has taken on the EC duties for Baker County. Dick Frey, K4XU, of Bend, has been chosen to be a judge at the World Radio Team Championships next year in Slovenia. Dick participated as a referee when the event was held in San Francisco. The IARU Region 2 Amateur Radio Direction Finding Championships, take place August 6-14 in Portland. Included will be a hidden transmitter hunt on 80 meters! Sounds like lots of fun! The Oregon QSO Party was a huge success, with operators participating in many Counties, including Jefferson, Crook, and Wheeler. Many Oregon hams are wondering what happened to Cycle 23? Let's hope the HF bands get a lot better, and that 6 and 2 meters get some good openings too. Don't forget the annual ARRL Northwest DX Convention will be held in Portland July 30th through August 1. Lots of great programs will be on tap, and this year, the "cw pileup" contest will again be featured. See you there, and keep in touch! NTS traffic totals for April: KK1A 266, W7VSE 159, KA7AID 118, K7NLM 99, N7DRP 48, KC7ZZB 40, KD7CWU 5, late March, N7DRP 196.

WESTERN WASHINGTON: SM, Harry Lewis, W7JWJ—Public Service Honor Role (PSHR)? Let's see who in Western Washington qualified for PSHR: In April K7BDU, W7LG, KD7ME, K7MQF, W7NWP, KJ7SI, W7TVA, N7YSS, W7ZIW. Once again K7BDU qualified for BPL during the same month with a traffic total of 772. Other traffic handlers: N7AJ 40, K7JML 18, W7LG 83, KD7ME 49, K7MQF 192, W7NWP 108, KJ7SI 105, K7SUQ 21, W7TVA 244, K7YOH 14, N7YSS 59 and W7ZIW 140. SEC N7NVP reports that King, Kitsap, Pierce, Snohomish and Thurston Co ARES members participated in the National Disaster Medical Services exercise which simulated a disaster in the Spokane area. Injured victims were medevac'd to Western Washington medical facilities. Members worked at various local hospitals and maintained communications with vehicles transporting the victims from Madigan Army Medical Center. Well done, and many thanks to all those who took part. Whatcom Co supported both the MS and March of Dimes Walkathons while practicing tactical calls on a directed net. Many thanks to Mike Colyar, K7ITL, who lead the Thurston Co team as the EC for the past year. The new EC for Thurston Co is Allan Jones, W7SAY, who reports the team received high marks for being able to provide the safety net for the overhead organization using three separate nets to coordinate all activities during a mock search. The OOs reported a light month with only one report for hum sent and that to W1AW! Net tfc: NTN 392, WARTS 117, WSN 247, NWSSB 25, CCAIN 4.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASM: KF6RCO. SEC: KE6NVU. DECs: WA6TGF/Alameda County, KO6JR/

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NEVADA: SM, Bob Davis, K7IY—ASM: Jan Welsh, NK7N. SEC: N7JEH. TC: NW7O. ACC: N7FFP. STM/SGL: N7CPP. PIC: WW7E. OOC: N7ELV. Hello to the entire Nevada Section. Nearly mid-summer now Travel seems to be a key word. Folks coming and going in all directions and what great fun to keep up with them on the HF bands as they criss-cross our country. The Bands seem to be in generally favorable condition allowing QSO's from a few hundred to thousands of miles away, sometimes mobile to mobile. And of course, being in Nevada, we can expect that many of these travelers will end up in our State. Please take the time to assist when possible and help welcome them and "show off" this terrific hobby of ours. Still time to make plans to attend the Reno Hamfest, July 31. Saturday mornings 7:35 AM. 3965, RARA net followed by the Nevada Section HF ARES net on 3965, 8:30 AM. Will probably have Field Day results in the next month or so. Starting the second term as Nevada Section Manager, thank you for supporting me...again! Hi to John, N6WRB. Thanks and 73, Bob, K7IY. Tfc: N7CPP 10, W7TC 2.

PACIFIC: SM, Ron Phillips, AH6HN—ASMs Harry Nishiyama, KH6FKG. Lee Wical, KH6BZF. Jim Reid, KH7M, George Heloca Sr. KH6A and NA; Mel Fukunaga, KH6H; SEC: Dennis Carvalho, KH7H. TC: Chuck Cartwright, AH7Y. PIC: Russ Roberts, KH6JRM. ACC: Bob Schneider AH6J. Dean Manley, KH6B, reports that the Coconut Island DXA members KH6AFQ, NH6XB, KH6BMM, KH6AVF, NH6D, NH6WW, NH6WX, KH6HHD, KH6DFW, AH7H, WH6CQA, KH6HME, AH7A and KH6B activated call sign AL0HA for the 7th annual Moku Ola Island DXpedition. KH6KB is the Les Nunes memorial club call of the Makani ARC with KH6AFQ as trustee. Thanks Dean for your input. Lee Wical reports the sad news that Sonny, KH7S, ex KH6FK, passed away Tuesday afternoon (April 20) at Kauai Veteran's Memorial Hospital. He had been in the hospital since last Friday with problems of chest pains and a hard time breathing. He will be missed by all. Corky (W6ORS) reports he will be off island for a month on a barge trip in France. Sounds like a lot of fun. The first Pacific Section Cabinet meeting will be held in Hilo on May 8, 1999. The Pacific Director, Brad Wyatt, has been invited to attend. More details later. Please continue to let me know how your *QST* is arriving at its condition. Mahalo, Aloha, 73.

SACRAMENTO VALLEY: SM, Jettie Hill, W6RFF—It is with deep regret that I announce that KA6SJK became a Silent Key. She was very active in the Amador County ARC. Condolences to K6BPB. Keep August 7 open for the Golden Empire ARS's 60th anniversary Hamfest & Swapmeet in Chico. Next VE session at Yuba Sutter ARC is Sept 9. 530-674-3648 for more info. Nevada County ARC announces VE tests on Sept. 25 and Nov 13, call 530-273-0524. Rudi, HB9DU, had a nice article on a Rotary Spark Transmitter that was used by Phil Keast, 6DD, in 1914 in NCARC's bulletin. River City ARCS report their Swap Meet was a huge success. An interesting article on "CW is a Language" by W6REC was published by RCARCS. KO6TH gives a Satellite Report each month in the Sierra Foothills ARC bulletin and weekly on their Club Net. W6MH gave a talk on the history of Tesla and a demonstration of a million volt Tesla generator - talk about arcs and sparks! Several clubs preparing for their fund raising "White Elephant Auction" in Oct. Mother Lode DXCC has a joint BBQ and pot luck meeting in Jackson with the Northern Calif. Contest Club on July 24. Mt Vaca RC will be celebrating their 30th anniversary soon. Congratulations! W6TEE spoke on "Radio Mobile Operations" prior to repeaters. He also writes on Mobile Radio for World Radio. If you are on e-mail, please send me your address. Do you have an ARRL.NET address? My new address is **jbhill@jps.net**. 73.

SAN FRANCISCO: SM, John Wallack, W6TLK—ASMs: N6KM, KE6EAQ. OOC: KD6VWD. PIC: N6BWS. SEC: WB6TMS. TC: N1AL. KH6GJV, Empire ARS, reports a special event station is being planned for Aug 21 and 22 at the Pacific Coast Air Museum annual open house and air show at the Sonoma County Airport north of Santa Rosa. All 3 Sonoma County radio clubs, SCRA, VOMARC and REDEX, are invited to participate. Some vintage radio equipment will be in operation next to many restored WW II aircraft. The air show draws several thousand guests and will provide an excellent opportunity to introduce amateur radio to the public. Thanks to N6OJ, N6AD, K6ANP, N6YEU and WW6D from the Redwood Empire DX Assoc for an excellent program on the basics of DX contesting for the Sonoma County RA monthly meeting. KF6JKP reports that KD6ZZL is the new Chief Radio Officer of Marin County RACES. A reminder that KA6OQJ in Arcata runs the outstanding California Weather Net on 3.954 MHz every morning from 0600 to 0730. WX reports from all over the Western US from many loyal and dedicated hams are a regular feature. Listen and join in.

SAN JOAQUIN VALLEY: SM, Donald W. Costello, W7WN—

YAESU

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ASM: Mike Siegel, KI6PR. ASM: John Lee, K6YK. ASM: Pat Fennacy, W6YEP. SEC: Kent LeBarts, K6IN. ACC: Charles McConnell, W6DPD. OOC: Victor Magana, N1VM. This year the ARRL is celebrating its 85th anniversary and moving forward into the 21st century. Happy Birthday to the League and Amateur Radio. As your SM, I would like to invite you to send me e-mail or snail mail about what you would like to see the League do or become in order to better serve you in the next century. I will make certain that all of your comments, suggestions and concerns reach the Directors and HQ in Newington. I am writing this issue of the Section News in May and recently attended the Fresno ARC hamfest at Riverland in Kingsburg. The wx was very nice and the tri-tip was delicious, as usual. I had an opportunity to shake many hands and also met with members of the BARA club who will be having a hamfest in October of this year. Enforcement of the Amateur Radio regulation is a wonderful breath of fresh air, and I would like to personally thank Riley Hollingsworth, K4ZDH, and his staff for championing renaissance of law and order on the bands. Victor Magana, N1VM, is the Official Observer Coordinator for the San Joaquin Valley Section. Victor and his staff are constantly vigilant in monitoring the bands. Jamming and indecent language on repeaters in the SJV Section will not be tolerated.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—May- I'll list the calls of FD messages I receive in the July column. The Santa Cruz ARC heard from Joe KN6O about SWR, facts & fallacies. SVECS had their quarterly breakfast—speaker was DEC Larry Carr, KE6AGJ. Santa Clara County ARES/RACES is in the process of upgrading the EOC packet network. SCCARA meetings at 7:30 PM on the 2nd Monday at the Hewlett-Packard Oak room, bldg #48 in Cupertino. KC7FG provided a tour of Lockheed-Martin ARC's wonderful new shack. PAARA heard from Bob Fabry, N6EK, h/w & s/w designer of the NCDXF/IARU HF beacon network. 73 de Glenn WB6W.

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W— SEC: K4MPJ. STM: K4IWW. TC: K4ITL. SGL: KI4AN. OOC: W4ZRA. PIC: KN4AQ. ACC: W4CC. BM: KD4YTU. Check the Section Web site **http://www.ncarrl.org** for the latest on S.B. 390, a Bill to reduce the extra fee for Amateur Radio License Plates. Thanks to all of you who responded to the requests to contact members of the North Carolina General Assembly. When Joe, WD4MRD, and I went to speak with legislators we were told they had received many requests for support for this Bill. The message we wanted to deliver was that the primary purpose of these plates is to identify vehicles with communications equipment during an emergency. By statute, these plates are only: "Issuable to an Amateur Radio operator who asserts to the Division that a portable transceiver is carried in the vehicle." They are not Personalized Vanity Plates. We told them that North Carolina's Radio Amateurs have been members of the State Emergency Response Team (SERT) since its inception and also work closely with local agencies and Emergency Management officials. We asked them to send a message of encouragement and appreciation to our licensed Amateur Radio Operators by passing this Bill. I am proud of the accomplishments of North Carolina's Amateurs. This was an excellent opportunity to let these officials know about Amateur Radio's contributions to our state. Again, thanks for your support in this effort. — Last year I wrote here that I was giving advanced notice that I would not seek another term as Section Manager. I hope that we will select a new Section Manager with the experience and dedication to help the ARRL Field Organization and the Amateur Radio Service prosper in our Section. Cary Swapfest Jul 17. Western Carolina ARS Hamfest in Waynesville Jul 31. Apr Tfc: W4EAT 430, AB4E 418, KI4YV 141, K4IWW 130, K4AIF 125, AA4YW 89, KE4JHJ 83, W3HL 77, W4IRE 53, KF4VDW 48, AC4DV 34, AB4W 33, KE4AHC 32, W4CC 18, WA4SRD 14, WD4MRD 14, KE4YMA 11, KF4OZF 9, KB4FWL 8, KR4ZJ 8, KF4PAK 7, KT4CD 7, W4DYW 7, WA4ZWC 7, KF4OCU 6, KB8VCZ 5, N2JLE 5, KF4YHG 3 [AR]

SOUTH CAROLINA: SM, Les Shattuck, K4NK—So Carolina SSB Net 7 PM, nightly at 3.915, Palmetto chapter QCWA net Sat AM at 9:00 on 3.930. Well no one sent any news again this month, so I guess this will be a short column. Some have asked why our SC is smaller than some others. It goes by the amateur population, the more hams in your state the more space you get to write.We had a great time at the Salkihatchie radio club tailgate party on May 1. Joyce won a small door prize and we had the best chicken BBQ. This week we will be off to the upstate hamfest at Anderson. This one is sponsored by the Blue Ridge ARS. Last year it drew the largest gate in our state. Field Day this year I will be down state checking on the local clubs, hope to get to visit your site. As I write this, I notice that the sunspots are coming up a little. I'm planning some upgrades to my station to be ready this fall. I am noticing a number of new volunteers who are interested in becoming OOs. That's great, but I really need a couple of folks who would be interested in the OBS (official bulletin station) appointment. The job would consist of getting ARRL bulletins from the Internet or other sources and reading them on your local 2-meter repeaters. This way, even those with no HF can hear the latest amateur news. Traffic (Apr): WW4SC 179, KT4SJ 114, W4DRF 73, KA4LRM 71, KA4UIV 59, WD4BUH 17, WA4UGD 13, W4CQB 12, K4NK 7,KQ4SY 4, KF4HAV 4, WT4F 2. PSHR: KA4UIV 146, WW4SC 119, KT4SJ 108, KA4LRM 102.

VIRGINIA: SM, Lynn Gahagan, AF4CD—ASM: W4TLM. SEC: K4EC. SGL, KK4IY. TC: W4IN.OOC: KR4UQ.PIC: W2MG. STM: AF4CD. Don't forget the outing at Blacksburg located at the NWS on July 24th. For more information contact DEC 13, Bob Ham, KK4IY. Everyone have fun at Field Day. Do not forget the bonus points for NTS traffic to the SEC or SM. Hats off to everyone that helped make the Warrenton training session a big success! Over 100 Hams came out to attend the training session at the New Baltimore Vol Fire House. A special thanks to the Women's auxiliary who prepared lunch and provided snacks for those who attended. To meet the State Code requirements for

training; Virginia ARES is conducting another round of training sessions throughout the state. The next one will be in SW Virginia to be followed by DEC 7 and the Valley. Dates and locations are to be announced later. State and local government officials have indicated that ARES/RACES assistance will be needed for the Y2K event. The Virginia EOC will be fully staffed for Y2K, with all stations (including digital) operational. Chesterfield County has already notified EC Robert Vest (KA4CBB) that it wants all fire stations, the County EOC, police precincts, and rescue squads with full amateur staffing. Chesterfield has one of the most modern communications systems, but is taking no chances. Many city and county governments are expected to request some level of ARES/RACES support. I strongly recommend that all ECs contact their city or county EMs and see if they will be requesting our help. Do not wait till the last minute. Plan ahead! Is your jurisdiction prepared and trained to meet a request for support? KE4NBX, DEC 7 reports: On May 8th the SKYWARN training took place at Newport News EOC. There were 42 students in attendance, which were mostly Amateurs throughout District 7. The City of Newport News issued a "press release." TV WTKR, WVEC, and FOX were there and had considerable footage on the news. A special thanks to Jack Williamson, Emergency Manager for the City of Newport News, a big supporter of ARES/RACES and also for making the Newport News EOC available for this training. Also hats off to Bill Sammler, WCM Wakefield Forecast Office, (a big supporter of Ham radio) for taking the time to impart his considerable years of knowledge, to those in attendance! 73 de AF4CD. Tfc: K4DOR 528, KR4MU 302, N4ABM 184, K4MTX 136, WA4DOX 129, W4CAC 122, WD4MIS 113, W3BBQ 107, K4YVX 105, W4UQ 79, WB4ZNB 58, AA4AT 48, AF4CD 44, WB4UHC 43, K0IBS 37, KE4NYY 34, KC8GUK 20, WA8AHV 16, KF4HJW 13, K4ISM 12, K4PRR 11, W4JLS 8, WA4JFW 8, W4YE 8, K4IX 8, KB4CAU 7, WB2KQG 6, KE4HFX 4, W4MWC 2, KB4AXR 2, W4IN 2, N4FNT 2, W4HDW 2, K4JM 2.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Tim Armagost, WB0TUB—ASM: Jeff Ryan, N0WPA. SEC: Mike Morgan, N5LPZ. STM: Mike Stansberry, K0TER. ACC: Ron Deutsch, NK0P. PIC: Erik Dyce, W0ERX. OOC: Karen Schultz, KA0CDN & Glenn Schultz, W0IJR. SGL: Mark Baker, KG0PA. TC: Bob Armstrong, AE0B. BM: Jerry Cassidy, N0MYY. As I write this, only two weeks have elapsed since the tragic Columbine High School killings in Littleton. Words fail to express the sense of shock and sorrow. Denver Metro hams provided communications support to the Salvation Army, Red Cross and other facilities in the area. Our thoughts are with all who were affected by this tragedy. In late April, record rainfall brought the worst flooding seen in thirty years to many communities up and down the Front Range. Hams were pressed into service in Ft Collins and Colorado Springs to support agencies dealing with the flooding and/or people displaced by it. A power failure to a telephone relay in eastern Teller caused an outage to 911 service in Teller and parts of six surrounding counties. Pikes Peak ARES and MARC members staffed the Teller Sheriff's Office, hospital and other key facilities and were visibly stationed at strategic intersections to provide emergency communications until the phone service was restored. The Pikes Peak Radio Amateur Association swap on May 1 was great with good turnout even though the WX was terrible. Hams from the northern Front Range loved the new location in Monument. E-mail to me: **n0wpa@arrl.net**. 73 de N0WPA. NTS Traffic: K0TER 116, N0UOD 36. CAWN W0WPD 682, W0GGP 620, N0DKK 452, N7EQ 424, W0LVI 404, AA0ZR 366, K0HBZ 321, WB0VET 300, N0FCR 298, N0JUS 293, KI0ND 250, N0NMP 210, W0NCD 124.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS & N5ART. SEC: K6YEJ. STM: N7IOM. NMs: WA5UNO & W5UWY. TC: W8GY. ACC: N5ART. New Mexico Roadrunner Net handled 126 msgs with 1082 checkins. New Mexico Breakfast Club handled 216 msgs with 1082 checkins. Yucca 2-mtr Net handled 15 msgs with 755 checkins. Caravan Club 2-mtr Net, handled 9 msgs with 86 checkins. SCAT Net handled 75 msgs with 693 checkins. Four Corners Net handled 28 msgs with 373 checkins. GARS Net handled 4 msgs with 32 checkins. Rusty's Net handled 105 msgs and 822 checkins. Valencia Co Net handled 16 msgs with 37 checkins. Enjoyed an extra cool spring tailgate in ABQ, thanks to KM5EL & KC5NZS and their fine crew! A bit chilly, but the wind wasn't so bad with a good crowd from around the state. Saw some people you only see once or so a year. We gratefully appreciated Rick Roy, KB5KJT, plowing through the wind sand from Lubbock, TX, to be here for the tailgate. After the tailgate, Don and I drove to Las Cruces to spend the night, and out to the Bean Feed the next morning. We had nice weather until the wind started up as we were closing down. A "Special Thank" you goes out to the Mesilla Valley ARC for all their hard work and such a nice club house! No sand in the chili and beans! The NM State Police have reported no missions in the ABQ District this month, thank heavens! We have again had our share of SKs with the passing of ole timer W5AAQ—I believe a 60-year member of ARRL! Also, we deeply regret the passing of AB4P, a super T-hunter and great DF'er. Vy best 73, W5PDY.

UTAH: SM, Jim Rudnicki, NZ7T—Greetings. After four years, and 48 editions of this tiny column, it is time to pass the reigns on to the next SM. As I head back to the back rows of club meetings and take time to start enjoying radio again, I would like to thank all of the members of Utah's Field Organization. I will admit that I probably haven't even personally met all of you, but rest assured your efforts for the betterment of Amateur Radio do not go unnoticed. Four years ago I told you my plans to meet every club in the state. Well, I almost made it; challenged by a shift work and family schedule that ate up the weeks like sand through an hourglass. I am proud of our accomplishments in areas like ARES, and all public service, along with working with many communities for the protection of your rights to raise an antenna. My tenure ends with many tasks unfinished. But I know that the next SM will continue in the best interests of ham radio. In closing, my warmest thanks to my family:

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***New** MFJ-259B reads antenna SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . covers 1.8-170 MHz . . . built-in frequency counter . . . side-by-side meters . . . Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . easy access battery panel . . . smooth reduction drive tuning . . .*

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MFJ-259B gives you a complete picture of your antenna's performance. You can read antenna SWR and Complex Impedance from 1.8 to 170 MHz.

You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open in feet.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously at a single glance.

You can also read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning, easy access battery panel and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance over the entire spectrum 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and approximate Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and much more!

NEW

Call your dealer for your best price!

MFJ-259B **$249.95**

Call or write for Free Manual

MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1315, $14.95. Its rugged all metal cabinet is a compact 4x2x6¾ inches.

How good is the MFJ-259B?

MFJ *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

More MFJ SWR Analyzers™

MFJ-249B, $229.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

MFJ-209, $129.95. Like MFJ-249B but reads SWR only on meter and has no LCD or frequency counter.

MFJ-219B, $99.95. UHF *SWR Analyzer*™ covers 420-450 MHz. Jack for external frequency counter. 7½x2½ x2¼ inches. Use two 9 volt batteries or 110 VAC with MFJ-1312B, $12.95. *Free* "N" to SO-239 adapter.

SWR Analyzer Accessories

Dip Meter Adapter

MFJ-66, $19.95. Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Save time and take the guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your *SWR Analyzer*™.

Genuine MFJ Carrying Case

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories.

Made of special foam-filled fabric, the MFJ-29C 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.

Has clear protective window for frequency display and cutouts for knobs and connectors so you can use your MFJ *SWR Analyzer*™ without taking it out of your case. *Look for the MFJ logo for genuine authenticity!*

MFJ-99, $54.85. Accessory Package for MFJ-259/B/249/B/209. Includes *genuine* MFJ-29C carrying case, MFJ-66 dip meter adapter, MFJ-1315 110 VAC adapter. ***Save $5!***

New! ***Tunable Measurement Filter™***

MFJ-731, $89.95. *Exclusive* MFJ tunable RF filter allows accurate SWR and impedance measurements 1.8 to 30 MHz in presence of strong RF fields. Has virtually no effect on measurements. Works with all SWR Analyzers.

MFJ *No Matter What*™ warranty

MFJ will repair or replace (at our option) your MFJ *SWR Analyzer*™ for one full year.

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• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders from MFJ

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FAX: (601) 323-6551; **Add s/h**
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MFJ-224 **$159.95**

MFJ 2 Meter *FM SignalAnalyzer*™

Measure signal strength over 60 dB range, check and set FM deviation, measure antenna gain, beamwidth, front-to-back ratio, sidelobes, feedline loss in dB. Plot field strength patterns, position antennas, measure preamp gain, detect feedline faults, track down hidden transmitters, tune transmitters and filters. Plug in scope to analyze modulation wave forms, measure audio distortion, noise and instantaneous peak deviation. Covers 143.5 to 148.5 MHz. Headphone jack, battery check function. Uses 9V battery. 4x2½x6¾ in.

More hams use MFJ SWR Analyzers™ than any others in the world!

Kathy, Paul, and Amy for all the support and love in the last four years. Couldn't have made it without you! 73 all, and see you on the bands! 73 de NZ7T.

WYOMING: SM, Bob Williams, N7LKH—WY Section is continuing to deliver public service in a very effective way. We provided communication for the 1999 March of Dimes WalkAmerica event again this year. The exercise involved 15 towns all over Wyoming and the MOD organization was very pleased with the our service. We can expect to be asked to help out with com again next year. As in the past, the lead in arranging the com support has fallen on the ECs and they have done an excellent job. In addition to the MOD, com support was provided in Cheyenne for Walk for Multiple Sclerosis by Marty Luna, WE7MA, with help from KA7VIS, KC7RZK, KC7DVE and AA7TB. Marty has recently become the Laramie County Director of Emergency Management. It is particularly nice to have a Ham in that position. There have instances where with a non-Ham there have been problems. Also, the JHAARC is helping the Learning Center with Miles for Money communications. Duane Shillinger, NN7H, had 92 points for PSHR for March and recently received his Public Service Honor Roll certificate for making the monthly Honor Roll 18 out of the last 24 months. Congrats! 73, Bob.

SOUTHEASTERN DIVISION

ALABAMA: SM, Bill Cleveland, KR4TZ—ASMs: W4XI KT4XA N4YYQ N4ZNO KX4I KD4PDQ. SEC: AF4HE. STM: WB4GM. BM: KA4ZXL. OOC: WB4GM. SGL: KU4PY. ACC: K4LI. TC: W4OZK. I hope everybody had a successful Field Day! In July we are going to have a Section Meeting in Clanton, AL. I wasn't able to confirm the meeting place in time for this SM report, so please check our Web site **http://www.qsl.net/kf4dzi/alarrl.htm** for up-to-date info. Let's thank Jason Rawls (KF4DZI) for maintaining our Web site. I would like to thank Farris Mosley (KD4PDQ) for stepping forward as an Assistant Section Manager. Farris will chair our new committee that will set standards and coordinate efforts to improve the Alabama Inter-City Net. The Alabama Inter-City Net (AICN) is a collection of linked repeaters that allow statewide communications on 2 meters. If you're an Amateur Radio club in Alabama and would like to be mentioned in the Section Report, please email me at KR4TZ @ARRL.ORG. Please keep in mind that there is a two-month lead time for publication, so tell me about your event as soon as you can. Thanks and 73, Bill KR4TZ.

GEORGIA: SM, Sandy Donahue, W4RU—ASM/So Ga: Marshall Thigpen, W4IS. ASM/Legal: Jim Altman, W4UCK. SEC: Tom Rogers, KR4OL. STM: Jim Hanna, AF4NS. SGL: Charles Griffin, WB4UVW. TC: Eddie Kosobucki, K4JNL, ACC: Jud Whatley, W4NZJ. OOC: Monroe Gaines, KF4NXD. PIC: Chuck Calmbacher, AD4JU. The bad news is that Dick Baxter, K5TF, has resigned as Section Traffic Mgr. The good news is that Jim Hanna, AF4NS, has agreed to become STM. Jim is manager of Ga State Net. Thanks for the years, Dick. Welcome, Jim. Thanks also to K4BEH for filling in for K5TF in handling tfc reports. The revived Ga QSO Party is July 31-Aug 1. Rules somewhere in this issue of *QST*. Dr Ray Bitley, KD4FZO, became SK in late April. A noted economist and consultant he sucumbed to congestive heart failure at age 55. Officers of Ga Tech ARC for 1999-2000: Pres KE4QLI, V Pres WJ2RM, Sec K4FLY, Tres N3NGG, Shack Steward KE4DSD, Rptr Mgr KD5BWT. Gwinnett ARES received Red Cross Good Neighbor award for work during the tornadoes of April 1998. Gwinnett EC is KM4Z. Next hamfest is July 10 in Gainesville. This is a change from the usual Sept date. West Ga ARC and ARES responded to tornado destruction in Bremen May 7. Condolences to the family of Robert Holly, KA4AXO, retired postmaster of Stone Mountain and an Alford Memorial ARC member. Tfc April: AF4NS 180, WA4GGS 131, K1FP 111, W4AET 91, K4BEH 90, W4WXA 61, KA4HHE 56, K4JNL 10, K4BAI 3. 73 Sandy.

NORTHERN FLORIDA: SM, Rudy Hubbard, WA4PUP—ASM-APRS: WY8O. ASM-Youth :KO4TT, ACC: WA4B. BM: N4GMU. OOC: WB4GHU. PIC: KF4HFC. SEC: WA4NDA. SGL: KC4N. STM: WX4H. TC: KO4TT. PACKET: N4GMU. Balanced Modulator, Jacksonville, reports Riley Hollingsworth moving to Jacksonville. He will retain his FCC position working from home via computer link to Washington. He has vowed to clean up Amateur Radio in Jacksonville. All rules violators will be expelled from ham radio and ordered to use Internet instead. It is also reported ten local hams are on the "hit list" and will be subject to intense scrutiny. Based on this report, it would be wise to advise all hams to follow the rules and regulations in their operations. The Jacksonville Hamfest is scheduled for October 29-30 at the Shrine Auditorium. This is a change from previous locations, so be aware of the new location. 28 amateur operators provided communications at the 1999 River Run on March 6th, with 8000 runners participating in the 9 and _ mile race. Santa Rose County has recently moved into a new EOC facility, and discussions between the EC and County Management, have concluded at improving emergency communications. The County installed a 250' tower at the south end of the county, and have agreed to purchase and install the antenna and feedline for an APRS digipeater, TNC, and associated transceiver and power supply. They are going to install two VHF antennas and feedline on their nee 200' tower at the new EOC location. This is an example of the EC establishing a good working relationship with the County Emergency Management. Dr Gray from Colorado State University released his forecast for the 1999 season at the National Hurricane Conference, and the figures are not very ecouraging for Floridians'. 14 named storms, 9 hurricanes out of which 4 will be major. It would be wise to be prepared for this Hurricane Season. 73 Rudy. Tfc: WX4H 1998, KE4DNO 635, NR2F 397, AD4DO 179, KE4OAV 178, KF4TAX 148, N0ZO 114, AF4GF 80, N4ORZ 78, KF4NFP 66, KE4PRB 65, W5MEN 58, KF4TM 55, W4KIX 42, WD4IIO 42, WB2FGL 32, N4JAQ 30, N9MN 26, KC4FL 23, KF4GUA 22, N4GMU 22, KF4YHK WA4EYU 20, KB4DCR 18, KJ4HS KM4WC AB4PG 13, N1RT 11, KF4VRS 9, WB9GIU 8, KF4WUZ 8, WB2IMO 8, W8IM 5.

VIRGIN ISLANDS: SM, John Ellis, NP2B—St Croix. ASM: Drew, NP2E. St Thomas. ASM: Mal, NP2L. St John. SEC: Vic WP2P. St Croix. PIC: Lou, KV4JC St Croix. ACC:

MFJ TUNERS

MFJ-989C *Legal Limit* Antenna Tuner

MFJ uses super heavy duty components to make the world's finest legal limit tuner

MFJ uses super heavy duty components -- roller inductor, variable capacitors, antenna switch and balun -- to build the world's most popular high power antenna tuner.

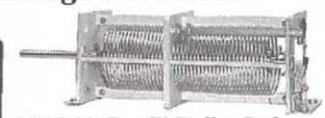
The rugged world famous MFJ-989C handles 3 KW PEP SSB amplifier input power (1500 Watts PEP SSB output power). Covers 1.8 to 30 MHz, including MARS and WARC bands.

MFJ's *AirCore*™ roller inductor, new *gear-driven* turns counter and weighted spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

MFJ-989C **$359.95**

You get everything you've ever wanted in a high power, full featured antenna tuner -- widest matching range, lighted Cross-Needle SWR/Wattmeter, massive transmitting variable capacitors, ceramic antenna switch, built-in dummy load, *TrueCurrent*™ Balun, *scratch-proof* Lexan front panel -- all in a sleek compact cabinet (10¾Wx4½Hx15D in).



MFJ AirCore™ Roller Inductor gives high-Q, low loss, high efficiency and high power handling.

MFJ's exclusive *Self-Resonance Killer*™ keeps damaging self-resonances away from your operating frequency.

Large, self-cleaning wiping contact gives good low-resistance connection. Solid 1/4 inch brass shaft, self-align bearings give smooth non-binding rotation.

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MFJ will repair or replace your MFJ-989C (at our option) *no matter what* for one year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T*™

MFJ-986 **$329.95**

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. 10¾Wx4½Hx15 in.

MFJ-962D *compact* Tuner for Amps

MFJ-962D **$269.95**

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. 10¾x4½x10⅞ in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969 **$189.95**

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. 3½Hx10½Wx9½D inches.

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E **$149.95**

More hams use MFJ-949s than any other antenna tuner in the world! Handles 300 Watts. Full 1.8 to 30 MHz coverage, 48 position *Precision48*™ inductor, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. 3½Hx10⅝Wx7D inches. **MFJ-948, $129.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

MFJ-941E **$119.95**

The most for your money! Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek 10½Wx2½Hx7D in.

MFJ-945E HF+6 Meter *mobile* Tuner

MFJ-945E **$109.95**

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $4.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971 **$99.95**

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x6½x2½ inches.

MFJ-901B *smallest* Versa Tuner

MFJ-901B **$79.95**

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-16010 *random* wire Tuner

MFJ-16010 **$49.95**

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906 **$79.95**

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $49.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921 or MFJ-924 **$69.95**

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 inches. Simple 2-knob tuning for mobile or base.

MFJ-922 *144/440 MHz* Tuner

MFJ-922 **$79.95**

Ultra tiny 4x2½x1¼ inch tuner covers VHF 136-175 MHz and UHF 420-460 MHz. SWR/Wattmeter reads 60/150 Watts.

MFJ-931 *artificial* RF Ground

MFJ-931 **$79.95**

Creates artificial RF ground. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire. Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. **MFJ-934, $169.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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Debbie, NP2DJ, St Thomas. NM: Bob VP2VI/W0DX Tortola. Big news this month was St Croix International Triathalon. Ham radio got a lot of good press due to hard work of Chief Organizer Chuck WP2AAA and good publicity on WJKC FM. Several accidents marred the event but we were able to get emergency vehicles deployed quickly. Those participating included WP2AAA Chuck, NP2FK Matt, WP2P Vic, NP2BJ Bob, WB6RCN Jerry, KV4JC Lou, W9UKK Merv, NP2FL Moises, NP2EN Charles, NP2EL Chris, KP2CF Alvin, NP2I Frank & NP2B John. Team RTTY, operating KP2D, participated in the CQRJ Rtty test 99 in the 2 xmtr category and wound up with a plaque. Good work by NP2E Drew, NP2W Bernie, NP2DZ Pete, NP2GM Bert, W5TTY Nick & KP2N Ron. Tnx Ron for the info. Hurricane season approaching as this is being written, hoping they all stay out to sea. 73, John, NP2B.

SOUTHWESTERN DIVISION

ARIZONA: SM, Clifford Hauser, KD6XH—The Hualapai Amateur Radio Club put on a very successful display booth at the Mohave County Educational Festival. They had a working Amateur Radio station that let kids and adults who were not Amateur Radio operators talk on the air and find out what is Amateur Radio. The publicity was great. We need to do more of this in our own communities. Most of the time, all the public hears about amateur radio is the interference problems, big ugly towers, or sees us during community serve events. It would be nice to change our image. Both DeVry and Sierra Vista hamfest were both successful with good weather and lots of people. This is the month of Fort Tuthill, and I am ready. I have my room reservations and all my material for the ARRL booth is ready to go. Are you ready? ARRL's MR RFI himself, Ed Hare, will be at Fort Tuthill this year to provide answers to your many questions on RFI, RF exposure, etc. Is your current address the same as listed on your amateur radio license? If not, then see me, and I will give you a 610A form to fill out and mail to the FCC. We are responsible for letting the FCC know our current mailing address. This has been a busy month with work, and having to care for my wife after her foot surgery. I am now finally caught up on all my ARRL paperwork. Hopefully, I can find time for DX in the evening. Our Amateur Radio stations are usually within the FCC guidelines, but once in a while we forget that we have neighbors that have electronic equipment that is not very selective. During our operations we must also be considerate of the people who live around us and if we are causing any interference, it is our duty to work with the neighbors to solve the problem. I have received a letter from the FCC asking me to check out an interference complaint in northern Arizona. Initial check found that the Amateur Radio operator is transmitting with FCC guidelines and the neighbor electronic equipment is not selective enough to block out the radio transmissions. But, is it the responsibility of the neighbors to BUY new equipment, or can the radio operator modify using filters the station to eliminate the problem? Will let you know of the outcome of this problem. See you at Flagstaff and then on the Queen Mary. 73, Clifford Hauser, KD6XH. Net QNI/QTC/Sess: ATEN 927/116/30. ACN: 186/193/30. Tfc: K7VVC 637, W7EP 48, W7DNJ 38.

LOS ANGELES: SM, Phineas J. Icenbice, Jr, W6BF – The ARRL DX Convention was in Fresno this year and sponsored by the Northern CAL DX'ers & the Pacific Division. As usual, we enjoyed meeting all of the active DX gang. Some attendees are over 90 years of age. Like my old friend, Bud Bane, W6WB, who has been licensed for more than 75 years and still going strong. Bud is on the air every day copying CW and even working on Ham equipment in his shop at the same time. He is also converting to touch typing because of his vision problem. Bud is a prolific writer for many radio magazines. At the joint meeting of California Section Managers, it was concluded that insurance for Official Observers, and other ARRL Officials was important and not well defined. The limits of liability were discussed with reference to the Volunteer Protection Act, HR 783, now in Congress, personal liability insurance and ARRL liability insurance coverage. Most of the cases that we discussed were settled out of court, but one case did require expensive legal services. Our Web Site is **www.qsl.net/arrlsw/lax**. PLEASE read your listing and update your information as needed. (The Web master address is listed on the Web site.) W6UPN, Joe, reports that a friend asked the computer store owner to please copy the "Internet" on a disk for his wife. We think that the computer store owner may still be working on this problem. W6UBM, Al, our ASM, is very happy with his new HF, "Skelton-Cone," multi-band wire antenna. This antenna is often referred to as a double dipole fed with 450 ohm-balanced line. W5ZBC, Eddy Shell published a paper about this great wire antenna in August of 1969. We would like to welcome one of our newest Ham Radio clubs in the San Fernando Valley, The Hispanic American Amateur Radio Club. The Club president is Gabriel Rivera, KQ6LK, **bc532@lafn.org**. Their club meeting is scheduled for the last Friday of each month at the Red Cross building, Burbank Chapter. Don't forget the ARRL Convention on the Queen Mary Oct 1 through Oct 3. Your own Section Manager, W6BF, and our OOCs are hosting an FCC/ARRL/OO Seminar. Open to all registrants at 1:00 PM on Friday Oct 1, 1999. As usual, we are expecting to have Jim Zoulek, our FCC regional manager and Rick Palm from ARRL HQ available to answer questions. If possible, please type out your questions and bring them to the meeting. Don't miss this great convention! C U at the Queen Mary Oct 1. AD0A, Jerry, reports as the acting Net Mgr. SCN/CW, 19 sessions, QTR 258 and a personal Traffic Total of 67 for April. Vy 73 de W6BF, Phineas.

ORANGE: SM, Joe H. Brown, W6UBQ—ASMs: Riv Co, Joe, KO6XB, 909-685-7441; Org Co, Art, W6XD, 714-556-4396; SB Co, James, KE6LWU, 909-824-2454; Sec News/PIC, Gwyn, KE6JOF, 909-685-7441. SEC: Ted, N6RPG, 909-947-1769. The 1999 Orange Co Fair 7-9 thru 7-25 will have an Am Radio Booth sponsored by OCCARO. To volunteer or get info, call Marcia Bruno, N6ISW, 714-775-6095 (res). IECARO held its second annual Leadership Conference on Apr 24 at the Riv Co Regional Med Center in Moreno Valley, and we understand the facility is one of the best for such meetings. Fullerton ARC held an "Antennas

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 Meter/440 MHz mobile/base and accessories with these new 25 or 45 Amp MFJ MightyLite™ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

NEW!

MFJ-4225MV 25 Amp **$149.95** Add s/h

MFJ-4245MV 45 Amp **$199.95** Add s/h

MFJ's new adjustable voltage switching power supplies do it all! You can power your HF transceiver or 2-Meter/440 MHz mobile or base and accessories.

MFJ's *MightyLites*™ are so lightweight and small you can carry them in the palm of your hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky power supplies that can give you a painful backache, pulled muscle or hernia.

MFJ's 25 Amp *MightyLite*™ weighs just 3.7 lbs. -- that's *5 times lighter* than an equivalent conventional power supply. MFJ's 45 Amp version is even more dramatic -- *8 times lighter* and weighs just 5.5 pounds!

No RF hash!

These babies are clean . . .

Your buddies won't hear *any* RF hash on your signal! *You* won't hear any in your receiver either!

Some competing switching power supplies generate objectionable RF hash in your transmitted and received signal.

These super clean MFJ *MightyLites*™ meet all FCC Class B regulations.

Low ripple . . . Highly Regulated

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

Fully Protected

You won't burn up these power supplies! They are fully protected with Over Voltage and Over Current protection circuits.

Worldwide Versatility

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Easily replaceable fuse.

MightyLites™ . . . Mighty Features

MFJ *MightyLites*™ feature a front-panel voltage control. It lets you vary the output voltage from 9 to 15 Volts DC and gives you a highly regulated voltage output.

You get an easy access front-panel with five-way binding posts for heavy duty use and a cigarette lighter socket for mobile accessories. The MFJ-4245MV has two sets of quick-connects on the rear for accessories.

Large 3 inch dual meters are brightly illuminated to make it easy to monitor load voltage and current.

A *whisper quiet* internal fan efficiently cools your power supply for long life.

Two models to choose from . . .

MFJ-4225MV, $149.95. 25 Amps maximum or 22 Amps continuous. Weighs 3.7 pounds. Measures 5¾Wx4½Hx6D inches.

MFJ-4245MV, $199.95. 45 Amps maximum or 40 Amps continuous. Weighs 5.5 pounds. Measures 7½Wx4¾Hx9D inches.

MFJ No Matter What™ Warranty

MightyLites™ are covered by MFJ's famous *No Matter What*™ one year limited warranty. MFJ will repair or replace (at our option) your power supply for one full year.

MFJ 35/30 Amp *Adjustable* Regulated DC Power Supply

Massive 19.2 pound transformer . . . No RF hash . . . Adjustable 1 to 14 VDC . . .

NEW!

MFJ-4035MV **$149.95** Add s/h

MFJ's heavy duty conventional power supply is excellent for powering your HF or 2 Meter/440 MHz transceiver and accessories.

A massive 19.2 pound transformer makes this power supply super heavy duty! It delivers 35 amps maximum and 30 amps continuous without even flexing its muscles. Plugs into any 110 VAC wall outlet.

It's highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. *No RF hash* -- it's super clean!

Fully protected -- has over voltage protection, fold back short circuit protection and over-temperature protection.

You get front panel adjustable voltage from 1 to 14 VDC with a convenient detent set at 13.8 VDC. A pair of front-panel meters let you monitor voltage and current.

Three sets of output terminals include a pair of heavy duty five-way binding posts for HF/VHF radios, two pairs of quick-connects for shack accessories and a covered cigarette lighter socket for mobile accessories.

A front-panel fuse holder makes fuse replacement easy. Whisper quiet fan speed increases as load current increases -- keeps components cool. 9½Wx6Hx9¾ inches.

Your MFJ-4035MV is protected by MFJ's famous *No Matter What*™ one year limited warranty. MFJ will repair or replace (at our option) your power supply for one full year.

MFJ *High Current* Multiple DC Power Outlets

Power two HF/VHF transceivers and six or more accessories from your 12 VDC power supply

MFJ-1118 **$69.95** Add s/h

MFJ-1116 **$44.95** Add s/h

MFJ-1112 **$29.95** Add s/h

MFJ-1118, $69.95. This is MFJ's most versatile and highest current *Deluxe Multiple DC Power Outlet*. It lets you power two HF and/or VHF transceivers and six or more accessories from your transceiver's main 12 VDC power supply.

Two pairs of *super* heavy duty 30 amp 5-way binding posts connect your transceivers. Each pair is fused and RF bypassed. Handles 35 Amps total. "ON" LED.

Six pairs of heavy duty, RF bypassed 5-way binding posts let you power your accessories. They handle 15 Amps total, are protected by a master fuse and have an ON/OFF switch with an "ON" LED indicator.

Built-in 0-25 VDC voltmeter. You get 6 feet of super heavy duty eight gauge color-coded cable with ring tongue terminals. Binding posts are spaced for standard dual banana plugs.

Heavy duty aluminum construction. 12½x2¾x2½ inches.

MFJ-1116, $44.95. Similar to MFJ-1118. No 30 amp posts. Has "ON" LED and 0-25 VDC voltmeter. 15 amps total.

MFJ-1112, $29.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse.

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in the Park" on Sat May 8 in Tri-City Park, Placentia. Joe Moell, WO0V, conducted an international-style T-Hunt, and there were several special event stations running all day long. FB! WO0V, ARRL ARDF Coordinator, reports that preparations are in full swing for the first International Am Rad Union Region 2 ARDF Championships in August. Check it out at **http://members.aol.com/homingin/** or write to Joe at **homingin@aol.com**. Morongo Basin ARC supported the Annual Grubstakes Parade in Yucca Valley on Memorial Day. Good show! And RCARA supported so many events during April and May, we don't have room to list them all! Hats off to all the hams who helped out. In ARA's "Squelch": At a Show-and-Tell, "Jim, KA6G, brought an old 1943 War Dept Tech Manual on antenna systems. It was marked "Restricted Material," even though it was primarily reprinted from the ARRL Handbook!" West Coast ARC is looking for old and new members. Check them out at **www.qls.net/wcarc/** (courtesy of Jane Avnet, KD6ODV). Also check out the Corona Norco ARC's Website at **www.pe.net/~nm/cnarc/** where you will find interesting links to other Am Radio sites. STM N6GIW reports for April '99: Tfc totals: KC6SKK 167, KO6RZ 157, W6QZ 116, N6GIW 83, KD6EYI 13. PSHR: W6QZ 158, KO6RZ 138, KC6SKK 137. Dig tfc: W6QZ NTS BBS 237310, N6GIW NTS Mailbox 162. SCN/V Net Mgr KO6RZ reports 29 sess, QNI 209, QTC 74. Vy 73, KE6JOF for W6UBQ.

SAN DIEGO: SM, Tuck Miller, K6ZEC, 619-475-7333— A big welcome goes to Ralph Acosta, KF6TOK, for taking on the awesome responsibilities of District Emergency Coordinator. Ralph is a newer ham, but has a lot of heart and dedication, which is what you need for volunteer work. A special thanks goes to Wade Rich, KE6BZI, for taking on the combined duties of both his own district, and the southern for 3 months while a replacement was found. The San Diego section is fortunate to be "rich" in volunteers, as Wade's dad, Al Rich, W6WYN, coordinates communications for the Red Cross as an Asst Section Manager, and his son, Dan Rich, KE6BZJ, has been known to help out with administrative duties within the central district. Many thanks go to Ralph Miller, W6OAB, chairman of the Elks Lodge 1812 radio club. I had the pleasure of joining the brotherhood in April, and George, KO6BU, has also recently joined. Pat, WA6MHZ, can regularly be seen flipping burgers at the Lodge on Saturday mornings. The Elks club meets on the 1st Wed of each month for a luncheon meeting at 11:30 AM. Speaking of George, KO6BU, he was recently re-elected to yet another term as chairman of SANDARC. From what I hear, it was a landslide victory. Folks know a good thing when they see it. You should be reading this July issue, just before Field Day weekend, so enjoy the festivities. Please let me know where your club is going to be, so I can drop by. I have a lot of clubs to visit during the two days, and a lot of miles to cover, but thoroughly enjoy seeing everyone and have so much fun. Thanks to my YL Evelyn, N6EVE, as we celebrate our anniversary on July 3rd. In closing, please have a safe 4th of July holiday. For traffic KT6A 701, KD6YJB 206, WA6ODQ 90, KD4WMI 14, KO6BU 8, KD6IVF 6 BPL: KT6A 701 PSHR: WA6ODQ 150 KT6A 141 KD6YJB 80.Until next month... Remember, Helping Others.....Always Worthwhile!! 73, Tuck, K6ZEC.

SANTA BARBARA: SM, Rob Griffin, K6YR, 805-543-3346 & k6yr@arrl.org—SEC: Jack Hunter, KD6HHG. AAC: Michael Atmore, KE6DKU. OOC: Howard Coleman, W6HQA. PIC: Jeff Reinhardt, AA6JR. TC: Warren Glenn, KM6RZ. ASM: Don Milbury, W6YN. DECs: SB- Dave Lamb, WA6BRW; SLO- Bill Peirce, KE6FKS, & Ven- Dave Gilmore, AA6VH; & Webmaster, Jack Bankston, AD6AD. The Santa Barbara Section Web Site address: **http://www.qsl.net/arrlsb/.** SCN/CW slow speed traffic net meets Mon thru Fri on 3598 kHz. The Amateur Radio Spectrum Protection Act of 1999 (HR 783) gaining sponsors and support. ARRL needs your acts of support for this important measure! Write to your Representative in the House. Another indirect act of support would be to come out for the ARRL-sponsored 1999 Field Day over June 25-27. Contact your local Amateur Radio Club and volunteer to take on a shift, help with set-up or tear down, make coffee, or be a rep to the public. It all helps to solidify our public communication service role in your community's memory. Check into our Section traffic net SCN/SB, held on most evenings at 2100 local on 147.000 + (131.8), 224.90 - (131.8) & 448.875 - (100). PSHR/Tfc: K6YR 170/198, KF6OIF 110/ -, KE6MIW 102/20 & KM6RZ -/4. That's 30, Rob, K6YR.

WEST GULF DIVISION

NORTH TEXAS: SM, Don Thomas, KA1CWM—SEC: K5UPN. STM: KC5OZT. TIC: W5CWO. BM: KB5YAM. SGL: N5GAR. OOC: WB5UDA, Sam's, KX5K, K5RE, W5FB, KK5QA, KK5NA, KC5ECM, AD5X, W5GPO. We recommend that section hams visit the section Web page often at (**http://www.lsic.net/net/ntexas.html**) We want to welcome and congratulate a new school club to the section the COMET Amateur Radio Club which is a club associated with the University of Texas at Dallas. We also want to welcome the Rosen Elementary Amateur Radio Society in Fort Worth, Texas as another new school Club and also the Hurst Amateur Radio Club for their re-affiliation. We have other new school clubs pending and hope to complete their affiliation shortly. It is rewarding to again see a gain in the number of affiliated clubs in the section after a long decline. We however must emphasize that all affiliated and special service clubs need to complete and send in their annual reports whenever there is a change and as their year comes to to close. In that way the records are correct and you can be assured that your are getting the latest mailing from all ARRL sources. A special thank you must again go to all of the dedicated ARES and Races personnel here in Texas who gave of their time during the storm spotting season this year. Thanks to all of you. While all of you were out storm spotting, many of you had wives and families at home wondering just when you would return. They also deserve praise and our appreciation for giving up time with each of you in your public service support. By the time most of you read this article you will have tried all of your new toys and equipment, purchased at Ham-Com and at Dayton. We know you will enjoy all of them and make your ham expe-

MFJ pocket size Morse Code Tutor

Learn Morse code fast, anywhere . . . LCD display lets you check your copy instantly . . . Easy no-code Beginner's Course . . .Takes you beyond Extra Class . . . Customized Practice . . . Plain English QSOs . . . Word Recognition Mode™ . . . Interactive Mode™ . . .

Learn Morse code anywhere, anytime with this tiny *MFJ Pocket Morse Code Tutor*™!

Take it everywhere! Enjoy code practice at home, going to work, on vacation, on a plane or in a hotel -- no matter where you are.

MFJ-418 gives you a large LCD display that reads out letters, numbers and punctuation in *plain English*. See code as it is being sent!

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Realistic plain English QSO practice helps you pass your FCC code exam.

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Practice copying words as *one sound* -- not individual characters. Instant word recognition makes you a true, high-speed CW pro.

InstantReplay™ Check your copy *instantly*!

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Easy-to-use -- choose from menus on the LCD display -- no instruction manual needed!

Beginner's Course

QST rate MFJ tutors *"the clear choice for beginners"*. Follows ARRL/VEC format.

MFJ-418 takes you from knowing zero code to solid copy fast! You learn individual letter, number and prosign sets first. As you do, previously learned sets are combined with new sets to reinforce all that you have learned.

InstantReplay™

Practice copying and then replay to instantly check your copy on the LCD display.

Custom Character Sets

If you have trouble with certain characters, you can *build and save* a custom set of these for extra practice -- *an MFJ exclusive.*

Realistic Plain English QSOs

You can practice copying *realistic* on-the-air style plain English random QSOs.

They'll help get you ready for your FCC exam. When you're comfortable copying these QSOs, you're ready to pass and upgrade!

They'll also give you plenty of confidence before you make your first *real* contact.

MFJ's *CodeTest*™ set lets you practice *only* the characters required on FCC exams.

MFJ Word Recognition Mode™

MFJ's *Word Recognition Mode*™ gives you hundreds of commonly used words in amateur radio. Practice recognizing *entire words* instead of individual letters.

Learn to copy words without writing it down and carry on an entire CW conversation without paper -- just like pros on 40 Meter CW.

You can save 10 words of *your choice* for word recognition practice -- *an MFJ exclusive.*

You'll never run out of practice

Select letter, number, punctuation, prosign or code test sets, random call signs, random words, QSOs or combination sets for practice -- you'll never run out of study material.

You can even make up and save your own word and character sets for practice.

NEW! MFJ-418 **$79.95**

MFJ InteractiveMode™

MFJ InteractiveMode™ lets *you* decide when to copy the next or previous group and how many -- great for beginners.

Normal or Farnsworth

Select normal or Farnsworth spacing.

Farnsworth makes it easier to recognize entire characters. It stops the tendency to count individual dots and dashes that slows learning.

Farnsworth character speed is adjustable 10 to 60 words-per-minute for high-speed practice.

Fixed or Random Length Groups

Use fixed length or more realistic random length groups. Up to 8 characters per group.

Change Speed on the Fly

Change speed on the fly while you're playing a session -- 3 to 55 words-per-minute.

No Instruction Manual needed!

Choose from easy-to-use menus on LCD display. Simple 3 button operation.

SettingSaver™

Your settings are *automatically* saved, ready to use next time -- no more #$%* resets!

Large LCD Display

Read words, letters, numbers and punctuations in *plain English* as code is being sent. It's a powerful sound and sight aid!

Check your copy, select from menus and program custom characters and words.

LCD has 2 lines and 32 *huge* 1/4" high-contrast characters.

SilkySmoothSidetone™

Only MFJ gives you *SilkySmooth Sidetone*™ with *TruTone*™ sinewave and *SoftStart*™ dots/dashes -- lets you concentrate on learning without the distraction of harsh keyclicks. Use earphones for private practice or built-in speaker for groups.

Adjustable volume. Loud, powerful audio amplifer.Variable pitch 300-1000Hz.

Pocket Size

Fits in shirt pocket with room to spare! *Smaller than a pack of cigarettes* -- tiny 2 1/4x3 3/4x1 in., weighs less than 5 1/2 oz.

Toss it in your briefcase, travel bag or stash in your car's glove compartment and you'll always have it ready for instant practice.

Uses 9 volt battery. Not included.

Tapes Can't Compare

Tapes play the same old boring stuff over and over again. Unlike tapes, you'll never memorize the MFJ-418 random code sessions.

You'll pay more for a few sets of code tapes than an MFJ-418. The MFJ-418 is less expensive, lots of fun and *far* more effective.

More pocket size MFJ Morse Tutors

MFJ-417, $59.95. Random characters, words, QSOs. Selectable character sets. *CombineSet*™ Fixed or random length groups. Instant replay. Normal or Farnsworth. *3 to 35 WPM. Setting Saver*™. *SilkySmoothSidetone*™. Adjustable pitch 300 to 1000 Hz. Volume control. Use earphone for private practice. No LCD.

MFJ-413, $39.95. Similar to MFJ-417, less random words, QSOs, *SettingSaver*™.

MFJ-411, $69.95. Widely acclaimed original. Has most of the features of MFJ-418, no LCD.

Get Yours Today!

Enjoy more ham band privileges -- learn Morse code and upgrade! *Order yours today!*

MFJ Code Practice Oscillator

MFJ-557 **$24.95**

Learn to send Morse code with MFJ-557. Straight key with adjustable travel and tension, and built-in speaker with volume and tone controls lets you practice to your heart's content. Earphone jack. Heavy non-skid steel base stays put as you tap out Morse code. Use 9V battery or 110 VAC with MFJ-1305, $12.95.

MFJ-550, $7.95, telegraph key only.

2 Meter *IntermodFighter*™

MFJ-713
MFJ-714
$59.95

Intermod causing squeaks, squawks, unidentified voices and other noises all across the 2 Meter band? Can't use your radio?

MFJ *IntermodFighter*™ eliminates intermod by reducing interference up to 50 dB with three high-Q bandpass filters. Plugs between radio and antenna.

MFJ-713, $59.95. For handhelds, has BNC connectors. Uses 9V battery. **MFJ-714, $59.95.** For mobile rigs, has SO-239 connectors. Uses 12VDC.

12/24 Hour Clock/ID Timer!

MFJ-116, $14.95. ID buzz every 10 minutes. Big 5/8" red LED digits. Loud/soft alarm. Uses 110 VAC. 9V battery backup. 4 1/2x2x4 inches.

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rience more enjoyable. By now you have probably completed all of your plans for Field Day 99, however, please be extremely careful in setting up you site and remember your safety is first. It is always good to have someone designated as a safety officer during the exercise to assure that everyone follows good safety practices. Good luck on your scoring and above all eat lots of good food and have a good time. Just remember to get your Field Day paperwork in so that your club/organization will be mentioned in *QST*. SAR—April 1999—N5JZ 313, K5AO 174, KC5OZT 168, KC5VLW 102, KB5YAM 81, WA5I 77, KB5TCH 76, KC5EIV 65, K5MXQ 52, KC5SMC 31, KD5AHW 30, AC5Z, 18. Congratulations to N5JZ, James Dye, who qualified for Brass Pounder's League with 150 origination's/deliveries. This completes his 3rd month of BPL, and qualifies him for the Brass Pounders' League medallion.

OKLAHOMA: SM, Charlie Calhoun, K5TTT—ASMs: N6CL, K5CPZ. SEC: W5ZTN. STM: AB5RV. ACC: KB5BOB. PIC: WA9AFM. OOC: K5WG. SGL: W5NZS. TC: KB5RV. By now we have made it through the worst of tornado season. We had some terrible tornadoes roll through at the time of this writing, in early May. Some 5700 homes were destroyed in the Oklahoma City area. 43 fatalities and over 600 wounded were treated. Ham radio played a crucial part in the warning and recovery efforts. There are numerous hams to thank for their time and efforts, so a big thank you goes out to everyone across the state and those in neighboring states who offered their time and resources. Your efforts are very much appreciated. Our thoughts and prayers are also with those who lost so much. Amateurs working with the Red Cross provided valuable services by passing tons of health and welfare traffic, and compiling lists of those who were lost and found. Amateurs working with the Salvation Army ensured that those in the devastated area had plenty to eat and drink. Amateurs even acted as transport vehicles, bringing food and drinks into the affected areas for two weeks after the incident. There were two amateurs who deserve special mention. Bennett Basore, W5ZTN, SEC, helped tremendously in coordinating the routing of health and welfare traffic. Frank McCollum, N5FM, diligently served the Salvation Army efforts by working long days coordinating amateur activities with their relief efforts. Many times we think of those who helped after the incident, but I would also like to thank the weather spotters who helped warn on this storm. If it were not for them, we could have lost many more lives. 73 Charlie. Tfc: KF5A 685, WB5NKC 543, K5GBN 303, N5IKN 217, WA5OUV 89, KE5JE 81, WB5NKD 58, KK5GY 44, KC5VOG 38, W5REC 34, AB5RV 25.

SOUTH TEXAS: SM, E. Ray Taylor, N5NAV—ASMs: NR5ED, N5WSW, W5GKH, K5DG, N5LYG, WA5UZB, KK5CA, WA5TUM, KB5AWM, WA5JYK, K5PFE, and K5SBU. STM: W5GKH. SEC: K5DG. ACC: N5WSW. PIC: KA5WSS. TC: KJ5YN. BM: W5KLV. OOC: W5JAM. SGL: KM5HY. My how time flies. Here it is July, the year of 1999 is half over. I hope you're ready for Y2K. Has anyone come up with an all band cat whisker for the old crystal set, just in case? By the time you read this, Dayton Ham Convention will be over. I hope you that had the privilege of attending and were able to visit the ARRL booth. They have a lot of new literature that may be of great interest. Hope you were able to purchase the rig of your choice, whether new or old. I hear a lot of the older SSB rigs coming back on the air. The main event for Texas is Ham Com 99 in Arlington, Texas. I hope you have read the news about Ham Com 99 on the Internet. We want to extend the welcome mat to everyone across the country, and hope to see you there. While you're in Texas, take time to visit South Texas. We're still re-building after our five hundred year flood, so unless your going to live longer than five hundred years, you're safe to come on down. At least, that's what they tell us. We had a great turn-out for the 7290 and the Texas Traffic Net picnic. 1999, in Smithville, Texas. We had a lot less Hams there this year, but we had quality. The bar-b-que was exceptional, thanks to Bill, N5WFC, and Ernnie, W5OYY. We also want to thank the city of Smithville for allowing us to use their city park. This year's picnic was dedicated to Rob Radican, K5ROB, who is now a Silent Key. Rob was a real asset to all the traffic nets. We're all going to miss Rob in the years to come. It was a pleasure to see his wife and the twin sons at the picnic. They took digital pictures, and had them on the 7290 Web page in two days. Dan, K5IQZ, and myself received the two Whitney Nugget Awards. I can understand why K5IQZ received the award, however I think there were others more deserving than myself. I do want to thank you for the award. The Oklahoma tornadoes just finished their destructive path through parts of the state. We do want to pass along our sincere sympathy to those that lost loved ones and property. I do want to congratulate the Hams, who spent so many hours working around the clock, to provide communications to those in need.I was monitoring most of the time. We're still trying to recover from the Floods of 1998, so or hearts go out to the people of Oklahoma. I'm writing this while at the NWS tonight, while we are having many tornadoes. God bless and 73. Tfc: W5YQZ 618, W5SEG 384, W5KLV 126, W4RRX 87, N5NAV 63, W5OYY 62, W5GKH 60, W5ZX 50, N5OUJ 36, K5UCQ 34, KD5GM 32, WA5FXQ 23, K5VY 10, N5JUU 5, N5HK 4.

WEST TEXAS: SM, Charlie Royall, WB5T, 915-944-0469, **cnroyall@wcc.net**—ASMs-Cley, K5TRW; Ron, KB5HGM; Jerome, K5IS; Fred, W6VPI; Sandy, W5MVJ. SEC: Alex, N5LRH. OOC: John, KO5D. OBM-Frank, N5WT. Weather was everywhere and most of it BAD! Tornado in Midland damaged the homes of several hams. There were no serious injuries or deaths. Thanks to all those amateurs that worked this event and assisted the Red Cross! The list is too long to publish here. High winds in Robert Lee damaged roofs and caused other minor damages around the city. Lubbock test results: 20 tested, 14 new hams and 1 upgrade to Extra. Abilene Hamfest forum was conducted by your new Asst W Gulf Director, Coy Day, N5OK. Tnxs Coy! Silent Keys: Bill Jones, N5DOX; John McMahan, KC5PAW; and Ed Roskelly, N5BNS. They will be missed. ARRL WTX Section membership figures for March are 825. It has been reported that the ZIA connection is going off the air after many years of service to the Southwest US and WTX. Texas Governor George Bush has signed the Texas Tower Bill, based on FCC PRB 1. Tnxs to all TX hams who helped make it happen!

10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground or radials

Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance gives high efficiency for more power radiated. Results? Stronger signals and more Q-5 QSOs.

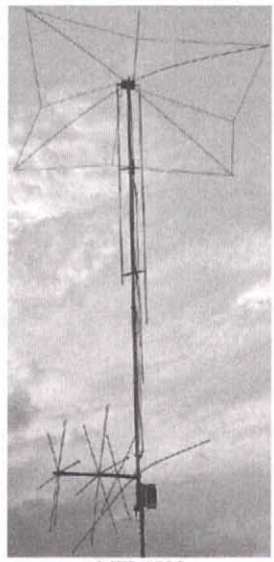
Full size performance also gives you exceptionally wide bandwidths so you can use more of your hard earned frequencies.

Full size performance is achieved using separate full size radiators for 2-20 Meters and highly efficient end loading for 30, 40, 75/80 Meters.

Get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR. Handles 1500 Watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

It's easy to tune because adjusting one band has minimum effect on the resonant frequencies of other bands.



MFJ-1798
$269.95
Ship Code F

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, roofs, tower mounts.

Separate Full Size Radiators

Separate *full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators.

This forms a very large equivalent radiator and gives you incredible bandwidths.

Radiator stubs provide automatic bandswitching -- absolutely *no loss* due to loading coils or traps.

End Loading

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands.

Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

No Ground or Radials Needed

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation.

You can mount it from ground level to roof top and get awesome performance.

No Feedline Radiation to Waste Power

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with *Teflon*® coax and can't saturate, no matter how high your power.

Built to Last

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant *Teflon*® covered wire.

MFJ's Super High-Q Loop™ Antennas

MFJ-1786
$379.95
Ship Code F

MFJ's *tiny* 36 inch diameter loop antenna lets you operate 10 through 30 MHz *continuously* -- including the WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics, or mobile homes.

Enjoy both DX and local contacts mounted vertically. Get both low angle radiation for excellent DX and high angle radiation for local, close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto-tunes to desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- not a lossy thin flat-strip -- *gives you highest possible efficiency.*

Each plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- gives smooth precision tuning.

Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

NEW! **MFJ-1788, $429.95.** Same as MFJ-1786 but covers 40 Meters-15 Meters continuous. Includes super remote control.

MFJ-1782, $339.95. Like MFJ-1786 but control has only fast/slow tune buttons.

MFJ-1780, $249.95. *Box Fan* Portable Loop is about the same size (2x2 foot) as a box fan, complete with handle. Covers 14-30 MHz. Control has fast/slow tunes.

MFJ Portable Antenna

MFJ-1621 **$79.95** Ship Code A

MFJ-1621 lets you operate in most any electrically free area -- apartment, campsite, hotel, the beach, etc. DXCC, WAZ, WAC, WAS have been won with MFJ-1621! Work 40, 30, 20, 17, 15, 12 and 10 Meters with a telescopic whip that extends to 54 inches. Mounted on a sturdy 6x3x6 inch cabinet. Built-in antenna tuner, field strength meter, and 50 feet of RG-58 coax cable. Handles 200 Watts.

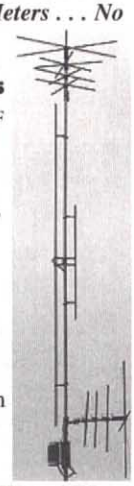
MFJ's G5RV Antenna

MFJ-1778, Ship Code A **$34.95**

Covers all bands, 160-10 Meters with antenna tuner. 102 feet long, shorter than 80 Meter dipole. Use as inverted vee or sloper to be more compact. Use on 160 Meters as Marconi with tuner and ground. Handles full legal limit power. Add coax feedline and some rope or other nonconductor and you're *on the air!*

MFJ halfwave vertical

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed



MFJ-1796
$199.95
Ship Code F

Only 12 feet high and has a tiny 24 inch footprint! Mount anywhere -- ground level to tower top -- apartments,small lots, trailers. Perfect for vacations, field day, DXpedition, camping.

Efficient end-loading, no lossy traps. Entire length is always radiating. Full size halfwave on 2/6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting 1 band has minimum effect on others.

MFJ-1792, $159.95. Full size 1/4 wave radiator for 40 Meters. 33 feet, handles 1500 Watts PEP. Requires guying and radials.

MFJ-1793, $179.95. Like MFJ-1792 but has full size 20 Meter 1/4 wave also.

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and Nearest Dealer . . . 800-647-1800

http://www.mfjenterprises.com

1 Year *No Matter What*™ warranty · 30 day money back guarantee (less s/h) on orders from MFJ

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FAX: (601) 323-6551; **Add s/h**
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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 for commercial firms offering products or services for sale is $1.00 per word. Individuals selling or buying personal equipment: ARRL member 50¢ per word. Non-ARRL member $1 per word. **Bolding** is available for $1.50 a word.

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 8½" x 11" sheet of paper.

4) Send ads to: the ARRL, 225 Main St., Newington, CT 06111 ATTN: Ham Ads. Or via fax 860-594-0259 or e-mail: hamads@arrl.org Payment must be included with ads (check or any major credit card accepted).

5) Closing date for Ham Ads is the 15th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received June 16th through July 15th will appear in September *QST*. If the 15th falls on a weekend or holiday, the Ham Ad deadline is the previous working day. Please contact Robin Micket, N1WAL at 860-594-0231 for further information.

6) 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.

7) 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.

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ARIZONA STATE CONVENTION AND HAMFEST July 23-25, 1999, Flagstaff, AZ. (I-17 Exit #337). Largest FREE admission convention in the Southwest. Manufacturers, dealers, exhibits, seminars, VE testing, huge swap, camping and more. Speakers include Gordon West, WB6NOA & Ed Hare, W1RFI, from ARRL and others. Contact Amateur Radio Council of AZ, POB 42003-312, Phoenix, AZ 85080-2003, or email: arcathill@aol.com. URL: http://www.hamsrus.com

BICYCLE MOBILE HAMS OF AMERICA. We mix hamming with biking! Members in 46 states, 6 countries. Tenth annual forum at HamVention. Net: 7.042, every Wed., 0200 UTC. Details, sample newsletter: SASE to BMHA, Box 4009-Q, Boulder, CO 80306-4009.

FRIEND OF BILL W.?? - Join HAAM net Saturdays at 12:30 Eastern on 14.290; Sundays at 09:00 Pacific on 7.283.5; Sundays at 09:30 Pacific on 14.340/2. K6LX.

JEWISH RADIO AMATEURS - CHAVERIM INTERNATIONAL is an organization for you and your friends. For information please contact Paul Kane, WA6WGP, 5401 Sadring Ave., Woodland Hills, CA 91367 or e-mail: wa6wgp@aol.com

JOIN the **Lambda Amateur Radio Club** (LARC) since 1975, the only open and visible public service-oriented ham club for gay and lesbian hams. Monthly newsletter, HF skeds, internet listserv and IRC, hamfest meetings, chapters, DXpeditions. Write LARC, POB 56069, Philadelphia, PA 19130-6069 or e-mail: lambda-arc@geocities.com

NEW JERSEY, (Augusta) Sunday, July 18, 1999. Sponsor: Sussex County ARC. Time: 8 AM, Sussex County Fair Grounds, Plains Rd. off Rt. 206. Free parking. Refreshments. Admission: $5 (YLs and Harmonics free). Tailgate space $10, indoor $15 per space. Limited supply of tables available. Contact Dan Carter, N2ERH, 8 Carter Lane, Branchville, NJ 07826. Phone: 973-948-6999. Email: n2erh@email.com; Web: http://www.scarcnj.org

OHIO: The 1999 TSRAC WHEELING/MARTINS FERRY HAMFEST has changed locations and date! Will be held Sunday, August 8th, 8 AM to 3 PM at Red Mens Picnic Grounds, County Road 4, Martins Ferry, OH. Talk-in 146.91. Send for details/map/info to: TSRAC, 2011 St Hwy 250, Adena, OH 43901. Phone 740-546-3930. E-mail: k8an@aol.com

QCWA— Quarter Century Wireless Association. If you were first licensed 25 years ago and currently licensed you are eligible. Be one of us! Write Dept. T, 159 E 16th Ave, Eugene, OR 97401-4017. Call 541-683-0987.

RAINBOW AMATEUR RADIO ASSOCIATION - the gay/lesbian club. Active HF nets, newsletter, uncensored listserve, web page: http://www.rara.org. Privacy respected. P.O. Box 191, Chesterland, OH 44026-0191. E-mail: RARA@EN.COM

THE ARRL LETTER — The League's news digest for active amateurs, professionally produced and edited and now available in a weekly electronic edition via the World Wide Web at http://www.arrl.org/arrlletter

THE Veteran Wireless Operators Association, a 74-year old, non-profit organization of communications professionals invites your inquiries and application for membership. Write VWOA, Edward Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863. Visit our web site for activities, history, membership: http://www.vwoa.org

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ANTIQUE KEYS, (1/2 price): Limited supplies. Spy-types, CMH brass, others. SASE, TEC, Box 400, Lincoln, MA 01773.

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BROADCAST MICROPHONES and accessories (call letter plates, stands) wanted: early carbon, condenser, ribbon, dynamic models. Cash or trade. James Steele, Box 620, Kingsland, GA 31548. 912-729-6106. jsteele@k-bay106.com; http://www.k-bay106.com/mics.htm

CLASSIC RADIOS FOR SALE: http://www.radiofinder.com Good used equipment wanted. The Radio Finder, 975 Arthur, Plymouth, MI 48170. Tel/Fax 734-454-4666. finder@radiofinder.com

CREI (Capitol Radio Engineering Institute) 1967 correspondence course in "Radio Engineering Technology" $250 OBO. W0KX, 5800 L St., Lincoln, NE 68510-2220.

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OLD TELEGRAPH KEYS and related equipment wanted by collector. Gerry Maira, KA2MGE, 716-672-5389. gm@netsync.net

RBL-2 RECEIVER MANUAL needed. George Marts, W0TDH, 5022 Pennsylvania, St. Louis, MO 63111-2041. 314-353-7669.

TELEGRAPH KEYS wanted by collector. Bugs and unusual or unique straight keys or sounders, and tube electronic keyers. Also pre1950 Callbooks. Vince Thompson, K5VT, 3410 N. 4th Ave., Phoenix, AZ 85013, 800-840-KEYS.

TELEGRAPH MUSEUM/COLLECTOR'S INFORMATION: http://w1tp.com

TELEGRAPH: PERERA'S COLLECTOR'S GUIDE: $12 ppd. Artifax, Box 88-Q, Maynard, MA 01754. http://home.fiam.net/tfrench/artifax.htm

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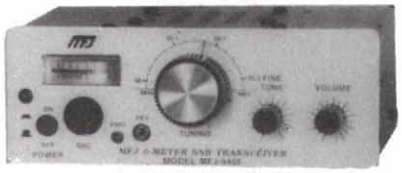

MFJ-9406
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MFJ-9406X
$269.95 with mic

Work exciting 6 Meter DX from all over the world on ham radio's *"magic band"*!

It's an adventure every time you turn on your MFJ-9406 six meter SSB transceiver.

Distant stations come rolling in loud and clear with crystal clear armchair copy. You'll have fun exploring exotic 50 MHz band openings -- Tropo, Sporadic E, F2, TE, Aurora, Meteor Scatter, and more.

Ragchew with locals, hunt down new grid squares from far-away places from home, car or mountain top.

Special Offer! MFJ-9406X, $259.95!
Includes MFJ-9406 & MFJ-290 microphone.

Here's what you get . . .

Full SSB/CW coverage: 50.0-50.3 MHz covers SSB, CW, propagation beacons.

Potent signal: 10 Watts PEP output. MFJ's exclusive *Constant-Current*™ syllabic speech processing gives you up to 6 dB more punch to cut thru noise, fading, QRM.

Hot receiver: Crystal-mixed single-conversion superhet with low-noise preamp digs deep into the noise to capture weak signals. If a station is there, you'll hear it!

Easy to operate: No microprocessor mumbo-jumbo . . . just turn on and tune in.

Low power drain: Mountain-top all day on lightweight NiCads or operate from home on 110 VAC with MFJ-4110, $39.95.

Excellent selectivity: Sharp *HF proven* SSB crystal ladder filter reduces QRM and passband noise.

TVI protection: Seven element low-pass filter knocks out TVI -- lets you operate when *you* want to!

Real S-meter: Give meaningful signal reports, accurately steer your beam, monitor speech processing.

Smooth tuning: Vernier reduction drive makes tuning precise and easy.

External amplifier: Jack provides a key-line for activating 6 Meter SSB amps.

Built to last: Premium PC board, quality components, brushed-aluminum panel and tough vinyl-clad case gives years of service.

Compact: At only 2½x6½x6 inches, the MFJ-9406 fits in just about anywhere.

Fully guaranteed: MFJ's exclusive one-year *No Matter What*™ warranty. We will repair or replace (at our option) your MFJ-9406, no matter what happens, for 1 full year.

MFJ-9406 Accessories

Handheld dynamic SSB microphone: Specially matched to compliment the *Constant Current*™ speech processor used in the MFJ-9406. **MFJ-290, $29.95.**

CW Module: Install this and operate CW -- a must for DXers. Provides semi-QSK break-in and sidetone. **MFJ-416, $39.95.**

Power Supply: Heavy duty wall transformer and voltage regulator delivers 13.8 VDC for MFJ-9406. Powerful, yet small. Fits in your coat pocket! **MFJ-4110, $49.95.**

Portable Battery/AC Power Pack: Use Ni-Cad, Alkaline, regular D cells or 110 VAC. Charges Ni-Cads. Fastens to MFJ-9406. Batteries not included. **MFJ-4112, $69.95.**

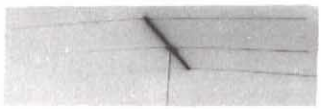
MFJ 6 Meter *FM Communicator*™ Transceiver

MFJ-9606
$159.95
MFJ-9606X
$169.95 with Mic

The MFJ-9606 *FM Communicator*™ is the most inexpensive way to get on 6 Meter FM Voice or Packet! 10 Watt transmitter, *CrystalClearVoice*™ puts the fun and fidelity back into ham radio with true-to-life speech quality and ultra-clean AFSK data signals. *Super fast* PIN diode switching, no compromise dual-convers- ion FM receiver with quiet LNA, factory installed 52.525 MHz calling frequency crystals. Addl plug-in crystals, $24.95 per freq.

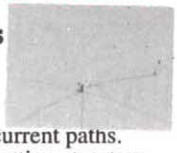
MFJ 6 Meter Antennas

MFJ 3 element 6 Meter Yagi



MFJ's three element 6 Meter Yagi quadruples your effective radiated power over a half-wave dipole. 6 foot boom. 2 pounds. Can use TV rotator and mast. Handles 300 Watts PEP SSB. Mounts vertically or horizontally. Current balun decouples feedline. Excellent front-to-back ratio.
MFJ-1762
$69.95

MFJ 6 Meter low-angle DX Vertical



MFJ's omni-directional low-angle vertical radiator lets you work plenty of DX in all directions even with low power. A *GroundIsolated*™ radial system eliminates common mode current paths. Reduces undesirable feedline/supporting structure radiation. 55" *high-strength* aluminum radiator.
MFJ-1756
$69.95

MFJ 6 Meter J-pole Travel Antenna

Hang up this 6 Meter J-pole in the clear and enjoy some exciting DX QSOs. Omni-directional full size halfwave antenna with low angle radiation that outperforms 1/4 waves.
MFJ-1736
$24.95

MFJ 6 Meter folded dipole

MFJ's efficient low SWR folded dipole is light-weight, easy-to-carry, easy-to-put up. Perfect for MFJ-9406 and other 6 Meter rigs.
MFJ-1776
$34.95

MFJ full halfwave 6 Meter Antenna

MFJ's *full halfwave* 6 Meter centerfed antenna has excellent bandwidth and low angle radiation for super DXing! Mounts vertically for FM/Packet or horizontally for SSB. Strong light weight aluminum. Two 47" radiators, 23" boom. 1½ pounds.
MFJ-1764
$44.95

MFJ Dual Band 6/2 Meter Mobile

On 6 Meters, it's a high performance *full quarter wave* mobile magnet mount antenna. On 2 Meters, it's a *maximum gain* 5/8 wave antenna. Low SWR, handles 300 Watts.
MFJ-1728B
$24.95

MFJ 6 Meter Antenna Tuners

MFJ-906, $79.95. Lighted 2 Range Cross-Needle SWR/Wattmeter, bypass switch. 100 watts FM, 200 Watts SSB PEP. 8x2½x3 inches.

MFJ-903, $49.95. Like MFJ-906, no meter, bypass switch. 5x2½ x3".

MFJ-945E, $109.95. Compact *mobile* tuner covers 6 Meters thru160 Meters. Lighted Cross-Needle SWR/Wattmeter. Antenna bypass switch. 300 Watts PEP SSB. 8x2x6". Mobile mount, **MFJ-20, $4.95.**

MFJ-969, $189.95. MFJ-969 has MFJ's superb *AirCore*™ Roller inductor, *continuous* 6 Meter - 160 Meters coverage and *QRM-Free PreTune*™! Wide matching range, lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, 4:1 balun., 300 Watts PEP SSB. 3½x10½x9½".

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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. wireless@pce.net

WANTED: Telegraph sounders, relays, and apparatus. Instruments needing parts or repair OK. John Casale, W2NI, 3 Pickering La., Troy, NY 12180. 518-272-3631. jcsl@global2000.net

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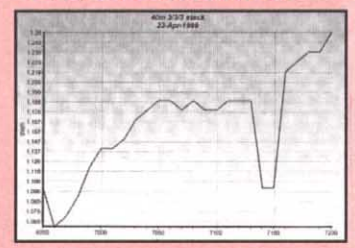

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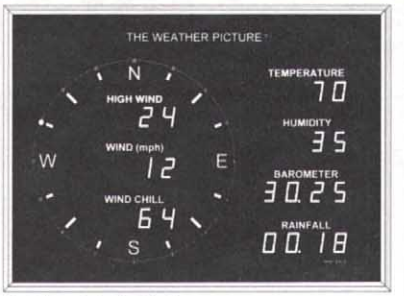

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Model	Bands	Traps	Length	Price
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D-42	10/15/20/40	2	55'	74.95
D-52	10/15/20/40/80	2	105'	79.95
D-56	10/15/20/40/80	6	82'	125.95
D-68	10/15/20/40/80/160	8	146'	162.95

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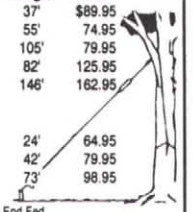
VS-42	10/15/20/40	2	24'	64.95
VS-53	10/15/20/40/80	3	42'	79.95
VS-64	10/15/20/40/80/160	4	73'	98.95



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ALL TRAP ANTENNAS are Ready to Use - Coax Fed - Factory Assembled - Commercial Quality - Handles 600 Watts - Comes complete with: Deluxe Traps, Deluxe Center Connector, 14 ga. Stranded Antenna Wire and End Insulators. Automatic Band Switching - Tuner usually never required - For All Transmitters, Receivers, & Transceivers - For All Class Amateurs - One Feedline works All Bands - Instructions included.

SINGLE BAND DIPOLES

Model	Band	Length	Kit Form Price	Assembled Price
D-10	10	16'	$18.95	$23.95
D-15	15	22'	18.95	23.95
D-20	20	33'	19.95	24.95
D-40	40	66'	24.95	28.95
D-80	80/75	130'	29.95	33.95
D-160	160	260'	41.95	45.95

Includes instructions, Deluxe Center Connector, 14 ga. Stranded Antenna Wire and End Insulators. Coax Fed.

LIMITED SPACE DIPOLES

- Reduces overall length over 40%!
- Coax Fed.
- Shorteners* are enclosed, sealed, weatherproof and lightweight.
- Complete with Deluxe Center Connector, 14 ga. Stranded Antenna Wire, End Insulators, and Assembly Instructions.
- Use as inverted "V", or flat-top.
- Excellent for all class amateurs.

Model	Band	Length	Price
LS-40K	40	38'	$48.95
LS-80K	80/75	69'	54.95
LS-160K	160	100'	56.95

Any single band, or Trap antenna with PB-1 Balun instead of Deluxe Center Connector; Add $10.00 to antenna price. (For PB-1-C – Add $12.00)

"PRO-BALUN" PB-1 – $19.95

- 1:1 For Dipoles, Beams & Slopers
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- Broadband 3 to 35 Mhz.
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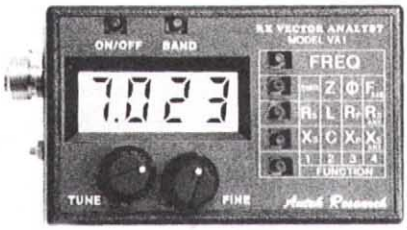

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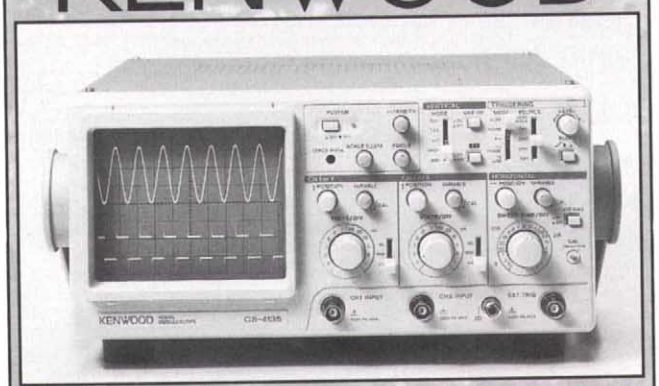

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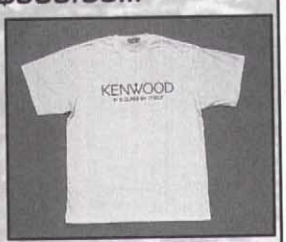

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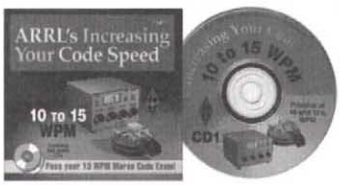

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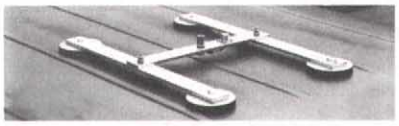

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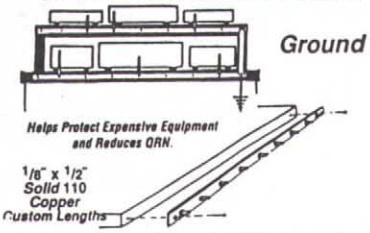

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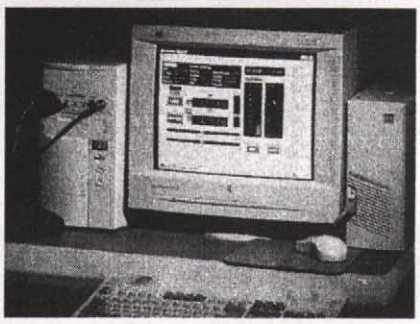

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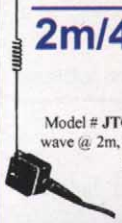

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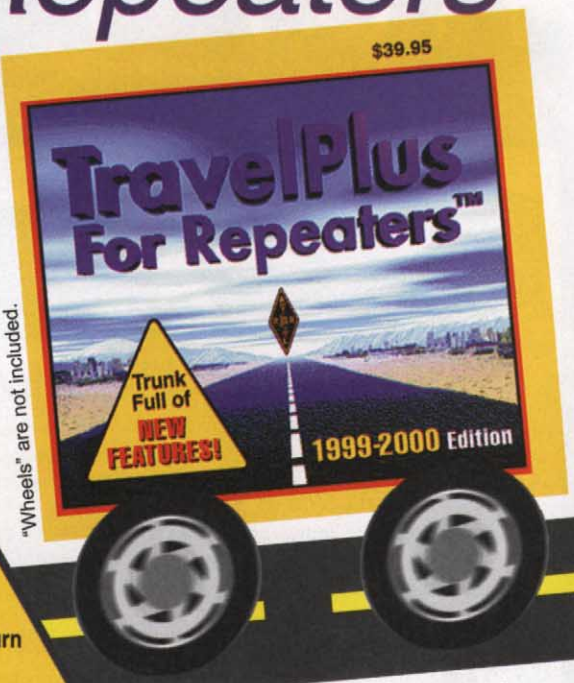

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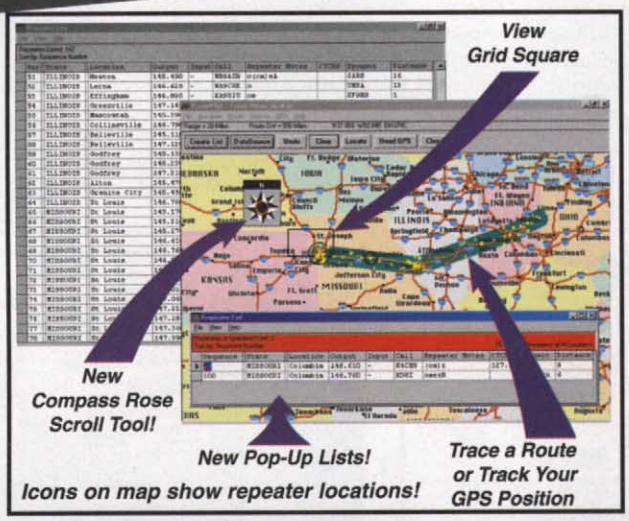

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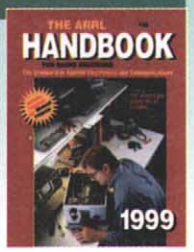

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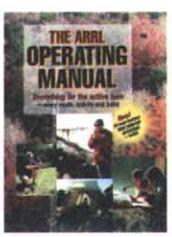

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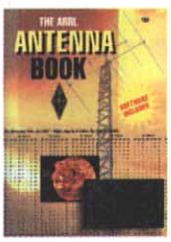

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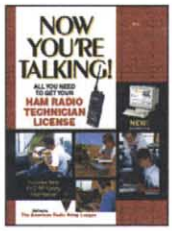

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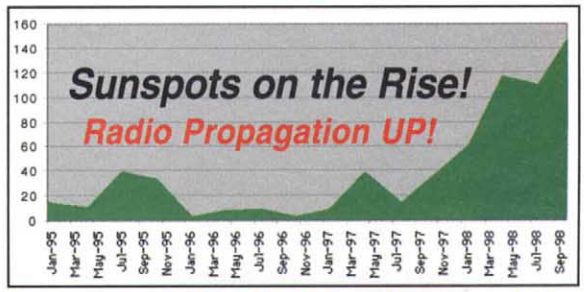

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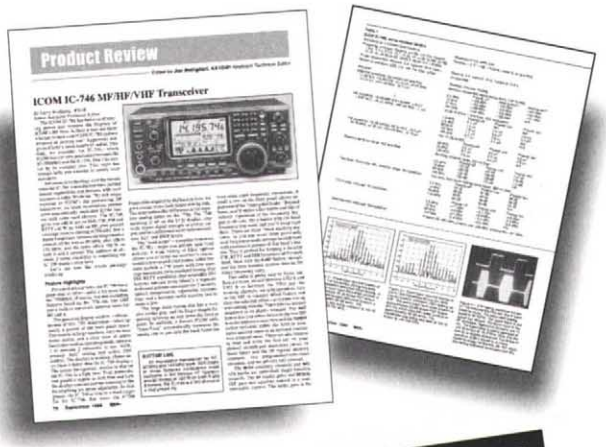

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- Smart Search™ Automatic Memory Loading
- Programmable Front Panel/Microphone Key Functions
- Battery Voltage Meter
- Auto-Range Transponder System (ARTS™)
- TX Time-Out Timer (TOT)
- Automatic Power-Off Battery Saver (APO)
- Remote-Head Operation using Optional YSK-90 Separation Kit
- 16-Digit 8-Memory DTMF Autodialer (requires MH-36A6J Mic)
- ADMS Windows™ PC Programmable
- Automatic Repeater Shift
- 1200/9600 bps Packet Compatible
- RF-Level Squelch for Quiet Monitoring of Busy Channels
- DCS Code # Search
- Versatile Scanning Features
- Priority Channel Monitoring
- Menu for Feature Customization
- Adjustable Display Brightness and Contrast
- Aluminum Diecast Chassis with Cooling Fan

MICRO COMMANDER

FT-90R

VHF/UHF Dual Band FM Transceiver

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KENWOOD has produced high quality communication and test equipment since 1946. Today Kenwood products are distributed in over 120 countries throughout the world and enjoy a reputation for reliability and technological innovation. Kenwood is committed to developing and building the finest quality components with state of the art technologies that will lead our customers and us into the 21st century.

At Kenwood we understand and believe that precise technology is one of the cores of reliability and quality. One of our foundations of success is our ability to listen to our dealers and our customers to build the right products that give more for the dollar. Kenwood Communications Corporation is a company on the move, growing and changing with our customers and their needs.

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FRS

TH-22AT
2 meters

TH-G71A
2 meters & 440 MHz

TH-D7A
2 meters & 440 MHz w/TNC

TH-79AKSS
2 meters & 440 MHz

VC-H1
Visual Communicator

TM-261A/461A
2 meters/440 MHz

TM-331A
220 MHz

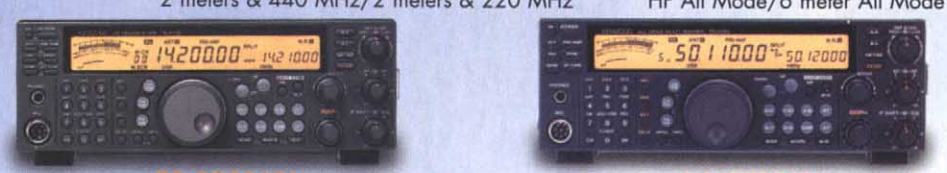
TM-G707
2 meters & 440 MHz

TM-V7A
2 meters & 440 MHz

TM-541A
1200 MHz

TM-742AD/642AD
2 meters & 440 MHz/2 meters & 220 MHz

TS-50/60
HF All Mode/6 meter All Mode



TS-570D(G)
HF All Mode

TS-570S(G)
HF & 6 meter All Mode

TS-870S
HF All Mode

TS-950SDX
HF All Mode

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Amateur Radio Products Group

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