Official Journal of
ARRL
The national association
for AMATEUR RADIO

QST

devoted entirely to
AMATEUR RADIO

November 2003

QST reviews

ICOM IC-703 Plus
transceiver

QST compares:
222 MHz FM mobile transceivers

Plumber's half-square
2 meter antenna

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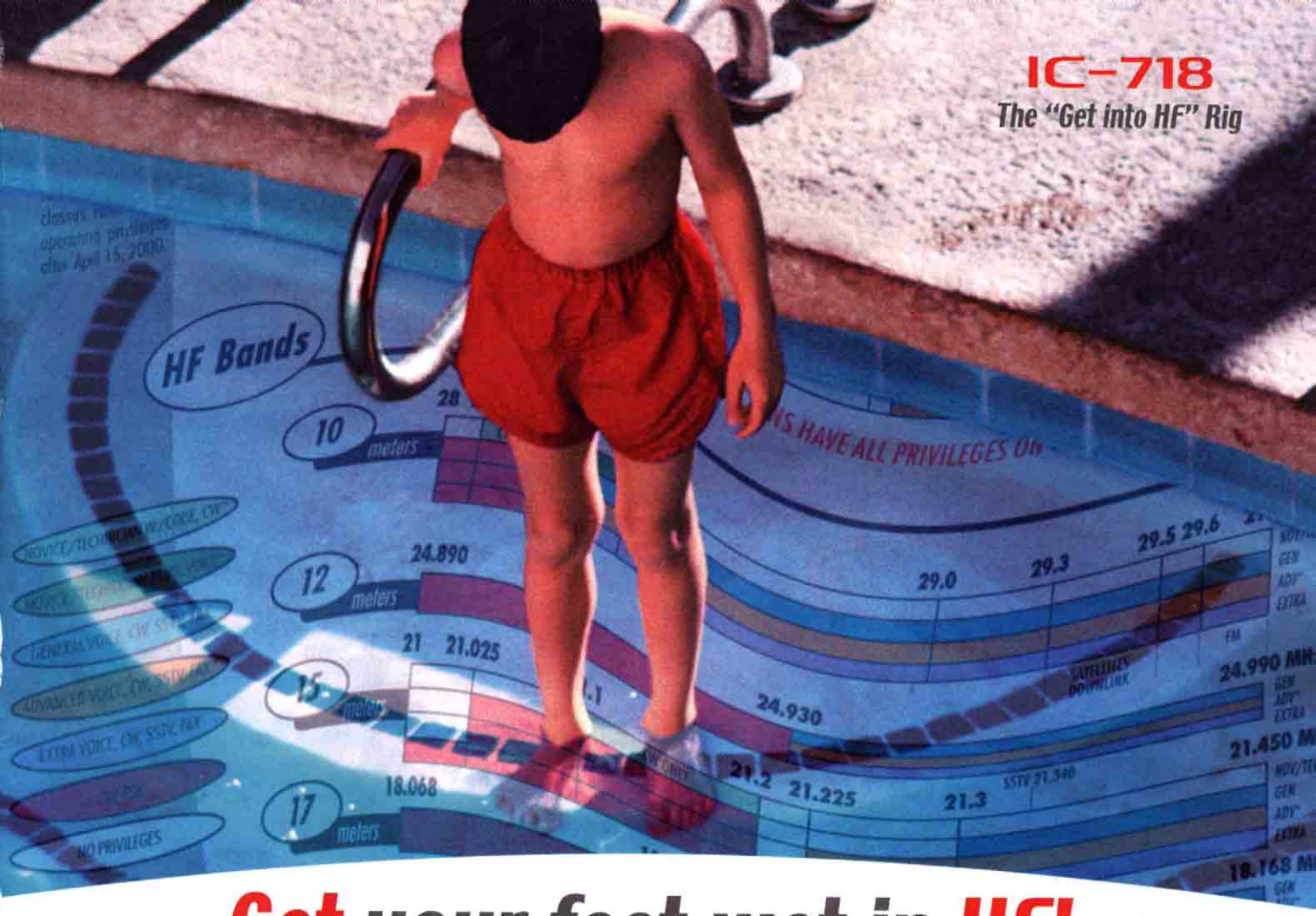

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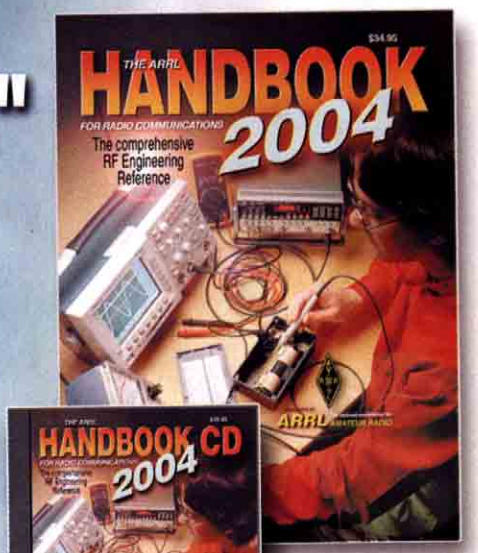

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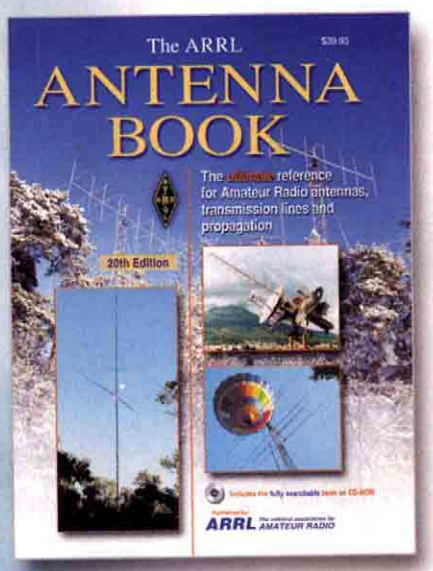

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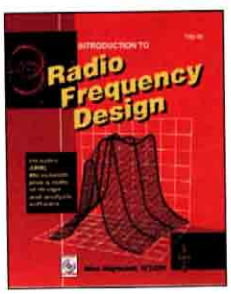

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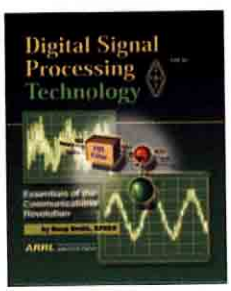

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Specifications:

Freq.: 2m: 144–148MHz
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Power: 200 watts
Wind Rating: 135 MPH (no ice)
Height: 5.6 feet

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- Heavy duty fiberglass radome
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- Strong–waterproof joint couplings
- Type–N Cable connection
- Wide band performance

Specifications:

Freq.: 2m: 144–148MHz
70cm: 440-450MHz
Power: 200 watts
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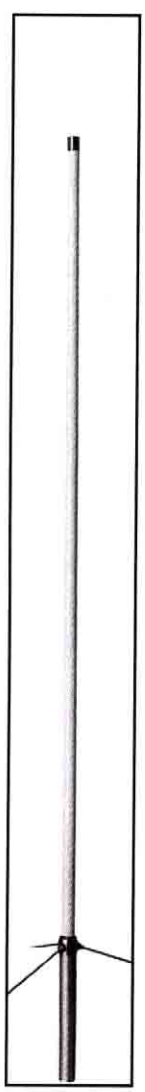
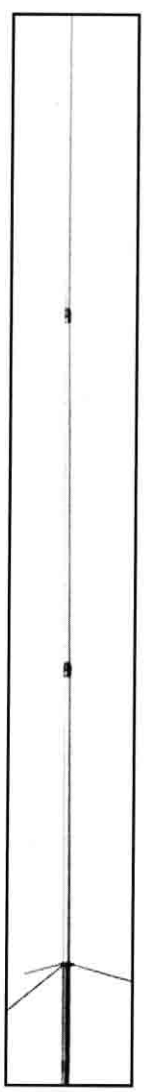


X50NA



X500HNA

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MODEL	BAND (MHz)	WATTS	CONN.	HT. FT.	RATED WIND MPH (No. Ice)
CP22E [1]	144	200	UHF	9.0	90
DPGH62 [1,6]	50	200	UHF	21.0	78
F22A	144	200	UHF	10.5	112
F23A	144	200	UHF	15.0	90
F718A [2]	440	250	N	15.0	90

DIAMOND Dual-Band Base/Repeater Antennas

MODEL	BAND (MHz)	WATTS	CONN.	HT. FT.	RATED WIND MPH (No. Ice)
X50A	144/440	200	UHF	5.6	135
X50NA	144/440	200	N	5.6	135
X200A	144/440	200	UHF	8.3	112
X510NA [3]	144/440	200	N	17.2	90
X510MA	144/440	200	UHF	17.2	90
X500HNA	144/440	200	N	17.8	90+
X700HNA	144/440	200	N	24.0	90
X2200A	144/222	150	UHF	11.5	112
U200	440/1240	100	N	5.9	135

DIAMOND Tri-Band Base/Repeater Antennas

MODEL	BAND (MHz)	WATTS	CONN.	HT. FT.	RATED WIND MPH (No. Ice)
U5000A	144/440/1240	100	N	5.9	135
V2000A [4,6]	52/144/440	150	UHF	8.3	110
X3200A [5]	146/222/440	100/200	UHF	10.5	112
X6000A	144/440/1240	100/60	N	10.5	112

[1] Heavy duty aluminum construction.
[2] F-718A: 440-450MHz., F718L: 420-430MHz.
[3] X510NJ: 144-147/430-440MHz.
[4] 1/4λ, rated in dBi. Most requirement: 1.4"-2.4".
[5] 2m: 146-148; 100 watts
[6] 52-54MHz. only; DPGH62 adjustable from 50-54MHz.

BAND: 144=144-148MHz., 222=222-225MHz., 420=420-430MHz.,430=430-440MHz., 440=440 450MHz., 1240=1240-1300MHz.

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November 2003 ♦ Volume 87 Number 11

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Technical

News and Features

QST (ISSN:0033-4812) is published monthly as its official journal by the American Radio Relay League, 225 Main Street, Newington, CT 06111-1494, USA. Periodicals postage paid at Hartford, CT, USA and at additional mailing offices. POSTMASTER: Send address changes to: *QST*, 225 Main St, Newington, CT 06111-1494, USA

QST Workbench

76

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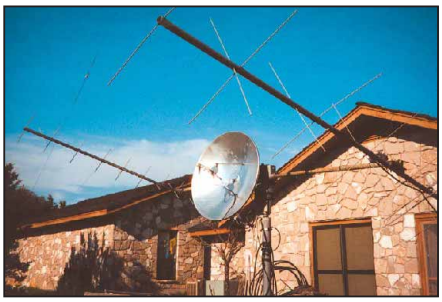

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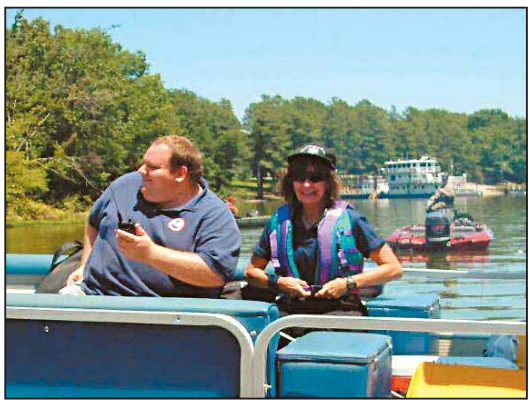

Operating

Departments

Our Cover
Getting to meet local hams and young people, fire up a station and just soak up the ambiance of the Orient proved to be a memorable experience for a New Jersey ham. The inset photo shows the author, Ray Jacob, W2RJJ, preparing to operate from BY4AA, the club station of the Shanghai Radio Sports Association. The larger photo, taken by W2RJJ, is of an ancient fishing village about an hour's drive west of the city. Photo of the author by Chen Yuan Chang, BA4EH.

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2004 Winter Edition

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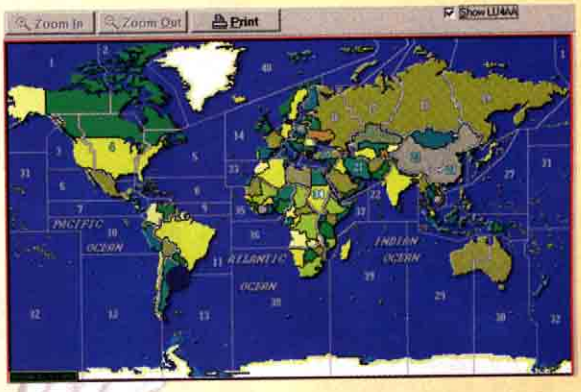

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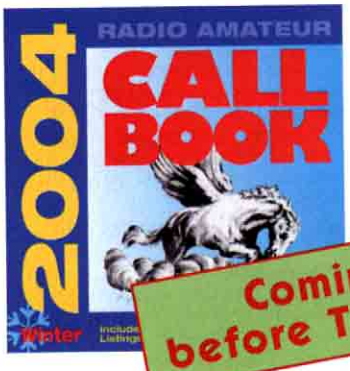

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- **Automatic digital receive**
Automatic voice signal detector recognizes the received signal as analog or digital, automatically switching to the appropriate mode.

- **Digital Slow Scan TV***
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- **Small and compact unit. Easy to operate.**
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- **Utilizes a uniquely designed high performance DSP engine**

- **Uses the established G4GUO open protocol**

Use any conventional voice transceiver for digital voice communications and images* while you maintain analog capabilities.

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"IT SEEMS TO US..."

Who Needs BPL?

What is the driving force behind the idea of delivering Broadband over Power Lines (BPL)? Who needs it?

Not consumers. Most already have access to broadband service (if they want it) via DSL, cable modems, wireless local area networks and satellites. They are not clamoring for more choices. Consumers might like lower prices, but no one is offering any guarantees on behalf of BPL in that regard.

According to the International Telecommunication Union, DSL is the most common broadband platform in the world today and is growing rapidly. Cable modems are popular in economies with developed cable TV networks.

As for future growth, the ITU says: "The cost of installing the fiber optic cables previously made it prohibitive for connecting small communities or homes, but prices have fallen to the point that in several economies, users can now connect to the Internet via fiber optic cable at speeds 20 times greater than the fastest DSL and cable modem connections. Several governments are gradually laying fiber infrastructure to have it ready when it finally becomes cost effective to install the connections and 'light up' fiber to the home."

BPL proponents claim to be interested in serving rural areas. The ITU has many experts working to bring the benefits of telecommunications to rural and underdeveloped areas. However, the best way to do that is by wireless local area networks. Again according to the ITU, "WLANs are an effective way to share wireless Internet access from a broadband connection within a distance of 100 meters. They are also increasingly used to provide broadband access over long distances in rural areas and developing nations (using special equipment and technology to boost the effective distance of the connection points).... WLAN technologies...are easy to install and inexpensive. Many projects around the world are looking for ways to use WLAN to bridge the last mile."

Who needs BPL? Not investors. They've already lost billions of dollars on other telecommunications ventures for which there was no market, such as mobile satellite services. Investors have already paid for the installation of a staggering amount of unused fiber optic cable that is generating no return for them. They don't need another black hole.

BPL is a latecomer to the broadband marketplace. To succeed, a latecomer has to demonstrate a clear superiority. BPL has none. It may not be cheaper, but it's definitely slower than other broadband delivery systems. It's fraught with potential safety and security issues that do not arise with its competitors. It pollutes the radio spectrum. There's not a single reason a consumer would select BPL over its competition if the competing service is available, and for most consumers it already is—and BPL isn't.

Who needs BPL? Not the power utilities. They have their hands full managing their core business. The smart ones realize that, at least while the public and the government are watching them like hawks to see how they respond to the August 14 blackout, they must avoid the distraction of a doomed venture. Anyone who thinks that BPL is a pot of gold right around the corner should consider this quote from an industry source in an Associated Press story earlier this year: "I think they're a long ways from proving it, let's leave it there," said Larry Carmichael, a project manager with the Electric Power Research Institute. "The tests to date have been so small as far as looking at the financial and technical viability. It's still at the very early stage of development."

Who needs BPL? Not anyone who uses radio communication—and not just those who use the frequency range from 1.7 to 80 MHz. In its comments in response to the FCC's Notice of Inquiry in ET Docket No. 03-104, the National Telecommunications and Information Administration observes: "As a result of non-linear elements in the electrical power distribution system, BPL systems may radiate emissions at frequencies substantially higher than the frequencies actually used intentionally within the BPL system." That makes BPL a concern to anyone who watches television, listens to FM radio, rides in an airplane, train or boat, cares about weather forecasting or radio astronomy, or relies on police and fire departments or any other services that use land mobile radio—including the power utilities themselves, who are heavy users of the Power Radio Service.

Who's left? Well, there are the companies that would like to sell BPL hardware. Were it not for the fatal flaw of its spectrum pollution, the engineering that has gone into making BPL work would be worthy of admiration. However, since it involves transmitting RF via an inappropriate medium—a transmission line designed for 60 Hz, not 6 or 60 MHz—it is the sort of admiration one might have for a dog walking on its hind legs: the dog doesn't walk very well, but the surprising thing is that it can walk at all. One can only hope that these engineers will find a better outlet for their talents on their next assignment, or with their next employer.—*David Sumner, K1ZZ*

Thank You

ARRL is pleased to honor the Amateur Radio organizations and industry partners that have contributed in 2003 to support **Spectrum Defense**, including the special campaigns for **WRC-03** and against **Broadband over Power Lines (BPL)**.
They join thousands of ARRL members who provide funds for ARRL's spectrum protection efforts on behalf of Amateur Radio.

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Las Vegas Radio Amateur Club
Liberty & Mundelein ARS
Loudoun AR Group
Mancorad ARC
Marietta ARC
Mason Area Repeater Club
Michiana ARC
Michigan City ARC
Mid-Atlantic ARC
Minnesota Wireless Assn.
Minnetonka MN ARC
Muskegon Area AR Council
NCG Companies
Nellis ARC
New England Division
North Florida DX Assn.
North Georgia QRP Club
North Kitsap ARC
North Texas Microwave Society
Northeast Wisconsin DX Assn
Northern California DX Club
Northern Illinois DX Association
Northwest ARS
Ocean Monmouth ARC
Orange County ARC
Pikes Peak Radio Amateur Assn.
Playground ARC
Portland Repeater Inc.
QCWA Chapter # 149 (Nutmeg)
Radio Club of America
Redwood Empire DX Association
River City ARCS
Riverland ARC
Roadrunner Microwave Group
Rowan ARS
SA Engineering
Sangamon Valley ARC
Santa Cruz County ARC
Santiam Canyon ARC
Shy-Wy ARC
Smoky Mountain ARC
South Baldwin ARC
South Lyon Area ARC
South East Metro ARC
Southeastern VHF Society
Southern Arizona DX Assn.
Southern California DX Club
Southern Counties ARC
The Southwest Traffic Net
Splitrock ARA Inc.
St. Augustine ARS
St. Charles ARC
Stillwater AR Assn.
Thibodaux ARC
Tri-Lakes ARC
Tri-State AR Assn. (TARA)
Twin City FM Club
Twin City DX Assn.
Valley Radio Club of Oregon
West Valley ARC
Williamson County ARC
Wynmoor ARC

For more information on the ARRL Spectrum Defense Fund, including BPL, and to make a club or individual contribution to this continuing campaign, go to the ARRL website at **www.arrl.org** or contact:

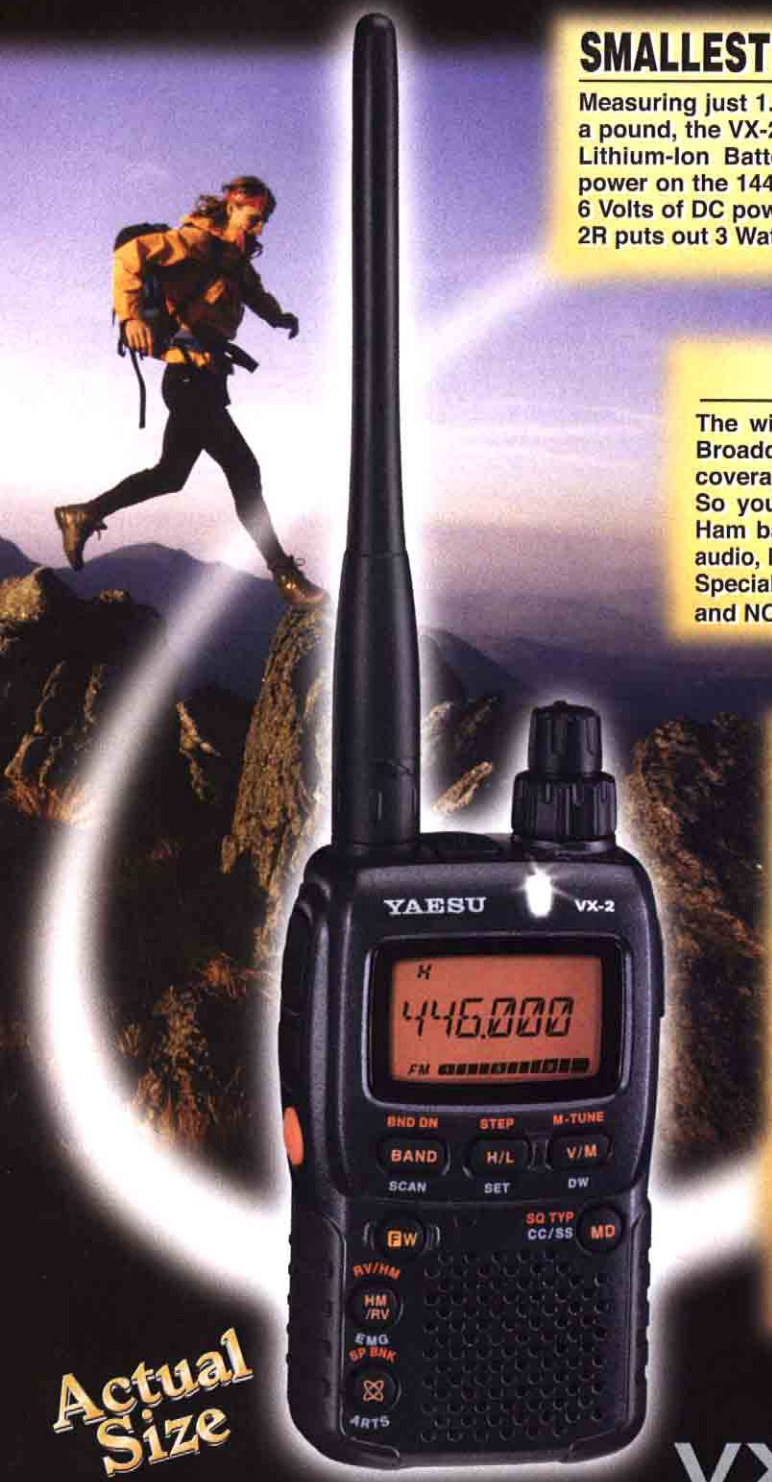
Mary M. Hobart, K1MMH
Chief Development Officer
ARRL
225 Main Street
Newington CT 06111-1494
Tel: 860-594-0397
Email: mhobart@arrl.org

This Honor Roll reflects contributions received through September 24, 2003. A complete listing appears on the web at **www.arrl.org**.

WORLD'S SMALLEST DUAL-BAND HT WITH WIDE-BAND RX

The world's smallest Dual-Band HT with up to 1.5 Watts* of output power is your high-tech gateway to the world, via VHF, UHF, Shortwave Broadcast, Marine and Aircraft bands, or WIRES™ Internet linking!

*1.5 W/144 MHz, 1 W/430 MHz



SMALLEST HT WITH HIGH OUTPUT POWER

Measuring just 1.9" x 3.2" x 0.9" and weighing less than 3/10ths of a pound, the VX-2R is supplied with a 1 Amp-hour (3.7 V) FNB-82LI Lithium-Ion Battery Pack, providing up to 1.5 Watts of output power on the 144 MHz band, and 1 Watt on 430 MHz. If you supply 6 Volts of DC power from the optional E-DC-21 DC Adapter, the VX-2R puts out 3 Watts on VHF, and 2 Watts on UHF!

WIDE BAND RECEIVE

The wide frequency coverage of the VX-2R includes the AM Broadcast band, continuous HF shortwave coverage, VHF/UHF coverage up to 729 MHz, plus 800-960 MHz (cellular blocked). So you won't miss any of the action, whether you're on the Ham bands or monitoring overseas news, FM broadcasts, TV audio, Marine or Air Band users, or Public Safety communications. Special memory banks allow quick recall of Marine, Shortwave, and NOAA Weather broadcasts (with "severe weather" alert).

HIGH PERFORMANCE

- WIRES™ Internet Linking Key and 9-Memory DTMF Autodialer
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Supplied accessories:
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*Simulated LCD.

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Ultra-Compact 144/430 MHz Dual-Band FM Transceiver

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ARRL in ACTION

YOUR membership at work

By Dave Hassler, K7CCC, dhassler@arrl.org

Flyer Reaches Out to Nonmembers

Do you know a few hams who haven't yet joined the ARRL? The ARRL Marketing Department has put together a new tool you can use to encourage your friends to become League members.

"The new membership brochure is a fresh look at the most current ARRL membership benefits and services," said ARRL Marketing Manager Bob Inderbitzen, NQ1R. "It emphasizes member services available via the Web, sports a more efficient membership application form and has a more attractive look, in general."

While the new tri-fold brochure highlights *QST*, the world's leading Amateur Radio news and information periodical, it emphasizes that ARRL membership constitutes much more than receiving the League's membership journal. The ARRL Regulatory Branch can aid with FCC, zoning, licensing and procedural questions; The Members Only portion of the ARRL Web site allows access to detailed contest results, on-line classifieds, *QST* product reviews and an on-line *QST* index, *ARRL Letter*, bulletins and other news; members can also take advantage of the outgoing QSL service, equipment insurance, operating awards—and more. But perhaps best of all, ARRL members are represented when issues affecting Amateur Radio are discussed in national and international arenas.

The new ARRL membership brochure highlights the value of *QST*, the many members-only benefits available and an updated membership application form.

Inderbitzen pointed out that the flyer is not a ham radio recruitment tract, but provides solid information on ARRL membership benefits for current hams who have yet to hear of all the League has to offer. "Instructors teaching a group of hams could use it to tie in ARRL membership, clubs can put a complete and compact brochure about membership benefits into non-members' hands, and individual hams can make use of the flyer to encourage friends who are not members to join," he said.

The brochure is available at no cost from both the ARRL Sales and Marketing Department and the ARRL Web site. Simply send an e-mail to **circulation@arrl.org** and let the folks there know how many you would like and how you plan to use them; they can also be reached by telephone at 860-594-0338. Or, the flyer can be downloaded as an Adobe PDF file from **www.arrl.org/join** and later printed out on high-quality paper.

ARRL Director Calls Attention to BPL

♦ The threat of Broadband over Power Line (BPL) is cause for alarm, but also a call to arms. During the recent FCC comment period on the proposed high-speed data delivery system, Great Lakes Division Director Jim Weaver, K8JE, took the latter tack to mobilize members in his division.

In his e-mail letter "Weaver's Words," sent to division members who are registered for the letter via the ARRL Members Only Web site, Weaver gathered facts on BPL from *QST*, ARRL bulletins and ARRLWeb articles. "I briefly restated the issue, gave the Web site for making reply comments to the FCC and provided a general outline of possible wording of the comments," he said.

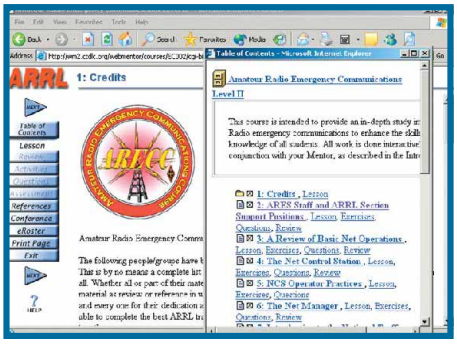
"In the future, I intend to fine tune things by providing a link to a site where members can get the names and addresses of their elected officials, and provide them with a boilerplate letter they can either modify to make it unique, or use as-is," Weaver said.

League Updates Level 2 EmComm Course

With added emphasis on ARES, ARRL section-level support and net operation, the Level 2 ARRL Amateur Radio Emergency Communications Course finished up a beta test run in October and is just about ready for student use.

"The revised course integrates the most up-to-date information available on the course's topics," said ARRL Emergency Communications Courses Grants Manager Dan Miller, K3UFG. "The original Level 2 course was completed in 2001 and not touched until now. It was time."

Chief Course Editor Dave Coulter, WA1ZCN, went over the course with an eye for changing methods, tools and student activities so they would be more in line with current field practices. Coulter added new material on HF propagation considerations (important in a region-wide relief effort), training and classroom teaching methods, and ways of using special events as training opportunities. Also, more information on ARES structure, net management, net control and nets in general was added, building on the basic material in the Level 1 course. All topics were part of the beta test and were pending approval at *QST*'s press deadline.



The revised on-line version of the Level 2 Amateur Radio Emergency Communications Course will place more emphasis on ARES, ARRL section-level support and net operations.

"The new printed course book for Level 2 will also include quizzes and student activities for each lesson in an appendix," Miller said. "I think this effort will also reflect some of the improvements we made in the Level 1 course last year." More information on the ARECC classes can be found on the ARRL Web site at **www.arrl.org/cce**.

Students in the ARECC courses can have tuition reimbursed upon successful completion of a course through generous grants made by the Corporation for National and Community Service (CNCS), an initiative of the White House, and United Technologies Corporation of Hartford, Connecticut. To find out about the successes the grant-funded courses have generated, check out the article, "EmComm Courses Make the Grade" starting on page 61 of this issue. The article includes information about how to enroll.

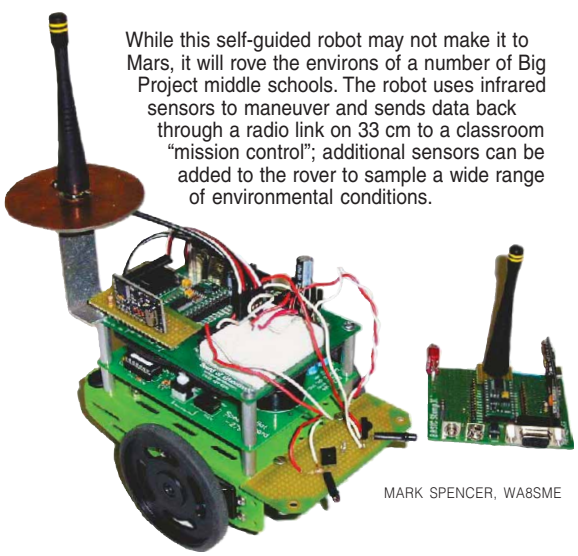
Is the Big Project Headed to Mars?

It's called "The Mars Lander," but it'll never touch the barren soil of the Red Planet...more likely the gym or classroom floor of a "Big Project" middle school. ARRL Education and Technology Program Coordinator Mark Spencer, WA8SME, has assembled a data gathering robot kit that he hopes will be the centerpiece of an in-depth semester, or even yearlong, learning opportunity for students in "Big Project" schools.

"I wanted to develop a higher-end project that was pointed right at eighth-grade students that included elements of wireless technology, computers, space exploration and problem solving," Spencer said. "This is not some radio-controlled race car, but a science data gathering robot. The goal of the project would be to learn what it takes to get to Mars and go exploring." The former math and science teacher explained that the idea is to have kids plan, build and operate a programmable robot equipped with measuring devices and then analyze the data it returns, just like their NASA counterparts. Spencer hopes the project can be active by the time the NASA *Spirit* and *Opportunity* rovers land on Mars in January 2004.

The robot kit is equipped with an RF data link on the 33 cm ham band, running less than 100 mW, which allows for a range of between 500 and 1000 feet. Spencer said that when all the logistical and construction elements are complete, a teacher can take the robot out to a gym or field (the "launch," so to speak) where topographical and geological elements have been set up. The students back in the "mission control" classroom could measure environmental elements such as heat, light and sound, along with geography and topology.

Throughout the term, students would be presented with a series of age-appropriate problem-solving lessons in project management, industrial design, telemetrics, wireless remote control robotics, environmental science, RF design, antennas and receiving systems, scientific testing methods, computer integration and programming, remote sensing, and more. "Really, the sky's the limit with this. A teacher could use this project in a yearlong curriculum of science and math," Spencer said. "Something like this lets the kids dive right into a project they can care about. This is real, hands-on science."



While this self-guided robot may not make it to Mars, it will rove the environs of a number of Big Project middle schools. The robot uses infrared sensors to maneuver and sends data back through a radio link on 33 cm to a classroom "mission control"; additional sensors can be added to the rover to sample a wide range of environmental conditions.

MARK SPENCER, WA8SME

Haynie Addresses Global 9-11 Memorial Net

On the second anniversary of the terrible events of September 11, 2001, ARRL President Jim Haynie, W5JBP, joined Amateur Radio operators across the US and around the world in pausing to remember those who died that day. Haynie joined more than 1400 amateurs checking into the 9-11 Commemorative Net, organized by Len Signoretti, N2LEN. The net linked repeaters across the country, with many links made through the Internet. In his remarks, Haynie addressed Amateur Radio's obligations in the aftermath of the attacks two years ago.

"One of the reasons we have a license and the privileges we have here in the United States is to provide a voluntary, noncommercial communication service, particularly with respect to providing emergency communications," Haynie said. "Since 9/11, our government at the federal, state and local levels has a new respect for the ability of Amateur Radio operators to do just that: provide communications when all others have failed. We can be vigilant, we can be trained and we can be ready. This is a task that we can do, and do well."

Haynie expressed his appreciation for those who volunteered in the aftermath of the attacks and for those amateurs who continue to assist in disasters and emergencies. Seven Amateur Radio operators died in the World Trade Center and Pentagon disasters.

ARRL President Jim Haynie, W5JBP, checked in to the 9-11 Commemorative Net, commenting that Amateur Radio has acquitted itself well in responding to communications emergencies. He expressed thanks to those who assisted at the World Trade Center site, at the Pentagon and in Western Pennsylvania.

Youth-Oriented Slideshow Debuts

The Harmonics Web page on the ARRLWeb (**www.arrl.org/FandES/ead/youth**) sports a new slideshow, depicting what Amateur Radio is and the many ways hams participate in radio-related activities. The 44-slide show notes how many hams there are in the US, the types of radios we use, various public service activities, fun portable operation, Kids Day and School Club Roundup, and more. ARRL Educational Program Coordinator Jean Wolfgang, WB3IOS, developed the show as a recruitment tool to be used at clubs, hamfests or other gatherings. Children can leaf through the slides to take a quick and lively tour of Amateur Radio. The slideshow is available as a downloadable PowerPoint presentation, but can also be viewed directly on the Harmonics Web page by clicking on the slide icon.

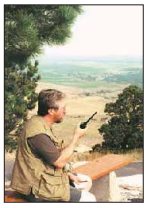
The first slide in the new Harmonics slide presentation sets the tone for a child's exploration of Amateur Radio.

Out and About with ARRL

- ARRL CEO David Sumner, K1ZZ, attended an IARU Administrative Council meeting September 6-8 in Amsterdam, The Netherlands, in his capacity as IARU Secretary. There's more about the Council meeting on page 100 of this issue. ARRL Directors, officers and senior staff were in St Louis September 13-14 for a strategic planning meeting.
- Dan Miller, K3UFG, ARRL's Emergency Communications Courses Grants Manager, represented the League at the Federal Emergency Management Agency Region IV Conference September 20 and 21 in Fort Gordon, Georgia.
- Lisa Tardette, ARRL Senior Dealer Sales Representative, attended Ham Radio Outlet's Manufacturer's Day in Salem, New Hampshire August 23. Quite a few ARRL Members stopped by the ARRL table. The hot topic of the day was Morse code testing.

Guide to ARRL Member Services

ARRL, 225 Main Street, Newington, CT 06111-1494



www.arrl.org/services.html/ **860-594-0200**

Technical and Regulatory Information Services

A wealth of problem-solving information is available to you on the ARRLWeb at **www.arrl.org/tis/**. Can't find the answer there? Call the Technical Information Service at 860-594-0214 from 9 AM to 4 PM Eastern Time, or e-mail **tis@arrl.org**.

Do you have a question about FCC Rules or local antenna restrictions? See the Regulatory Information Branch on the Web, call 860-594-0236 or e-mail **reginfo@arrl.org**.

ARRLWeb www.arrl.org

Log on for news, information and ARRL services. Members have access to special ARRL Web site features. Place free classified ads. Download and view *QST* product reviews and search the on-line periodicals index.

ARRL E-mail Forwarding

Life in cyberspace is easier when you have your own **arrl.net** e-mail address. When you switch Internet Service Providers, all you have to do is let us know and we'll change your e-mail forwarding automatically. You're spared the hassle of having to tell everyone that you've changed addresses! Sign up on the Web at **www.arrl.org/members-only/emailfwd.html**.

ARRL News

The ARRL News service is the most credible source of news for the amateur community. Breaking stories are available on the ARRLWeb. You can also listen to ARRL Audio News on the Web, or by telephone at 860-594-0384. Have a news tip? E-mail **n1rl@arrl.org**.

QSL Service

The most economical way to send and receive QSL cards throughout the world is through the ARRL QSL Service.

Educational Materials

A complete line of educational materials are available to schools, clubs and individuals.

Books, Software and Operating Resources

You can rely on ARRL for the very best publications and products: license manuals, circuit design and project resources, antenna construction ideas, and more. Shop online or locate a dealer near you at **www.arrl.org/shop**. What's the secret for making great publications even better?**—We listen to you!** E-mail your publications feedback, suggestions and product ideas to **pubsfdbk@arrl.org**.

Insurance

The ARRL "All Risk" Ham Radio Equipment Insurance Plan provides protection from loss or damage to your amateur station and mobile equipment by theft, accident, fire, flood, tornado, and other natural disasters. Antennas rotators and towers can be insured too. Call 860-594-0211.

DXCC/VUCC

The DX Century Club and VHF/UHF Century Club award programs are among the most popular Amateur Radio awards in the world.

Volunteer Examiner Coordinator (VEC)

Are you looking for a place to take your license exam? Do you have questions about the examination process? The ARRL VEC network is the largest in the nation.

Trust in Advertising

ARRL's advertising acceptance process is a unique and respected service provided to both members and advertisers. The ARRL Lab regularly evaluates products for acceptable construction quality, safety, compliance with FCC requirements and performance claims. Members rely on *QST* and other ARRL publications to locate reputable suppliers of Amateur Radio equipment and services.

ARRL Foundation

This is your source for scholarships and other financial grant programs to support Amateur Radio. See **www.arrl.org/arrlf/** on the Web or call 860-594-0230.

Write for *QST*

We're always looking for articles of interest to amateurs. See our Author's Guide at **www.arrl.org/qst/aguide/**. If you have questions, or wish to submit an article for consideration, send an e-mail to **qst@arrl.org** or simply mail your article to *QST* c/o ARRL Hq.

Interested in Becoming a Ham?

Phone toll free 1-800-326-3942, or e-mail **newham@arrl.org**. We'll provide helpful advice on obtaining an Amateur Radio license. See **www.arrl.org/hamradio.html**.

We're at *your* Service

ARRL Headquarters is open from 8 AM to 5 PM Eastern Time, Monday through Friday, except holidays. Call **toll free** to join the ARRL or order ARRL products: **1-888-277-5289** (US), M-F only, 8 AM to 8 PM Eastern Time.

If you're in Connecticut, stop by ARRL Headquarters for a visit and tour. Located at 225 Main St, Newington, CT 06111, HQ offers tours at 9, 10 and 11 AM, and 1, 2 and 3 PM Monday through Friday, except holidays. Bring your license and operate W1AW anytime between 10 AM and noon, and 1 to 3:45 PM.

If you have a question, try one of these ARRL Headquarters departments . . .

	Contact	*Telephone*	*Electronic Mail*
Joining ARRL	Membership Desk	860-594-0338	**membership@arrl.org**
***QST* Delivery**	Circulation Desk	860-594-0338	**circulation@arrl.org**
Permission Requests	Maty Weinberg	860-594-0229	**permission@arrl.org**
Publication Orders	Sales Desk	860-594-0355	**pubsales@arrl.org**
Amateur Radio News	Rick Lindquist	860-594-0222	**n1rl@arrl.org**
Regulatory Info	John Hennessee	860-594-0236	**reginfo@arrl.org**
Exams	VEC	860-594-0300	**vec@arrl.org**
Educational Materials	Educational Services	860-594-0267	**ead@arrl.org**
Contests	Dan Henderson	860-594-0232	**contests@arrl.org**
Technical Questions	ARRL Lab	860-594-0214	**tis@arrl.org**
DXCC	Bill Moore	860-594-0234	**dxcc@arrl.org**
Awards/VUCC	Eileen Sapko	860-594-0288	**awards@arrl.org**
Development Office	Mary Hobart	860-594-0397	**mhobart@arrl.org**
Advertising	Advertising Desk	860-594-0207	**ads@arrl.org**
Media Relations	Jennifer Hagy	860-594-0328	**newsmedia@arrl.org**
QSL Service	Martin Cook	860-594-0274	**buro@arrl.org**
Scholarships	Mary Lau	860-594-0230	**foundation@arrl.org**
Emergency Comm	Steve Ewald	860-594-0265	**emergency@arrl.org**
Clubs	Field Services	860-594-0267	**clubs@arrl.org**
Hamfests	Gail Iannone	860-594-0262	**hamfests@arrl.org**
Write for QST	Joel Kleinman	860-594-0273	**qst@arrl.org**

Can't find the department you're looking for? Call 860-594-0200 or e-mail **hq@arrl.org**. Sending e-mail to any ARRL Headquarters staff member is a snap. Just put his or her call sign (or first initial and last name) in front of **@arrl.org**. For example, to send mail to Martin Cook, QSL Service Manager, use **n1foc@arrl.org** or **mcook@arrl.org**. If all else fails, send a message to **hq@arrl.org** and it will get routed to the right person or department.

ARRL Division Directors

As an ARRL member, you elect the directors and vice directors who represent your division on ARRL policy matters. If you have a question or comment about ARRL policies, contact your representatives at the addresses shown.

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Vice Director: Dr David Woolweaver, K5RAV
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(956-425-3128); **k5rav@arrl.org**

ARRL Section Managers

The 15 divisions of ARRL are arranged into 71 administrative *sections*, each headed by an elected *section manager* (SM). Your section manager is the person to contact when you have news about your activities, or those of your club. If you need assistance with a local problem, your section manager is your first point of contact. He or she can put you in touch with various ARRL volunteers who can help (such as technical specialists).Your section manager is also the person to see if you'd like to become a section volunteer. Whatever your license class, your SM has an appointment available. Visit your section page on the Web at **www.arrl.org/sections/**.

Atlantic Division (DE, EPA, MDC, NNY, SNJ, WNY, WPA)

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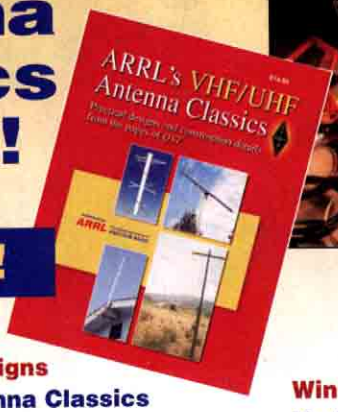

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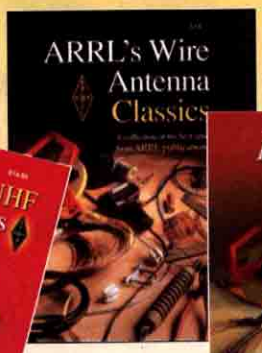

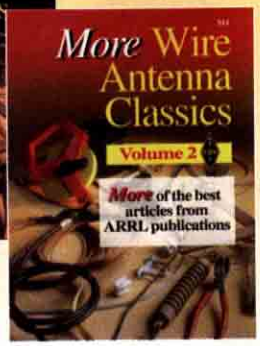

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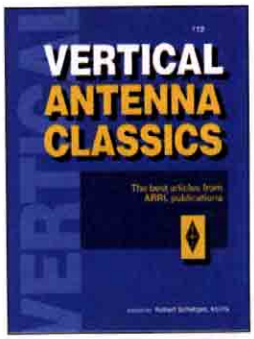

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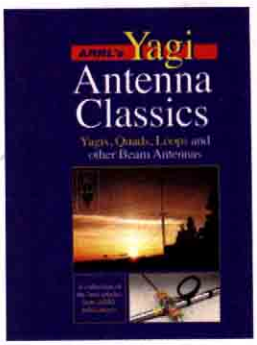

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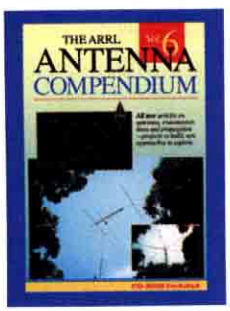

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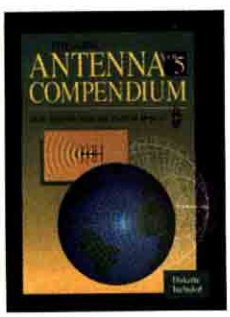

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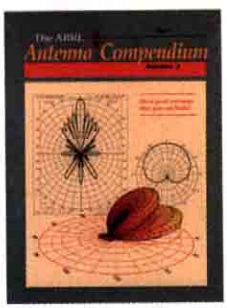

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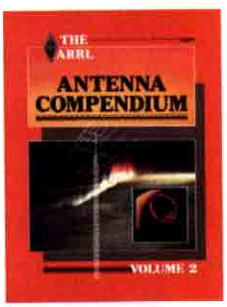

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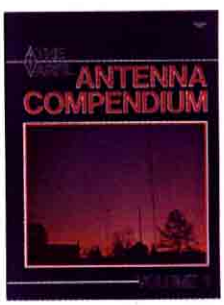

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COURTESY JONI TORNWALL, KC8TUX

When the Hocking Valley Amateur Radio Club, K8LGN, of Logan, Ohio, held a J-pole antenna building session in September, Katherine Tornwall, KC8TUY, a 13 year old Extra class licensee, wasn't to be outdone. She built her own 2 meter antenna with the help of several other hams in the club, including Gary Lemley, K8SPQ.

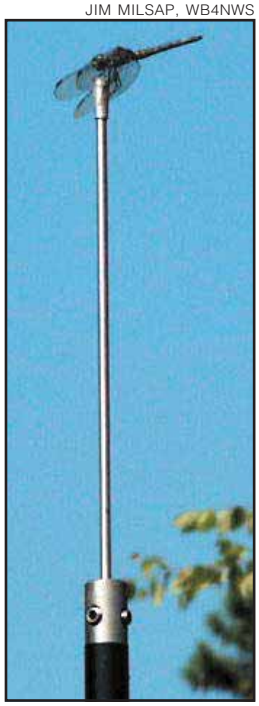
The sons of Jon Rudy, DU9/NØNM, enjoy building parodies of the OM's shack. Jon reports that, try as he might, his "Texas-sized tuner" just won't fit inside the shack.

JON RUDY, DU9/NØNM

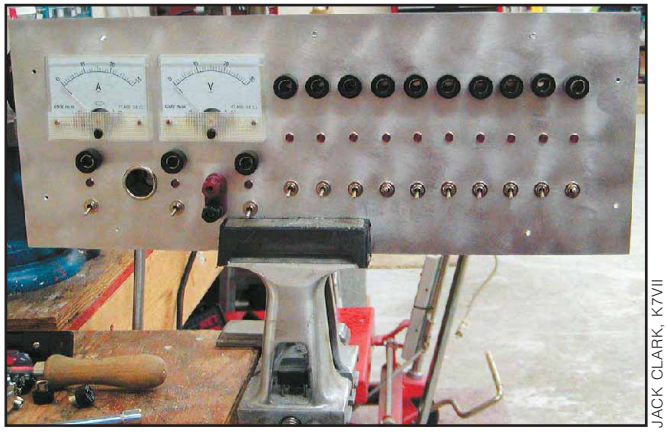
TIM ROGERS, N4XND

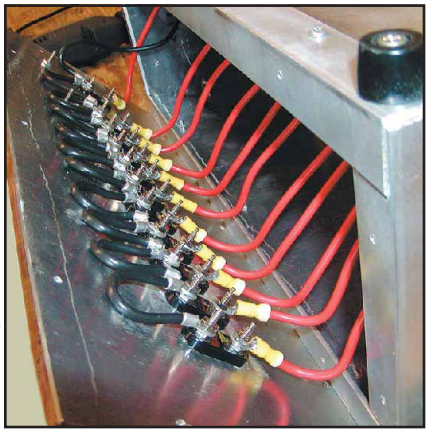
The art of homebrewing is alive and well at N4XND. Tim Rogers, of Gloucester, Virginia, has built a few things over the past couple of years. At the upper left is an L/C meter; upper right—10 W, 432 MHz ATV transceiver/ATV repeater monitor; lower left—2.4 GHz counter that also serves as a 100 MHz crystal oscillator, 50 W dummy load/wattmeter, crystal test oscillator, single tone/two tone audio oscillator, audio amp and (for good measure) 13.8 V/12 A switching power supply. Oh yes—at the lower right is a 65 W PEP 20 meter SSB transceiver.

JIM MILSAP, WB4NWS



Hamstick to Bugcatcher: Jim Milsap, WB4NWS, of Woodstock, Georgia, sends proof that his conversion was successful!

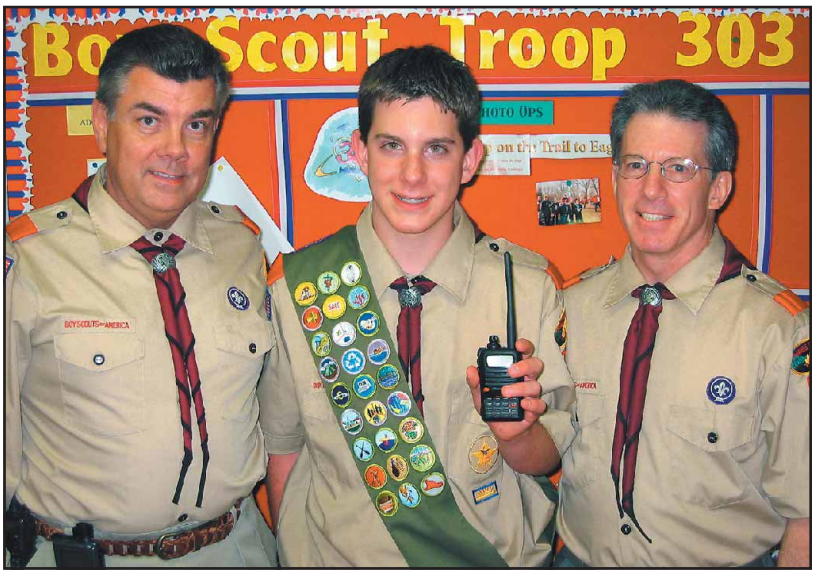




JACK CLARK, K7VII

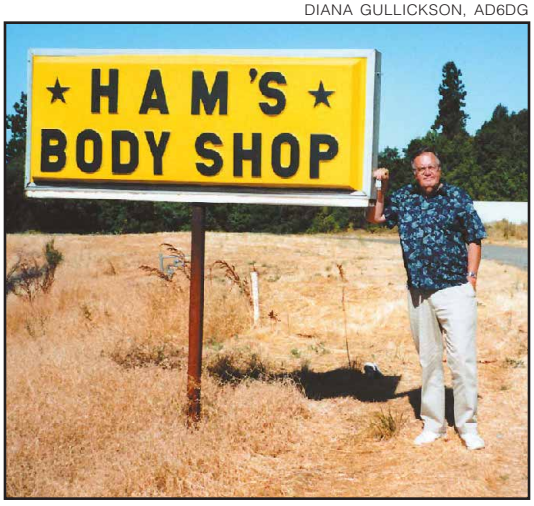
Homebrew power distribution: Jack Clark, K7VII, of Palm Desert, California, distributes things nicely in his ham shack, thanks to this power distributor. As he writes: This is a project I built to allow distribution of power from an Astron power supply to various ham projects. The panel will carry more than 25 A if the switches are replaced with heavier duty switches. The meters could be recalibrated or replaced to handle higher output supplies. For most of my circuitry, such as lights for meters in tuning boxes, small 5-10 W transceivers and miscellaneous testing use, the panel is more than adequate. I have 10 outputs fused as 2-15 A, 2-10 A, 3-5 A and the rest 3 A. The binding posts are fused at 20 A, and the cigarette lighter is fused at 15 A. By using both sides of the mini toggle switches, I was able to get enough rating to handle all of the power I will need from each circuit.

FRANK KROZEL, KG9H



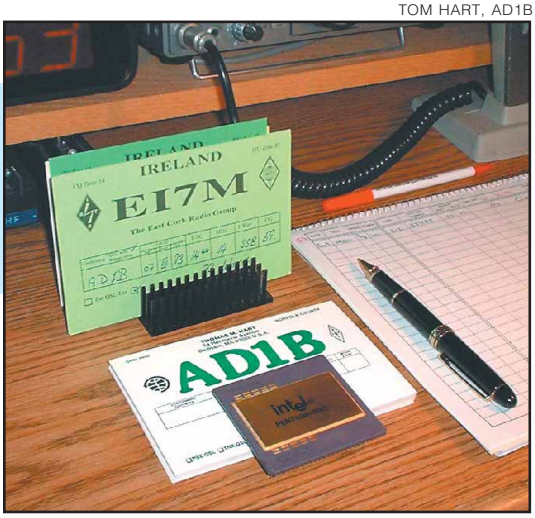
Two new hams in Troop 303: **From the left are ARRL Life Member Frank Krozel, KG9H, the troop's new scoutmaster; Brandon Krozel, KC9DNH, the troop's senior patrol leader, and Jess Hines, KC9DLJ, assistant scoutmaster. The "KC9s," although newly licensed, are veterans of the Wheaton, Illinois, troop's radio-related activities, such as Jamboree on the Air. This year's JOTA is October 18-19, by the way.**

DIANA GULLICKSON, AD6DG



Tony Gullickson, W6WI, of Fresno, California, spotted this sign while driving through Grants Pass, Oregon, recently. He suggests a stop by the shop for any hams needing some body work. Another approach is described in an article that begins on page 54.

TOM HART, AD1B



One of the 1000 uses for a dead computer: **"Every so often," writes Tom Hart, AD1B, of Dedham, Massachusetts, "I suffer computer failure and strip the unit of useful parts. I have found that the CPU and heat sink can be very useful on my radio desk. The Intel 200 MHz chip makes a great paperweight, while the aluminum heat sink fins work great as a QSL organizer."**

MATT CLINE, KB8WFH

Good place for a ham: **Radio Island, Matt Cline, KB8WFH, writes, is a little sand bar between Morehead City and Beaufort, North Carolina. Matt, who was visiting from Springfield, Ohio, worked several stations from the aptly named island with his mobile HF station for the lighthouse weekend August 16.**

JOHN HOLMES, W9ILY

Next time you're in New Buffalo, Michigan, during ice cream season, you'll want to head to Oink's Dutch Treat. The owner of this ice cream emporium is clearly wild about pigs, and porcine-themed signs like this one abound.

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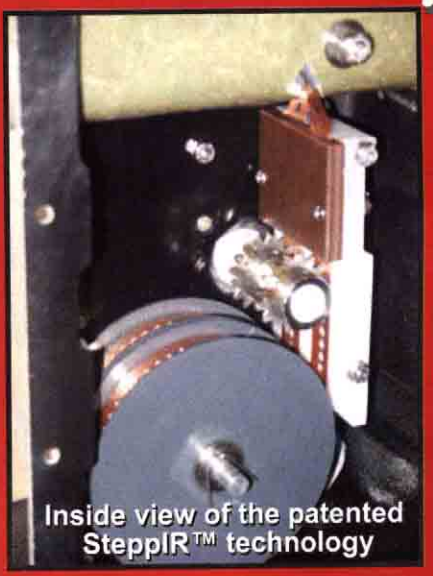

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QUALITY

♦ I'm a new ham (licensed only about a year) and have gravitated toward QRP. I was hooked after hearing that QRP is lovingly defined by its fans as "Quality Replaces Power." What I have come to realize only recently is that this "quality" moniker refers as much to the operator on the other end of my QSO as anything I might have done.

The patience, diligence and plain hard work of other operators during Field Day and again during the recent North American QSO Party was nothing short of amazing to me. Without fail, other operators took whatever time necessary to dig my signal out of the mud. Never once did I hear a recrimination for using QRP and only one station gave up on the QSO because my signal was too weak. I took it as a sign to finally go to bed on Field Day!

On behalf of all who work QRP, I would like to say thank you to all the operators who take the extra time and make the extra effort to work us. Your Quality has replaced our Power.—*B. Scott Andersen, NE1RD, Acton, Massachusetts*

WHAT'S IN A NAME?

♦ The 75, 50 and 25 Years Ago column shows how Amateur Radio has changed over the years. It seems that the only thing that has stayed the same is the name.

Now there is a push to change the name, too. Didn't we once come close to becoming the Citizens' Radio Service?—*Hal E. Dietz, WA8ZYH, Willoughby, Ohio*

♦ I increasingly become concerned by the number of letters in the "Correspondence" section of *QST* concerning the term "Amateur Radio operator."

Most writers seem to be offended by the designation "amateur." One even stated that it was a misnomer.

The dictionary defines "amateur" as "someone who does something for pleasure, not for money." If that is not a perfect description of our field, I don't know what would be.

I was a "professional" radio operator for 20 years in the United States Navy. At the same time I was an Amateur Radio operator, and continue to be an Amateur Radio operator now, 33 years after retiring. I have been asked numerous times by friends and associates, over the years, what Amateur Radio is. I give them the dictionary definition and take a few moments to tell them what it is we do.

If allowed to vote on the matter, I would vote to proudly keep the title "Amateur Radio operator." Please don't cave in to those who do not seem to appreciate why we call ourselves Amateur Radio operators.—*Eugene F. Leafty, WA7PHY, Phoenix, Arizona*

NOT SO FAST!

♦ When steam replaced wind propulsion, it was to be the end of sailing. And today, there are more recreational sailors than ever.

Electronic keyers and refined paddles brought a tremendous improvement in clarity and speed of Morse transmissions. Just listen in on, say, a Sweepstakes or any CW contest for that matter. Code became better than ever. In September *QST* "Correspondence," WN5FIZ makes an interesting suggestion, which I heartily endorse: Make the code test at, say, 15-18 WPM a part of the Extra class requirements. Code privileges everywhere on all HF bands should be enough incentive.

Leonard, W8LWB, has my sympathy. As a kid in Europe, I struggled with flow chart code to no avail. But after many nights going to sleep with the headphones on, crystal radio tuned to the powerful long-wave stations, then broadcasting Reuters and DNB News at about 15 WPM A2 modulation, things looked up. Pretty soon, short familiar words were snapped up, then longer ones, and so on.

When one reads, one sees the entire word at once, even though the eye has captured the letters sequentially. The brain does the integration. It does the same thing with code. One is unaware of individual letters; the complete word pops out. Pencil and paper are used for data to be retained. When Leonard crosses the proverbial "hump," he'll enjoy good code as one should.—*Paul Boller, W8IRT, Beaverdam, Virginia*

♦ It looks as if International Morse code will no longer be required for amateur qualifications. Nevertheless, I would like to petition for retention of substantial spectrum space in each Amateur Radio band for exclusive Morse operation, to preserve the art of home brew.

CW is by far the simplest mode for transmitter designs and is therefore the choice for neophytes and also for oldtimers like myself who have trouble soldering two wires together. If you wish to encourage homebrewing, please reserve spectrum for that mode.

CW is also the most efficient mode, which is why we QRPers use it. While other digital modes claim equal efficiencies, they do not lend themselves to Class C or E amplifier design and they generally require a great lumpy computer. However, QRP CW is subject to interference from 1500 W SSB signals.

So I appeal to the ARRL to retain band space for the more innovative, efficient hams of this world.—*Charles Hooker, VE3CQH, Orangeville, Ontario*

WORD IS SPREADING!

♦ My present consulting contract has me doing computer support for the US Forest Service. In a recent casual office conversation, I mentioned being a ham.

The response, "Oh yeah, you and your ham buddies are sure bailing us outta trouble in Idaho and Montana..." brightened my day. The folks in "FIRE" out here in the SF Bay area know very well how helpful the hams out there are. The government grapevine speaks well of us.— *R. "Texx" Woodworth, KG6ATH, Santa Clara RACES, KARO/ECHO, Kensington, California*

HE CAME BACK

♦ The radio shack was way past due for a real cleaning and reorganizing. Why not start with the closet? That sounded doable and a way to avoid the serious work ahead.

But then I came across all my logbooks from the past decade (gad, all together in one place!). It's amazing how a little reminiscing can halt a work project. There it was on the first page of Logbook No. 1: after over 30 years, the first of a weekly NTS Transcontinental Corps (TCC) traffic schedule. You see I am a "retread"—having let my license lapse while keeping Danang in touch with incoming B-52s, I came back to Amateur Radio in 1993. The return has been an important part of my life, and working top-notch operators with CW, SSB and PACTOR II helps keep me young and involved.

I have kept the same TCC CW sked now for a decade. My counterpart, Jack, W5TFB, and I have grown older, raised (and still raising) youngsters and retired.

Both of us are NTS leaders and have kept our operating skills honed in the way of George Hart, W1NJM. Jack and I have never met in person or spoken in other than the mode that has sustained us over the years. Both of us have witnessed some amazing changes to Amateur Radio, yet much of value remains. It is important to reflect on change; it is more important to reflect on what we value most about Amateur Radio and strive with others to hold on to it—and to share it.

Now, if I moved the transceiver closer to the amplifier and tuner would I save some time changing bands? But then... I do need the daily physical exercise..... *—Robert Griffin, K6YR, Chair, NTS Pacific Area Staff, San Luis Obispo, California*

WAY TO GO!

♦ Elecraft has introduced its newest product, the KX1 ultra-portable QRP CW transceiver. In a small box, they managed to put a three-band rig for the portable operator—with lots of features that any ham could appreciate. This time, I really mean *any* ham, because right out of the box (or off the workbench, as it were), Elecraft built accessibility features right into the rig.

Whether intentional or not (and I suspect it was a factor), they designed a rig that it seems a blind ham can easily use. With CW output of rig settings and frequency, the blind ham has the same access to this rig's operation as do his sighted brethren.

This small company has done what other manufacturers of ham gear have either not done or, for the most part, only halfheartedly done. Elecraft has strived to make their rigs as accessible to the disabled population of hams as to the fully able-bodied. They've listened to our suggestions and have implemented them, from keeping a list of hams willing to build equipment for others—something they certainly didn't have to do—to releasing talking computer software to control their rigs, to a CW interface for the K2. And now, with the new KX1, Elecraft has done what other companies have not been willing to do: They have listened to the needs of potential users of their products and done their level best to make eyes-free use of their equipment a reality. And they did it without sacrificing ease-of-use for the fully sighted or able-bodied operator.

We've been told in the past that we just aren't worth bothering with—that we can't afford to buy new gear, so there's no need to take our needs into account. We've been told that it's too difficult to design accessibility into a rig without compromising on other usability features. Or they might make all the right sort of noises but then not do anything else. Well guys, sit up and take notice. It can be done, and Elecraft has done it.

I want to publicly acknowledge them and thank them for their efforts. Other companies would do well to follow their lead—technologically and in forward thinking toward equipment accessibility.—*Buddy Brannan, KB5ELV/3, Erie, Pennsylvania*

SINGLE WIDEBAND

♦ My attention was quickly captured by the emotion of the August 2003 Op-Ed piece on "single wideband," and such claims as "heavily processed audio easily overdrives every RF amplifier stage" (only a strong signal, processed or not, can overdrive a stage). Curious about all the fuss, I listened carefully on several bands for examples of single wideband, but wasn't able to locate any. Instead I observed hamming's dirty little secret, that nearly half of the rag-chewing SSB signals are distorted, making them more difficult to tune, and less comfortable to copy. I always attributed this to hams leaving their audio compression on, even when it wasn't needed.

To hear the potential for amateur SSB, an interesting experiment is tuning in broadcast stations in the 540-1600 kHz AM band, as though they were SSB signals. They will come through clear as bells, completely distortion-free, just like on an AM receiver only with fewer highs depending on your filter. Unless conditions are poor, why not strive for high quality in our signals.

Experimentation is the nature of the hobby, and using an "expensive recording microphone" or contouring one's audio are not grounds for getting scolded. While audio improvement doesn't necessarily require wide bandwidth, I'm not sure there's much harm in some exploration there as well. Using SSB even out to 5 kHz would match the fidelity of AM broadcast stations, while consuming less bandwidth and requiring considerably less power. The human voice has little energy above 3 kHz anyway, so not much power would get transmitted beyond 3 kHz. Besides, if bandwidth was all that mattered, we might all switch to digital modes. Having said this, I applaud the author's urging to all hams to pride themselves in being considerate, especially on the crowded bands.—*Gary Gordon, K6KV, Saratoga, California* QST

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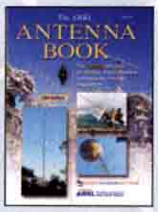

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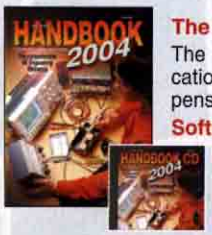

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By Sam Karty, KD4VRS

The Dangers of Cathode Keying

Keying an older transmitter? Be careful!

Mention cathode keying to older hams and you will probably hear a chuckle as they remember how surprised they were to get shocked the first time they touched the hot side of a key. But the problem is much too serious to laugh off as nothing more than a simple rite of passage—cathode keying combines dangerously high voltages with substantial currents.

Touching voltages as seemingly benign as 40 V dc or 32 V ac can be potentially (so to speak) fatal, and many solid-state circuits in television sets, computer monitors and power supplies operate above these voltages. Because most other solid-state circuitry uses lower voltages, we have been lulled into a false sense of security working with electronic circuitry. Many younger hams have grown up with transistor circuits, which they mistakenly assume are always safe, and far too many experienced hams have become complacent working on solid-state equipment.

Cathode Keying Explained

Most transmitters built before the 1960s were cathode keyed. The external key was placed in series with the cathode and its ground return in one or more key control lines (Figure 1). Cathode keying is simple and effective, but it has one very serious drawback: Because the plate voltage of the keyed stage appears on the key of a cathode keyed transmitter, anyone who happens to touch the hot side of that key and ground places himself in series with the keying circuit and the keyed stage.

Many hams learned to avoid these dangers by trial and error and most survived serious injury. A narrow escape from electrocution, however, should not be part of a learning experience. These dangers have existed since the early days of radio and they have not gone away, even with the transition to solid-state equipment in the 1970s. Dangerous voltages appear in both modern linear amplifiers and most tube equipment. Although we expect dangerously high voltages within the interior of tube-type equipment, it is also possible to get badly shocked by touching the external key line of many of these transmitters. Vintage novice rigs, including transmitters such as the popular Heathkit DX-40, commonly used cathode keying. The dangers continue to surface as older transmitters and classic boat-anchor rigs are rediscovered and restored by newer hams.

Potentially Fatal—How Many Volts?

When current flows across a person's chest, which would occur between the hands or from hand to foot, a reliable medical source states that the current required to produce ventricular fibrillation is (approximately) 80 mA and that the resistance of wet skin is about 500-1000 Ω.[1] Assuming a worst-case wet skin resistance of 500 Ω, a possibly fatal voltage, at that current level, could be E = IR = 0.08 A × 500 Ω = 40 V dc.

Calculating a potentially fatal voltage is somewhat more complicated for alternating current because ac voltages are normally stated in root mean square (rms) values. For example, the standard 120 V ac line voltage is an rms value, which corresponds to a peak value of 120 V_{rms}×1.414 ≈170 V peak. The 40 V dc value calculated in the previous example, when equated to an ac rms value, corresponds to 32 V ac rms, if the waveform is a sine wave.

The ac calculation is confusing because dc levels are usually interpreted as being the same as ac rms values. That holds true for heating and power calculations only, however. For determining electrocution potentials, the dc level and the same peak ac value are equally dangerous. This is true even though the rms

[1]Notes appear on page 30.

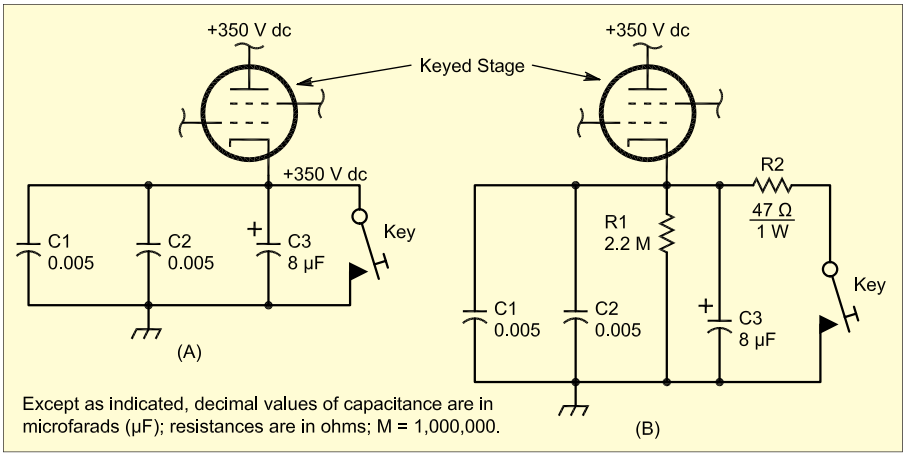

Figure 1—The keying circuit of a typical cathode-keyed tube transmitter is shown in A. Note the transmit key click suppression capacitor, C3. C1 and C2 handle local keying noise caused by key sparking. In B, C3 and R2 furnish wave shaping of the keying pulse and suppress transmitted key clicks. Resistor R1 is added to bleed charge from C3. High voltage is still present at the key.

value of an ac voltage is less than its peak value and it means that the 32 V ac rms potential is as dangerous as a 40 V dc potential (because they both have the same peak value of 40 V).

Alternative to Cathode Keying

To counteract the danger of cathode keying, most ham transmitters (both prebuilt and kits) began using grid-block keying in the 1960s. [Actually, grid-block or blocked-grid keying goes back to the late 1920s. Its primary purpose was to eliminate *key-thump* (hard clicks at turn-on) and *backwave* (RF output when the key is up). It also afforded an easy way to *differentially* key a transmitter (turn on the oscillator slightly before the amplifier... so-called *timed-sequence keying*). The lowered keying voltage and current were byproducts of this technique.—*Ed.*]

Grid-block keying is safer than cathode keying because grid-block keying uses much lower voltages and currents. Grid-block keying applies a negative voltage to the control grid of the keyed tube to bias it off; it is this negative voltage that the code key switches. The bias voltage is usually around –50 V dc, but it can go to –150 V dc. Although this can still produce a shock, grid-block keying is relatively safe because it uses a very low current that is well below the 80 mA danger level. Because it is more complex (since an additional power supply is required to generate the negative bias voltage), grid-block keying is rarely shown in construction articles, even those that appear in today's ham magazines.

Tubes and Nostalgia

Most solid-state QRP rigs are inherently safe because of their low voltages and currents. However, those old tube-type boatanchor rigs typically use plate supplies that are ten times higher than the 40 V dc fatal value. Some hams still build tube-type rigs from scratch, similar to the one shown in an ARRL publication from the 1950s.[2] That transmitter uses cathode keying with the key connected between the tube's cathode and ground, as do most homemade transmitters of the period. It takes just the slip of a hand to come in contact with the metal part of the key that is connected to the cathode.

Although the circuit described[3] (whose keying circuit is shown in Figure 1A) shows no obvious connection between the cathode and plate, the tube's ungrounded cathode floats up to the same potential as its plate, which is at the B+ voltage level. At the same time, the available current is almost always far above 80 mA. All that is required to complete the circuit is a ground. Simply touching the transmitter's case grounds the operator, with possibly dire consequences if the hot side of the key is touched at the same time.

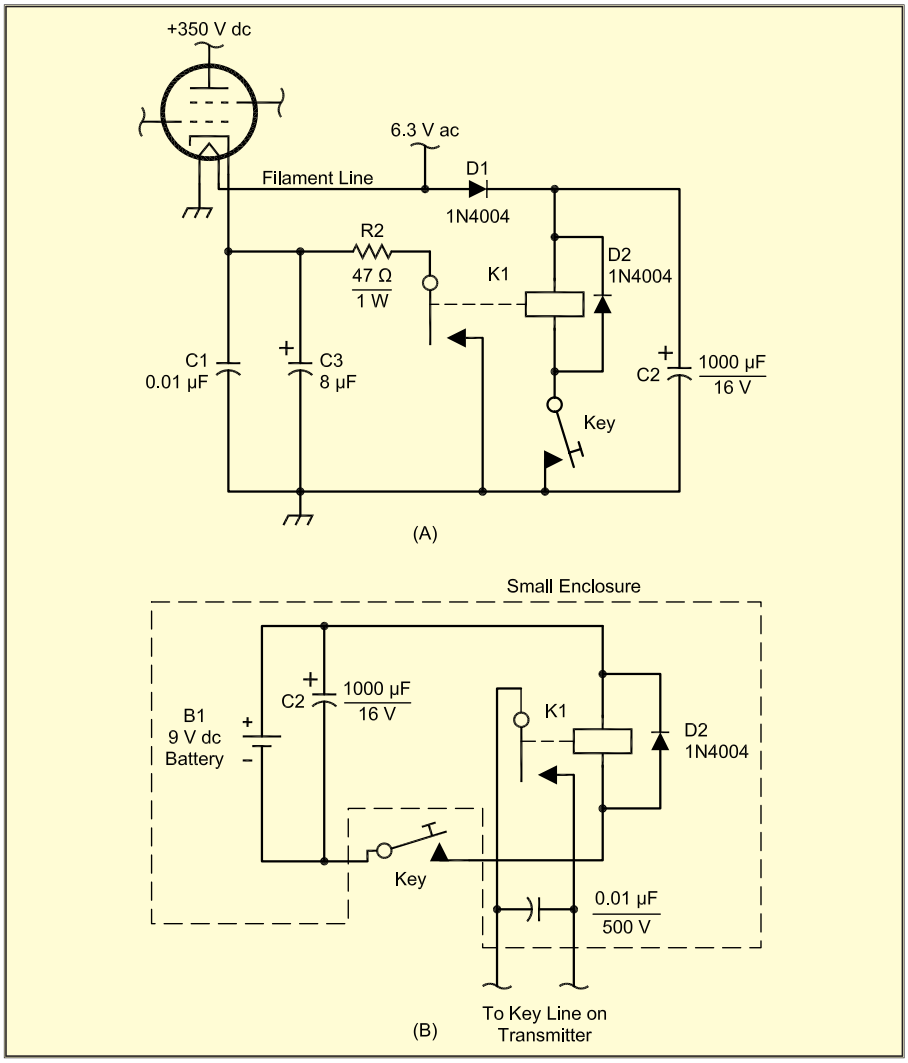

Figure 2—An inexpensive low-voltage keying relay can be used to key a cathode-keyed stage as shown in A. The dc coil voltage is obtained from a rectifier/filter fed by the existing ac filament line. D1 and C2 provide the relay voltage and D2 suppresses the coil back voltage. The reed relay will follow substantial keying speeds and its contacts will handle up to 0.5 A. The key voltage is now a harmless 9 V dc; current limited by the coil resistance to about 10 mA. If desired, the circuit can be built external to the transmitter, as described in the sidebar and shown in B.

The circuit reproduced in Figure 1A shows one additional design/safety error. The 8 µF electrolytic key-click capacitor across the key is dangerous because it remains charged long after the power supply is turned off. As a result, it is possible to receive a shock from the electrolytic discharge by touching the key, even hours after everything has been turned off and disconnected. Because there already are two 0.005 µF capacitors across the key, which are sufficient for key-click suppression, that electrolytic can be removed to improve safety and eliminate arcing across the key contacts. [The twin 0.005 µF (C1, C2) capacitors don't take care of key clicks in the *transmitted* signal. They mainly affect local clicks heard in the receiver due to sparking at the key contacts. The 8 µF capacitor (C3), together with a resistor (R2, 47 Ω), effectively suppress transmitted key clicks by wave-shaping the keying pulse. For safety's sake, R1, a 2.2 MΩ, ½ W resistor placed across the 8 µF capacitor, will take care of any lingering charge. The modified circuit is shown in Figure 1B. Cathode voltage is still at the key and the operator is not protected while keying, however.—*Ed.*]

A similar potential danger exists in electrolytic filter capacitors in power supplies because those electrolytics can remain charged for hours after the equipment has been turned off (if the bleeders have failed). Most power supply designs incorporate bleeder resistors

Use a Keying Relay

By Stu Cohen, N1SC, Technical Editor, QST

For high voltage or cathode-keyed stages, a good solution to the high-voltage keying situation, and one that avoids the complexity of grid-block keying, is the use of an inexpensive low-voltage reed relay as a keying relay. This can be driven from the rectified ac filament voltage line, putting only a harmless 6-10 V dc, current limited (in this case to 10 mA) by the coil resistance, across the key terminals. RadioShack (RS)[6] 275-233 will work; a 12 V dc, 10 mA coil reed relay with 0.5 A contacts. Another candidate for K1 is Ocean State Electronics (OS)[7] RY1031. The reed relay will easily follow substantial keying speeds. The circuit is shown in Figure 2A. If you are concerned about modification to an existing piece of classic equipment, a "keying adapter," consisting of a 9 V battery in series with the reed relay coil and the key, can be built into a small box, external to the transmitter. A 1000 µF, 16 V capacitor (OS CER1000-25, RS 272-958) across the battery ensures reliable keying at lower battery voltages. A 1N4004 (OS 1N4004, RS 276-1103) back-voltage diode should also be placed across the coil and a 0.01 µF, 500 V disc capacitor (OS CD01-1K, RS 272-131) across the relay key line contacts. The battery lifetime should be quite long, as the relay draws negligible current. A short piece of "zip cord," hard wired and terminated in a suitable jack can then go directly to the transmitter key jack. The entire assembly, including a box, can be built for less than $10 and the circuit appears in Figure 2B. The reed relay contacts will easily handle the plate current of most classic transmitters. It's a good thing to have around the shack if you do much work with classic tube equipment.

(high resistance power resistors) connected across the B+ output to discharge the filters after the power supply has been turned off. However, because they dissipate so much power, bleeder resistors sometimes fail open, leaving the electrolytics still changed. Although many magazine articles contain prominent safety warnings about the dangers of working around these high voltages,[4] few discuss the specific dangers of a cathode keying circuit.

More Nostalgia

Unfortunately, because of the nostalgia for tubes, the danger of having high voltage across a key is not going away any time soon. In fact, this danger appears to be increasing: A recent magazine article includes plans for building a quarter-watt tube transmitter that requires a B+ supply of 150 V dc.[5] Instead of using cathode keying (so that only one side of the key is hot to ground), the design places the key directly in the B+ line so that both sides of the key are hot! The article states that some amateurs might be uncomfortable with 150 V dc across their key and that there are "other ways" to key this transmitter, but it leaves it up to the reader to find those other ways, any of which would be safer than having high voltage on both sides of the key.

Conclusions

That most tube circuits are dangerous because of the high voltages they require does not imply that all transistor circuits are safe, since many transistor circuits do operate above 40 V dc. Many experienced hams might consider these precautions to be just plain old common sense, until they think about how often they could have been electrocuted while learning them. It is far better to discover these dangers by reading about them, rather than by experiencing them firsthand.

As a suggestion, future articles that describe how to build tube-type transmitters should contain circuitry for the use of safe keying. At the very least, these articles should include prominent warnings about the dangers of cathode keying.

Notes

[1]S. L. Shafer, MD, "Electrical Safety in the O.R." **www.stanford.edu/~sshafer/LECTURES.DIR/Notes/Electrical%20Safety.Doc**.

[2]"A Simple 30-Watt Oscillator-Amplifier Transmitter," *How to Become a Radio Amateur* (Newington: ARRL, 1955) pp 32-39.

[3]See note 2, p 33.

[4]See note 2, p 57.

[5]R. Fisher, KI6SN, "QRP," *Worldradio*, Aug 2002, pp 40-42.

[6]**www.radioshack.com**.

[7]Ocean State Electronics, PO Box 1458, 6 Industrial Dr, Westerly, RI 02891; tel 800-866-6626; **www.oselectronics.com**.

Sam Karty, KD4VRS, is an 18 year old freshman engineering major at Virginia Tech. Sam's been licensed over 10 years. He comes from a family of hams—a brother, KD4BYW; father, N5SK; grandfather, NØRDL; uncle, KØEKP and cousin, KB7LNX. He can be contacted at 8709 Southern Pines Ct, Vienna, VA 22182 or at **karty@netkonnect.net**.

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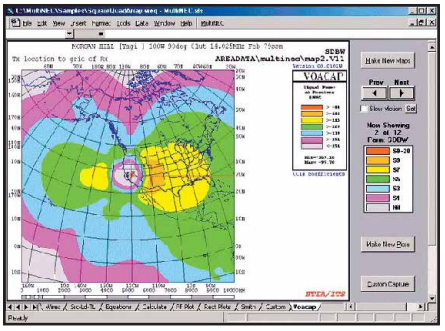

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By Ron D'Eau Claire, AC7AC

The Simple Superhet

Is it possible to design an easy-to-build receiver that will demonstrate the basic concepts of the superheterodyne circuit and still give adequate performance?

In response to requests from kit-building friends, the Simple Superhet is designed to give the builder some experience with receiver design, as well as exposure to vacuum tubes. It uses two tubes and requires only 12 V dc at about 500 mA. Many of the parts required may be found in modern junk boxes and all, including the vacuum tubes, are readily available at modest prices. Construction is discussed first; the alignment and the use of the receiver are then covered in detail.

The receiver, shown in Figure 1, covers the 20 and 40 meter bands without the need for bandswitching or coil changes. Information is provided for other frequency combinations. The Simple Superhet demodulates AM, SSB and CW signals. In AM mode, the detector is capable of synchronous detection of AM signals.

While the Simple Superhet does not approach the selectivity or stability of modern synthesized receivers, it is adequate for normal use on CW, SSB and even for monitoring PSK31 digital signals.

The vacuum tubes are a type designed to operate entirely on 12 V dc (both plate and filament), popular in the 1950s before transistors suitable for RF applications were available. The tubes are still readily available. Drawing only a few milliamperes of plate current, these tubes are not capable of producing much more than a few milliwatts. The Simple Superhet uses an IC amplifier to drive low impedance headphones or a small loudspeaker.

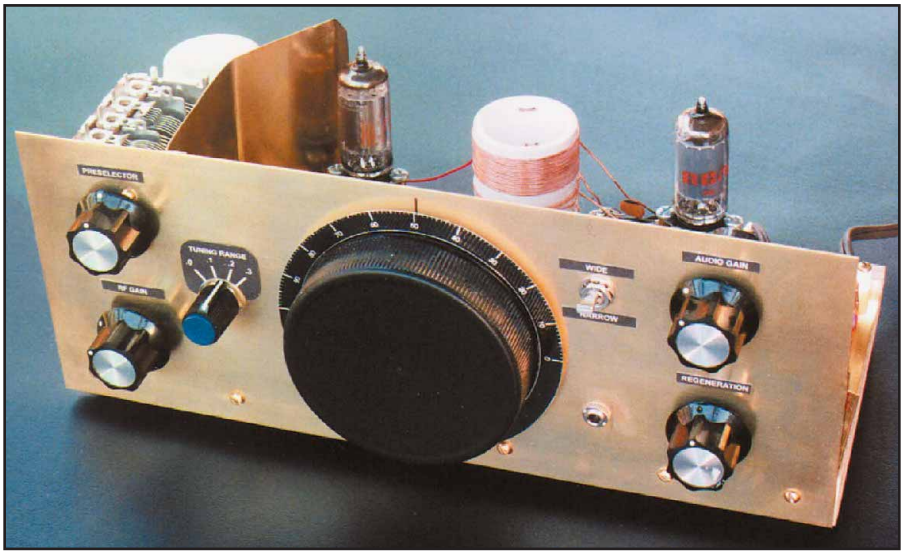


Figure 1—The completed Simple Superhet. PRESELECTOR and RF GAIN controls are on the left and AUDIO GAIN and REGENERATION controls are on the right. The TUNING RANGE selector is to the left of the dial and the PHONE/CW (labeled WIDE/NARROW) switch is to the right. The main tuning dial is homemade, but a commercial unit is included in the parts list.

The Circuit—How it Works

The circuit is shown in Figure 2. [Chapter 8 of *The ARRL Handbook*[1] has an excellent discussion of the principles of vacuum tube technology.—*Ed.*] With only three stages, this receiver is about as simple as a superhet can be. The commonality that all superheterodynes have is that received signals are converted to an intermediate frequency (IF) where the bulk of amplification and selectivity occur. In the Simple Superhet, the first stage 12AD6 tube is a frequency converter that serves as both the local oscillator (LO) and mixer.

L3 and the associated capacitors form a tuned circuit that controls the frequency of oscillation set up in the tube. Signals from the antenna are applied to the grid at pin 7 where they modulate the stream of oscillating electrons moving to the plate. The resulting heterodynes, or sums and differences of the local oscillator (LO) and the incoming signals are produced in the plate circuit at pin 5.

The IF chosen is 3.5 MHz and the LO is tuned from 10.5 MHz to 10.9 MHz. With the LO tuned to 10.5 MHz, a 7 MHz signal at pin 7 will produce a difference heterodyne of exactly 3.5 MHz (10.5 MHz–7 MHz=3.5 MHz). Similarly, a signal at 14.0 MHz will also produce a difference frequency of 3.5 MHz (14.0 MHz–10.5 MHz=3.5 MHz). This combination of IF and LO frequencies allows the receiver covers both 40 and 20 meters with a single tuning coil.

L1, L2 and C1 form a preselector that passes 40 or 20 meter signals. It also attenuates any LO energy traveling back toward the antenna. Changing bands is simply a matter of tuning C1 to the desired band.

The second stage 12DZ6 tube is used in a regenerative detector, probably one of the most versatile detector circuits. In this design the circuit's problems of instability, tuning difficulties and radiating a signal at the receiver frequency are avoided because the detector is isolated from the antenna and operates at only the 3.5 MHz IF. In the Simple Superhet, the

[1] *The 2004 ARRL Handbook for Radio Communication*, 81st edition, Ch 8.

regenerative detector is a stable and effective circuit.

The regenerative detector performs four functions in one tube:

1. Amplifies the IF signal.
2. Increases the selectivity of L4-C11/C12 to better reject signals on adjacent frequencies.
3. Demodulates the IF signal to produce an audio output.
4. Provides a beat-frequency oscillator (BFO) signal required to receive CW and SSB and for the synchronous detection of AM signals.

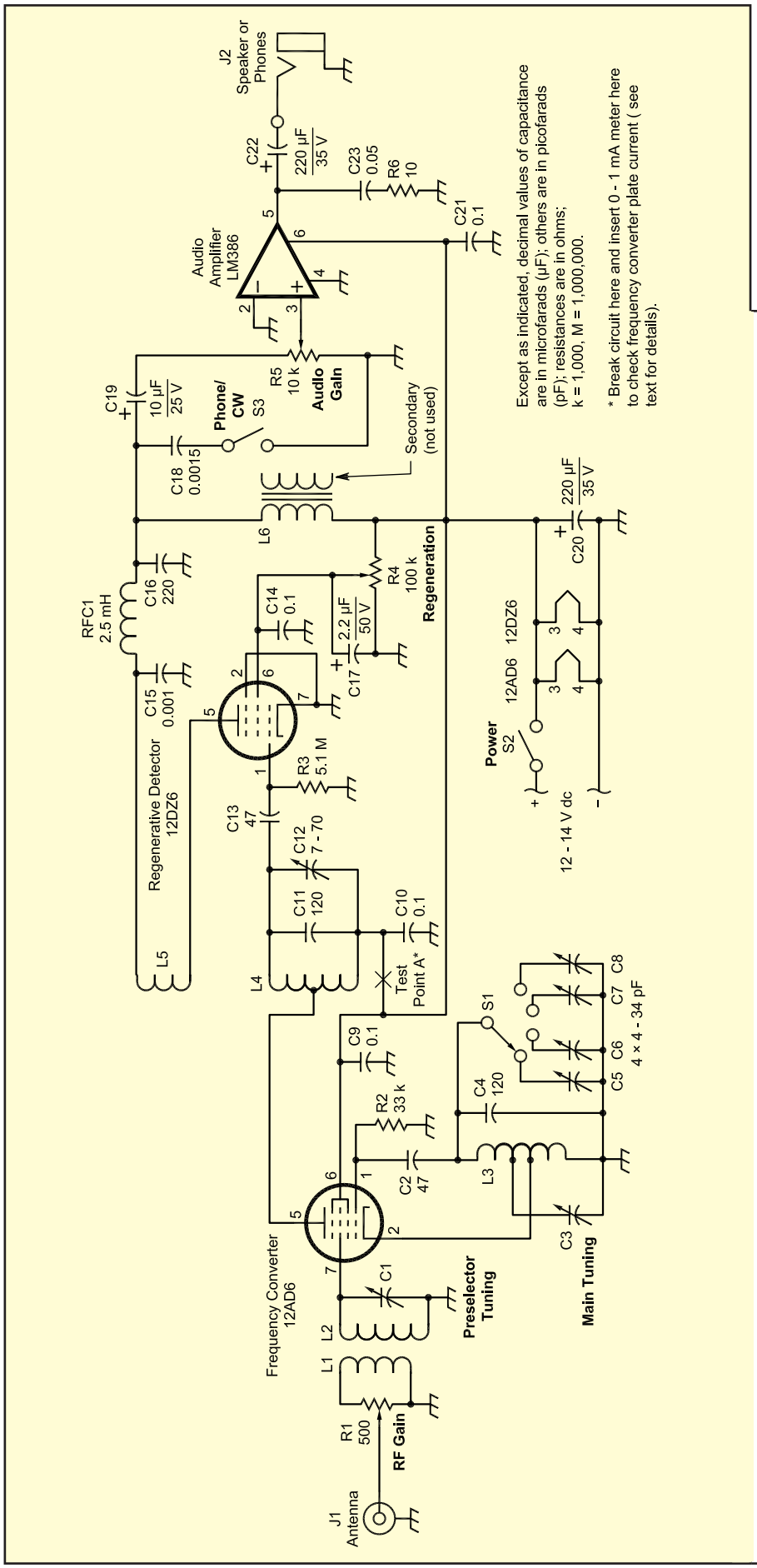
L4, C11 and C12 are tuned to pass the 3.5 MHz IF signal to the grid of the 12DZ6 at pin 1 where it is amplified and appears at the plate at pin 5. L5 couples some of the IF signal back into L4 where it is returned to the grid and amplified again. This regeneration process, in which the signal is passed through the tube again and again, is what gives the detector its name and provides a large amount of amplification in a single stage. It also increases the selectivity of L4-C11/C12 to better reject unwanted signals.

Grid resistor R3 allows a negative voltage to build up on the grid at pin 1 of the detector. This causes the IF signal to be rectified which produces an audio signal across C13. The audio signal is amplified along with the IF signal. L5 is too small to couple any of the audio signal back into the grid circuit. C15 shunts most of the IF signal to ground without affecting the audio signal. Radio frequency choke RFC 1 blocks any remaining IF signal at 3.5 MHz. The audio signal passes on to the audio amplifier through C19, blocked from the power supply by L6.

The amount of regeneration is made smoothly adjustable by changing the voltage on the screen grid at pin 6. Regeneration control R4 acts as a voltage divider to set the grid voltage precisely for the amount of regeneration needed.

The audio amplifier uses a single LM386 integrated circuit. C16 and C18 control the audio frequency response. C16 reduces the high frequencies outside of the range used for SSB or AM modulation. C18 further limits the audio response for CW reception and resonates with L6 to produce a broad peak in the audio response at about 700 Hz, rejecting nearby interference and reducing the background noise. Both C16 and C18 can be left out or adjusted to suit the user's preferences.

C23 and R6 are essential to ensure that the amplifier remains stable with a variety of loads connected to J2. Loudspeakers or headphones with impedances from 4 to 40 Ω may be used. C21 is a bypass capacitor included to ensure that RF from the other stages does not find its way into



the amplifier.

The main tuning control deserves careful attention. Nothing destroys the enjoyment of using a receiver more quickly than clumsy and difficult tuning. The electrical and mechanical soundness of the tuning system is critical to the overall stability of the receiver.

It was found that covering a range of 100 kHz without a vernier drive was acceptable provided a physically large knob was used. Four switch-selected trimmer capacitors are set for consecutive 100 kHz ranges so the receiver tunes 14.0-14.4 MHz and 7.0-7.4 MHz.

If a vernier drive is used, S1, C6, C7 and C8 may be discarded. C5 should be permanently connected across C4 and used to set the low frequency end of the tuning range.

C3 should be a solidly built double-bearing air variable capacitor that turns smoothly and easily. Resistance in the bearings of the capacitor will cause tuning "creep" no matter what sort of knob or vernier drive may be used. Suitable capacitors are those built for standard broadcast band receivers or FM receivers. The exact value of C3 is not important. The connection to L3 can also be adjusted to accommodate a wide range of capacitor values as described in more detail below.

Figure 2—The Simple Superhet schematic and parts list, including parts reference notes. Parts suppliers include the following: Ocean State Electronics (OS), PO Box 1458, 6 Industrial Dr, Westerly, RI 02891, tel 800-866-6626, www.oselectronics.com; Antique Electronic Supply (AES), 6221 S Maple Ave, Tempe, AZ 85283, tel 480-820-5411, www.tubesandmore.com; RadioShack (RS), www.radioshack.com; K & S Engineering (KS) metal products are available through hardware and building supply stores.

C1—Capacitor, variable, 10-200 pF, OS BC5G. Second section from capacitor front specified (see parts note 1).
C2, C13—Capacitor, disc ceramic, 47 pF NPO, OS CD-47N.
C3—Capacitor, variable, 5-86 pF, AES C-V365 (use only the smaller section and see parts note 2).
C4, C11—Capacitor, disc ceramic, 120 pF NPO, OS CD-120N.
C5–C8—Capacitor, ceramic trimmer, 4-34 pF, OS TC440 (see parts note 3).
C9, C10, C14, C21—Capacitor, ceramic, 0.1 µF, OS CD-104.
C12—Capacitor, ceramic trimmer, 7-70 pF, OS TC-777.
C15—Capacitor, disc ceramic, 0.001 µF, OS CD-001.
C16—Capacitor, disc ceramic, 220 pF, OS CD-220 (see parts note 4).
C17—Capacitor, electrolytic, 2.2 µF, 50 V, OS CER 2.2-50.
C18—Capacitor, Mylar, 0.0015 µF, OS CPS00015 (see parts note 5).
C19—Capacitor, electrolytic, 10 µF, 15 V, OS CER 10-50.
C20, C22—Capacitor, electrolytic, 220 µF, 35 V, OS CEA 220-25.
C23—Capacitor, disc ceramic, 0.05 µF, OS CD 05-5.
J1—Antenna connector (SO-239), OS 25-7350.
J2—Headphone / speaker jack, 1/4 inch, OS 30-411 or 1/8 inch, OS 30-702J.
L1–L5—See Coil Table 1 and Figure 4.
L6—Transformer, audio interstage, 100 kΩ primary, 1000 Ω secondary (not used), OS 45-700.
R1—Potentiometer, 500 Ω, linear taper, OS P500.
R2—Resistor, carbon film, 33 kΩ, 1/4 W, OS RQ33K.
R3—Resistor, carbon film, 5.1 MΩ, 1/4 W, OS RQ5.1M.
R4—Potentiometer, 100 kΩ, audio taper, OS PA100K.
R5, S3—Potentiometer/SPST switch, 10 kΩ, audio taper, OS PAS10K.
R6—Resistor, carbon film, 10 Ω, 1/4 W, OS RQ10.
RFC 1—Choke, RF, 2.5 mH, AES P-C1535B.
S1—Switch, rotary, 1 pole, 12 pos (4 pos only used), RS 275-1385 (see parts note 3).
S2—Switch, SPST (part of R5).
S3—Switch, toggle, SPST, OS 10006.
U1—Integrated circuit, audio amplifier, LM386, RS 276-1731.
V1—Tube, 12AD6, AES 12AD6.
V2—Tube, 12DZ6, AES 12DZ6.
X1, X2—Socket, tube, 7 pin miniature, OS STM7M.
X3—Socket, IC, RS 276-1995.

Misc
Magnet wire, 24 gauge, OS MW24.
Terminal strip, 3 post (GND), OS 15-83A.
Terminal strip, 5 post, OS 15-86.
Knobs (for R1, C1, S1, R4, R5).
Tuning dial for C3, AES P-K984 (see parts note 6).
Power connector/cable.
Brass sheet, 0.005×4×10 inch, to cover board, KS 250.
Brass sheet, 0.015×4×10 inch, shield, KS 252.
Brass sheet, 0.032×4×10 inch, front panel, KS 253.
Brass tubing, socket standoffs, KS.
Brass "L" brackets (4) to fasten panel to base.
PVC, Sch 40, 3/4 inch coupling with end plugs, 2 each (for L1/L2 and L4/L5 forms).
PVC, Sch 40, 3/4×1/2 inch, outside threaded nipple and end plug (for L3 form).
#8×1 1/2 inch wood/sheet metal screws (4) (for tube socket mounts).
#6×1/2 inch brass wood screws (18).
#6 brass washers (12).
Rubber feet (4).
Chassis—wooden board, 10×4.25×0.75 inch.

Building the Simple Superhet—Mechanical Construction

The mechanical design is probably as old as radio itself and avoids the need for a lot of specialized metalworking tools. Figure 3 shows both the component layout and the completed receiver. The base is a simple 10 inch long piece of pine or fir of 1×6 size. The base is covered with thin 0.005 inch brass sheet that is held in place by brass wood screws that also hold the tube sockets, terminal strips and other hardware. The front panel is 0.032 inch brass sheet attached to one long side of the base with six wood screws and four angle brackets. Brass was chosen for aesthetic reasons; it takes solder well and sheets and tubing are available at hardware, home improvement and hobby stores. Printed circuit board material could be substituted for the sheet brass.

The receiver will only be as stable as its mechanical and electrical construction. Unlike modern receivers that contain temperature-stabilized oscillators, the Simple Superhet depends entirely on its mechanical and electrical stability to stay tuned to the desired signal. As many Old Timers say, it should be "built like a battleship."

The tube sockets are supported one inch above the board on sections of brass tubing secured to the wood base with screws. Flat washers at the bottom of each section prevent the tubing from being pressed into the wood as the screws are tightened.

The coils are wound on Schedule 40 PVC plastic pipe fittings with press-mounted PVC end plugs mounted on the base. The coils are secured by drilling two small holes through the fitting where each winding starts and ends, then passing the wire through both holes. See Figure 4 for details.

A brass sheet shield separates the frequency converter from the preselector to help keep LO signals from entering the converter through the preselector circuit. A small hole in the shield allows the wire from pin 7 of the tube socket to pass through to L2/C1.

Building the Simple Superhet—Electrical Construction

Begin construction with the audio amplifier and work toward the antenna.

Each stage will be tested to be sure it is working properly before going on.

Stranded 18 gauge hookup wire should be used for all of the filament connections and the power connections to S2 to handle the current. All of the other connections can be made with lighter gauge wire. Avoid unnecessarily long lead lengths in any of the RF or IF circuits.

The audio amplifier is built "ugly bug" style and mounted directly above the headphone/speaker jack behind the front panel on a socket. The audio amplifier can also be located on the base near J2. The thin sheet is easily soldered with a small iron. The IC socket is suspended by the ground leads to pins 2 and 4 and by short leads connecting C21 to pin 6.

Wire AUDIO GAIN control R5 with the wiper at the grounded end when the control is fully counterclockwise so that gain increases as the control is rotated clockwise.

When the audio amplifier has been wired and all the connections double-checked, apply +12 V dc to the receiver and insert headphones or a speaker into J2. Touching the center pin on R5 should produce an audible hum in the audio output indicating that the audio amplifier is working.

Build the regenerative detector next. The winding information for L4 and L5 is shown in the coil winding information, Table 1. Be careful to wind both windings the same direction around the form. If they are reversed, the detector will not work. Also, pay careful attention to the connections between L5 and pin 5 of the tube and RFC1. If the end of L4 that connects to C13 is nearest the top of the form, then the end of L5 that connects to RFC1 must also be nearest the top of the form. Otherwise, the detector will not oscillate. C14 also provides a ground return path for the IF signal flowing through L5. The detector may fail to oscillate or oscillate erratically if it is left out of the circuit.

Keep the lengths of the leads from pin 1 of the 12DZ6 to R3 and C13 as short as possible. This tube will amplify any audio signal at pin 1, including any ac hum picked up by the leads, an effect known among Old Timers as "Grid Hum." Connect R3 with short leads directly between pin 1 of the tube socket and the brass foil below it. Use short leads to connect C13 to pin 1 and C10 to the lower end of L4.

L4 supplies +12 V dc to the plate of the frequency converter stage. C14 provides an RF ground for pin 6 of the 12DZ6 and should be connected directly between pin 6 and ground with short leads. C15 prevents scratchy sounds in the audio caused by the wiper moving across R4 as the regeneration is changed. The physical location of C15 is not critical, nor are the leads from RFC1 to L6 and the other dc and audio leads.

When the regenerative detector is completed, double-check the wiring against the schematic. Position the tap that will connect L4 to the frequency converter so that it does not short to anything. If the frequency converter socket has been installed, solder the tap lead to pin 5 on the 12AD6 socket.

Turn the regeneration control fully counterclockwise, apply power and listen to the audio output. Advance AUDIO GAIN control R5 until you can hear slight background noise in the phones or speaker. Now bring your finger near pin 1 of the 12DZ6. [These are 12 V dc tubes—don't try this on normal-voltage tube equipment.—*Ed.*] You should hear an ac hum increase rapidly as your finger approaches the pin and grow quite loud if you touch the pin. This indicates that the 12DZ6 is amplifying. Now advance the REGENERATION control slowly clockwise.

At some point there should be a very rapid increase in background noise. If no point is found where the background noise quickly increases the detector is probably not oscillating. If it has passed the hum test with your finger at pin 1, the most likely cause is that the connections to L5 are wired backward. Try reversing them.

Once the detector is oscillating, tune it to 3.5 MHz using C12. If you have a calibrated receiver available, set it to 3.5 MHz with a short piece of wire near the Simple Superhet to act as an antenna. Advance the REGENERATION control past the point where the background noise increases so that the detector is oscillating, then slowly adjust C12 while listening for the signal in the calibrated receiver.

You can also use a transmitter and a dummy load to transmit a weak test signal on 3.5 MHz, then tune C12 while listening for the signal on the Simple Superhet. The test signal should be at a very low level in order to avoid overloading the detector.

It is not important to set the calibration closely at this time; just ensure that the detector is capable of being tuned to the proper IF frequency. If, for some reason, you cannot adjust the detector to 3.5 MHz, adjust the number of turns on L4 or change the value of C11 to shift the tuning range. Add turns or capacitance to lower the frequency range.

Finally, check the operation of the REGENERATION control to ensure it goes in and out of oscillation very smoothly. There should be no "pop" or hysteresis. Hysteresis is usually accompanied by a sudden "pop" or "thump" in the audio when the regeneration begins. If either of these effects is noted, remove a turn from L5 and repeat the test. There should be no more than 1/4 inch of space between L4 and L5. Spacing them too far apart makes the regeneration difficult to control. Use the least number of turns on L5 that will still allow the detector to oscillate and keep L5 physically very close to L4.

Regeneration should be smoothly controllable from virtually no oscillation to a very strong oscillating condition. The voltage on pin 6 of the detector (or at the wiper arm of R4) is about +2.5 V dc when oscillation begins.

Finally, it is time to build the frequency converter. R2 and C9 should go directly from the pins on the tube socket to the grounded sheet below it. The tap point on L3 for C3 is selected to provide the tuning range desired. It will vary with the value used for C3 and whether a 100 kHz tuning range is desired or something wider. A good starting position for the tap for C3 is to use the same tap point for the cathode (pin 2) of the 12AD6.

When wiring the preselector circuit, connect the RF GAIN control so the wiper is at the grounded end when the knob is turned fully counterclockwise just as you did with the REGENERATION and AF GAIN controls.

This completes the wiring part of the

Table 1
Coil Winding Data

Coil	*Winding Information*
L1	7 turns, close-wound, 24 gauge enameled wire, 1/8 inch below L2.
L2	10 turns, close-wound, 24 gauge enameled wire on 1 1/4 inch form.
L3	8 turns, space-wound in threads of 3/4 inch PVC nipple. Tapped 1 3/4 turns from bottom for connection to the cathode (pin 2) of 12AD6 frequency converter. Tapped as needed for desired bandspread with C3 (see text for setting both taps). 24 gauge bare copper used to make adding and adjusting taps easier.
L4	20 turns, 24 gauge enameled wire, close-wound on 1 1/4 inch form with tap for plate connection (pin 5) of 12AD6 frequency converter 8 turns from bottom.
L5	3 turns close-wound, 24 gauge enameled wire 1/4 inch below L4 (see text for adjustment of this winding for proper operation).

job. Figure 3 shows the completed receiver.

Alignment

Once the Simple Superhet wiring is completed and checked, apply power and wait for the tubes to "warm up." Since the audio amp is solid state, you will hear a pop in the phones or speaker when the power switch is turned on, but the tubes will require 15 to 30 seconds to warm up sufficiently to operate.

Using a receiver that will tune to 10.5 MHz, set the LO to 10.5 MHz with the main tuning capacitor at maximum capacitance (fully meshed). You may have to adjust C5 very carefully to hear the LO signal sweep past on the external receiver. If you have the receiver connected to an antenna, you may hear signals as you tune C5 or C3. If so, you can be sure the local oscillator is working.

Now is the time to check and adjust the tuning range of C3. Move the tap further up on L3 to increase the tuning range. If the tuning scheme shown on the schematic diagram is used, set the tuning ranges as follows:

- Set C3 to maximum capacitance (closed) and select C5 with S1.
- Adjust C5 for a local oscillator frequency of 10.5 MHz.
- Select C6 into the circuit, and adjust it for a local oscillator frequency of 10.6 MHz.
- Similarly, set C7 and C8 for 10.7 MHz and 10.8 MHz.
- Set the detector back to 3.5 MHz as you did before assembling the frequency converter stage.

If no external general coverage receiver is available, C5 through C8 can be set while listening to a test signal at 7.0, 7.1, 7.2 and 7.3 MHz or at 14.0, 14.1, 14.2 and 14.3 MHz.

While setting the tuning ranges, a very strong signal will be heard near 7.0 and 14.0 MHz. These are "birdies" caused by the second and fourth harmonics of the regenerative detector oscillating at 3.5 MHz. If you do a lot of listening right at the bottom edge of the bands, the birdies can be shifted out of the band as described later.

Attach an antenna and set the RF GAIN control to maximum (clockwise). Tune the PRESELECTOR with C1 across its range. You should find two pronounced peaks in the background noise appearing near the maximum and minimum capacitances of C1. These are the 40 and 20 meter bands, respectively. If only one peak can be found, adjust the range by adding or removing turns from L2 until both peaks are well within the range of C1. It is important to be able to tune through both peaks to get the full benefit of the preselector.

Using a meter capable of measuring 0.5 mA dc, check to see if the feedback setting on L3 is at the optimum point. Insert the meter at point A on the schematic. Remove power from the receiver before opening the plate circuit. (It is good practice not to remove the place voltage from a tube while voltage remains on one or more of the grids.) With power applied again, the meter should read approximately 0.45 mA. The best gain is obtained from the frequency converter stage at a current level of between 0.2 and 0.5 mA. The feedback setting is not extremely critical, but if it is too far off it will reduce the overall gain of the frequency converter stage.

The current is adjusted by moving the

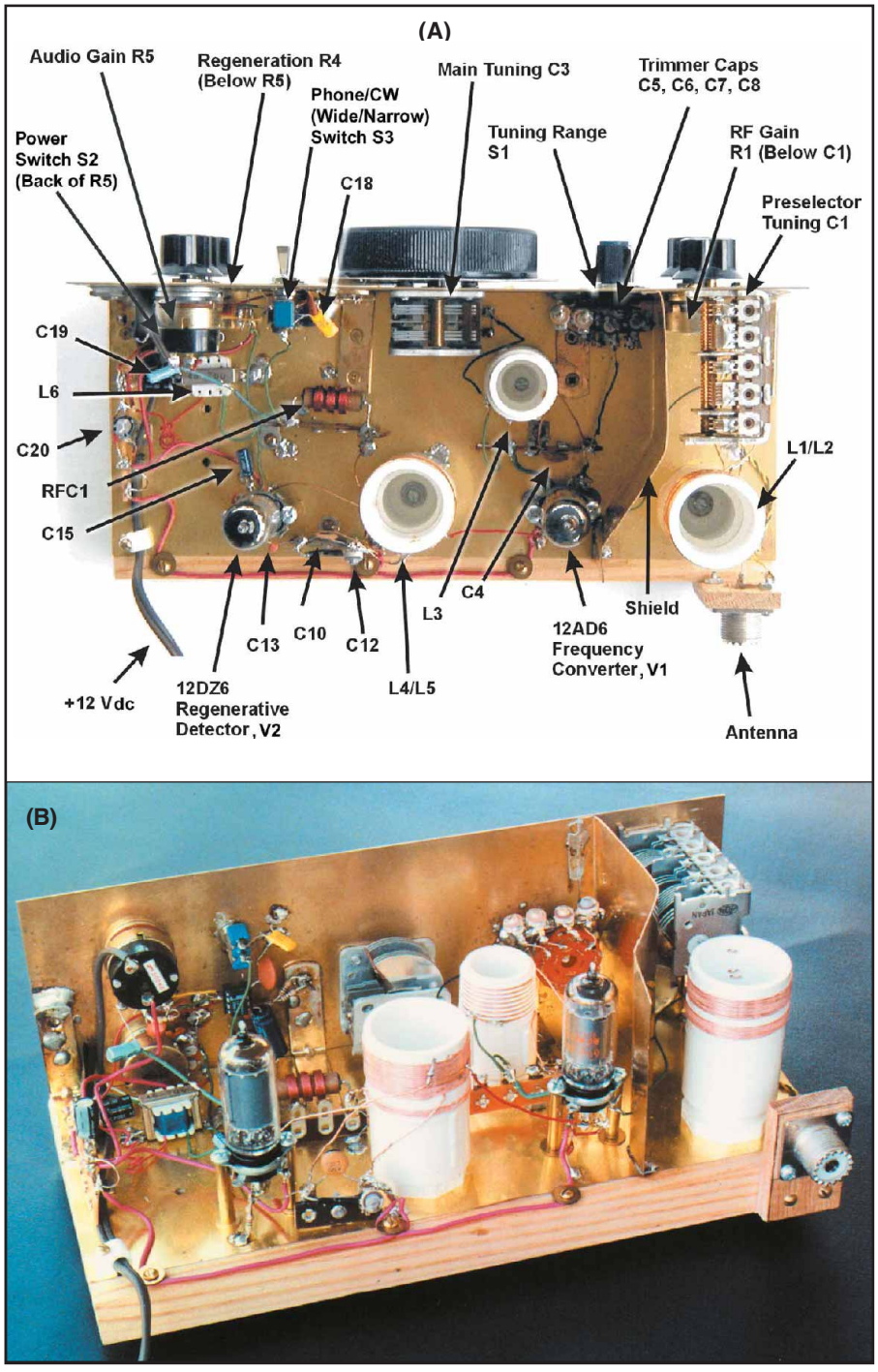


Figure 3—The general arrangement of the parts on the base is shown in A. The coils are, from right to left, the preselector (L1-L2), local oscillator (L3) and regenerative detector (L4-L5). The shield separating the preselector from the 12AD6 frequency converter is to the left of L1/L2 and C1. The 12DZ6 regenerative detector is toward the left end. A rear view of the completed receiver is shown in B.

tap point on L3 that is connected to the cathode of the 12AD6 at pin 2. Moving the tap toward the end connected to the grid at pin 1 will *decrease* the current.

Operating the Simple Superhet

Set the REGENERATION control just above the point at which the detector begins to oscillate. Set the PRESELECTOR for maximum background noise (or signal level) on the desired band, and then tune in a signal with the MAIN TUNING control. The detector will now heterodyne its oscillation with CW and SSB signals to demodulate them.

The receiver is at maximum sensitivity just at the point where the detector begins to oscillate but that is not always the best point to operate it. For example, when tuning in a strong CW signal with the detector set for maximum sensitivity, the beat note may suddenly disappear altogether or become a rough "growl." As you keep tuning, a smooth beat note will suddenly appear again, after you have passed through the "zero beat" zone. Instead of heterodyning against the signal, the detector starts oscillating in phase with the strong signal and no beat note is produced. Correct the problem by turning down the RF GAIN, by increasing the REGENERATION, or both. The effect and cure are much the same when tuning in a strong SSB signal. It is always best to keep the strength of the signals coming in at the antenna no greater than is needed.

AM signals are normally tuned in with the REGENERATION control set just below the point at which the detector oscillates. However, when the AM signal is fading rapidly and sounds distorted, increasing the REGENERATION control so the detector starts to oscillate will often make the signal stand out clearly with much less distortion. In this mode, the detector is oscillating in phase with the carrier in the signal, providing a strong local carrier that properly demodulates the signal even as the signal fades. This is synchronous detection. The detector is oscillating in sync with the signal providing a strong, stable carrier. The tuning is quite critical in this mode, and you may have to frequently touch up the tuning to keep the detector in exact sync with the incoming signal.

Room for Improvement

The difference between a superheterodyne receiver like the Simple Superhet and a $1000 model is the degree of the limitations. If you understand the limitations of the Simple Superhet you will understand the important limitations in any superheterodyne.

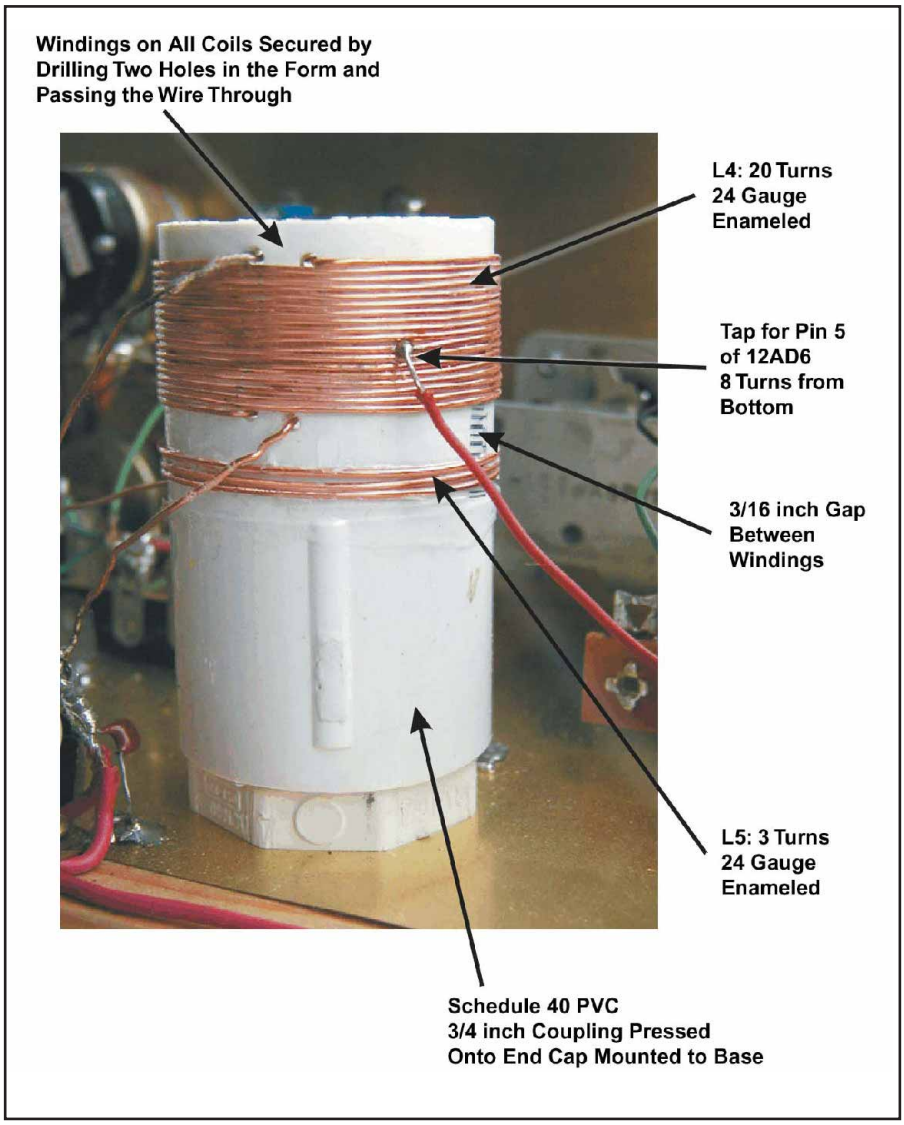


Figure 4—Coil construction of L4/L5. Coils L1/L2 are similarly wound. Refer to Table 1 for the winding details. Make sure the coupled coils are wound with same winding "sense," that is, in the same direction. The coil ends are secured by passing the wires through small holes drilled in the coil form. The coupled coils L1/L2 and L4/L5 are placed close to each other on the form. The forms attach to PVC interior pipe caps mounted to the receiver base. Press fit them onto the caps, without glue.

Images

If you are listening to a 20 meter signal on the Simple Superhet and a very strong signal is present at the right frequency on 40 meters, you may hear that signal as interference on 20 meters. This unwanted signal is an "image" response and it is a natural result of the heterodyning process. As explained earlier, with the local oscillator on 10.5 MHz and the IF is at 3.5 MHz, the receiver will respond equally well to signals at either 7.0 or 14.0 MHz. The preselector is responsible for keeping signals on the image frequency out of the mixer, but no preselector is perfect.

There is often more than one image frequency. In the Simple Superhet you may hear signals on the 20 meter band that grow louder if you tune the preselector to the highest possible frequency. They are the second harmonic of the LO at 21 MHz heterodyning with signals at 17.5 MHz to produce a signal at the 3.5 MHz IF. The Simple Superhet uses a relatively high IF. The higher the IF, the easier it is to keep signals on the image frequencies out of the receiver.

Birdies

If you set up the IF exactly at 3.5 MHz, you will find loud signals at 7.0 and 14.0 MHz due to the second and fourth harmonic of the detector oscillating at 3.5 MHz. All superhets are susceptible to birdies because they use two or more oscillators. The receiver may hear har-

monics of the oscillators or the results of the oscillators heterodyning.

After reducing the strength of birdies with shielding, they may be moved out of the primary tuning range of the receiver. In the Simple Superhet, the birdie at 7.0 and 14.0 MHz may be shifted below the edge of the ham bands by setting the detector a few kHz below 3.5 MHz.

Sensitivity and Selectivity

With the preselector tuned to the desired band on the Simple Superhet, you will hear the background noise increase. That means the receiver has all the sensitivity it can use. Adding more amplification only increases both the signal and noise level.

If you want to hear weaker signals, you must improve the selectivity to reduce noise. The Simple Superhet is not very selective compared to most modern communications receivers. If you added a very narrow filter to the receiver you may discover that you cannot hear any change in the background noise when tuning the preselector. At that point most of the noise you are hearing is being generated in the frequency converter stage and is being amplified and detected just like noise received off the air. High performance receivers with very narrow filters go to great lengths to reduce the amount of internally generated noise so it will not limit their sensitivity.

Dynamic Range

If you try to operate the Simple Superhet on 40 meters while someone near your location is operating on 20 meters or some other HF band, you may find that the overloaded receiver produces an awful mixture of clicks and howls. The regenerative detector, in particular, is susceptible to overload from very strong signals. A great deal of the design effort in high-performance receivers has a goal of increasing the dynamic range of the receiver.

The first step to improving the receiver's dynamic range is to keep the signal levels at the preselector as low as possible while still keeping the signal readable. The RF GAIN control should be the primary means of adjusting the volume with the Simple Superhet.

Stability

Most modern receivers are designed to drift no more than a few hertz in an hour. The Simple Superhet uses oscillators, whose frequencies are entirely dependent upon the value of its capacitors and inductors, thus requiring care in component selection. Special temperature-compensating capacitors may be added to the oscillators to offset the tendency to drift caused by heating. One common trick that added greatly to the stability of vacuum tube receivers was to leave the filament power on at all times, keeping the interior of the receiver and the components at a stable temperature.

Shielding

Due to the open "breadboard" style wiring of the receiver, strong local signals near 3.5 MHz may be directly detected by the regenerative detector stage, regardless of preselector setting. In addition, the LO signal at 10.5 MHz may leak back to the antenna and be radiated. If you can hear the Simple Superhet's LO more than a few yards away from your shack, it may be a good idea to install a 20 or 40 meter bandpass filter in the antenna line to prevent interfering with users near 10.5 MHz.

Using the Simple Superhet on Other Frequencies

Trying out other bands is a simple matter of changing the preselector and local oscillator frequencies. If you want to tune 80 meters, you will want to move the IF to a lower frequency outside the desired tuning range. Coincidentally, this will also improve the stability and the selectivity. Frequencies near 1.7 MHz are often used.

If you try bands above 20 meters, you will probably find two undesirable effects. First, the stability of the local oscillator will decrease as the frequency is raised. Second, while the receiver has adequate sensitivity at 20 meters, at higher frequencies, probably in the vicinity of 21 MHz, it will be found that most antennas will not provide enough signal to override the noise generated in the frequency converter. High performance receivers generally use a low-noise preamplifier stage or a special low-noise frequency converter to avoid this limitation.

Summary

The Simple Superhet provides a great experience for the builder that wants more than just step-by-step kit construction. The performance of the receiver will be more than adequate to make contacts, and the novelty of adjusting it will keep the builder coming back for more!

Parts Notes

[1]A common 365 pF "broadcast" variable capacitor may be substituted for C1. It may be necessary to remove one turn from L2 if no peak can be found near minimum capacitance. Alternatively, a 150 pF mica or disc ceramic capacitor may be placed in series with the variable to reduce the maximum capacity to about 106 pF.

[2]The value of this capacitor isn't critical. The tap on the local oscillator coil may be adjusted to provide the desired bandspread. If a 365 pF "broadcast" variable is used, it may be necessary to place a 150 pF capacitor in series with it to reduce the total capacitance. Otherwise, the position of the tap on coil L3 (for the desired bandspread) may become very critical.

[3]The four trimmers are used for selecting the frequency range when not using a vernier dial. Only one trimmer is required if the MAIN TUNING (C3) is equipped with a vernier drive. In that case, the rotary switch used to select the trimmers (S1) is not required.

[4]Used to "roll off" the high frequency response for the most pleasing sound. Select a value between 100-500 pF, based on personal preference.

[5]Selected to resonate with L6 to produce a peak in the audio response at about 700 Hz. It may be necessary to experiment with the value if a substitute transformer or choke is used at L6 or if a different audio response is desired.

[6]The AES knob listed is designed for CCW turning capacitors. "100" on the scale appears when the control is turned fully CCW. With most variable capacitors, that places "100" at the low frequency end of the scale. The knob is not required if a vernier drive is used.

Ron D'Eau Claire, AC7AC, has been licensed since 1952. He also has both First Class (now General) Radiotelephone and Second Class Radiotelegraph commercial licenses. His career has been a mixture of "hands-on" electronics and writing, with stints at Lockheed Aircraft, Lenkhurt Electric and Motorola. He's also worked as a commercial broadcast engineer. Ron began writing in the 1960s, producing technical material for Lockheed and Sylvania, in addition to being publications manager for Ampex Corporation in the 1970s. He's an avid builder and says that his shack has always included at least one homebrew piece of gear. Ron is currently a business and technical writer. He can be reached at 1604 Main St, Forest Grove, OR 97116 or at **ac7ac@arrl.net**. QST

NEW PRODUCTS

MANUAL AND MOTOR DRIVEN ROTATABLE HF DIPOLES FROM HI-Q

◊ Hi-Q-Antennas has announced two versions of its Hi-Q-2.5/80 TAD (Tune-A-Dipole) portable HF antennas. The MT-TAD version is tuned manually, weighs 7 pounds and breaks down into two components, each less than 36 inches in length. The RT-TAD version is remotely tuned via two 12 V dc motors that draw 350 mA each. This model weighs 9 pounds and breaks down into components less than 42 inches in length. Both versions are rated for up to 750 W and cover 80 through 10 meters continuously. A single half-dipole can be used as an 80 through 10 meter mobile antenna.

When disassembled, the components fit into a plastic rifle case for shipping, transport or storage. Hi-Q-2.5/80 TAD RT $595.00, Hi-Q-2.5/80 TAD MT $450 including rifle case. For more information, contact Hi-Q-Antennas, 21085 Cielo Vista Way, Wildomar, CA 92595; tel 909-674-4862; fax 909-245-2031; **www.hiqantennas.com**.

By Douglas Stinson, KG6ADR

The Plumber's Half-Square

The half-square antenna has a bidirectional pattern with some gain and useful nulls. In crowded RF environments, this easy to construct antenna is an excellent choice.

JOY BARNITZ, KG6ACN

The J-pole has been called "everyone's first homebrew antenna." Easy to construct from copper tube and fittings available at the hardware store, it is a rugged, well performing, omnidirectional antenna. The J-pole can be connected directly to 50 Ω coax with no matching network and requires no ground plane. These are admirable characteristics, particularly for an antenna that is to be deployed in the field for emergency communications.

Sometimes an omnidirectional pattern is not desirable. For example, many of the communities in the San Francisco-San Jose area are located along the shore of San Francisco Bay. Any power directed toward the Bay is interference for our neighbors on the other shore, while power directed away from the Bay is wasted on the mountains. Clearly, what is needed in this situation is a bidirectional antenna. I searched for such an antenna design and soon came across the "Half Square," which fit the bill.

Ben Vester, K3BC, first described the Half Square antenna, in 1974.[1] It consists of two vertical wires, each a quarter wave long and spaced a half wave apart. The two vertical wires are connected at either the top or the bottom by a third wire. The result is a simple antenna that has a low radiation angle, is vertically polarized and develops strong nulls to the side.

A more recent article by LB Cebik, W4RNL,[2] showed plans for a PVC-supported version of this wire antenna. This convinced me that the antenna could be built using copper tube and pipefittings. The antenna would be self-supporting and rugged (a necessity for use in emergency situations). The use of 1/2 inch tube vs #12 AWG wire would result in a broader bandwidth. Like a J-pole, the Half Square does not require a ground plane and can be connected directly to 50 Ω coax.

[1]Notes appear on page 41.

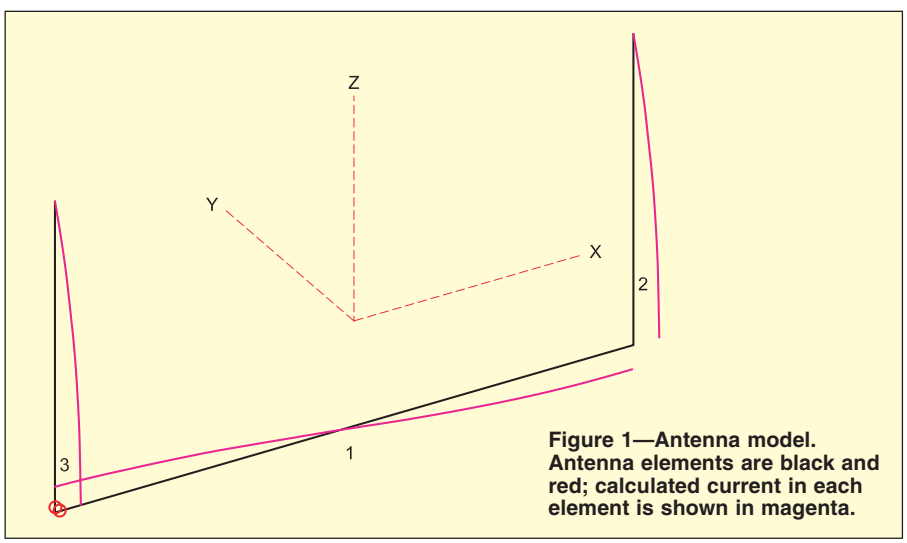
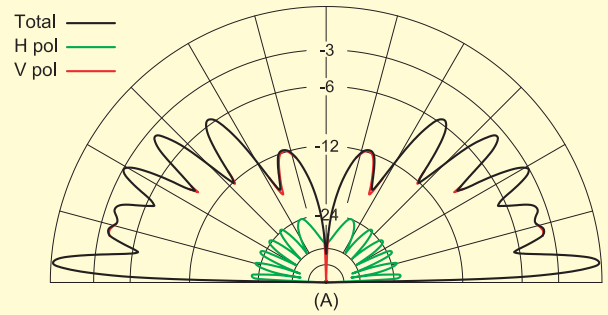


Figure 1—Antenna model. Antenna elements are black and red; calculated current in each element is shown in magenta.

Designing the Antenna

With Cebik's design as a starting point, the antenna was modeled using *EZNEC*.[3] Minimum SWR, maximum gain and deepest nulls were optimized at 146 MHz when the vertical elements were 22 inches long and the horizontal element was 40 inches long. If the antenna is fed at one corner, it will present 50 Ω impedance to the feed line.

Most hams are so familiar with Yagi antennas that they assume the direction of maximum radiation is along the line connecting the two vertical elements. Unlike a Yagi, however, a Half Square is a phased array antenna with both elements driven. The currents in the two vertical elements are always in phase (see Figure 1). Since the elements are a 1/2 wavelength apart, everywhere along a



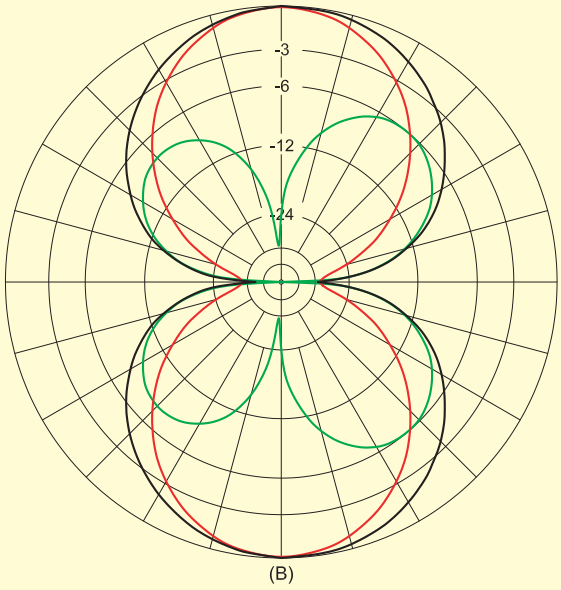
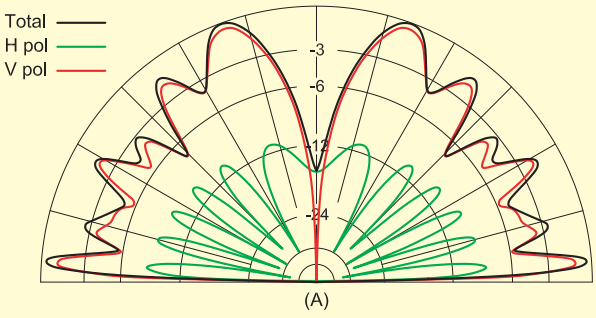


Figure 2—Radiation pattern of the antenna at an elevation of 20 feet above average conductivity ground. The total, horizontally and vertically polarized field strengths are shown. (A) Relative field strength as a function of elevation at azimuth of maximum radiation. (B) Relative field strength as a function of azimuth at elevation of maximum radiation.



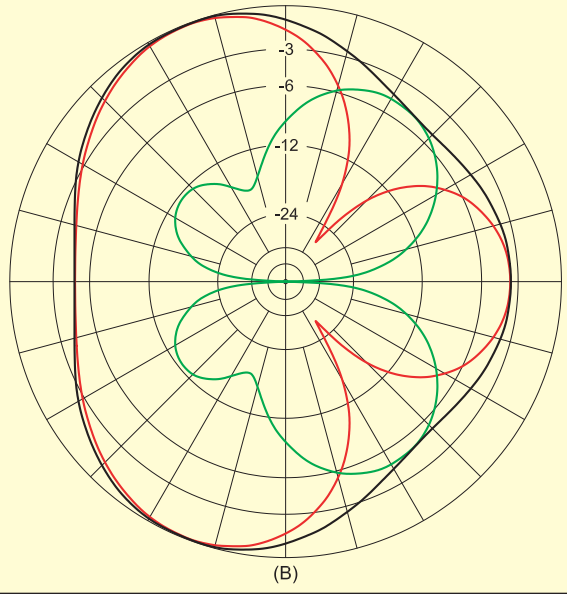


Figure 3—The elevation (A) and azimuth (B) patterns showing the pattern distortion from feed line interaction.

line connecting the two elements the field from one element will be 180° out of phase with the field from the other—they will cancel. This is responsible for the nulls in the radiation pattern as shown in Figure 2B.

In the perpendicular direction, the fields from the two elements reinforce, producing the bidirectional antenna pattern. With a 3 dB beamwidth of about 77°, this is not an extremely directional antenna. It is a good compromise for use at a net control station in the environment described in the introduction, however.

Figure 2A is the radiation pattern as a function of elevation, including the effect of ground. The take-off angle is reasonably low at 4°. The theoretical gain is a modest 8.5 dBi, about four times the power gain of a dipole or a 1/4 wave vertical.

Perhaps the most interesting effect to come out of the modeling was the impact of the coax feed line shield. The obvious place to mount the antenna is at the center of the horizontal member. To simulate the feed line, a wire was run at a 45° angle from the source in the corner of the antenna down to the mast. The wire was then continued to ground. The effect on the antenna pattern was dramatic and detrimental, as shown in Figure 3.

Having the feed line drop straight down from the feed point will significantly reduce its effect on the pattern. This suggests that the mechanical mount should be as close to the corner feed point as possible. Placing a current balun (such as a ferrite bead) close to the feed point and 1/4 wavelength down the coax is good practice.

Construction Tips

Construction of the antenna is shown in Figure 4. All of the parts, except the UHF connector and coax, can be purchased in the plumbing section of a typical hardware store—hence the name "the Plumber's Half Square." Each of its three elements are cut so that the final, assembled length of each element is as given by the model. This means that the dimensions of the elbow and cap fittings should be taken into account. The method I used to connect the feed line to one corner requires one vertical element to be 2 inches shorter than the other.

Solder the end caps onto each of the

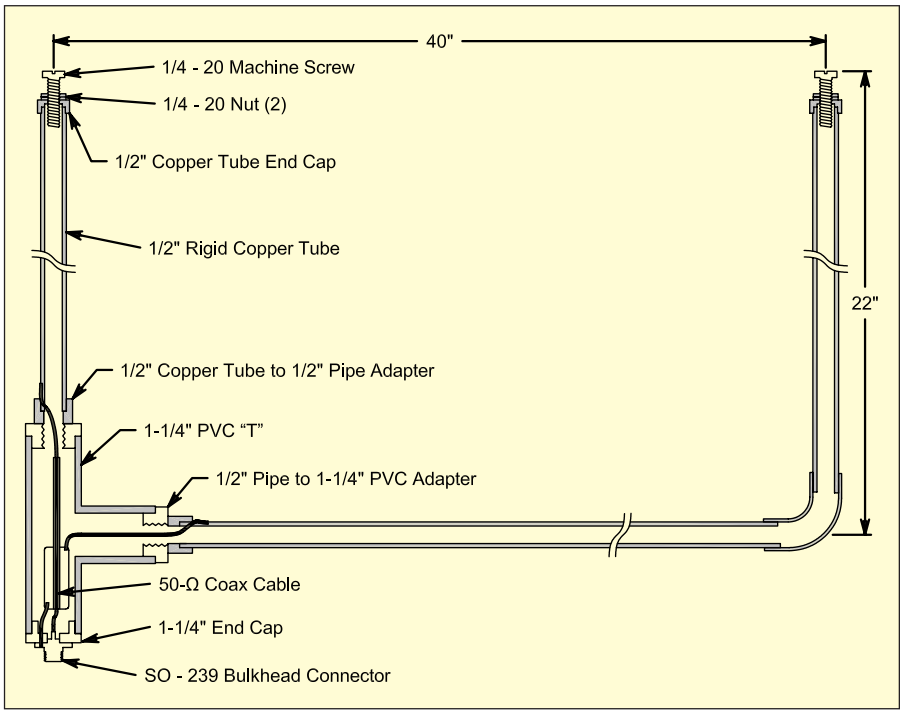


Figure 4—Cross section of the Plumber's Half Square.

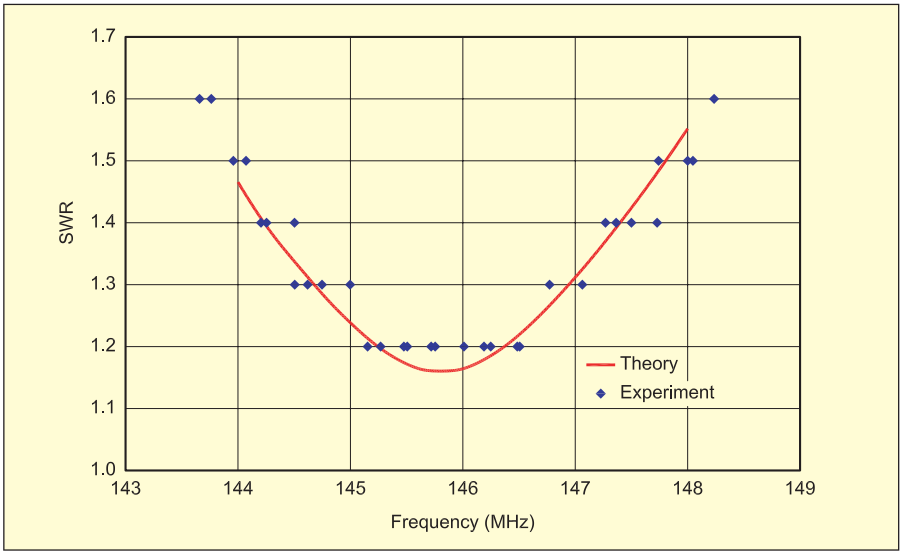


Figure 5—The calculated (red) and measured (blue) SWR of the Plumber's Half Square antenna.

two vertical elements. The horizontal element, the longer vertical element and the 90° elbow are then soldered. Finally, solder one pipe thread adapter onto one vertical element and one onto the horizontal element.

To accommodate construction variability, drill each end cap to clear a 1/4 inch-20 machine screw and solder a 1/4 inch-20 nut over each hole. To prevent solder from wicking into the threads, coat the screw with grease and screw it into the nut before soldering. The screw can be adjusted in or out to change the length of the vertical elements for minimum SWR. A second nut placed on the screw can be tightened against the first to lock the screw in place. Note that the length of the pipes that make up the vertical element will need to be reduced to accommodate the length of the screw.

A corner connector electrically isolates the two arms of the antenna and provides mechanical strength. It is the most challenging part of building this antenna. In keeping with the plumbing theme, the solution is based on PVC tubing.

The basic design of the corner connector is also shown in Figure 4. A 1 1/4 inch PVC T is fitted with female 1/2 inch pipe adapters on the base and one arm of the T. These mate with male 1/2 inch pipe adapters soldered to the end of a 1/2 inch copper tube that forms one vertical element and to the tube that forms the horizontal connecting arm.

Before the parts of the T are assembled, the electrical connections must be made. Drill a hole through the male pipe adapters at a sharp angle toward the open end using a 3/32 inch drill. Thread a 3 1/2 inch long bare #12 AWG wire through the hole in the horizontal member. Bend the last 1/2 inch around the pipe and solder into place.

Strip the outer insulation from the last 3 inches of a 7 inch long piece of 50 Ω coax and slide the braid back to expose the entire length of inner conductor and insulation. Remove the last inch or so of the inner insulation and thread the center conductor through the hole drilled in the vertical element. Again, bend the last 1/2 inch around the pipe and solder in place.

Now thread the pipes into the PVC pipe adapters. Apply PVC cement to the pipe adapters and slide them into the T, making sure that the vertical elements are parallel. Working inside the T, use a solder gun to attach the coax braid to the copper wire. When you are done, the copper wire and the center conductor of the coax should be extensions of the horizontal and vertical elements. This means that the bare copper wire and coax center conductor should be parallel to their respective antenna elements; the copper wire should not extend beyond the centerline of the vertical element and the coax braid should not extend above the centerline of the horizontal element.

For the final step, mount a bulkhead SO-239 connector on a PVC end cap. Use a small amount of RTV adhesive to make a watertight seal. Solder the coax to the connector. Apply PVC cement to the end cap and slide it into the T, coiling the excess coax into the cap as it is inserted.

Testing the Antenna

The easiest test of the antenna is SWR. The measured results are compared to the model in Figure 5. The antenna behaves as expected with SWR less than 1.5:1 over the entire 2 meter band. At the center of the band the SWR is less than 1.2:1.

Determining the radiation pattern is trickier. I tried several methods, from listening to distant repeaters while the antenna was set up on my deck to having my wife transmit to me from across a lake. The chatter on the repeater always

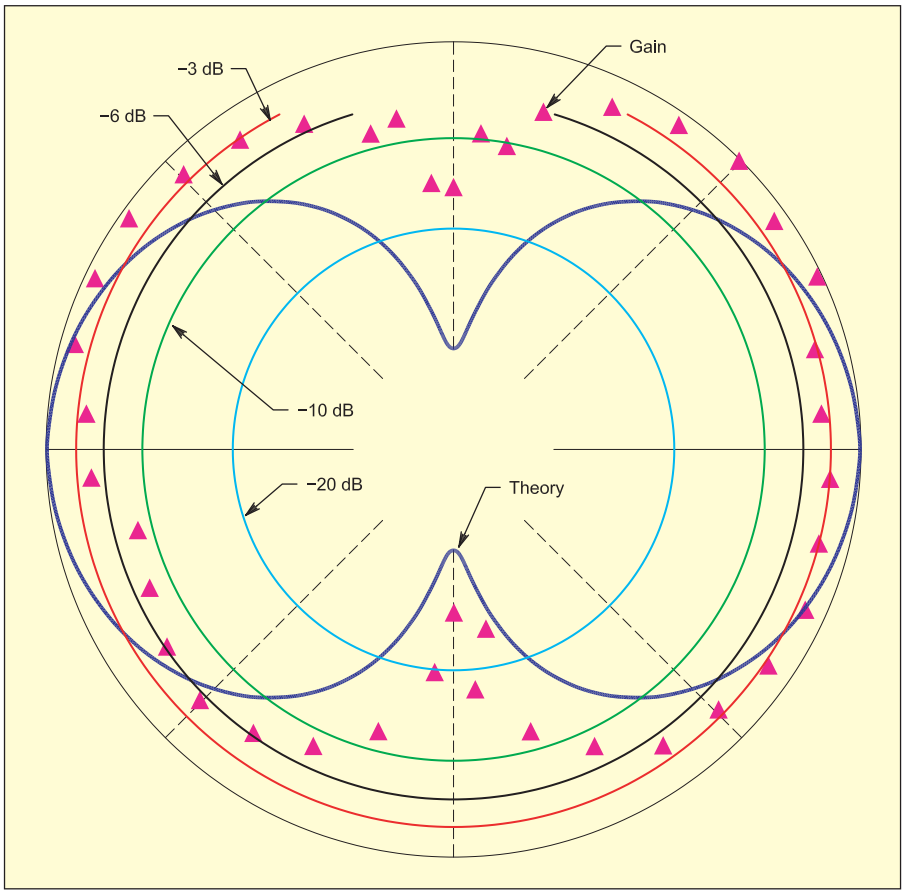


Figure 6—Measured (triangles) and calculated (solid line) antenna pattern.

seems to cease during the most critical measurements. I also saw what appeared to be reflections from nearby mountains in the antenna pattern. I believe that the latter method would have produced good results, but the experiment was, mercifully for her, interrupted by interference and I didn't have the heart to impose on her patience any further.

I finally settled on setting up the antenna on a high knoll during a transmitter hunt. The fox produced a reliable, continuous low power signal. I rotated the antenna and noted the signal strength as a function of angle.

Since S-meter calibration is somewhat unreliable, I inserted a precision step attenuator in the line between the antenna and the radio. At each angle the attenuator was adjusted until a constant S value was obtained. The amount of attenuation inserted is proportional to the received power. A quick initial sweep was performed to determine which S value would require some attenuation for the minimum signal level and which was within the range of the attenuator at the highest signal level.

The results (see Figure 6) show a qualitative agreement with the prediction, although there is also a striking asymmetry to the pattern. This is likely due to the feed line interaction described earlier.

Conclusions

Anyone who enjoys wielding a torch will enjoy building one of these antennas. The performance, though far from perfect, will significantly reduce interference to and from stations located on the side. At least one side null is narrow and deep, so this antenna may also make a decent direction finder.

Notes

[1]Ben Vester, K3BC, "The Half Square Antenna," *QST*, Mar 1974, pp 11-14.

[2]L.B. Cebik, W4RNL, "The Half-Square on 2 Meters: A Bi-Directional Vertical Antenna," **www.cebik.com/hs.html**.

[3]*EZNEC* is available from Roy Lewallen, W7EL, **www.eznec.com**.

Douglas Stinson, KG6ADR, received his Technician license in 2000. He is active in emergency communications through ARES and his local Community Emergency Response Team (CERT). Doug holds a PhD in Physics and has held a number of technical and management positions in telecommunications and data storage. He can be reached at **kg6adr@arrl.net**.

NEW PRODUCTS

HEIL SOUND PROLINE MICROPHONE PRODUCTS

◊ Bob Heil of Heil Sound has announced the formation of a new division, the Proline Division, to provide high performance microphone products for commercial broadcast, live sound performers and advanced amateurs. The Proline dynamic microphone elements feature a large diameter and low mass design intended to provide excellent transient response and low IMD with a specified 40 Hz to 18 kHz frequency response. They are intended to be terminated by a balanced 600 Ω load. In addition, the Classic model also includes either a HC-4 or HC-5 communications response element and a high impedance transformer to allow use with older tube type equipment.

Shown are the Heritage ($165), with the double plated look of a '50s studio mic, and the Classic Pro ($229), looking like a '30s model. Also in the Proline series are the Goldline Pro ($130) and the PL-2T Proline Topless Boom ($75).

For more information contact Heil Sound at 618-257-3000; **www.heilsound.com**.

By Robert B. Login, AA8A

My Big Homebrew Rig Project

Let's jump back to the 1950s when many an amateur—including this one—dreamed of a big rack-mounted kilowatt transmitter.

I felt like I was starring in the movie *Ground Hog Day*—you know…the one where Bill Murray wakes up to repeat the same day over and over? I was bored! I had been retired for a year and needed a big project to keep me busy. Building an SSB rig looked out of my league. How could I build one even remotely similar to the first class equipment now commercially available?

Most of the new rigs are marvels of technology with parts that are unique and difficult to obtain. My hamming interests, however, harken back to the '50s, and I am now active in the new AM activity. I had never, in 46 years as a ham, built a big rig and, since I was into retro radio, I could relive that era in style. I now even had the time to build a vacuum tube era Class C plate-modulated rock crusher.

I remember looking through *QST* during the '50s, marveling at the big kW relay-rack transmitters. Usually, the builder was dressed in a suit and tie, seated in his operating position, looking like someone of importance…an electrical engineer, a scientist or perhaps even a general. As a boy, such hams held tremendous status. All these years later, I was determined to savor the big rig "machismo" of the '50s myself. Actually, during those years, I never got past CW and poverty. Working and going to college at night brought an end to my first foray into ham radio.

I started my project by searching each new hamfest for parts that might be of value and using my collection of old *ARRL Handbooks*, *Electric Radio*, *QST* and *CQ* as a guide to potential circuits. By studying other hams' ideas, I was able to spot a worthwhile part instantly from a distance of at least two tables and pounce on good buys. When you homebrew vintage rigs you are at the mercy of those parts and tubes that come into your possession. If it was a bargain and it looked like those parts illustrated in the old Handbooks, I bought it.

This aspect of vintage homebrewing is real fun. You need a quest to really enjoy a hamfest. And don't forget, you need a place to store all this "junque." I was very fortunate to have recently moved to a place in rural South Carolina that came with a second two-car garage. I converted it into a shack/workshop.

No matter how early I arrived at a hamfest, I could not find hide or hair of a suitable modulation transformer! I was becoming frustrated, even though plate voltage iron seemed plentiful, by comparison. All of a sudden, I got lucky. Lea, K4VWD, a fellow member of the Old Friends Club, asked if I might be interested in some of the equipment from an estate. He was helping the wife dispose of her husband's lifetime accumulation of rigs and parts. I bought all of the parts that might be of value for the project. This included a Thordarson 500 W multimatch transformer and three Thordarson plate transformers, all of late 1930s vintage. I also obtained a variety of power tubes (including 100THs), tube sockets, a 6 foot relay rack with a very well done meter panel (like a Collins kilowatt rig), a variety of chassis and several aluminum panels. I now had almost everything I might need for the project.

Although the former owner had barely started to build a rig in the relay rack, I found that the only thing I could use was the panel fixture with four meters. At this point, I worried that the old transformer iron wasn't any good. After all, the stuff was at least 60 years old! One of the big plate transformers proved to be shorted out. It was rated at 6000 VCT at 0.5 A! I was very upset, but the other iron appeared okay. Even the 500 W modulation transformer looked

Do It Safely

I want to warn anyone working around high voltage that some very smart and clever hams have made fatal mistakes. Be *very careful*—when using my jury-rigged test setup, I didn't move anything except the Variac and tuning controls with power on. Pull the ac plugs every time you go into the chassis and discharge the power supply before touching any circuit. Don't count on bleeders. Ground the B+ to be sure. Most importantly, have a friend observe your setup. I'm lucky to have an experienced ham friend, Jim, K4DEE, who looked over my test setup and helped me troubleshoot the entire project.—*Robert B. Login, AA8A*

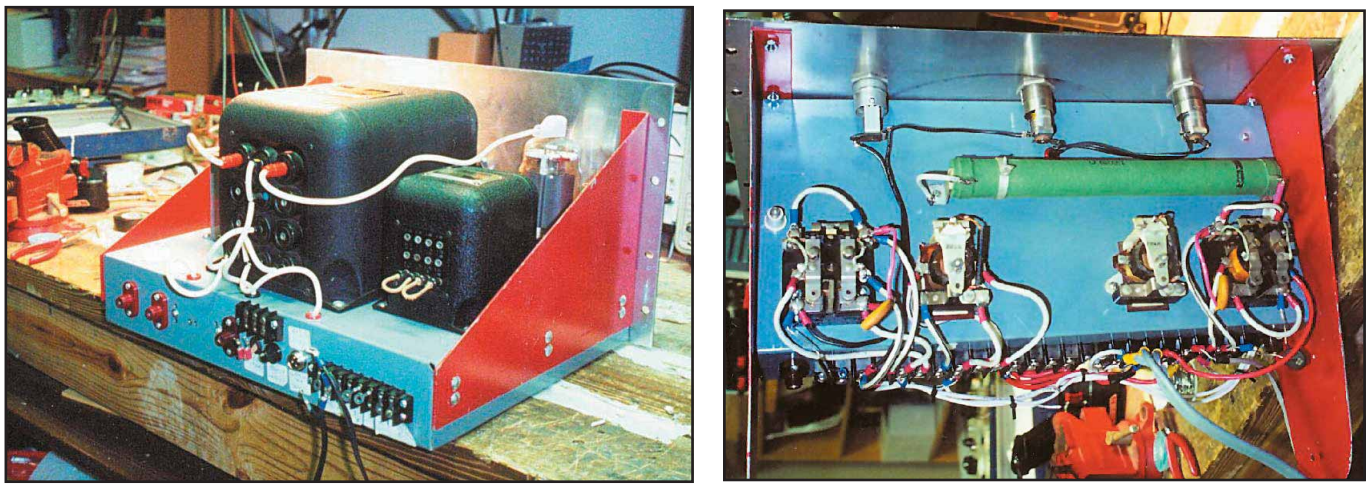


Figure 1—The modulator deck above and below chassis. The transformers were mounted facing toward the rear so the taps could easily be changed.

okay. With 120 V ac on the primary, it had the expected voltage on the output.

Tube Selection

I wanted a band-switching amp and decided to homebrew my own pi-network. The big decision was which tubes to use. After much thought, I decided on 4-400As for the final and triode connected 813s in the Class B modulator. These were available at reasonable prices and would easily produce a kW of plate modulated RF. I also decided that it would be easy to control the screen voltage of the 4-400As as a way toward keeping the output at the legal limit. These tubes would be hardly breaking a sweat at that power, and used, cheap tubes, even at the end of their careers, could "soldier-on" in my service. I've purchased several of them at hamfests for very little. As long as the filaments are okay, you can place your bet that the old tube will put out at least 200 W. Both *The ARRL Handbook* and the *Radio Handbook* published during the late '50s have construction articles dealing with Class C 4-400A amplifiers and suitable Class B modulators.

Collins 32V-2 Exciter

My overall plan was to use my Collins 32V-2 as an exciter for both RF and audio. The setup for this is shown in the 1959 edition of *The ARRL Handbook*. I knew the 32V-2 would produce excellent audio. Furthermore, it has a 500 Ω tap on the modulation transformer secondary. This was ideal, because I had a 600 Ω input transformer (Thordarson T15D82), designed with a multimatch output, that would easily drive the triode connected 813s. I carefully measured each unit's panel space in the rack and found that the 32V-2 would fit nicely at tabletop height.

The big problem was how to get it in the rack without breaking my back (it weighs over 100 pounds). I wanted to be able to work on the transmitter without having to trouble a friend for help! The problem with the typical relay rack is that it usually lacks support for each deck until they are affixed to the front. I solved this problem by bolting a heavy-duty shelf wall fixture to each side inside near the middle of the rack. The shelf support arms that lock on to the fixture were then cut so that they were a few inches long. With the 32V-2 on a table, and the cut-down support arms positioned approximately and slightly below where I wanted it to be positioned, I was able to push the relay rack next to the table, reach through the back of the rack and pull and pivot the 32V-2 onto the support arms. Once it was on the arms, it was easy to pivot the 32V-2 into position. As a safety precaution, before I started to move the 32V-2, I placed two of the front rack screws slightly below where the 32V-2 was to match up with the front panel so that it could not slip down. I never had to lift the hundred pound exciter and, once in the rack, I was able to adjust its position by placing shims between it and the support arms.

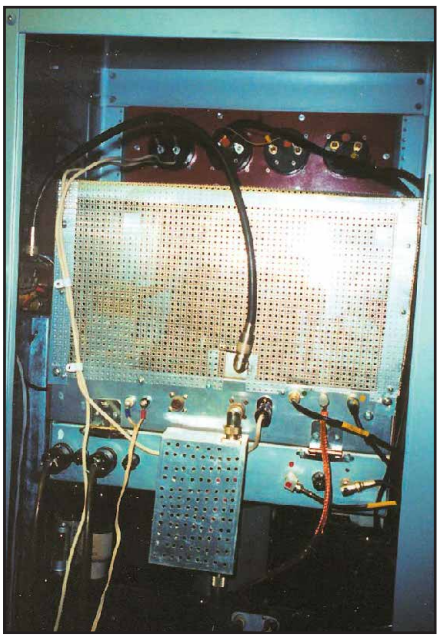
Modulator and RF Deck Circuits

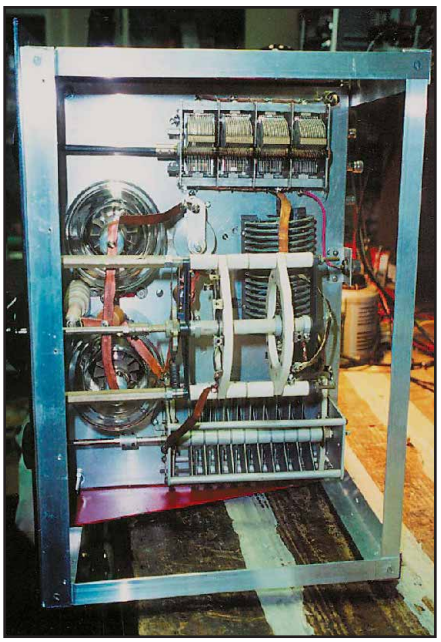
The 1959 edition of *The ARRL Handbook* article, "4-250As in a 1-kW Final" (originally described in *QST*, June 1956, by L. McCoy) and the *Radio Handbook* (W. Orr) "General Purpose Amplifier" formed the models for my project. Of course, I had to "mix and match" according to the parts I already had. Should the rig not work properly, I could always fix the problem once it became obvious. After all, I could then renew the fun search for a more appropriate part.

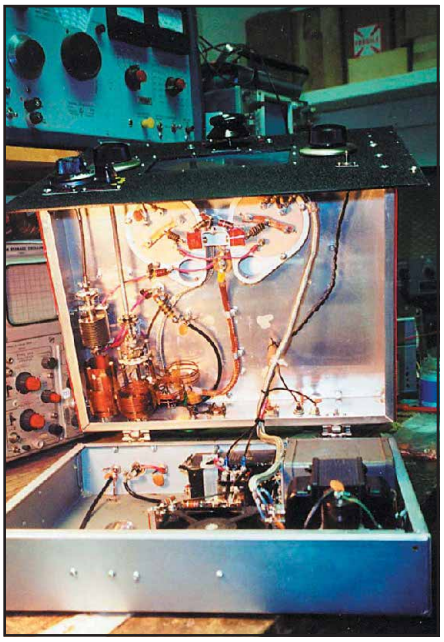
I decided to hinge together two large chassis to make a box whose bottom would house the filament transformer, the bias and the screen supplies. Also, I cut a hole in the bottom chassis and mounted a muffin fan under the 4-400A air sockets to force cooling air through the sockets and the chimneys above. The input grid circuit was built around a Bud 80-10 meter turret assembly that looked like it would work. The pi-network consisted of a big ceramic two-pole switch and an E. F. Johnson silver-plated coil. I used copper tubing for the 15/10 meter section. This was mounted at right angles to the main coil and a 100 pF, 9000 V tuning capacitor. This capacitor required several small 20 pF doorknobs to resonate on 80 meters but it worked well, according to my grid dip meter, on the other bands.

The loading cap was a multisection receiver type that I guessed would be about 2000 pF total. I used a National type R-175A choke as the plate choke and the largest neutralizing capacitor I could find. It looked like the one pictured in the *Handbook*. Otherwise, I tried to match the circuit as closely as possible. You can see the results of my efforts in Figures 1 and 2. Figure 1 is a composite of the modulation deck and Figure 2 shows some views of the RF deck.

I used more shielded wire than suggested, especially where the filaments had to be long enough for the two chassis to swing open. Additionally, coax shielding, salvaged from bits of coax was slipped over a suitable twisted pair of filament leads. I used extra 1 kV/ 0.001 µF bypass disc ceramics, as I was concerned, because I had the bias and screen supplies in close proximity to the RF section, that I might couple RF into them, causing the final to be unstable. So, I bypassed everywhere the bias and screen supplies were exposed. A 100 mA fuse was placed in the output of the screen supply to protect the tubes should B+ be removed while the screen voltage was applied. I also had to use a 10 H choke in the screen so it could be







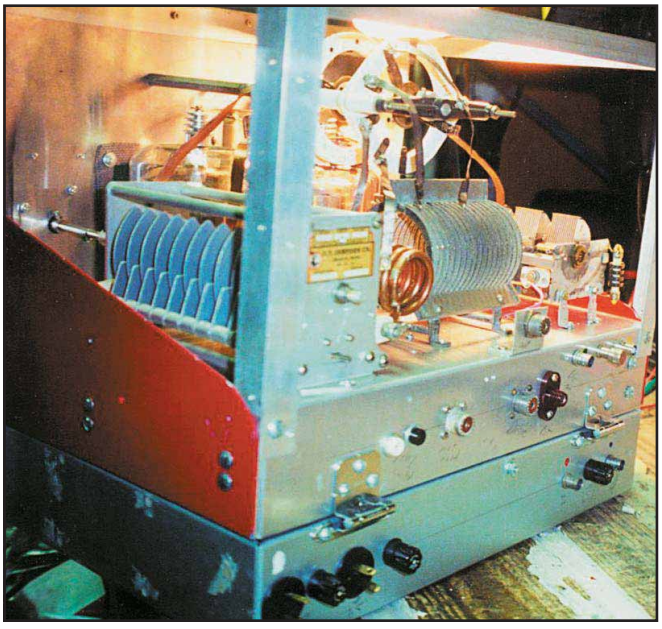


Figure 2—A composite view of the RF deck. Note the two chassis that are hinged together. The cooling system is located on the lower chassis, along with control circuitry.

modulated. When you build something with parts on hand, and you take liberties with the design, you have no idea anything will work or work properly! This was always on my mind as I labored to cut the holes and do all the metal and mechanical work to put the final amplifier together.

I want to recommend a Dremel tool along with a variable speed hand drill as the two most necessary tools to have to do this type of work. While it's possible to make all the holes with the two, I wouldn't recommend being without a set of socket punches. They make the job much easier and cleaner. The Dremel tool with cutting discs can be used to cut out large holes for windows, transformers, etc. It may require several discs to do the job but you can cut pretty accurate holes that look very good. Circular holes are a problem for the Dremel. I'm sure there are hams that have much better tools for this type of metal work but for utility and low cost you can't beat the Dremel. I used circular cutout saws designed for 1/4 inch hand-drills for larger holes. With a little practice and the appropriate cutting fluid, you can cut pretty neat meter-sized holes.

Preliminary Testing

When I finished the final, I decided to test it on the bench. I had a power supply that would deliver 3000 V at 250 mA. I used a Drake T4X as a preliminary driver and before powering up I tried to neutralize the amplifier according to the *Handbook*. The final did not behave as suggested and the neutralizing cap seemed to have little effect, but I adjusted it to what I believed to be a minimum. The filaments have their own ac source and I put a 5 A inrush current limiter in the primary of that supply to afford a softer start for the 4-400As. The tubes lit up and looked really nice. The bias supply is also connected to the filament ac source so that the bias is on all the time. It delivers –150 V dc (regulated) to completely turn off the tubes during receive. On transmit, a 5 kΩ resistor causes the bias to rise for Class C operation.

I hooked meters up to all the circuits and plugged the screen supply into a Variac (a variable ac power supply). With the filaments on, I started to feed 80 meter RF into the rig. It took nearly full power from the exciter to kick the grid up to 25 mA. Something was wrong! Could the input turret be wrong for this circuit? It resonated quite nicely affording a sharp peak indication. It crossed my mind that the output of the T4X exciter was 50 Ω but I had no idea what the input turret impedance was.

I installed a Drake MN4 antenna tuner between the exciter and the final. Sure enough, they were significantly mismatched. When they were properly matched, it took less than 10 W to kick the grid meter up to 25 mA. I also had the B+ supply on a Variac and increased the voltage to 1000 V and the screen voltage to 200 V. When I keyed the exciter the final showed an output that I was able to tune and load to a maximum of a few hundred watts. I increased the B+ to 2000 V and now was obtaining much more output. I went for the maximum B+ and, as I keyed the exciter, I also increased the screen voltage to 500 V. This gave me 600 W out according to my wattmeter. At a plate voltage

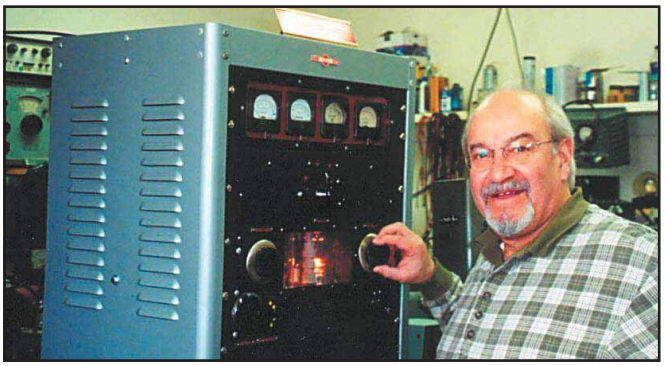


Figure 3—It's gratifying when everything operates as designed. The final amplifier tubes can be observed through the clear window—no red plates here!

of 3000 V and 270 mA, that worked out to be 74% efficiency. Not too bad! In fact, I had to reduce the drive to about 4 W to keep the grids at 25 mA.

Attenuator

Since it took only a few watts to drive the amp, how was I to reduce the output of the 32V-2? That's when I discovered attenuators. I noticed that the Viking Thunderbolt amp also used 4-400As and that its manual showed several attenuator circuits that Johnson recommended. I built a version of the one recommended for 100 W rigs. This proved to be too little attenuation, so I added a 50 Ω dummy load to the attenuator output made from paralleling a dozen or so 2 W carbon resistors.

I placed the whole collection of 2 W resistors in a mini box with numerous holes to allow for cooling. The attenuator with the 50 Ω dummy load also solved the matching problem. The 32V-2 switched to the 600 V setting was resonated to 3885 kHz but the loading was set to a light level. Experimenting, I found that I could lightly load to about 40 W and through the attenuator/dummy load connected to the amp, with the filaments on, I was able to obtain the magic 25 mA of grid drive. Similarly, I found the settings for 7290 kHz. Neither 20 nor 15 meters required the attenuator/dummy load because the 32V-2 could be very lightly loaded and I was able to get 25 mA of grid drive reliably. All of this took place with the 32V-2 mounted in the rack, which could be rolled to a position convenient to my workbench where the amp was being tested.

I was able to place the amp deck in the rack above the 32V-2 and the meter panel across the top and it all fit perfectly. As mentioned, the modulator deck was as described in the *Radio Handbook*. The book has a section on triode-connected Class B modulators and I also made use of the amplifier input circuit meant for the 32V-2 as an exciter. Thordarson manufactured both the 500 W multimatch modulation and input transformers. I positioned each to face the rear of the deck so that transformer connections could be changed if my impedance calculations were incorrect. A ceramic wafer switch was used to close the ac interlock to the modulator plate supply so that ac is available to the modulator power supply. It also lights an indicator bulb showing that the modulation deck is activated. Another ceramic wafer switches the 32V-2 audio into the modulator or returns the circuit to the original 32V-2 configuration should I ever want to run the exciter by itself.

Power Supplies and Control Relays

Because I had two transformers, each individually unsuitable to powering the rig, I was forced to construct two power supplies. Both are choke input with the choke in the transformer center tap. I used banks of 450 V dc electrolytics and 6 A/1000 PIV diode rectifiers in a full-wave or bridge configuration, depending on the transformer. They are standard solid-state power supplies whose circuits are well covered in the literature.

The control deck consists of a SPST contactor whose 120 V ac input comes from the ac activated by the 32V-2 exciter PTT circuitry. This relay is used to the feed 120 V ac to the other relays. I did this because I was concerned that the relay in the 32V-2 couldn't handle the current required to activate all of the other relays.

The RF deck's power supply is activated by a DPST heavy-duty contactor, which also completes the circuit to the modulation power supply ac contactor relay. I did this so that the RF deck would require turn-on before the modulation deck. I also used interlocks that are activated by the antenna changeover relay and the relays used to connect the 32V-2 to the RF deck. Therefore, the antenna and the 32V-2 have to be activated for the power supplies to come on. The RF deck power supply must come on before the modulation deck power supply comes on. This guarantees that the modulation deck has a load before it is up and running.

Troubleshooting

After months of work, I was finally going to test it out. I plugged her in and hit the ON switch. The filaments came on. I had the power supplies connected to the ac but not connected to the RF and modulation decks in order to test them out. Using a Variac on each in turn, I was able to convince myself that they would give the expected voltages.

Reconnecting them and testing with just the 32V-2, I was able to get the required 25 mA of drive. I then keyed the rig and *bam!*—the fuse blew in the RF supply. I won't bore you with stupid mistakes like using audio plugs for some 120 V ac connectors or the nut shorting out the power supply that had, unbeknownst to me, fallen into it! Once these mistakes were rectified, I was able to key the rig on. Turning up the panel-mounted small Variac in the screen supply resulted in the output coming up. The amp could easily put out the legal limit. I switched to AM, pressed the PTT switch and watched my SB610 'scope as I talked and increased the audio drive. It worked! The 'scope waveform looked pretty good. No doubt about it… I was getting 100% modulation. I cycled through several test transmissions into the dummy load and found no problems. I worked my friend Jim, K4DEE, on 7290 and he really liked how it sounded, loud with good audio.

I had several contacts and received good reports, but then started blowing fuses again. This time I found that the fuse socket assembly was too close to one of the transformers. I changed that and no more fuse blowing. I run the rig at 375 W, the legal limit for AM, but it can do much more, the limitation being the quality of the 4-400As and their plate and screen voltage. I've teamed the big rig up with my 75A-3, resulting in my '50s dream AM station. I'm sure the boy who drooled over *QST* in the '50s would be impressed! I'm very happy with the performance—just look at that smile in Figure 3. As for operation, you can catch me on the 75 and 40 meter AM hangouts.

"Rig Here is Homebrew"

I have a tremendous feeling of accomplishment whenever I say that the rig here is a homebrew pair of 4-400As modulated by triode connected 813s. When that big rig keys on and the meters read what they should and flicker with my voice, I feel the effort was well worth it.

Bob Login, AA8A, was first licensed in 1956 as KN2VQM and received his present call after upgrading to Extra in 1977. He enjoys homebrew building, restoring vintage equipment and ragchewing. Bob recently retired as Vice President of Technology for an international chemical company and has a PhD in Organic Chemistry from Purdue University. You can contact him at 30 Bark Ct, Travelers Rest, SC 29690 or at **jlogin@mindspring.com**.

By Marc C. Tarplee, N4UFP

Two Bands from One Dipole

A dual-band dipole design using no traps or coils.

My quest for a simple two-band dipole began when I decided to become active on the 17 and 12 meter bands. I wanted to operate on both bands, but did not have room for two separate dipoles. A single antenna design that would operate on both bands was required; it also had to be lightweight, simple to construct and reliable.

Adding a Second Band to a Dipole—The Techniques

There are several ways to modify a dipole for multi-band operation. The first is to tie two dipoles to a common feed. Plastic or wooden spreaders can be used to keep the two dipoles apart or separate sets of supports can be used for each antenna. Spreaders add weight, and unless the wires are fairly widely spaced (λ/100 or more), the antenna can be difficult to adjust.

It is possible to add a parasitic dipole for coverage of a second band. While only one dipole is directly fed, the closely coupled parasitic radiator makes tuning difficult. There are no simple design rules for this type of antenna, so a successful design is normally the result of considerable experimentation. [R. Dean Straw, N6BV, points us to "The Coupled-Resonator Principle: A Flexible Method for Multiband Antennas" by K9AY in *The ARRL Antenna Compendium*, *Vol 5*[1] for detailed design information on parasitic coupled-dipoles.—*Ed.*]

Many amateurs have used trapped dipoles for multi-band operation. Low-loss traps that can withstand the elements are not easy to construct and the traps greatly increase the weight of the antenna. Additionally, the traps, no matter how well designed, introduce some additional loss.

[1]Notes appear on page 47.

The Transmission Line as a Transformer

When a transmission line is terminated in any impedance other than its characteristic impedance, the impedance measured at the input of the line depends on its electrical length. The input impedance for a specific load impedance, line length, and frequency may be computed from the following equation:

$$Z_{in} = Z_0 \left[(Z_A \cos\Psi + j\, Z_0 \sin\Psi) / (Z_0 \cos\Psi + j\, Z_A \sin\Psi) \right] \quad \text{[Eq 1]}$$

where:

$\Psi = 2\pi\ f\ x\ /\ 983.6\ f_v$

and,

Z_0 = characteristic impedance of the transmission line (Ω)

Table 1
Two Band Dipoles Using 450 Ω Ladder Line and 14 Gauge Copper Wire

Bands (Meters)	*Dipole Length (Feet/Inches) (L)*	*Ladder Line Length (Feet/Inches) (T)*	*Lower Resonant Frequency (MHz)*	*Lower Frequency Input Z*	*Higher Resonant Frequency (MHz)*	*Higher Frequency Input Z*
75/40	144/10	89/6	3.87	89 Ω	7.25	32 Ω
30/17	54/9	36/2	10.12	88 Ω	18.12	39 Ω
20/17	77/8	76/2	14.13	33 Ω	18.11	83 Ω
20/15	51/0	50/8	14.17	53 Ω	21.27	41 Ω
20/12	68/0	46/8	14.15	33 Ω	24.92	82 Ω
17/12	28/7	46/8	18.11	77 Ω	24.95	75 Ω
17/10	33/4	62/6	18.08	88 Ω	28.42	87 Ω
15/10	102/0	70/6	21.25	48 Ω	28.32	64 Ω
10/6	16/6	33/5	28.40	69 Ω	50.10	64 Ω

Table 2
Two Band Dipoles Using 300 Ω Ladder Line and 14 Gauge Copper Wire

Bands (Meters)	*Dipole Length (Feet/Inches) (L)*	*Ladder Line Length (Feet/Inches) (T)*	*Lower Resonant Frequency (MHz)*	*Lower Frequency Input Z*	*Higher Resonant Frequency (MHz)*	*Higher Frequency Input Z*
40/20	96/9	101/0	7.02	30 Ω	14.23	48 Ω
20/10	48/3	50/6	14.08	34 Ω	28.40	50 Ω
15/10	23/0	41/0	21.20	68 Ω	28.40	46 Ω

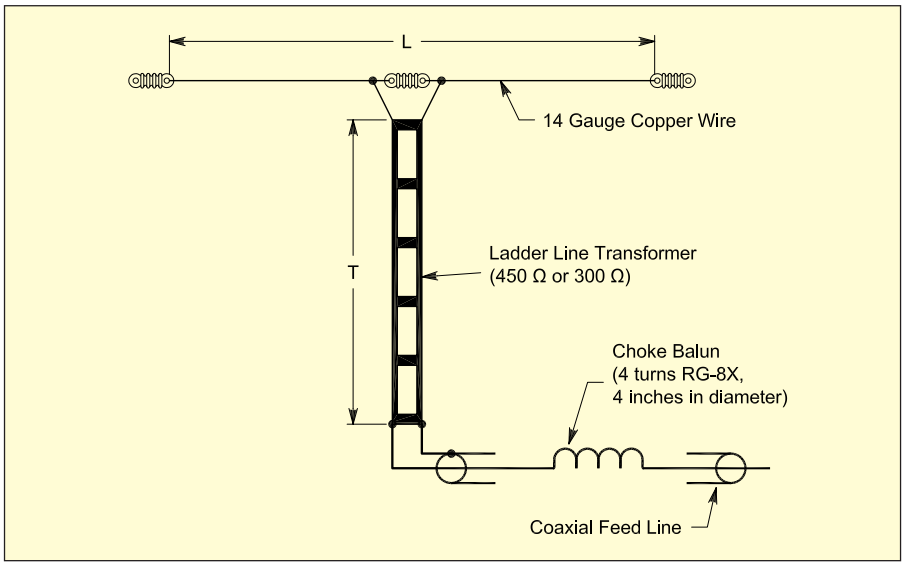


Figure 1—The antenna consists of a dipole of length L with a transmission line transformer of length T. The antenna is fed with coaxial cable through a choke balun.

Z_A = antenna load impedance (Ω)
Z_{in} = input impedance (Ω)
x = line length (feet)
f = frequency (MHz)
f_v = velocity factor of the line

A transmission line can be used as a matching network that transforms an antenna's impedance to a more desirable value. In principle, it should be possible to find a length for the antenna and matching section that results in an input impedance near 50 Ω on two frequencies by using Equation 1. In practice, this can be difficult; Z_A, the antenna impedance, cannot be computed from a simple formula and is usually found by simulation. An optimization program using impedance data from simulation software must be used to determine the proper lengths for the dipole legs and the matching section.

Actual Designs

Table 1 shows dimensions for several two-band dipoles. *EZNEC 3.0*,[2] in combination with *MathCAD 2000*[3] was used to develop the designs. All designs using 450 Ω ladder line were tested, except for the one for 75/40 meters. The designs are based on a velocity factor of 0.90 for the transmission line used as an impedance transformer.

The antennas were fed with 50 feet of RG-8X-type coax. A choke balun was formed at the connection to the ladder line by winding a coil of 4 turns of RG-8X that was approximately 4 inches in diameter. When the antennas were pruned to resonance, the measured input impedance was within 10% of the theoretical value. [Where the input Z for both bands is closer to 75 Ω, rather than 50 Ω, the use of 75 Ω coax (RG-6) as a transmission line would be advised, such as in the 17/12, the 17/10 and the 10/6 meter antennas. The choke balun should be made from the same cable.—*Ed.*]

It is not possible to design two band antennas for all band combinations using 450 Ω ladder line as the matching network. Additionally, some 450 Ω designs result in inconveniently long matching sections. Table 2 shows some designs based on 300 Ω parallel line:

These antennas are very simple to construct and erect, but there are some points that should be kept in mind:

1. These antennas are usually somewhat longer than other two-band designs using multiple wires or traps.

2. The bandwidth of these antennas is lower than a half wave dipole cut for the same frequency.

3. The radiation patterns on the two bands may be very different.

Summary

Figure 1 shows the basic antenna layout, which consists of the dipole, the transmission line transformer, the choke balun and the coaxial feed line. This two-band dipole is lightweight, easy to build and tune, and requires no special components such as traps or spreaders. They are ideal Field Day antennas for 12, 17 and 30 meter operation. Other band combinations besides those presented in the tables are possible. The combinations chosen result in dimensions of the antenna and matching section that are feasible for many amateurs.

Notes

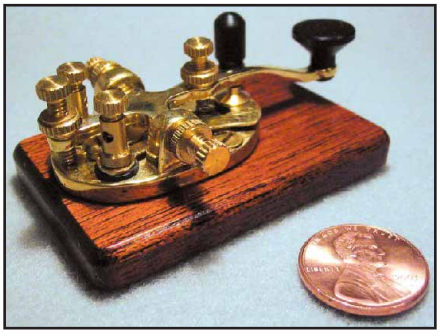
[1]Available from your local dealer or the ARRL Bookstore. Order no. 5625. Telephone toll-free in the US 888-277-5289 or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.
[2]**www.eznec.com**.
[3]**www.mathcad.com**.

Marc Tarplee, N4UFP, has a PhD degree in electrical engineering from the University of South Carolina. His research interests include semiconductor device modeling and computational electromagnetics. Marc is presently the Dean of the Engineering Technologies Division of York Technical College, Rock Hill, South Carolina. He has been a licensed ham for 15 years and is ARRL Technical Coordinator for the SC Section. He can be contacted at 4406 Deer Run, Rock Hill, SC or at **mtarplee@yorktech.com**. QST

FEEDBACK

◊ Thanks to the many *QST* readers who pointed out that we were snookered by the fake photo of the August 14 blackout in the Northeastern US (see October 2003, page 80). *Real* power blackout satellite images are available at several Web sites, including the US Air Force Defense Meteorological Satellite Program (**https://afweather.afwa.af.mil/news/black_out.html**), the Universe Today Web site (**www.universetoday.com/html/archive/2003-0818.html**) and NASA's Earth Observatory site (**earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=16273**). ARRL regrets the error.

NEW PRODUCTS



QRP J-38 TELEGRAPH KEY

◊ This key is a miniature version of the World War 2 J-38 telegraph key. It has all of the features of its larger ancestor. Constructed with over 30 parts, the QRP J-38 comes with an adjustable tension spring, key travel and bearing tension, a hand finished mahogany or optional black Bakelite style base and nonslip feet. The shorting switch and terminal posts function as in the original.

The design is constructed of brass at half scale size of the original—approximately 1.5 inches wide with an overall length of 2.5 inches.

Price $95. Contact Lee Hutchins, KA6IRL, PO Box 228, Oroville, CA 95965; **info@qrpj38.com**; **www.qrpj38.com**.

By Bill Tynan, W3XO

AO-40 for Us Appliance Operators

Setting up a station for the OSCAR 40 satellite is easier than you think.

S band is too hard."

"I lost interest in AO-40 when it exploded soon after launch."

How often have you heard remarks like these concerning Amateur Radio's newest and still most capable high-altitude satellite? Phase 3D, as it was called prior to launch, was dubbed AMSAT-OSCAR 40 soon after being hurled into space atop a huge Ariane 5 rocket. Those listening in those first few days were enthralled by strength of the 2 meter beacon signal.

AO-40 Runs into Trouble

This most ambitious Amateur Radio satellite to date was some 10 years from concept to launch. Much hard work and a great deal of money went into its design, construction and testing. The amateur community was primed to enjoy this high-powered spacecraft that would always have its high gain antennas aimed toward Earth. But, despite its advance publicity and the rock-crushing strength of the 2 meter beacon signal, this promise was not to be fully realized. Following an unfortunate propulsion accident a few days after launch, the 2 meter beacon went silent. It was feared that the satellite, to which so many people had contributed much time and money, was completely dead—possibly only a cloud of orbiting aluminum shards. But, not only was it later discovered that AO-40 was still in one piece, but on Christmas Day 2000, the satellite was brought to life—a feat accomplished by long hours on the part of the dedicated volunteers comprising the AO-40 command station team.

Then followed weeks of intensive work by these same people who operate this worldwide network of specially equipped stations. Using sophisticated computer software, they made complex calculations. They spent many sleepless nights testing AO-40's various systems to determine the ones that were still usable and those that had apparently been lost forever.

One of the first things concluded was that AO-40 would never be heard again on 2 meters. What a blow! Also the 70 cm (435 MHz) transmitter, which was inoperable just after launch, continued to be nonfunctional. On the other hand, the fact that the satellite was accepting commands through both L band (1269 MHz) receivers demonstrated that they were working and that the short backfire antenna they share was still in one piece. Both S band transmitters were tried and found to be operable. But, unfortunately, one failed soon afterward. The two 10 GHz transmitters could not be activated, but the 1 W, 24 GHz unit was okay. It was also determined that the 70 cm receiver, and its array of six patch antennas, worked fine. That left AO-40 with a 70 cm and two 23 cm uplinks, plus S band (2401 MHz) and K band (24 GHz) downlinks. It was the realization that neither the 2 meter or 70 cm downlinks would ever be heard, which prompted so many to lose interest in the new spacecraft. Even dedicated satellite operators, already equipped for AO-10 and 13, gave up on AO-40. In my opinion, they should not have.

AO-40 Not That Hard

This article is aimed at showing how one admitted appliance operator became operational on this very capable satellite!

Although, over the years, I have built some of my own equipment. For various reasons, I cannot do the fine work required to assemble high performance microwave gear—even from kits. So, I was not about to tackle the task of building a precision low-noise S band receiving system; many such units employing surface mount technology. Besides, it would have to be weatherproof, or I would have to use a run of huge low-loss hardline to get from the antenna to the shack. It was just too hard! So how could I acquire the S band

Figure 1—Overall view of AO-40 antenna installation at W3XO/5.

Figure 2—Dish mounting.

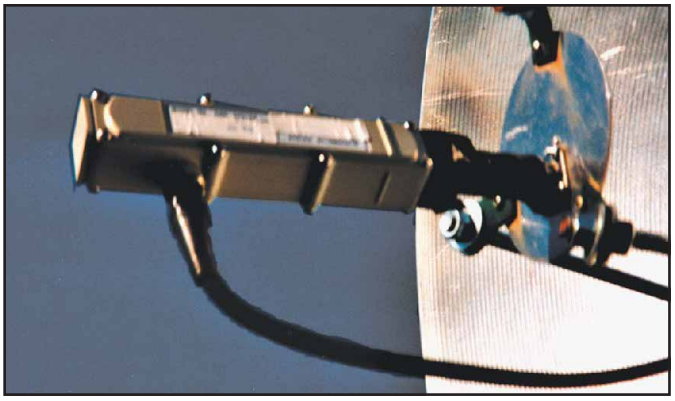


Figure 3—Close-up of downconverter/patch feed assembly.

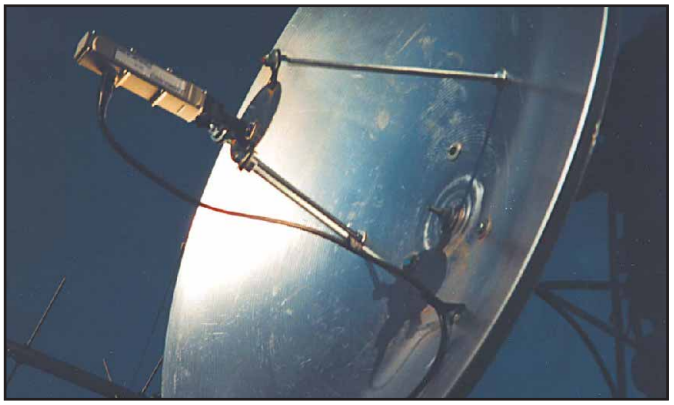


Figure 4—Close-up of dish showing downconverter and patch feed mounted at focal point.

capability needed to receive the weak 2401 MHz signals from AO-40? A little thought soon convinced me that a simple approach was possible. And, if it was possible for me, it is certainly within the reach of many other hams; particularly those already equipped for earlier high-altitude satellites.

So where does an appliance operator find the exotic equipment needed to receive AO-40's S band downlink? Receiving satellite signals on 2.4 GHz is not as difficult as it might seem. If your family gets its TV from what is termed "wireless cable," you are receiving signals only 100 MHz higher than those coming from AO-40. If you use one of the small-dish satellite systems, you are receiving on 12 GHz, a much higher frequency than AO-40's S band downlink. It is the wireless cable industry that provides a simple approach to reception of AO-40, making it "duck soup" even for us appliance operators.

There are, of course, a number of ways for getting on AO-40, but I will concentrate on how I accomplished it.

After trying to hear the satellite's 2401.323 MHz beacon signal with one of the so-called barbeque dishes and not succeeding, I decided to go for something a little larger. That was a 90 cm (34 inch) diameter solid dish from Down East Microwave.[1]

What about a downconverter? There are several approaches to this. Down East Microwave has both kits and pre-built units especially intended for AO-40 reception. SSB Electronic is another firm offering such equipment. My approach was to take advantage of gear intended for wireless cable. These units are installed outside the house, so they are weatherproof. They convert the 2500 to 2700 MHz signals transmitted by the local wireless cable station to cable channels. Thus, TV sets in the subscriber's home can be tuned to these cable channels to receive the various channels offered by the system.

The specific unit I chose was the AIDC 3731AA, as modified by Bob Seydler, K5GNA.[2] Modification consists of changing the crystal so that 2400 MHz signals are converted to the 2 meter ham band. This permits AO-40's S band signals to be copied on CW/SSB receivers or transceivers for that frequency range. The unit is only about 1 inch square and about 5 inches long. K5GNA can supply it with an attached dipole and rear mounting, so the entire assembly can be mounted in the center of a dish. For the real appliance operators, he has a "plug-and-play" system that includes a 2 × 3 foot grid dish. However, a dipole feed provides only linear polarization, whereas circular is preferred. So, I chose the downconverter with an N connector. The only other connector on the device is an F type for 75 Ω TV cable. Power is supplied through this cable, so you do need to provide a device for sending 15 to 30 V dc 165 mA up the line, while blocking it from your 2 meter receiver or transceiver. I used a RadioShack unit originally intended to power a mast-mounted TV preamp.

With the dish and downconverter in hand, what do I do for a feed? If you are satisfied with the additional fading, you can opt for the unit with the built-in dipole, but I decided I wanted circular polarization. Many use helixes that can be homebrewed using a few turns of heavy solid copper wire. Numerous articles have appeared on constructing such feeds. But, I had become intrigued by the patch antenna as a dish feed. Several articles have appeared on constructing both dual band (L and S band) patches as well as those meant for a single band. They don't appear too difficult to build. But, being an appliance operator, I obtained a ready-made S band unit from Robert Suding, WØLMD.[3]

Now I had everything I needed. I already had an azimuth/elevation rotator and a 70 cm circularly polarized antenna left over from the heydays of AO-10 and 13.[4] There would be no need for the 2 meter crossed Yagi and preamp which served so well back then. All that was left was to find a way to mount the dish to the crossboom and the feed/downconverter assembly at the dish's focal point. The idea for mounting the dish was suggested by Jim Akers, W5VZF. He had used one of his wife's old frying pans, removed the handle, drilled holes through the pan and matching holes in the dish. Then, using U bolts, he mounted the pan on the crossboom and ran screws through the holes in the pan and dish and fastened with nuts and lock washers. I wasn't successful in talking my wife out of one of her old frying pans, so I went to a local store and came home with an aluminum cake pan stout enough to support the dish. Down East Microwave sells a ring that also provides an appropriate support for this size dish.

I have already noted that I chose the 3731AA downconverter equipped with a female N connector. The WØLMD patch feed came with a similar connector. So, I needed a double male adaptor to connect them. WØLMD informs me that he can supply the patch with a male N connector, making the adaptor unnecessary. Thus, the downconverter is directly connected to the patch feed—no feed line and almost zero loss.

Now for mounting the assembly at the focal point. Where is that? Since this is a symmetrical dish, not one of the off-center-fed type, it's at the center. But, how far out? There are several approaches for finding the focal point of a dish. Since it's a solid aluminum dish, it reflects sunlight very well. So I simply propped the dish up facing the afternoon sun, took a piece of paper and moved it in and out until I got a concentration of light. By the way, it got warm rapidly. Then I measured the distance to the dish center. I later checked the result with a formula

[1]Notes appear on page 50.

from the *RSGB VHF Handbook* and obtained a nearly identical number.

Okay, so I know where I want to mount the patch feed/downconverter assembly, how do I do it? The dish comes with three 1/4 inch holes. Being the conservative type, I drilled them out to take 3/8 inch screw stock that I obtained from a local hardware store. I now believe that 1/4 inch stock would have been adequate. Then I made three simple brackets to fasten the patch to the three pieces of screw stock. It came out within a few tenths of an inch of the concluded focal point. At this point, I decided I was close enough, so I quit. Then it was simply a matter of connecting the 75 Ω coax to the downconverter and running it into the shack. I connected it to my ICOM R-7000 receiver. I had decided to use that rather than my FT-736R, so I could not put RF into the downconverter. Believe me, people have done this, then wondered why their downconverters suddenly became deaf. By the way, both SSB Electronic and Down East Microwave offer devices to prevent this. Also, K5GNA provides a 6-dB attenuator with the plug-and-play package to reduce excessive IF gain and afford burnout protection. RadioShack also has an in-line 6 dB attenuator (Model 15-1257) using 1/8 W resistors that will burn out and open rapidly, should you accidentally key your transmitter on 2 meters.

Operating on AO-40

Now it was time to turn on the computer and bring up *InstantTrack*.[5] Yes, I still cling to this *DOS*-based program. I noted that AO-40 was within range and pointed the dish at the indicated azimuth and elevation, then tuned around. Don't expect the mid-band beacon to be exactly where you think it should be. For one thing, Doppler will shift it by up to roughly 30 kHz either side of its actual frequency. In addition, your down-converter crystal may not be on exactly the right frequency to convert 2400 MHz to precisely 144 MHz. Thus, the 2401.323 MHz beacon may not appear at 145.323 MHz, even at zero Doppler. You may have to tune around as much as 50 kHz or more before you acquire the raspy sounding beacon signal.

Once you do, adjust the dish azimuth and elevation for maximum signal. You will find that, once you have done this, you won't have to touch it up more than about every 15 minutes or so. Tune up from the beacon. Most operation is above it. If the transponder is activated, and it is throughout most of each orbit, you should start to hear CW and SSB signals. A word about the uplink is in order. For the antenna, I use a 70 cm M[2] 30 element circular Yagi. The FT-736R and the same 100 W solid-state amplifier I employ for 432 MHz terrestrial work, serves as the transmitter. But I must cut the power back, to about 10 to 20 W at the antenna or I will be greeted by the warbling tone of AO-40's uplink power-monitoring system, better known as *LEILA*, telling me to reduce power.

Working AO-40 is just like it was on AO-10 and 13. For those with satellite-capable transceivers, tune your receiver to the beacon and your transmitter to 435.667 MHz. This is the uplink frequency that will put you on the beacon frequency. Now lock your transmitter to your receiver in the reverse tracking mode. As with AO-10 and 13, AO-40 inverts the signals. Now tune off the beacon at least 20 kHz. The command team asks that you not operate closer than that to the beacon. Pick a clear spot, unlock your transceiver and send dots while tuning your transmit frequency back and fourth until you hear your signal coming back. Now, re-lock and adjust power so that you have a readable signal, but not too strong or LEILA will be on you in an instant. She represents the only major difference from what we were used to with AO-10 and 13. Those using separate transmitters and receivers, as I presently do, will have to find themselves each time they change frequency. Now call CQ on CW, or switch to *lower* sideband and put out a voice call. The inverting transponder, of course, causes LSB to come out as USB.

This is how one appliance operator got on AO-40. It wasn't hard, and I have had many nice conversations with hams all over the world. However you decide to do it, the bird provides many hours at a time of satellite hamming.

You Say You Can't See the Satellite for the Trees?

There is one problem many face, which I do not. Trees can cause significant attenuation of S band signals. This is particular a problem in the northern states, where the elevation to the satellite is lower and trees tend to be taller than where I live in south Texas. Other than getting out the chain saw, all I can suggest is an elevated antenna installation; or portable operation. It would be quite easy to mount this size dish, or a smaller one, on a tripod, or on a plate that can be placed in the bed of a pickup truck or on a small trailer. You'll need an SSB/CW radio which can receive on 2 meters and transmit on 70 cm and is capable of vehicular operation. Several transceivers are available that fill this bill. Wouldn't it be fun to sit in the park, or beside a lake, while working the world on AO-40? What a neat ready-made Field Day setup!

One factor you should familiarize yourself with is AO-40's operating schedule. As noted, the transponder is not active throughout the entire orbit—although it is during much of it. The AMSAT-UK and AMSAT-DL Web pages, accessible through the AMSAT-NA site at **www.amsat.org**, carry current information.

Come Join Us

Whether you operate from your shack or in the great outdoors, I'm certain you'll enjoy AO-40. I'll be looking for you.

And, if you're not already a member of the AMSAT group in your country, please consider joining. Through AMSAT membership, there is strength and more exciting Amateur Radio satellites to come. Check the AMSAT-NA Web site for further information.

Notes

[1]Steve Kostro, N2CEI, proprietor of Down East Microwave Inc (**www.downeastmicrowave.com**), tells me that shipping the 90 cm dish is too expensive, so he does not list it in his catalog. However, it is available at his establishment and at conferences at which DEMI is present. These include the Dayton Hamvention, the Central States VHF Society Conference, the Northeast VHF Conference and the Southeast VHF Conference. He does have a 60 cm dish that can be shipped. Many stations I have worked on AO-40, particularly in Europe, are using 60 cm dishes. I simply wanted to be sure I had enough gain to ensure success, so I went for the larger one.

[2]Bob Seydler, K5GNA, 8522 Rebawood, Humbel, TX 77346; **k5gna@aol.com.**

[3]WØLMD provides information on constructing patch feeds at: **www.ultimatecharger.com/Dish_Feed_S.html**. He might also be persuaded to supply a few pre-built ones. Another approach is that supplied by K3TZ at **qsl.net/k3tz/index.html**. Tim details the construction of an S band patch. I am told it works well, too.

[4]Those not already equipped with azimuth and elevation rotation systems can use the scheme I used before I acquired my Yaesu 5400. Find an old TV rotator, the kind with a hole all the way through, such as the Alliance U-100. Mount it horizontally, with the crossboom through the hole. Then mount the entire assembly on a conventional rotator.

[5]*InstantTrack* and other satellite tracking programs are available from AMSAT-NA, 850 Sligo Ave, Silver Spring, MD 20910; tel 301-589-6062; **www.amsat.org**.

All photos by the author.

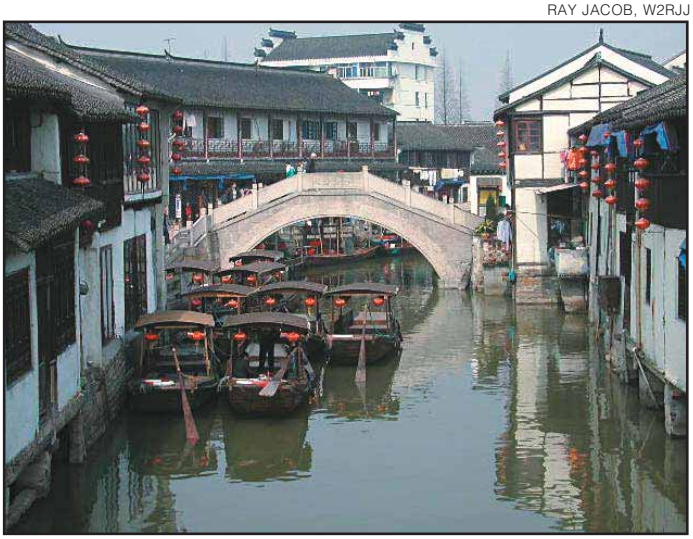
Bill Tynan, W3XO, was one of the founders of AMSAT in 1969 and served as its first Vice President for Operations. He became President of AMSAT-NA in 1991 and served in that post until 1998. Bill recently retired as a member of the AMSAT Board. Bill was also the editor of QST*'s "The World Above 50 MHz" column from 1975 through 1992. He continues his interest in VHF and is active on all bands from 50 through 2304 MHz, as well as AO-40. You can contact Bill at 1054 Indian Creek Loop, Tierra Linda Ranch, Kerrville, TX 78028-1736;* **w3xo@amsat.org**.

By Ray Jacob, W2RJJ

The QTH Is Shanghai

Enjoying Amateur Radio from a different cultural point of view.

RAY JACOB, W2RJJ



Shanghai Municipality extends west to an area with many lakes and rivers from which ancient fishing villages grew. This village is a one hour drive from the city's center.

Finishing a hot meal of turnip cakes, shrimp dumplings and chicken mai-fun, I look out the window and observe the midday traffic getting drenched in a torrent of rain. Throngs of bicyclists covered in yellow and grey ponchos are moving effortlessly among swerving taxis and buses; their determined pedaling is unaffected by motorists so aggressive as to humble a New York City cabby. A steaming pot of jasmine tea makes me forget the aches and exhaustion from yesterday's 18 hour economy-class flight. I feel rejuvenated and ready for action on 15 meters, as portable BY4.

A week earlier, Ming and I were in New Jersey preparing for the trip and wondering about my permit. It should have arrived in the mail weeks before, and now we figured something was wrong. I didn't want to board the plane until permission to operate was secured, so we telephoned the Chinese Radio Sports Association in Beijing, and connected with Mr Chen, BA1HAM. He's the CRSA Secretary General. It was immediately clear that my application never got to them, and he offered to expedite the permit process for me electronically. All I had to do was fax him my paperwork and email a photo. Within hours of that phone call, my permit was on its way to our Shanghai address. Mr Chen didn't even mention the $5 permit fee; I sent it to him later by regular mail.

Ming and I have been visiting Shanghai since we were married in 1985. It's her birthplace, and for one month each year we call it home. As it turns out, Shanghai is a good place to operate ham radio. The city has many excellent stations throughout, configured with radios and antennas for HF, VHF and UHF. Some are equipped for digital operating, and one even boasts moonbounce capability. China thinks of ham radio as a way of reaching out to foreigners. The courtesies extended by their regulating authorities, and by the local hams, bear this out.

The Chinese visitor's permit authorizes operation from stations assigned the BY prefix. BYs are club stations, usually found in middle schools, universities or the neighborhood children's palace, and are an example of a determined effort to integrate ham radio into the general education system. There are 94 club stations in Shanghai, so finding operating opportunities is easy, especially with the help of the Internet. Each BY is managed by a *station master* who is responsible for operations, maintenance and radio curriculum. The "masters" treat their stations as an accessible resource for students and visitors, and they showed great accommodation in getting me on the air.

If you look at a map of China's eastern seaboard, you'll find Shanghai at the halfway point between North and South, sitting on the bulge that pushes into the East China Sea. Its latitude is close to Jacksonville, Florida. This is China's largest city, home to 14 million people and covering 6200 square kilometers. I became acquainted with Shanghai's Amateur Radio culture from my experiences operating portable BY4 on each of my last three visits. What follows is a brief account of what I learned, and of the great people I met.

I Meet Some of China's Future Hams

I found Zhang Min, BG4ADR, while searching the Internet for stations to visit. Our e-mail correspondence led to a face-to-face meeting at the gates to the Shanghai #3 Girls' Middle School, where "Jack" (Zhang's English name) teaches math and serves as master for the BY4CYL club station. Their shack sits atop a spiral staircase inside the old campus water tower, and I suppose it would feel distinctly familiar to those who have operated from a lighthouse. Up on the roof, at about 90 feet, a HyGain TH7DX antenna peers toward the horizon. A room below the shack, just large enough for a blackboard and some desks, serves as the classroom where Jack teaches a ham radio course that prepares students for the basic license exam.

He gave me an opportunity to speak to the class one afternoon, where I delivered a presentation about Amateur Radio in America. The students were attentive, and handled my English with ease. They understood about computers and space, and easily digested concepts linking these to Amateur Radio. I thought about how these bright young girls might someday make their own mark on the hobby by becoming skilled operators and teachers themselves, or perhaps even contributing a technical innovation. For now, they are clearly benefiting from an education culture that provides such easy access to ham radio.

As an operator, Jack likes working phone and SSTV on HF, and during my last visit he was busy installing a 70 cm vertical antenna on the roof in preparation for the station's new IC-2720H transceiver. Over the course of many meetings, we explored PSK31 and MFSK16, shared stories about our lives, and became friends.

Like many Shanghai residents, I get around on bicycle. Mine is a single-speed job with hand brakes and a basket large enough for my radio carry-ables. For long hauls I can flag down a cab easily, or else squeeze onto a crowded bus. Streets signs are printed with Chinese characters and *ping-ying* English, a phonetically derived equivalent of the Chinese name. It's easy enough to match the ping-ying against a good tourist map and know where you are.

It's a 20 minute bike ride along Fuxing Road from my apartment to the Huangpu district Children's Palace, where Bony Dai, BA4EE, spends a lot of his time in the fourth floor shack. You might find him teaching, operating or hosting a gathering of hams if it's the weekend. That's when he opens the BY4BNS club station to anyone needing a place to operate. Drop-ins can come for help with a repair or else to see friends, and the station's high availability helps local hams get on the air, especially those who can't fit an antenna at home. During my first visit, I noticed several interesting Morse keys, some military, lying about the room. I knew I was in the presence of a fellow key collector, and so did Bony, once we began discussing them. We have since made a few exchanges between us, and now I am very proud to show off my keys to the gang back home. Bony also enjoys mountain climbing, and his love for the outdoors has led to his participation in several DXpeditions.

Every year, teachers from neighboring schools send about 100 students to BY4BNS for a ham radio demonstration. Bony tells me that a handful of kids will enroll in his Amateur Radio class, and that about five make it through to getting a license. The instruction Bony provides is part of a broad learning program that exposes kids to technical activities like art, music, astronomy and photography. The program is implemented at the children's palace within each of Shanghai's 20 school districts.

Jack and Bony represent the first of a new generation of hams in China. They are career oriented, college educated and average around 30 years old. Many have a good command of English. They were teenagers in 1994 when China made license testing available, resurrecting a hobby that was silenced in 1950 when the Communist Party won control of the country. Like their counterparts in America, Bony and Jack saw Amateur Radio as a unique domain for technical experimentation and fun, and they jumped at the chance to get a license when it was offered.

RAY JACOB, W2RJJ

Zhang Min, BG4ADR, in front of the old water tower on the campus of the Shanghai #3 Girls' Middle School. The tower has been converted to house the school's ham radio station, BY4CYL, and a classroom.

Shanghai's First Ham

It is customary in China to greet your visitor with a cup of hot tea. This gesture demonstrates the host's desire to make the guest feel comfortable and welcomed. And so it is that upon entering Shanghai's only ham radio shop, its proprietor, Mr Xu Ru, BA4AA, greets you with a warm smile, tea in hand. In Xu Ru's shop you can buy Chinese-made keys and paddles, log books and other accessories. Behind the small display case, lying on shelves, are American-made beams and verticals in their boxes. Radios are not a stock item, but he'll order one for you, or ship a broken one for repairs. He's the elder statesman of Amateur Radio, and proudly introduces himself as Shanghai's first ham (look at the call). Xu Ru is known well among Shanghai's amateurs. He's an Elmer, and many stations owe their excellent antenna installations to his expertise. I always enjoy my tea with Xu Ru, and so does my wife, who has also become his friend.

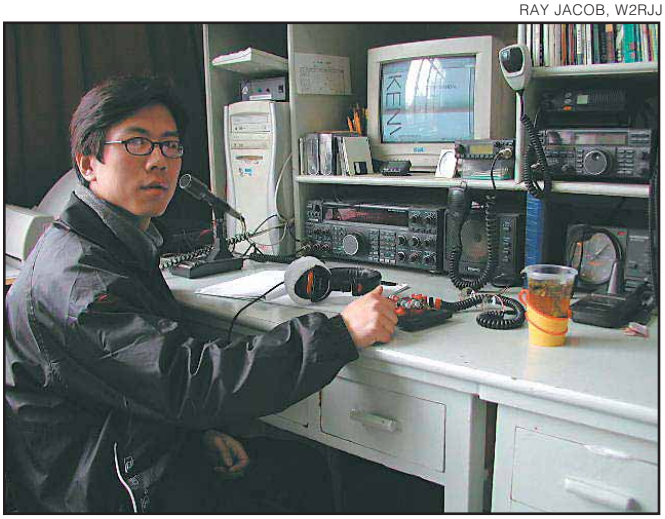
A few steps down the hall from Xu Ru's store are the offices of the SRSA and its impressive station, BY4AA. Xu Ru was once its station master, a task now belonging to Chen Yuan Chang, BA4EH. Chen is an ex-military telegraphist, and so a mutual interest with Morse will give us lots to talk about in future meetings. He's glad to open the roomy station for visitors, and when I operated, I was greeted with a pileup that took two hours to work through. Several operators can be on the air simultaneously working into several Yagis and a wire.

The SRSA station is used for training and demonstrations. It is also used to evaluate young hams hoping to participate in the annual student exchange program between the SRSA and Japan Amateur Radio League (JARL). The candidates are teenagers who have been chosen as the best operators from their school district. They are tested on kit building skills and performance during on-air contests. The winners spend two weeks in Japan as guests of the JARL, while the young Japanese team is hosted in Shanghai.

CQ CQ DE W2RJJ/BY4

I adjusted quickly to the frequent pileups that occur when I CQ from Shanghai (my 100 W station in New Jersey never attracted one!). I was late, however, in appreciating my new role in the spotlight,

RAY JACOB, W2RJJ



Bony Dai, BA4EE, is the station master for BY4BNS at the Huangpu District Children's Palace. He participates in DXpeditions and collects military keys and radios.

and my casual ragchewing had to have frustrated many who just wanted to make the contact and be gone. For 2003, my third BY4 experience, I decided I'd better develop some basic pileup management skills, setting a goal to work stations quickly and maintain operating consistency. My transition toward this goal wasn't as easy as I thought. I read Martti Laine's (OH2BH) *Where Do We Go Next?* to learn what DXing was all about. I started listening to contest operators to learn efficiency, then practiced with a code oscillator, mimicking their style until I got comfortable executing a barebones exchange. The homework paid off, and in 2003, I quadrupled my QSO count compared to the previous years. More importantly, I gave the DX hunters what they wanted and let them move on.

The BY4 station masters will tell you that early morning is a good time to work the USA. "Come at 7:30," they'd often say. "We'll point the antenna northeast toward Japan." My schedule wouldn't let me operate before 10 AM, and by that time stations from Japan, Russian Federation (mostly the eastern oblasts directly north of Shanghai), Korea and the South Pacific were out in force. As morning became early afternoon the action would shift westward, first toward Kazakhstan and Ukraine, then to northern Europe by 2 PM. Near afternoon's end I would work into Western Europe with the antenna pointed northwest.

One late morning I could just barely hear US stations calling in between the dits and dahs of the much louder JAs. I responded quickly, USA ONLY PLS, and the frequency was suddenly quiet enough for me to work the States for the next 30 minutes. This was a one-time-only event. Other times, whenever I worked a US station, I hoped a run would develop. But it was always too late in the morning.

Except for a handful of digital and SSB contacts, I always worked the paddle on 15 and 20 meters. I brought along a battery powered keyer in case the station radio was without, and a handful of plug adapters. The output power of the radio never exceeded 100 W.

Moonbounce, ATV and Cisco Routers

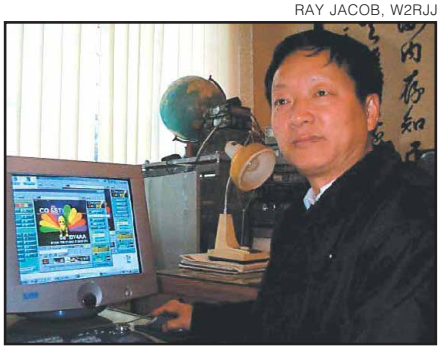
Rhode Island is 140 miles away from my home in New Jersey, but I never worked a station from there until I heard Tom, K1TL, call me at BY4BJA. I smiled when I heard, QTH RI. Here I was at the Jing-An Children's Center of Science and Technology, an after-school learning facility with its own astronomical observatory. I arrived at the Center for my first meeting with the Assistant Director, and found the lobby bustling with parents rushing their kids to class even though it was Saturday. Feng Jing-Hua, BZ4DJR, introduced himself and led me to the BY4BJA station where I spent the first 15 minutes sipping tea and acquainting myself with the IC-756 transceiver in front of me. As CW operating relies on frequent filter and RIT adjustments, these are the controls I first look for on an unfamiliar radio. Jing-Hua returned later on and we went to the roof for a peek at the antennas. In May 2001, he completed the first US/China moonbounce contact on 430 MHz using an array of four 20 element Yagis antennas and a 100 W Mirage UHF amplifier. The contact was made using slow CW. I didn't let the rain keep me from taking pictures. Before we said goodbye, Jing-Hua explained his interest in bringing ATV to the Center's station. I'm quite sure he'll make that happen.

A few days before leaving Shanghai I visited East China Normal University, which is where BY4AEE is located, in a real "shack" on the roof of the Physical Sciences Building. It was 4 in the afternoon and the bands were quiet, so I hunted around on 15 meters and answered CQs from stations mostly in Ukraine and Byelorussia. Between QSOs I chatted with Fei Jia-Jun, who was sitting next to me. He's a student majoring in computer network engineering, and the one who got me access to the station. Since I, too, work in the networking field, it was natural that we fell into a discussion about Cisco routers, switching and VLANs. Jia-Jun began hamming in high school, but the demands of college and intern assignments leave him with too little time for the hobby. He'll reactivate as soon as his schedule relaxes a bit. I enjoyed my visit to BY4AEE, and as the sun was near setting, we turned off the radio, killed power to the shack, and climbed down to the street. A day or two later, Jia-Jun invited me to the network training lab where he teaches IP routing. I had to decline the offer, as I had just a few days to prepare for the journey home.

CHEN YUAN CHANG, BA4EH

The author operating BY4AA, club station of the Shanghai Radio Sports Association.

RAY JACOB, W2RJJ



Chen Yuan Chang, BA4EH, demonstrating SSTV. He's the station master for BY4AA at the Shanghai Radio Sports Association.

Destination Shanghai

There is no reciprocal licensing agreement with China, so if you want to operate during your stay, you need to obtain a visitors' operating permit from the CRSA. It comes laminated with your picture, and is slightly larger than a QSL card; it makes a nice souvenir. To get one, send a photocopy of your passport and ham license, $5 US and a passport photo to their office in Beijing. Information is available at **www.crsa.org.cn**. The transaction is very smooth, notwithstanding this year's mail problem, and the turnaround has been about one month. The permit will indicate your operating privileges and must be presented to the station master before operating.

I can't say for sure that I would have ever visited Shanghai had I not married a girl from there. I'm sure grateful for the opportunity, though, and if you happen upon a chance to visit, do take advantage. This is one of those cities that will offer any traveler a deep cultural experience. Its long past is celebrated everywhere in the living preservation of custom and architecture, yet Shanghai stands as the model for China's technological and economic readiness for the 21st century. The radio amateurs I met there share my own enthusiasm for the hobby and its camaraderie. I was 8000 miles from New Jersey, and felt right at home.

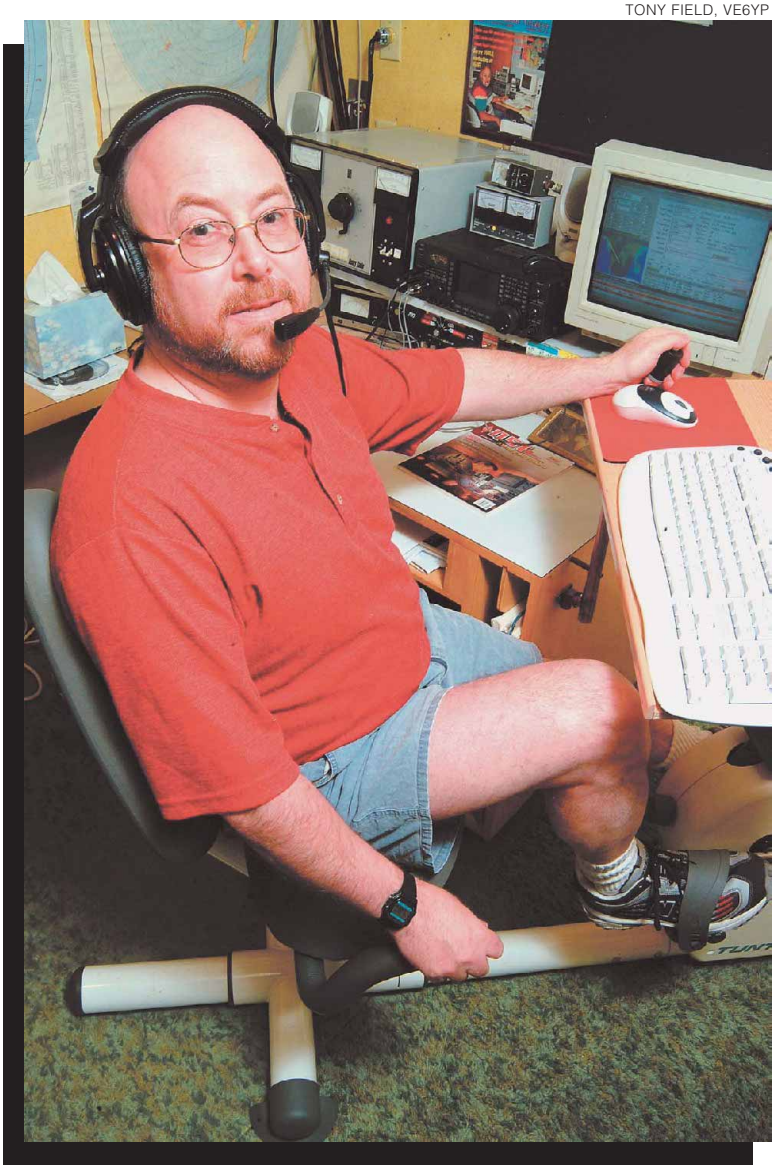
Ray Jacob, W2RJJ, has been an SWL his whole life and got his first ticket in 1996, at age 39. After upgrading to General, he began working CW, PACTOR and RTTY on HF. Since then, he's explored all the digital modes, but CW remains his favorite. Ray works for the City of New York as an Information Technology manager, where he oversees network design and administration for a large agency. He enjoys writing and has been published in CQ *and* Popular Communications *on topics where the radio and PC come together. Ray is a member of the ARRL and the Bergen Amateur Radio Association in New Jersey. You can contact the author at 633 Johnson Ct, Teaneck, NJ 07666-4218;* **rjj@hpd.nyc.gov**.

By Paul Taenzer, VE6PY

Exercise and Ham Radio—Why Not?

It's no oxymoron. The author has been biking his way to fitness for 15 years... and he's still at it.

TONY FIELD, VE6YP



Surprised? So was I when I contacted a CW operator on his exercise bike in the late 1980s. I tried it and just didn't feel that my fist was up to the task. I decided to try SSB and have never looked back.

Over the years, many of the hams I've talked with while huffing and puffing away have been intrigued and some have suggested that I write an article about "exercise bike mobile" (EBM). Many more have suggested that I go the final step and generate my own power while I'm at it.

What has intrigued me is how this simple idea solves one of the most irksome problems with regular exercise: It's boring. Some people try their luck watching TV while exercising. It's a good idea, but it usually helps for only a few weeks. Now try doing something that's really fun while you're exercising, and you've got the magic you need to actually look forward to getting on that bike! What's more fun to a ham than ragchewing on the radio?

Shack Mods

Over the years, I've made some changes to the shack to make operating from the bike convenient and passably ergonomic. My goals have been to be able to operate the radio, do my logging and turn the beam while continuing to sit upright and peddle. Two major changes were required. The first was to computerize the shack so that all the necessary controls could be accomplished without sitting directly in front of the radio and rotator controller. The second was to find a comfortable exercise bike that would also allow me to position a keyboard tray and monitor ergonomically in front of me as I peddled.

These days computerizing the shack is accomplished quite easily. I use an ICOM IC-756 transceiver and the *YPLog* software that, along with the Rotor-EZ modification to the TailTwister rotator control box allows me to do everything from changing frequency to turning the antenna to logging my contacts from the keyboard. Adding a wireless keyboard and mouse allows me to shift these between the bicycle and "usual" operating positions without fussing with wires. The only wired part of the station that requires attention is PTT for the radio. I shift between a foot switch, which in my shack is a recycled Dictaphone transcription switch unit, and a hand switch for cycling. I use an SPST push-button switch mounted inside a 35 mm plastic

film can. It costs less than a dollar and works perfectly. A Heil Boomset does an admirable job handling the sound interface with the rider/operator.

The Bike

The bicycle has several roles to fulfill. It should be comfortable; I choose a recumbent design. It should also be quiet. Who enjoys a QSO with a station transmitting a lot of background noise, even if he *is* exercising? Newer bikes that use "magnetic resistance" instead of friction belts on a drive wheel are both smooth and quiet, but a bit more expensive. The last requirement takes some ingenuity: ergonomic placement of the keyboard, mouse and monitor. I chose the Tunturi F520 because the instrument console is low to the ground and allows me to place a keyboard tray in an adequate position for "mousing" and typing. The tray is higher than it should be in order to clear my knees. Ergonomically it's good enough for the occasional typing needed to record QSO data.

Monitor placement is another challenge. I thought about using a videocard that would allow me to use dual monitors. This would allow optimal placement of each monitor for the usual and the cycling operating positions. While this would be ideal, it's also expensive. I realized that by moving the monitor to a midway point between the operating positions, I could comfortably look a bit to the left while peddling and a bit to the right while seated and save my money! It's worked very well in my shack. If the operating positions were more distant, the dual monitor solution would be necessary.

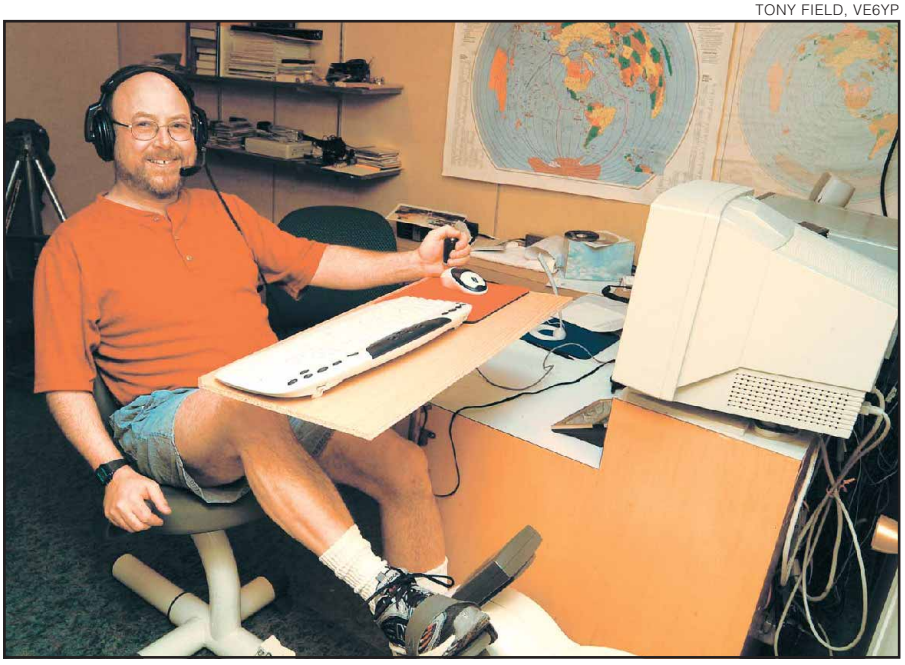
Operating EBM

Operating "exercise bike mobile" is quite simple. I look for a clear frequency in the "ragchew" portions of the 20, 15 or 10 meter bands, and call CQ. I make a point of positioning the mike at about the level of my chin so that I avoid directly blowing into it as I'm speaking. I believe that reduces the amount of huffing and puffing that gets transmitted. I also make a point of letting the other station know what I'm doing. Aside from being a good topic of conversation, they worry less that they're talking to a fellow ham who is about to have a heart attack! I also make a point of adapting the amount of effort I expend on peddling so that I can talk relatively comfortably. This usually means starting the exercise session peddling more slowly and speeding up as my body adjusts to the exertion. I also peddle faster while listening then while speaking.

Over the 15 years I've operated EBM, I've logged many enjoyable contacts—and have kept fit as well. As for generating my own power, I'll leave that ultimate refinement to one of you. I've not yet had a QSO with another EBM station. Give it try and let's make a sked!

[*Editor's Note:* Consult a physician before beginning any exercise program.]

TONY FIELD, VE6YP



A few shack and computer mods allows the author to operate EBM (exercise bike mobile).

Paul Taenzer, VE6PY, was first licensed in 1965 as WN1DPU. He operated, mostly on 6 meters, through high school in Lexington, Massachusetts, with a General class license, WA1DPU. He reentered the world of ham radio in 1987 as VE6CSZ and has held that call sign since about 1990. His ham radio passions include DXing on HF and 6 meters, contesting and HF QRP backpacking the magnificent Canadian Rocky Mountains. Paul's wife Judith, VE6RAL, and children April, VE6PYD, and Joseph, VE6PYJ, also actively use their ham radio skills for communication in the wilderness. VE6PYJ, who is now 17, shows great promise as a contester. In his other life, Paul is a clinical health psychologist specializing in helping people with serious chronic illnesses to lead fulfilling lives. You can reach the author at 207 Canova Pl SW, Calgary, AB, Canada T2W 2E9; **ve6py@rac.ca**. QST

STRAYS

I would like to get in touch with...

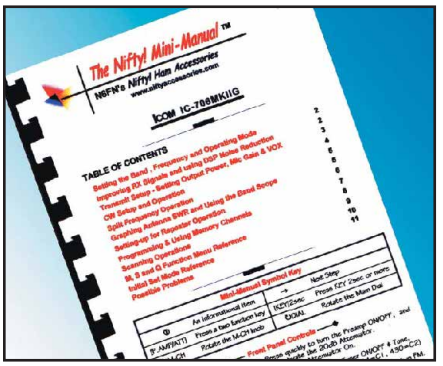
◊anyone with information about the logbook of Reginald Fox, AC4YN, who operated from Tibet before 1950. I am also interested in information about other hams who operated from AC4 pre-1950.—*Roger Croston, Eaglescliffe, 4 Bridge Dr, Christleton, Chester, CH3 6AW, England*

NEW PRODUCTS

IC-706MKII-G QUICK REFERENCE MINI-MANUAL

◊Nifty Ham Accessories announces the addition of the ICOM IC-706MKIIG Nifty Mini-manual to its series of quick reference guides. In 12 pages, the guide provides simplified step-by-step instructions for setting up and operating the '706MKIIG. Printed in color and laminated for durability, this 4.5 × 8 inch spiral bound guide is designed to be kept with the radio—so it's there when you need it.

Price: $16.65 plus shipping and handling. For further information see **www.niftyaccessories.com**, or contact Nifty Ham Accessories, 1601 Donalor Dr, Escondido, CA 92027; tel 760-746-7411.



By Paul Courson, WA3VJB

Hams Redeem Old Transmitter at Fountain of Youth

Historic radio station relocates and leaves behind a vintage Collins rig.

WFOY-AM, St Augustine, Florida, bills itself as "the oldest radio station in the nation's oldest city." Its call sign relates to the station's being built at the Fountain of Youth National Archaeological Park, where artifacts traced to Spanish explorer Ponce de Leon helped date the discovery of the New World.

A group of Amateur Radio operators discovered that the station would soon discontinue operations at this location, 490 years after the explorer made landfall there, and that the station's owner would leave behind an artifact now housed at a radio museum where town curators plan to showcase it as part of a fascinating claim to some technical history in the earliest days of wireless.

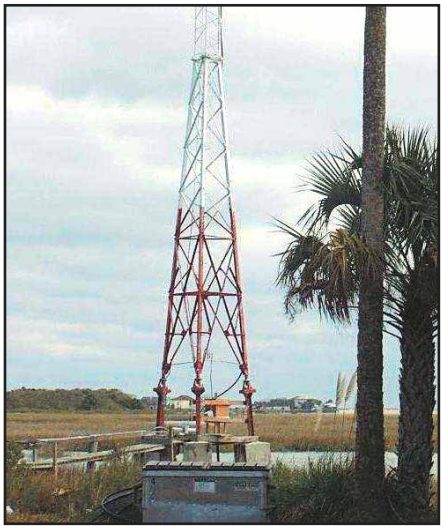
The "artifact" happens to be a beautiful, art-deco style Collins AM transmitter, the model 300-G, which features a picture window to admire a quad of tall, glowing, type 810 triode vacuum tubes. The rig will take a new spot on the dial on 160 meters where it will be operated as a demonstration of vintage radio for museum visitors and the amateur community. Its first formal appearance on the bands is expected to be during the "Heavy Metal Rally" when retired broadcast transmitters like this one are fired up for the prime winter no-static season.

WFOY, 1240 kHz, is thought to be the first station in America where planners deliberately located a transmitting tower in marshland to test whether such an installation would boost the range of a signal. The concept of *ground conductivity* as it relates to signal patterns has long been proven, but in the early days of broadcasting "we got on the air and then all of a sudden we started getting DX reports from as far away as New Zealand and England," said John R. Fraser, ex-WD4KQX, son of the station's founder, Walter Fraser, who put WFOY on the air in the 1930s.

Fraser said his father quickly faced many questions from others in the broadcast industry, curious as to whether WFOY was within its licensed power limit to be received at locations so far away. Fraser recalled stories of engineering crews coming to Florida from CBS, the station's network, as well as from WLW, the legendary Ohio powerhouse. The technicians had the same question, Fraser said, "It was just, with 135 watts, 'how do you do that?'"

"The only thing they could reckon was

WFOY transmitted from this building for 63 years; those are oyster shells in poured concrete!



This tower, erected in 1936, was among the first in broadcasting to prove the link between ground conductivity and enhanced signal.

One of the last known pictures of WFOY on the air at its original 1936 location. The Collins 20V-2 is on the left, while the 300-G is to the right.

that it was in the marsh," Fraser continued. "What we didn't know was that by putting the ground rods out in the marsh it drew the top of the lobe down closer to the water, so therefore we could get some transmission to stay closer to the surface" and follow the curvature of the earth.

But until WFOY came on the air, the effect "was sort of a blackboard theory—it had never been tried, and this was the first place they tried it," according to stories surrounding the station passed along by Parky Boone, W4YVX, a retired aircraft communications technician who first met the Fraser family as a teenager growing up in St Augustine.

Boone, the station's engineer the past 15 years, affirmed that the station's strong signal has been attributed to its location. "It's ground conductivity. The salt water is far superior to any conductivity you could get on ground." He noted the tower is about a hundred feet out in the marsh of the Matanzas River, just south of St Augustine Inlet to the Atlantic Ocean. Boone said, "The tide comes in and out. It's mud flats at low tide and about three feet deep at high tide."

The station's claim to history seems to be solid. Broadcast engineers and historians contacted for this article knew of no research suggesting any station had gone on the air earlier than WFOY at such a site specifically with a possible signal advantage in mind. Many stations have, however, located their transmitting towers in wetlands over the years as a function of cheap land value, and as validation later came in that such locations can indeed enhance a signal.

Retired Transmitter Rescued

The station's current owner, Doug Shull, had no future plans for the Collins 300-G, but wanted to keep as a backup a newer Collins 20V2, which was now on the air as the primary transmitter at the old site. He told the author that he would give away the 1951 300-G in exchange for moving the 1961 20V2 to the new location. Calls went out to other hams who own examples of the 300-G, Jim Young W8MAQ, and Tom Mackie, W2ILA, and the three of us enthusiastically decided to stage a rescue.

Tom first saw a 300-G at the author's house and has been hooked ever since. "The size and look caught me. This was the essence of the art of radio. I believe I mumbled something like 'if you find another one of these, let me know.' That was probably 12 years ago," said Mackie, an engineer with Trimble Navigation who has brought several 300-Gs to safe haven after stations abandoned them or otherwise decided to get rid of the well-built old machines. He operates on 160 meters with a totally restored 300-G that he retrieved in Oklahoma. A second 300-G from Texas awaits his curative powers.

"These little transmitters kinda grow on you, they're pretty, very stylish, even endearing." said Young, also a longtime fan of the 300-G who works as Chief Engineer at a radio station in Ohio. Jim has done the research and design work to allow the Collins to operate at full power on 160, 75 and 40 meters, the most popular bands where AMers gather to share vintage radio stories and technical tips at building, repairing, restoring and enjoying this nostalgic specialty in ham radio (see the sidebar "New Life for an Old Transmitter").

WFOY's old site presented some challenging logistics for the removal of not one but two huge transmitters. When word first came, the station was still in

New Life for an Old Transmitter—Converting the Collins 300-G to HF

Jim Young, W8MAQ, sums up best why it is sometimes justified to permanently modify a classic transmitter like this. At more than half a ton but only a quarter kilowatt, "the 300-G had little inherent value as it sat. It could serve an entire second life as a tribanded ham AM transmitter." And so the broadcast engineer took on a design challenge increasing functionality to cover 160, 75 and 40 meters, while somehow preserving many original components.

The original inductively tuned RF tank was a "T" section followed by a "Pi," and used tuning motors that pushed slugs within differential coils. Collins, in a service memo accompanying late serial number transmitters like WFOY's No. 147, realized friction would cause chronic failure of these motors, "which led to the Pi-L solution with dc motors replicating the original tuning method," Young explained. "After that process I never felt guilt about reworking the network," especially when measured RF efficiency jumped from 70% to around 76%.

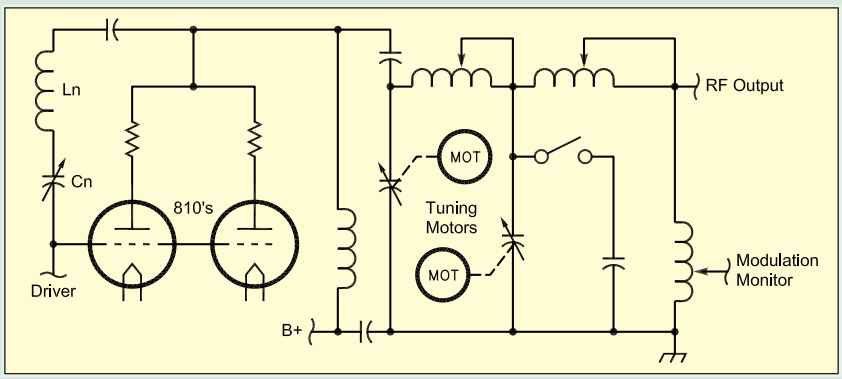
With an eye on how WØCXX, Art Collins himself might have envisioned it, Jim said "I re-used the glazed ceramic coil forms, rewound them to suit and used motor-driven variable capacitors for Tune and Load. This works great. I employed dynamic braking of the dc motors so there's no over travel when power is removed."

Jim continued, "I switch in a fixed capacitance for loading on 160 meters and move adjustable taps on the coils for band changing, and the original motor control circuits in the rig still function as intended." They are tuned from the original momentary contact, spring-loaded switches capped by the pre-war style, anodized aluminum knobs on front door.

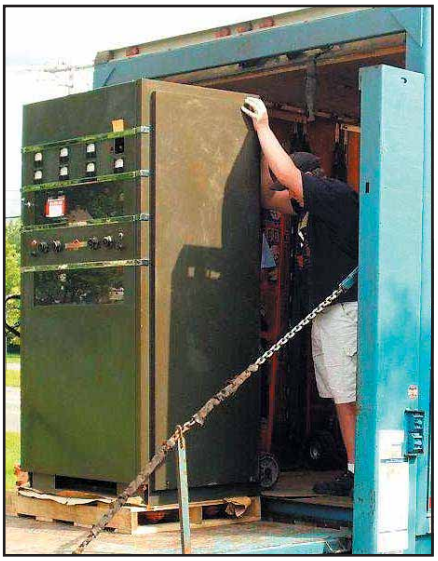
The RF drive comes from a pair of parallel-connected 807s and is tuned by a conventional tank. Jim said, "I only had to rewind the coil and determine appropriate taps. The variable capacitor is also motor driven from the front panel, as original, and a fixed cap is added for 160."

Collins used a 6L6 as an untuned Class-A buffer before the 807s. "I added a band switched plate tank here and made the 6L6 screen voltage adjustable to set the 807 drive at 3 or 4 mA," he explained. "For an exciter I am currently using a Boonton Labs signal generator; input requirements are about 4 volts across 10K. I also built a couple of protective bias supplies, one for the finals and another for the 807s."

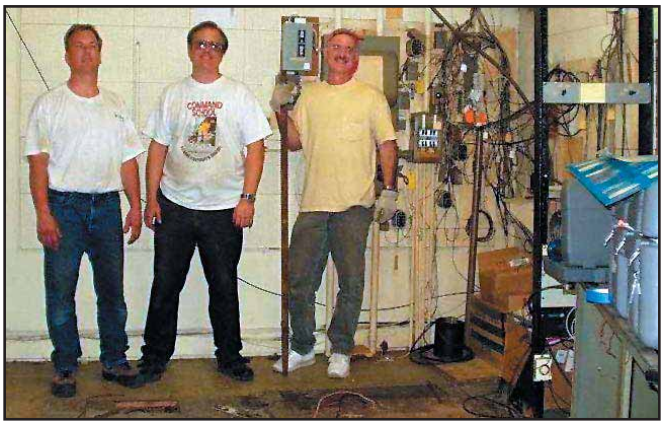
This protects the impressive and hard-to-replace Weston meters, which originally would pin and (hopefully) trip breakers. Jim notes the RF input is muted while receiving, but can be turned on locally for driver tuning and frequency spotting. Remote controls for plate ON and OFF, and receiver muting complete the conveniences.



The Pi-L output network for 160, 75 and 40 meters.



Professional movers gently bring No. 147 to its new home.



Success! Tom, W2ILA, engineer Alan Alsobrook, and Paul, WA3VJB, view the now-spacious studio.

Sixty-seven years worth of weathering at the base of the WFOY tower.

operation at the property next to the Fountain of Youth. The units were located in the same room as the on-air personalities. The Collins operating console in the small studio was directly in front of the transmitters, and nothing could happen until that mixing board was disconnected and removed from the path out the door.

Meantime, Parky and his assistant, Alan Alsobrook, were busy solving some antenna problems at the new site a few miles across town that delayed the switchover and the move. This temporarily sidetracked plans by the hams to gather at St Augustine from their homes in Annapolis, Rhode Island and Cleveland, respectively.

This provided some additional time to establish what the trio would do with the transmitter. All three men already have working examples of the 300-G on the air. All three men also already have spare, dismantled examples for parts support. And all three men had some trouble seeing where at their homes they could fit another big rig like this. Alert readers will notice this sort of discussion happened after the decision had already been made to retrieve Serial No. 147 at St Augustine.

Radio History Society Becomes Safe Port

Near Washington, DC, is an old farmhouse renovated as a municipal museum sponsored by the town of Bowie, Maryland. The Radio History Society is dedicated to nurturing the appreciation of radio's heritage through displays of broadcast and communications receivers and memorabilia from the "golden age" of radio, including a set of NBC network chimes.

Everyone has heard of or experienced the days when a family's home entertainment center was a big wooden floor console playing the rich, mellow sounds of shows picked up on what was known as the Standard Broadcast Band. The author, who lives near the museum, contacted officials at the Radio History Society with an idea to give people a vintage look at a source of those old signals. They reacted well and responded quickly with an invitation for the men to place the vacuum-tube transmitter on long-term loan for display at the museum.

"I suspect very few of our visitors (other than those who actually worked in radio) have ever been inside a station," said Brian Belanger, the museum's curator who also is an executive with the national Antique Wireless Association. "Being able to showcase even some of that atmosphere is something to strive for." The Maryland museum includes many local radio station artifacts, and by chance, the 300-G was the same model originally installed at local WYRE-Annapolis, and WUST-Washington, DC, when these stations first went on the air just after World War II.

Jim, one of the hams on this mission, owns the WYRE transmitter, Serial No. 22, and the author owns the WUST rig, Serial No. 33. (We've taken to referring to these rigs by serial number since we've now tracked down more than a dozen examples, each with its own history, that are now owned by hams.)

The museum has eventual plans to put together a replica radio station featuring vacuum-tube studio equipment, open-reel tape machines and other gear of the 1940s and 1950s, but for now it is constrained by space. Meantime, hopes are high for a functional ham radio station, combining the Collins 300-G with some classic Hallicrafters and other receivers that have been donated to the facility. Officials say the Radio History Society will be the first museum in the country to have an antique broadcast transmitter on the air and in direct contact with other nostalgic stations, thanks to AM activity on the ham bands.

Related Web sites:

- **www.amfone.net**
- **www.amwindow.org**
- **www.radiohistory.org**

All photos by the author.

You can contact the author at PO Box 73, West Friendship, MD 21794-0073; **wa3vjb@arrl.net**.

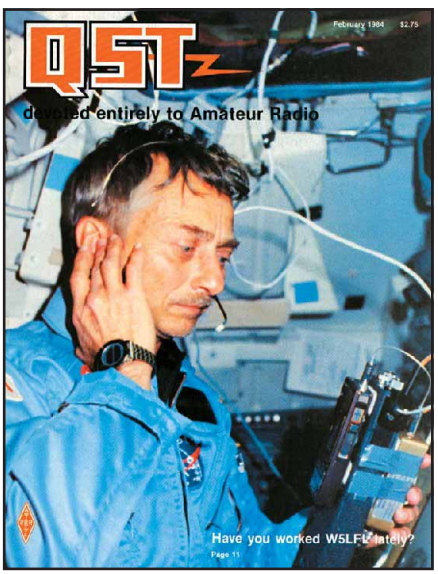
By Rosalie White, K1STO

Two Anniversaries for Ham Radio in Space

This month marks the anniversaries of the first Amateur Radio communication aboard two space entities: a NASA space shuttle and the *Mir* space station.

First to walk on the Moon? That's easy—Neil Armstrong. First ham to operate from space? Also easy—Owen Garriott, W5LFL. When was that, anyway? If you said November 30, 1983 on space shuttle *Columbia*, you'd be right!

First ham operation from a space station? That one's a little more difficult, but it turns out to be 15 years ago—November 1988—when two cosmonauts operated aboard space station *Mir*.



Back in 1965, Dr Owen Garriott, W5LFL, was one of the first six Scientist-Astronauts selected by NASA. Spacelab-1 was his second space flight. Recently, Owen wrote of the 20th anniversary: "From a modest beginning two decades ago, ham radio has grown to become an integral part of planning for human space flight operations. It's an important, even essential, element in space station operations, contributing even to safety of flight. Think what it will become in the next two decades on long duration missions to Mars, when half of the earth is visible to our hams en route to and from the red planet!"

STS-9 and Beyond

Amateur Radio first rode into space November 28, 1983 aboard STS-9, also called Spacelab-1. AMSAT-NA and ARRL had worked together to persuade NASA that Amateur Radio could greatly enhance NASA's public outreach and educational programs. Some facts and figures about the first ham radio operation from space:

- Launched November 28, 1983; in orbit 10 days.
- W5LFL operated as time allowed during parts of the last seven days of the flight.
- First contact from space was with Lance Collister, WA1JXN (now W7GJ), of Frenchtown, Montana.
- W5LFL also made contact with Jordan's King Hussein, JY1, and Senator Barry Goldwater, K7UGA.

The Floodgates Open

In July and August 1985, astronaut Tony England became the second ham in space, and Amateur Radio operators worldwide excitedly contacted WØORE during the 8-day flight of STS-51F/Spacelab-2. Tony created the SAREX acronym (for Shuttle Amateur Radio EXperiment), and devised a plan for more youth to take part in ham-radio-in-space experiences.

Next came Ron Parise's mission in December 1990 aboard STS-35/Astro-1,

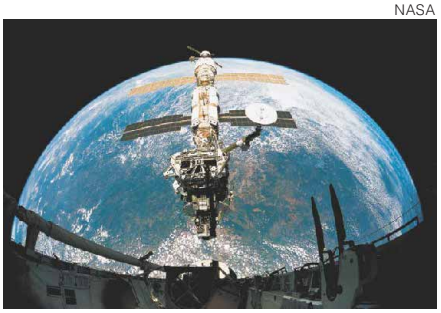
ROSAVIACOSMOS (RUSSIAN AVIATION AND SPACE AGENCY)

Ham radio debuted on the Russian *Mir* space station in 1988, 15 years ago this month. Sergej Samburov, RV3DR, related that Russia had considered a ham station for *Mir* earlier, but it was a cosmonaut friend of his who got the space officials to give the okay. Sergej ran with the ball after Larry Agabekov, UA6HZ/N2WW, donated equipment. "That's when the pieces of the puzzle went together; the crew wanted to have it, we could provide support on the ground (I was the support), and there was technical capability to do it," Sergej said. "We ran tests, trained crews and installed hardware."

FARRELL WINDER, W8ZCF

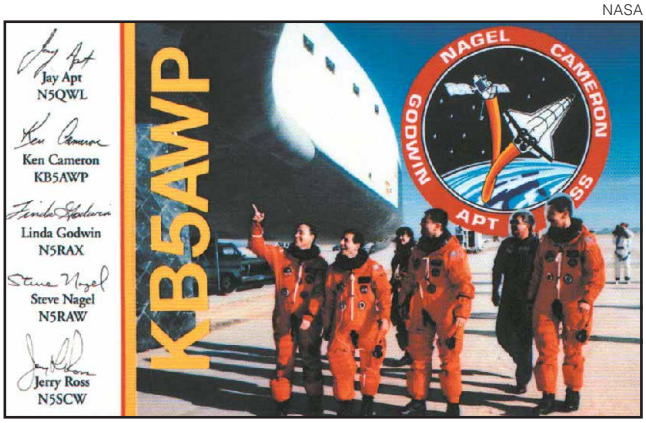
Hams around the world enjoyed SSTV shots from *Mir*, such as this photo of Sergei Avdeyev and Gennady Padalka. Ham radio served as a communications venue between a US space shuttle and *Mir* for the first time on July 5, 1997. *Columbia* commander Jim Halsell, KC5RNI, had several-minute direct contacts with *Mir* astronaut Mike Foale, KB5UAC. This first ship-to-ship QSO happened during a "conjunction" over the Indian Ocean with the two craft 50 nautical miles apart. On a subsequent contact, the shuttle crew heard Foale on *Mir* a lot longer than Foale could copy the shuttle's signal due to *Mir*'s superior antenna and higher power. That day W1AW Manager Joe Carcia, NJ1Q, reported W1AW connected with the RØMIR-1 packet BBS. The message posted was: "Hello from the staff and visitors from W1AW in Newington, CT. Good luck and 73." Foale told the NASA chief administrator that he felt spoiled by the good communication with his family that ham radio had made possible.

NASA



In 1996, ARRL and AMSAT networked with IARU and AMSAT societies in countries that were partners on the International Space Station, and voila: ARISS—Amateur Radio on the International Space Station—was born. In 2002, ARISS became known worldwide with the debut of the IMAX film *Space Station*.

NASA



In April 1991, another milestone: the first all-ham space shuttle crew—Ken Cameron, KB5AWP; Jay Apt, N5QWL; Linda Godwin, N5RAX; Steve Nagel, N5RAW, and Jerry Ross, N5SCW! It was a proud moment when we learned that many more astronauts were requesting that SAREX be a part of their future missions. SAREX missions enabled students to experience the thrill of talking in real-time to astronauts via ham radio.

NASA

Can you spot the 2001 ARRL Field Day pin? International Space Station Expedition 2 crew member Susan Helms, KC7NHZ, proudly wore her pin after taking part in the first Field Day operation from space. The pin, ferried up to her on a shuttle shortly after FD, was presented to KC7NHZ by shuttle crew member Jim Reilly, with a formal letter that read, in part: "Through Field Day, you have demonstrated capabilities to hams around the world. 73 from all hams on Earth."

ENERGIA

This October, another two-ham crew moved into the ISS. The Expedition 8 crew—NASA astronaut Mike Foale, KB5UAC, and Russian cosmonaut Alexander Kaleri, U8MIR—are former *Mir* crew members. Here, Sergej, RV3DR, demonstrates new hardware to Alexander and Mike. During Foale's earlier flight, he found ham radio a valuable supplement to conventional Russian and NASA communications. Kaleri flew on three *Mir* missions. Prior to Foale and Kaleri's arrival, a Russian Progress rocket delivered to the ISS the Phase 2 hardware prepared by the ARISS team. The hardware included a Kenwood TM-D700A, a power unit and switches, which the crew will unstow and set up this winter. In early 2004, a Yaesu FT-100, SSTV hardware and power cables will be delivered.

ARRL

Retired NBC News space correspondent, producer and executive Roy Neal, K6DUE (right), became a Silent Key August 15, 2003. Here, he and AMSAT's Frank Bauer, KA3HDO, ready equipment for a QSO with the ISS during the AMSAT forum at the Dayton Hamvention. Roy was truly dedicated to ensuring Amateur Radio was part of the space program; he worked diligently, becoming responsible for many of our milestones in space. He was involved from day 1 in nearly every aspect of SAREX and ARISS, knew many astronauts and NASA officials quite well, and saved the program when Amateur Radio was nearly dumped after the *Challenger* accident. SAREX and ARISS were blessed to have him working so tirelessly on behalf of Amateur Radio in space.

giving hams the opportunity to put WA4SIR in their logbooks as the shuttle *Columbia* circled the Earth.

As the SAREX program evolved, its main objective became education, and soon many astronauts were asking NASA to fly SAREX on their missions. NASA, ARRL and AMSAT signed a Memorandum of Understanding allowing a minimum of three SAREX missions per year. Other payload groups got jealous, and nicknamed SAREX "The Frequent Flyer." Now many astronauts sport Amateur Radio call signs.

First *Mir*, Then the ISS

In 1988, Russia put Amateur Radio on the space station *Mir*, launching a new era of ham radio in space. Rather than a week-long SAREX mission, *Mir* offered the opportunity for Earth-to-space QSOs during months-long missions. The first cosmonauts to operate Amateur Radio from *Mir* were Vladimir Titov and Musa Maranov, U1MIR and U2MIR, respectively. Operations commenced November 19, 1988.

These lengthy missions led to the planning and development of the more modern International Space Station. Simultaneously, hams started doing their own planning for what is now called ARISS—Amateur Radio on the International Space Station.

Mir was deorbited into the ocean in 1999 and the shuttle *Columbia*, along with its crew of seven, was lost February 1, 2003. *Columbia* was the very first shuttle to orbit the Earth, back in April 1981.

The photos accompanying this article provide a glimpse at a few of the many accomplishments of those who have worked (mostly as volunteers) over the years to make it possible for hams to communicate to and from space.

Rosalie White, K1STO, is Field and Educational Services Manager at ARRL Headquarters. She can be reached at **rwhite@arrl.org**.

By Dave Hassler, K7CCC

EmComm Classes Make the Grade

ARRL emergency communications courses provide students with the right tools to begin participating effectively in emergency public service work.

It's only been a couple of years, but ARRL's Amateur Radio Emergency Communications Course (ARECC) has already made a big difference for a lot of people in a lot of communities. Here's what some of them are saying:

- "When Tropical Storm Grace approached the Texas coast Saturday, August 30, I heard the call for net controls on the Texas ARES Emergency Net. A year ago I didn't even know where to find the emergency net, much less want to serve as a net control. The (ARECC) Level 2 course encouraged me to get some net control experience on local nets, which I have done, and helped me as I got involved in this most recent tropical storm event." —*Pat Knight, AD5BR, San Antonio, Texas*
- "The Northeast Blackout was the perfect scenario to see the invaluable training of the Amateur Radio Emergency Communications Courses at work. The training paid off as all of our people were on the air almost immediately, providing status reports and getting to pre-assigned locations. The training becomes paramount in a crisis like this because the smooth response was reflexive."—*Tom Carrubba, KA2D, New York-Long Island Section Emergency Coordinator*
- "We had some huge fires in Arizona in 2002 and 2003, and we did an adequate job in 2002, flying by the seat of our pants and sometimes succeeding by accident. When it was over, I decided to take all three ARECC levels. The information in the courses was exactly what we needed, explaining the relationships and coordination between hams and served agencies. It also helped us establish a memorandum of understanding with our county—now we're not just a bunch of people with radios. In 2003, we did things with knowledge, advanced planning, organization and purpose."—*Cris McBride, KB7QXQ, ARES member and Navaho County, Arizona, Emergency Coordinator*

Setting the Stage for Success

The genesis of the ARECC program occurred in January 2000, when the ARRL Board of Directors approved the formation of a continuing education program for amateurs. Emergency communications was at the top of the list for course development. ARRL Emergency Communications Course Grants Manager Dan Miller, K3UFG, said section managers, section emergency coordinators, RACES officers and others were all polled as to what needed to be taught. The gathered information formed the foundation upon which the courses were built. By December 2000, the Level I course was opened for registration. In the 18 months before grant-funded tuition reimbursement became available, ARRL trained 1080 hams in emergency communications, developing a solid curriculum and building a base of dedicated volunteer instructors and mentors.

Two things changed the response from strong to overwhelming: the events of September 11, 2001 and the availability of grant funding to train Amateur Radio emergency communications volunteers. "Suddenly, there was a whole new national awareness of Amateur Radio's role in emergency communications. The benefit of the courses ARRL had developed was immediately understood," Miller stated. Suddenly, courses filled up in a matter of minutes, with many hams perched at their

How to Get Started

ARRL Amateur Radio Emergency Communications Courses are offered monthly. Cost for each level of the ARECC program is $45 for ARRL members and $75 for non-members. For information on registering for a class, visit the ARRL Web site at **www.arrl.org/cce**. Prospective students can also e-mail ARRL Emergency Communications Course Grants Manager Dan Miller, K3UFG, at **dmiller@arrl.org** or call him at 860-594-0340.

DAN MILLER, K3UFG

At right, ARECC seminar attendee Don Moore, KMØR, discusses an issue with classmates Dana Joines, WØAIA, and Rick Bennett, KCØPET, of the Missouri Department of Transportation.

computers at 11:59 PM just itching to press the "register" button, hoping for a seat.

First came a June 2002 grant of $33,000 from United Technologies Corporation of Hartford, Connecticut to train 250 Connecticut hams in the final six months of the year. The donation brought the number of trained volunteer emergency communicators in Connecticut up from 12 to almost 300 in just six months, and the experience gained by the ARRL in administering that groundbreaking program paved the way for future national successes. ARRL Chief Development Officer Mary Hobart, K1MMH, was instrumental in securing the grant and continues to work toward more financial support for amateur emergency communications.

In July 2002, the Corporation for National and Community Service (CNCS) awarded a three-year $540,000 grant to the ARRL for national Level 1 training. The Corporation is part of USA Freedom Corps, a White House initiative with the stated aim of fostering a culture of citizenship, service and responsibility. The League was among several dozen nonprofit organizations designated to receive $10.3 million in federal money to boost homeland defense volunteer programs. CNCS is particularly interested in seeing senior citizens becoming involved in all areas of community service, and the League works to promote that agenda.

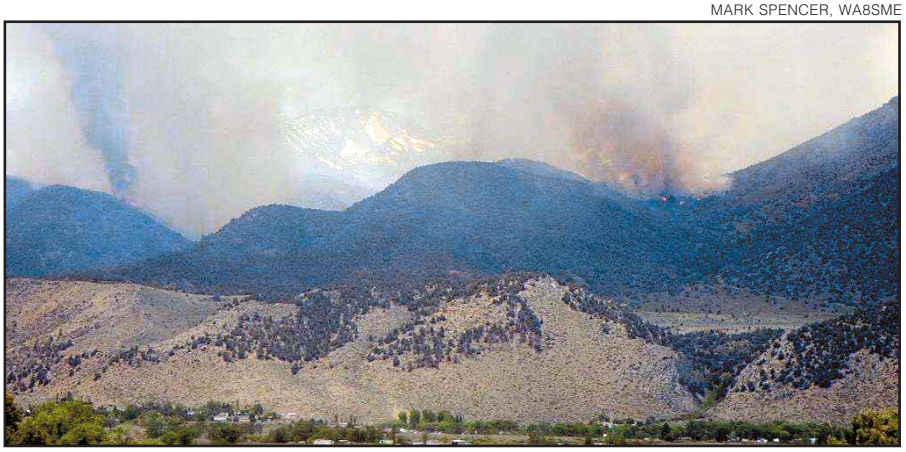
In February 2003, UTC awarded a new three-year grant of $150,000 to cover all US amateurs and all three levels of the course. In its first year, the CNCS grant provided tuition reimbursement for 1699 hams in the Level 1 course, with a 75.4% graduation rate, up 15 points from pre-September 11 figures. The UTC grant has provided training for an additional 707 emergency communicators so far this year. Registration continues to be strong today and the second year of CNCS funding aims to train an additional 1666 amateurs in the Level 1 emergency communications course through the summer of 2004.

Getting Prepared the Right Way

ARRL President Jim Haynie, W5JBP, has long been a participant in emergency communications as a public service. After years as a net control station and aiding with disasters ranging from floods to airplane crashes to tornados, Haynie said that with grant funding, amateur emergency communications training took a huge leap forward.

"There are two ways to do things—halfway and the right way. You don't want to have a disaster at the disaster with untrained and unprepared volunteers. The grants give us the ability to craft useful courses that we could make available to all amateurs in the country. The Amateur Radio Emergency Communications Course gives people with an interest in public service the advanced preparation to perform useful service to served agencies," he said.

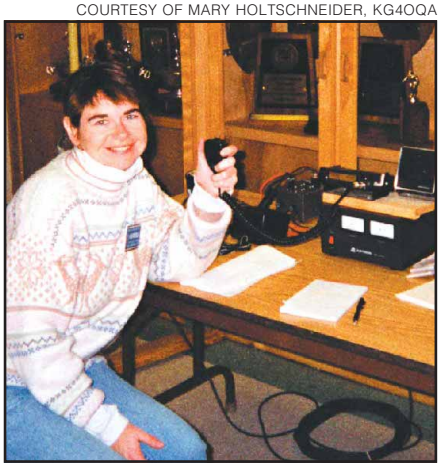
MARK SPENCER, WA8SME



In remote areas of California, providing backup emergency communications for agencies presents a difficult challenge. With cellular telephone towers long out of range and local government 800 MHz trunked systems taxed, well-trained and knowledgeable Amateur Radio volunteers—with access to a variety of spectrum segments from 160 meters down to centimeters—can provide efficient radio links where no others can be reliably established.

The Amateur Radio Emergency Communications Courses are broken up into three levels: Level 1, introductory; Level 2, intermediate; and Level 3, advanced. The Level 1 course covers basic message handling, emergency nets, the incident command system, equipment, activation, operation, safety and logistics. Level 2 covers liaising with public safety officials and served agencies, running an emergency net, SKYWARN, hospital and medical communications, and working with volunteers. Level 3 tackles ARES and RACES, local and federal response plans, large-scale disasters, mobile operation, severe weather disasters, health and welfare traffic, building an ARES group and designing meaningful drills.

COURTESY OF MARY HOLTSCHNEIDER, KG4OQA



During an atypical ice storm in the Carolinas last winter, Wake County Assistant Emergency Coordinator Mary Holtschneider, KG4OQA, helped staff an emergency communications station at a shelter at Cary High School in Cary, North Carolina. Wake County ARES members kept the communications lines open from the shelter for most of five days straight.

The on-line courses are presented in 15 to 25 learning units, made up of course study materials and practical activities. A short quiz concludes each learning unit and a final, 25-question assessment is taken at the end of the course, with 80% correct answers constituting a passing grade. Each student is assigned a volunteer mentor/instructor who has taken the class and also passed a mentoring training course. Mentors review and comment on student progress, and serve as a learning resource. Student/mentor interaction is usually via e-mail, but telephone and on-the-air contacts are encouraged.

"Because the courses are on-line, students can work at their own pace and convenience within the eight weeks allotted for a course," Miller explained. "The average student spends about 25 hours over the eight weeks to complete a course."

In addition, there are "hybrid courses," designed to provide a mix of on-line study with locally organized classroom workshops and discussions. Miller said the ability to have students interact with mentors who have "been there and done that" is one of the most value-laden facets of the program. "These dedicated people give freely of their time and talents to benefit their communities and their country by working with course students. They are truly a treasure," he said.

Training Pays Off During Ice Storm

Mary Holtschneider, KG4OQA, knows what a difference solid, dependable communications can make. Holtschneider is a

registered nurse and clinical care instructor at Duke University, and has served as a volunteer emergency medical service worker in addition to working as a hospital critical care nurse. She is involved with Wake County, North Carolina ARES and is an assistant emergency coordinator.

On December 4, 2002, a massive ice storm crippled the Carolinas, leaving 1.5 million residents without electricity for a number of days. It was the worst power outage in the region since Hurricane Hugo came through in 1989. Amateur Radio operators went into action to help with the emergency. "The ice storm was massive and it was extremely cold and many people were without heat in their homes," Holtschneider recalled. "My ARES group was called to aid with five shelters in Wake County."

Landline and cellular telephones were knocked out by the icy punch of the storm, although roads were passable. Holtschneider worked two shifts over two days at Cary (NC) High School passing tactical messages from shelter managers to the state Office of Emergency Management in Raleigh. She said the training she received through the ARECC courses thoroughly prepared her for the communications tasks at hand that week and had all hams—and emergency management and shelter staff—on the same page.

"First, we understood the concept of a shelter, what it can and cannot do," Holtschneider said. "We understood that we were there to communicate only and we were well-prepared to do it. The (Level 1) courses...reinforced our previous knowledge and Levels 2 and 3 took us beyond the basics. It's extremely valuable."

As a health care professional, Holtschneider pointed out that hams just can't show up at a hospital or event site during a disaster without a predetermined emergency communications plan in place, preferably cemented by a memorandum of understanding. She suggested that hams interested in public service get involved with emergency nets and the National Traffic System (NTS), and participate in practices and drills.

Meeting the Need for Uniform EmComm Training

The genesis of the ARECC program occurred in January 2000, when the ARRL Board of Directors approved the formation of a continuing education program for amateurs. As a first step, the League queried a sample of the membership and found that a large majority of respondents chose the topic of emergency communications as their first choice for a new course. ARRL Emergency Communications Course Grants Manager Dan Miller, K3UFG, said section managers, section emergency coordinators, RACES officers and others were all polled as to what needed to be taught. The gathered information formed the foundation upon which the courses were built. By December 2000, the Level I course was opened for registration.

ARRL Emergency Communications Course Grants Manager Dan Miller, K3UFG.

Response was strong, but not overwhelming, Miller remembered. Two things changed that: the events of September 11, 2001 and the availability of grant funding to train Amateur Radio emergency communications volunteers. "Suddenly, there was a whole new national awareness of Amateur Radio's role in emergency communications. The benefit of the courses ARRL had developed was immediately understood," Miller stated. Suddenly, courses filled up in a matter of minutes, with many hams perched at their computers at 11:59 PM just itching to press the "register" button, hoping for a seat.

Grant funding of the courses began June 18, 2002, with a donation from United Technologies Corporation for 250 Connecticut Amateur Radio volunteers to take the Level 1 course. The donation brought the number of trained volunteers in Connecticut up from 12 to almost 300 in just six months. Three weeks later, the CNCS grant was awarded to the ARRL for national Level 1 training and in February 2003, UTC awarded a second grant to cover all US amateurs and all three levels of the course. ARRL Chief Development Officer Mary Hobart, K1MMH, was instrumental in securing the grants.

The first one-year CNCS grant period ended in August. In the first year the CNCS grant provided tuition reimbursement, 2254 hams signed up for the Level 1 course, with 1699 graduating—a 75.4% success rate, up 15 points from pre-September 11 figures. The UTC grant provided training for an additional 707 emergency communicators so far this year. Registration continues to be strong today and the second round of CNCS funding aims to train an additional 1666 amateurs in the Level 1 emergency communications course through the summer of 2004.

Training Takes Montanans "Outside the Box"

This past summer, the Lincoln Complex Fire charred tens of thousands of acres in northern Montana. Lewis and Clark County Emergency Coordinator Bob Solomon, K7HLN, said that ARECC training helped his ARES group work smoothly with the American Red Cross in very difficult circumstances.

"We were 60 miles from Helena, across the Continental Divide from the Red Cross Evacuation Center in Lincoln and the main repeater for our county was out," Solomon recalled. "Plus, the town of Lincoln is down in a bowl, with mountains all around. Propagation was very tough, at best. We had to be more creative and imaginative to solve the problems and get the messages through."

Solomon said local hams took advantage of their ARECC training to "think outside of the box" and try things they had not thought of before taking the courses. The team turned to simplex operation and worked into Helena by bouncing VHF signals off of nearby mountains. The Lewis and Clark ARES, along with members of the Capital City Amateur Radio Club, also requested HF support and within hours a statewide HF emergency net was set up on 80 meters. "I have no idea just how many hams were on that net, but it was a lot, with the net running 24 hours a day for several days, with everything handled efficiently," Solomon said.

He said he felt a major factor of providing meaningful service to the working agencies was that everyone providing volunteer emergency communications understood and worked within the proper framework. "The (ARECC) courses expose the student to the Incident Command Structure, which is used by our county officials for everything from fires to birthday parties," Solomon said. "The Level 1 course stresses the Incident Command Structure. If hams have at least Level 1 under their belts, they get a tremendous advantage and can't help but be of help."

During their work in aiding firefighters, the well-trained ARES group also built a strong bond of trust with county and state officials. They were asked to aid in public service communications for the weary and thinly spread sheriff's department, as well.

Amateurs' Training and Discipline Seen Nationally

Amateur Radio's usefulness in times of crisis is being recognized on the national

level. Events such as September 11, 2001 and the *Columbia* space shuttle disaster have found hams providing vital backup communications, establishing critical links when nothing else in the normal communications infrastructure worked. Getting the message through under crisis-level conditions requires training and discipline. That ability is beginning to be seen and recognized nationally.

"These courses have given the average ham a uniform training and a connection to a national effort that is approved by the federal government, attested to by the fact that we received the grant from CNCS," Haynie said. "The federal government is increasingly recognizing that ham radio has an important role to play. The training given by the emergency communications courses is good for our nation and the overall security fabric of the country."

In September, CNCS reviewed the ARECC program's effectiveness and approved the release of the second year of funding on the three-year grant. A newly revised version of the Level 2 course is now on line. Miller said that while the variety of emergency communications course offerings will probably not expand, the curriculum will continue to improve to meet new situations and current demands.

"In the future, we hope to have a yearly update manual for graduates, to get them up to speed on the most current techniques and procedures. New learning units such as aiding in a bio-terrorism event or an ecological disaster, or other special topics, may be added at a future time," he said.

"Emergency communications continue to play a bigger and bigger role each time there is another incident, whether it's a natural or man-made disaster," Miller continued. "In large part, it's due to the raised level of knowledge available to volunteers through the ARECC courses. The grant funding of these courses has made a huge difference in this country whenever disaster has struck."

Completing the Courses is Only the Beginning

Being an effective emergency communicator, however, requires more than studying material and passing some exams. Much like getting an Amateur Radio license, the graduation certificates for ARECC are just the starting point for those who want to perform backup emergency communications. Like any skill, gaining proficiency in emergency communications requires practice.

"Those certificates and a dollar will get you a cup of coffee," Haynie said. "It doesn't make you a pro. It's the application of common sense and gained knowledge that's the goal. How you enroll yourself within the community is entirely up to the individual. The grant-funded courses allow an amateur to have the opportunity to serve in a meaningful and effective manner."

Every journey begins with a first step. For hams interested in emergency communications public service work, getting into an ARECC class is the best first step one can take. ARRL Amateur Radio Emergency Communications Courses are offered monthly. The cost for each level of the ARECC program is $45 for ARRL members and $75 for nonmembers. For information on registering for a class, visit the ARRL Web site at **www.arrl.org/cce**. Prospective students can also e-mail Miller at **dmiller@arrl.org** or call him at 860-594-0340.

Dave Hassler, K7CCC, is the Assistant News Editor of QST *and the ARRLWeb. He can be reached via e-mail at* **k7ccc@arrl.org**, *or by telephone at 860-594-0240.*

NEW PRODUCTS

AOR DIGITAL HF FORMAT MODEM

◊ AOR USA has introduced the ARD9800, a digital modem unit that converts analog voice to a digitally encoded set of modem tones for transmission via standard HF SSB radios. The stated advantages offered by the ARD9800 include "near FM" quality audio and the likelihood that the digital format can operate at lower signal levels than those of analog SSB.

The ARD9800 is a modem-size unit that requires only two connections to an existing transceiver, one through the radio's microphone input port, and the other from the rig's "speaker out" jack to the ARD9800's audio input port. No modifications to the radio are necessary and the full analog capabilities of the transceiver are maintained. The owner may use the microphone provided with the ARD9800 or wire his mic to work through the ARD9800.

The ARD9800 uses the open G4GUO digital protocol, a digital format that incorporates elements of phase shifting to transmit the digital signal. The digital tones have been engineered to fit within the normal voice audio passband, making it possible to use unmodified, existing radios for the digital format. The format uses forward error correction (FEC), making unlinked communications possible with two or more participants. While designed for SSB, the ARD9800 can also be used with AM or FM radios.

In addition to voice communications, with an optional memory board the ARD9800 can also be used to transfer still images and computer files. The ARD9800 has composite video input and output ports, sending an image similar in speed to SSTV. The unit also has a computer connection port, along with a provided serial connection cable, to allow controlling parameters of the ARD9800 and to facilitate the transfer of files over the air.

Options include a power cube, the memory expansion board and custom-made cables that fit the microphone input ports of a variety of popular transceivers.

The ARD9800 price is $549. For more information contact AOR USA, Inc, at 310-787-8615 or **www.aorusa.comard9800.html**.

STRAYS

WEB PAGE FOR REAL TIME HF PROPAGATION

◊ I would like to introduce you to my new all-in-one Web page for real-time HF propagation prediction. It can be found at **salsawaves.com/propagation**. What makes this page distinctive from the many other propagation pages is the fact that all tools and information for real-time shortwave propagation prediction are gathered on just one page.—*Serge Stroobandt, ON4BAA*

I would like to get in touch with...

◊ former naval personnel who served on the USS *Orion* AS-18 or other submarine tenders. The *Orion* is going to serve her country again as a training facility in the southeast. If you are a ham, or have an interest in ham radio and served on the *Orion* or any of its sister ships and would like to be associated with the ship's new Amateur Radio club, contact Wayne Irwin, W1KI, at **w1ki@yahoo.com**.

◊ hams who own Corvettes. A list of hams who drive Corvettes appears at **forums.corvetteforum.com/zerothread?id=634889**.—*Dick Kriss, AA5VU, Austin, Texas*; **aa5vu@arrl.net**

◊ police officers who are active hams and who have interfaced their departments with their local ARES group.—*Terry Neumann, PO Box 1324, Chehalis, WA 98532, tel 800-493-1493;* **KQ7K@arrl.net**

The 2003 ARRL Frequency Measuring Test

In 2002, the Frequency Measuring Test attracted 137 participants from across the continental US, Canada, Europe and Hawaii. They were able to measure the transmission frequencies to within a few parts per million (ppm). The 2003 test will be conducted in essentially the same format, although transmissions will be longer to give stations more time to make a measurement. Last year's results can be found at **www.arrl.org/w1aw/fmt/fmtResults.pdf**.

If you're thinking about giving the Frequency Measuring Test a try, here's a *QST* article that covers the basics: **www.arrl.org/w1aw/fmt/0210051.pdf**. This article, "The ARRL Frequency Measuring Tests" by Ward Silver, NØAX, originally appeared in October 2002 *QST*. If you'd like more information about the equipment that will be in use at W1AW to generate the test signals, take a look at **www.arrl.org/w1aw.html**. For more information about the FMT, including a list of reference articles and updates to test schedules, the Frequency Measuring Test Web page is at **www.arrl.org/w1aw/fmt**.

Schedule

The W1AW FMT will run on November 20, 2003 at 0245Z (9:45 PM EST November 19). It will replace the W1AW Phone Bulletin normally scheduled at that time. It is recommended that participants listen to W1AW's transmissions prior to the event to get an idea of conditions in order to see which band (or bands) will be best for measurement purposes.

Format

The FMT will begin with a general W1AW (QST) call beginning exactly at 0245Z sent simultaneously on four amateur frequencies. The test will consist of three 60-second key-down transmissions, followed by a series of dits, followed by station identification.

The test will last for a period of approximately 15 minutes total. The test will end with a series of Vs, followed by station identification. W1AW will identify before, during and after the transmissions.

The approximate frequencies are as follows:

80 meters	3,584 kHz
40 meters	7,049 kHz
20 meters	14,051 kHz
15 meters	21,054 kHz

Reporting and Results

The submitted report should include the time of reception, frequency measured and signal report, in addition to name, call and location. If possible, participants should submit reports on more than one band (but not necessarily on all four).

A Certificate of Participation will be available to all entrants. Entrants who come closest to the measured frequency as measured by the ARRL Laboratory will be listed in the test report and will also receive special recognition on their certificate.

Entries should be postmarked by December 19, 2003 to be eligible. Send entries to W1AW/FMT, 225 Main St, Newington, CT 06111. QST

NEW BOOKS

UP TWO—ADVENTURES OF A DXPEDITIONER

By Roger Western, G3SXW

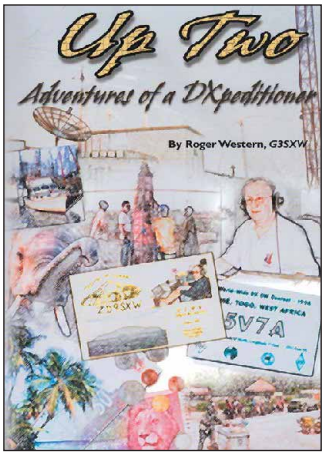
Idiom Press, PO Box 1025, Geyserville, CA 95441; **www.idiompress.com**. *First Edition, 2003, 6 × 9 inches, softcover, 238 pages, no illustrations, some tables.*

Reviewed by David Sumner, K1ZZ

◊ Unless you at least occasionally work CW DX, G3SXW may not be a familiar call sign to you. No matter—if you have ever thought about operating from some semi-exotic location, you will find plenty to stoke your daydreams in Roger Western's personal saga.

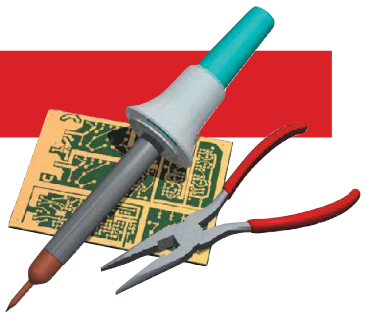
Roger first became hooked on managing CW pileups while living in Tehran in 1970-73 and 1976-79, where he was EP2IA. During his first stint he also managed to activate YA1R from Kabul. Along the way he developed an admirable cultural sensitivity that has added to his enjoyment and success in West Africa, Asia, the Pacific, and other far-flung places.

The first 22 chapters of *Up Two* contain personal narratives of Roger's experiences in activating that many countries, ranging from a solo journey to Tristan da Cunha in 1993 to massive multi-operator contest efforts from West Africa. While contest successes clearly are a source of pride, one gets the definite impression that Roger's favorite trips are those with one or two like-minded mates to reasonably accessible, yet fairly rare, DX locales. While making as many QSOs as possible is the first priority, there is always time to make new friends and to leave behind a positive impression of Amateur Radio.



Each chapter is written to stand alone, which means that you can dip in and out of the book according to the places that interest you. The down side is that if you read it from cover to cover you will find some of it to be a bit repetitious, but this is a small price to pay for the privilege of getting to know one of the friendliest and most respected CW DX operators in the world. The last three chapters recount failed projects (fortunately, all of which were abandoned before anyone actually left home), pile-up operating, and Roger's personal views on QSLing—all well worth reading.

My favorite parts of *Up Two* are Roger's descriptions of "road trips" by bus, laden with equipment and antennas, across African borders that are seldom traversed in such fashion. Should you ever receive the extraordinary privilege of being invited to accompany Roger on one of his jaunts, you might want to read these bits before saying yes!



The Doctor is IN

Q Here's a question about power supplies: I've been contemplating the purchase of a new 12 V dc power supply for my station. I'm a bit confused about the difference between switching power supplies and linear power supplies. Specifically, what's all this talk about "hash" and "low noise"? What should I buy…a switching power supply or a linear one?

A The power supply you buy should really depend on your application. First, let's talk a bit about the differences between switching and linear supplies. All ac-dc power supplies do several important things and, among others, they must carry out the following functions: voltage conversion, rectification, filtering and regulation.

Consider that, in order to generate the 13.8 V dc appearing at its output, the station low-voltage dc power supply needs to convert the 115 V_{rms} ac wall voltage to a low voltage. It can use a step-down transformer as a voltage converter or, in the case of a switching supply, it can do the conversion by using switches and energy storage components (inductors and capacitors). In operation, the switches are either ON or OFF and control inductors and capacitors to both *source* (provide) and *sink* (absorb) current in a repetitive or cyclic fashion to a load.

The cyclic nature of this switching is referred to as the power supply's *switching frequency*. While in the ON or OFF state, the switches dissipate very little power and so this conversion technique exhibits greater efficiency compared to a linear power supply. In other words, the switching supply requires less input power to produce a given output power. Additionally, because there's no heavy high-current power transformer required, the weight and size of the supply is but a fraction of that of the linear power supply. A 13.8 V dc, 25 A switcher can weigh as little as 3 pounds, while an equivalent linear supply will weigh in at a hefty 25 or 30 pounds…quite a difference! The weight and size differences become even more dramatic as the power output increases.

The rectification process is generally similar in both supplies; that is, they both use solid-state diodes to convert ac to dc. The smoothing or filtering components can be lower in value in a switching supply because the switch frequency is so much higher (70-500 kHz, compared to 60 or 120 Hz). The filtering requirements of a switcher are complex and demanding, however, because the rise-time of the switching waveform creates spurious pulses (transients or spikes) that are harder to filter. Capacitors become more critical because, at the high switching frequencies the capacitor's ESR (equivalent series resistance) becomes a substantial part of its reactance. A linear supply, on the other hand, has only the fundamental 60 or 120 Hz sine wave to deal with and that is relatively easy to filter and smooth with high orders of capacitance.

The regulation processes are a bit different, in that the switcher generally doesn't need a high current linear pass transistor and can accomplish its regulation task by appropriate modulation of its switching waveform and by altering the duty cycle of its conversion circuits. The load and line regulation specifications of both supplies are similar, with the linear supply having a slight, but not significant, edge.

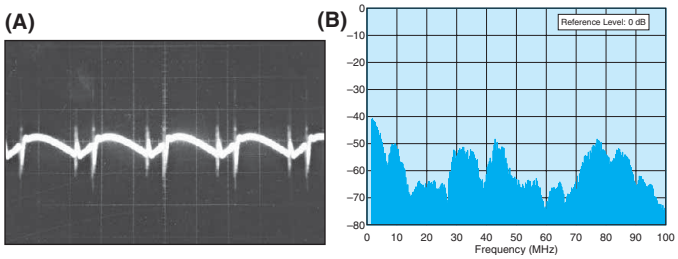


Figure 1—A shows an oscilloscope of the switching noise on the dc output line of a switching power supply made for amateur service. B shows the spectral characteristics of that noise.

So, with all the weight and size and efficiency advantages, why don't we always use switching power supplies? Well, the switching supply can have one serious disadvantage. The switcher's converter or switching frequency is generally in the range of 70 kHz to 500 kHz. And, that switching waveform is generally a square wave or a repetitive pulse train with lots of transients and spikes, so the very action of switching produces lots of electrical noise and harmonics. That noise is generally located right in the middle of the HF radio spectrum. Figures 1A and B show an oscilloscope trace and spectrum display of the noise output of one switching supply built for amateur use. The switching noise is obvious.

Switching power supplies designed for communications use, therefore, usually require extensive filtering and waveform shaping to limit their RF noise output. That noise can be both *radiated* (broadcast) and *conducted* (transmitted over wire). The power supply will have to be carefully shielded to limit its radiated noise and carefully filtered to reduce its conducted noise. Even with extensive shielding and filtering, these supplies can have ripple, noise and hash figures in the 30 to 50 mV_{rms} range, with their ripple and noise usually dependent upon, and directly related to, load current (a higher load current bringing higher noise). By comparison, a linear power supply's ripple and noise figures are at least an order of magnitude better, generally around 1 to 2 mV_{rms}, with some coming in at half these values. *QST* reviewed several switching power supplies in the January and September 2000 issues and, while some were better than others, all were found "acceptable." Some of the supplies tested can be seen in Figure 2.

Figure 2—Some of the switching power supplies reviewed in the January 2000 issue of *QST*. Two additional supplies were reviewed in the September 2000 issue.

So, what does all this mean? It means that you should choose the right supply for the right application. For the quietest of RF environments, you'd probably be better off with a linear power supply. For example, I would not use a switching power supply for critical, low-level, weak-signal receiver use in the VHF-UHF range. On the other hand, if your primary operation is on the HF bands and you have a clear need for portability and low weight and your requirements demand high current capability at the same time, then you'd be fine with a switching supply. Many HF high-power solid-state RF amplifiers usually come with built-in switching power supplies—a linear supply would simply be too large, too heavy and too expensive for the high current demanded for this application.

Another option can, and should, be considered, however. All of the station 12 V dc power can come from batteries. That's right—batteries! Sealed lead-acid batteries can now be used to supply all of an amateur station's power requirements and these can be float-charged on a suitable battery charger. Not only is the power pure (it's as dc as you can get!) and clean, but the batteries can be counted on to provide emergency power, as well. It's a worthy option to the 12 V dc station ac-driven power supply and the Doctor urges its consideration. Watch for an article on full-time station battery operation in an upcoming issue of *QST*.

Q Paul, W8TM, writes: On page 4-12 of the 19th edition of *The ARRL Antenna Book*,[1] it says, "When window-type line is suspended from an antenna in a manner such as that shown in Figure 14, the line should be twisted—at several twists per foot—to prevent stress hardening of the wire because of constant flexing in the wind." Yesterday, my first-ever installation of 450 Ω ladder line rode out its first wind/thunderstorm. The transmission line is not twisted and runs about 25 feet from the antenna to a window. I'd like to improve its ability to withstand wind effects, but that "several twists per foot" has me confused. So much twisting would turn the ladder line into a pretzel. Might you be able to give further suggestions for weather-worthy installations of ladder line?

A The technique of twisting window line is only appropriate where all slack in the line can be taken up so as to prevent the pretzel effect. Where the line is run horizontally, that just isn't practical. In fact, you will probably get wind flexing in that type of installation no matter what you do. However, you can still put a few twists in the line (say one every 3 to 5 feet) to reduce the amount of wind flex. The idea is to eliminate constant pounding due to the wind. Not only do you want to eliminate stress hardening, you also want to limit the ladder line motion with respect to its immediate surroundings. Local influences of walls, wires and pipes will affect the characteristic impedance of the line, and this is something you don't want to change randomly.

Ladder line standoff insulators are available or you can make your own. A 2-3 inch PVC pipe T, cut lengthwise with a hacksaw, down one side, makes one type of ladder line support. The hacksaw cut makes it easy to insert the line after the support is mounted. The coupling can be supported with a 4-inch length of PVC pipe attached to the building wall with a wood screw angled through the pipe.

Television type standoff insulators can also work (RadioShack[2] 15-854), although these must be used with care so as not to deform the line. It should be possible to carefully position a standoff over one side of the line (through the "window" of the ladder line) and tighten around one conductor only. Try to keep the ladder line spaced at least 3-4 inches from any adjacent structure.

The object is to keep the line motionless within the vicinity of local supports. This also applies when the line enters the house. If it's impossible to eliminate the proximity to wires and pipes within the structure or at the entrance, a better solution might be to use an outside-mounted balun transformer and revert to coaxial cable when the feed line enters the house. Try to keep the coax length as short as possible, as coax has substantially more loss than ladder line.

Q From Greg, K9ON, comes this: I had no problem in getting a permit for a tower but my local ordinance required that I put it within 10 feet of my house. At the time, I saw no problem with that, but once I put my antenna up the birds came from everywhere. Now my wife is about to evict me! The problem is the birds sit on the antenna and our deck has become almost unusable because of bird droppings. I have tried a fake owl on top of the boom but the birds only built a nest in the base of the owl. I've also tried a sonic bird repeller that emits calls of predator birds. After listening to it for a couple weeks, my nerves are shot.

A At W1AW, we just let the birds roost as they will, but we don't have a backyard deck under the antennas. A visiting hawk surveying the scene up high on one of the W1AW towers can be seen in Figure 3. The owl usually works, but apparently you've got some pretty smart birds or that owl is simply not realistic enough. Perhaps you should try a hawk! However, here are some suggestions for other methods to try:

DAVID PINGREE, N1NAS

Figure 3—A hawk visits one of the W1AW antenna towers.

1. Run fishing line or other nylon/dacron line slightly above the horizontal elements and parallel to them. If the line is thin enough, the birds won't roost on it or the beam elements and boom. A suitable support for the line at the element and boom ends would have to be designed, however.

2. You can try a sticky bird-repellent liquid applied to the beam elements.[3] The problem is that this would have to be renewed periodically.

3. Plastic tubing sections can be placed around the beam tubing. The downside to this is that the tubing can rattle with the wind.

[1]Available from the ARRL bookstore and your local dealer. Order no. for the new 20th edition is 9043. (See page 4-33.) Telephone toll-free in the US 888-277-5289 or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2]**www.radioshack.com**.

[3]**www.bird-x.com**.

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; www.arrl.org/tis/. Add your comments: "The Doctor is On-line" at www.arrl.org/members-only/qst/doctor/.

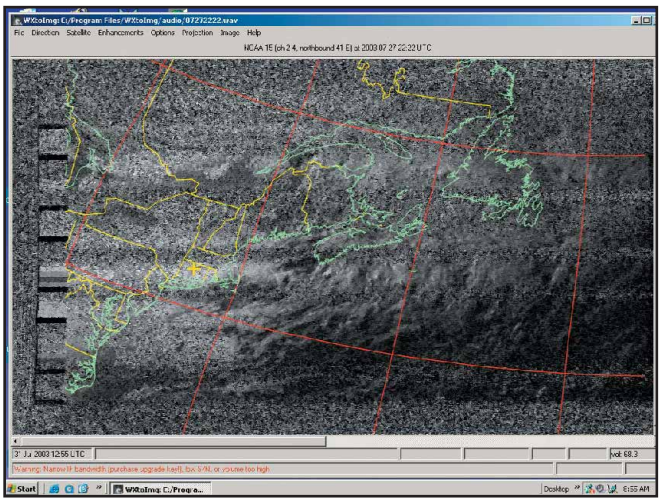
WXtoImg

Every so often you stumble upon a piece of freeware that defies logic. By this I mean that you can't understand how anyone could possibly give it away without cost. *WXtoImg* from Abstract Technologies New Zealand Limited is one of those "illogical" freeware applications.

WXtoImg is sound-card based software for *Windows*, *Linux* and *MacOS* that decodes images transmitted from orbiting weather satellites (polar orbiting and geostationary), as well as HF WEFAX. All you have to do is feed the audio from your receiver to the line or microphone input of your computer sound card. *WXtoImg* does the rest.

For this review I used a 1.5 GHz Pentium laptop running *Windows XP* and an ICOM IC-R5 communications receiver in the FM mode to monitor polar-orbiting weather satellites that transmit at about 137 MHz. The IC-R5 wasn't the ideal choice because, for best results, you need a receiver with an IF bandwidth of about 20 kHz. A good example is the Hamtronics R139 weather satellite receiver reviewed in the June 1999 *QST*.

My antenna was an ordinary 2-meter ground plane. Once again, this is not ideal. I would have been better off with a crossed-dipole antenna cut for 137 MHz, or a quadrifiliar. Despite these deficiencies, the fact that *WXtoImg* still provided viewable images is a testimony to its design.



The results of a NOAA 15 pass decoded by *WXtoImg*. The bands of noise are obvious, but look carefully and you can see clouds swirling off the New England coast.

Using *WXtoImg*

If you know your way around weather satellite image processing, *WXtoImg* offers an array of tools to enhance and display the information you receive. But if you are like me, you simply want to grab the data and see a near-real-time view of your corner of the world from outer space.

WXtoImg makes scheduling surprisingly easy. If your computer is connected to the Internet (dial-up or broadband), *WXtoImg* will update the orbital elements of all active satellites with a single mouse click. You should probably do this every few days. With the latest orbital elements in hand, *WXtoImg* will display a list of upcoming satellite passes in both local time and UTC with maximum elevation data for each pass.

WXtoImg is designed to *automate* the process of capturing satellite images. This is particularly easy if you have a receiver that will scan the various weather satellite frequencies. With the orbital elements up to date, you can click RECORD under the FILE menu and walk away. *WXtoImg* will detect the signal from the satellite and automatically begin storing it to your computer hard drive as a WAV audio file. When the satellite pass ends, *WXtoImg* will decode and display the image according to the parameters you've chosen. For instance, it can display the image and superimpose a map overlay.

For my tests I preferred to operate the system "manually." It was fascinating to hear the *tick-tock* signals as the NOAA weather satellites rose above the horizon. *WXtoImg* displays the calculated position of the target satellite, updating continuously. The incoming audio levels are indicated by a color bar in the lower right corner of the window.

When a satellite pass ends, *WXtoImg* goes to work processing the data it has received. About 30 seconds later you see the results. With my less-than-optimum setup there was a significant amount of noise in most images, but I could clearly see the swirling patterns of clouds.

Upgrading

Although the basic *WXtoImg* application is free, you can purchase upgrade versions that add greater capability. For example, *WXtoImg* "Standard Edition" offers Doppler correction (a kind of automatic frequency compensation similar to what you find in some Amateur Radio sound-card applications). The "Professional Edition" goes even further, including 3D views (3D glasses are included).

Conclusion

You obviously don't need *WXtoImg* or any other software to view images from weather satellites. Just turn on your TV and watch your local weather forecast, or get on the Internet and see the images at a weather-oriented Web site. But there is something exciting about capturing these images in real time with your bare hands. There are no Webmasters or media conglomerates between you and the spacecraft.

To learn more about weather satellite imagery, I strongly recommend that you purchase a copy of *The ARRL Image Communications Handbook* by Ralph Taggart, WB8DQT (**www.arrl.org/shop/**). There is more going on above your head than you probably realize. With *The ARRL Image Communications Handbook* and a copy of *WXtoImg*, you'll be able to catch a glimpse of this "hidden" world.

Manufacturer: Abstract Technologies New Zealand Limited, PO Box 113-126, Auckland, New Zealand; **www.weather.net.nz/wxtoimg**. *Standard Edition upgrade, $58.95. Professional Edition upgrade, $94.95. System requirements: 400 MHz or faster PC running* Windows 98/NT/2000/XP, Linux *or* MacOS *with 64 Mbytes of RAM and a SoundBlaster-compatible sound card.*

Steve Ford, WB8IMY ♦ *QST* Editor ♦ sford@arrl.org

By Phil Salas, AD5X

An FT-817 Compact Fast Charger

Don't wait 20 hours to recharge those FT-817 cells. Build your own versatile fast charger and have 16 more hours to operate!

I really enjoy using my Yaesu FT-817 low power tranceiver in portable applications. With an internal NiMH battery pack, it can give me several hours of operation even at the 5 W level under normal operating conditions. Unfortunately, that few hours of operation results in 20 hours of charging time when using the internal FT-817 charger. The One Plug Power (OPP) option by W4RT Electronics helps get around this.[1] The OPP provides an 1800 mAh NiMH battery pack and a new battery cover for the FT-817 that includes a 2.1 mm × 5.5 mm charging jack. You can now fast-charge the batteries from an external fast charger without having to remove the batteries from the radio, but…what do you do about the fast charger?

The Idea

I have a small, portable kit that includes my FT-817 and some accessories (MFJ-4103 power supply, multiband dipole, antenna tuner, paddle and some RG-174 coax). I also wanted a fast charger to carry along with my portable kit to give me the option of fast-charging the OPP. Unfortunately, most of the fast chargers available are physically large. Probably the most popular is the Maha C777/C777+.[2] But this fast charger is almost the size of the FT-817 and all of its accessories put together! It occurred to me that there's really no reason that the charger must be self-contained—it does not have to run directly from 117 V ac if you already have access to a 13.8 V dc power source. So, I decided to build a very small fast charger that would run from any 13.8 V dc source, like the MFJ-4103[3] miniature switching power supply or your car cigarette lighter socket.

The Design

The compact charger is built around the Maxim MAX712/713 Fast-Charge Controller IC.[4] Either the MAX712 or MAX713 can be used with NiMH batteries. These are very versatile ICs that permit fast charging of many different types of battery packs (NiCd, NiMH) with many different voltages. In this case, however, I was just interested in the 8 cell, 9.6 V NiMH battery pack used in the FT-817, which results in a very simple circuit.

Figure 1 shows the final design. Again, it is designed specifically for an 8 cell, 9.6 V NiMH battery pack. The fast-charge current is about 600 mA, and it will charge a depleted pack in 3 to 4 hours. It is also designed for a time-out of 4.4 hours. This controller automatically senses when the battery is charged and switches to trickle. The green LED is just a "power" indicator. The red LED is on during fast charge, and turns off when the charger is in "trickle" mode.

All the parts, except for the MAX712/713, are available from All Electronics.[5] All resistors are 1/4 W. The MAX712 can be purchased directly from Maxim.[6] You can also download data from the Maxim site for other charging conditions or numbers of batteries.

I built the entire unit into a tiny plastic enclosure with a metal cover, with most of the parts being mounted on the All

[1]Notes appear on page 70.

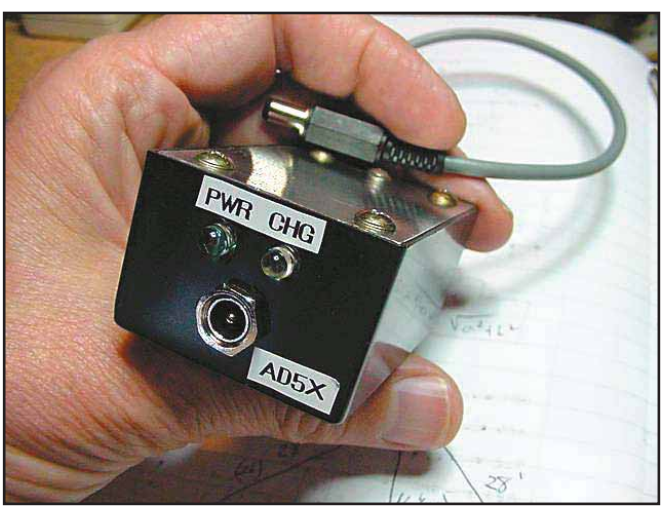


Figure 1—The completed fast charger unit ready to be plugged in. Note the power input and charge indicator LEDs. The charge LED remains lit until the charger reverts to "trickle" mode.

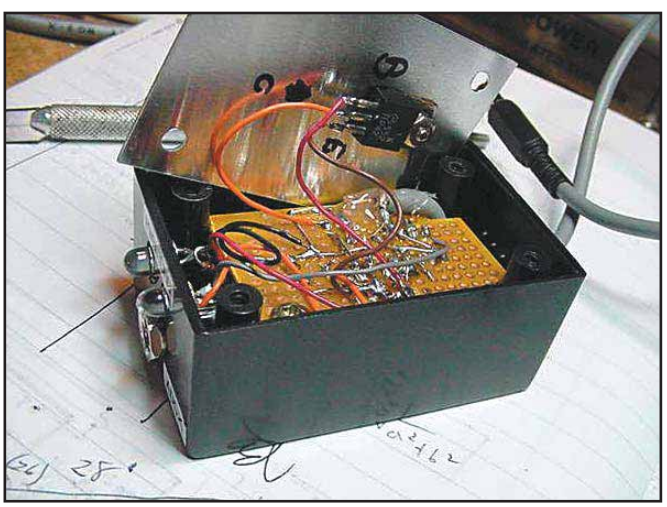
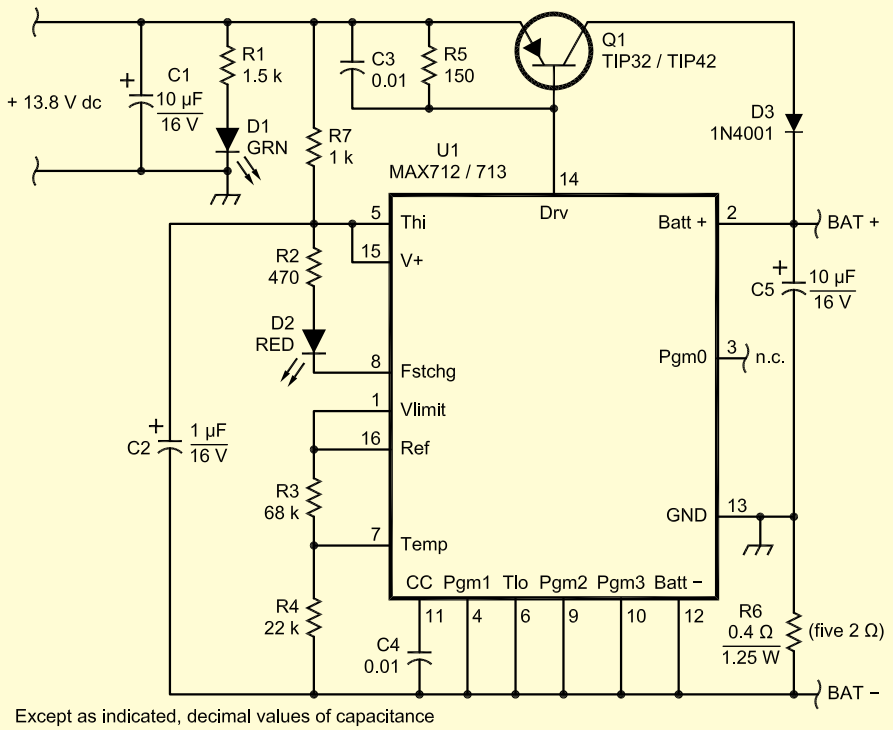


Figure 2—The interior view of the charger showing the wired perf-board. Transistor Q1 must be heat sinked. It is bolted to the top plate.



Except as indicated, decimal values of capacitance are in microfarads (µF); others are in picofarads (pF); resistances are in ohms; k = 1,000.
n.c. = No connection

Figure 3—The complete schematic and parts list for the FT-817 fast charger.
C1, C5—10 µF, 16 V.
C2—1 µF, 16 V.
C3, C4—0.01 µF, 16 V.
D1—LED, green.
D2—LED, red.
D3—Diode, 1N4001.
R1—1.5 kΩ, 1/4 W.
R2—470 Ω, 1/4 W.
R3—68 kΩ, 1/4 W.
R4—22 kΩ, 1/4 W.
R5—150 Ω, 1/4 W.
R6—0.4 Ω, 1.25 W (five 2 Ω, 1/4 W resistors in parallel).
R7—1 kΩ, 1/4 W.
Q1—Transistor, PNP, TIP32 or TIP42.
U1—IC, fast charger and regulator, MAX712/713 (Maxim).

Misc
Enclosure with metal panel (heat sink), perf-board, coaxial power connector.

Electronics PC-1 perf-board that matches their TB-1 enclosure.[7] The TIP32 transistor must be mounted to the metal cover so as to be able to dissipate its heat during high-current charging. I mounted a 2.1 mm dc socket[8] on the plastic box for the 13.8 V input, and I used a pendant cable with a 2.1 mm dc plug[9] for the output that plugs into the W4RT OPP 2.1 mm jack. As you can see from Figure 2, the perf-board is mounted with the components facing down into the box. Figure 3 is the complete schematic and parts list. Obviously, you can use this charger with other vendor battery packs depending on how you may wish to adapt and access them.

Finally

With just a few hours of assembly time and less than $20 you can build a compact fast charger for your FT-817 internal battery pack. Keep that Maha 777 at home for all your other battery backs—use this compact fast charger to keep your FT-817 travel pack of accessories compact and lightweight.

Notes
[1]W4RT Electronics, 3077-K Leeman Ferry Rd, Huntsville, AL 35801; **info@w4rt.com**; **www.w4rt.com**.
[2]**www.mahaenergy.com**.
[3]**www.mfjenterprises.com**.
[4]**www.maxim-ic.com**.
[5]**www.allelectronics.com**.
[6]See Note 4.
[7]All Electronics TB-1 enclosure (see Note 5).
[8]All Electronics DCJ-1 (see Note 5) or RadioShack 274-1563 (**www.radioshack.com**).
[9]All Electronics dcSID (see Note 5).

Phil Salas, AD5X, has been licensed for 38 years and enjoys all facets of HF operation. He is currently the Vice President of Engineering for Celion Networks in Richardson, Texas. Phil may be contacted at **ad5x@arrl.net**.

NEW PRODUCTS

WAØJOW *TRANSTENNA PRO*, TRANSMISSION LINE SOFTWARE

◊ *TRANSTENNA PRO* is a *Windows* program intended for use with SWR analyzers or other impedance measuring instruments. It allows impedance measurements, which are made at one end of a transmission line, to be transformed to the opposite end of the transmission line. Impedances can be transformed in either direction, from the source toward the load or from the load toward the source. This allows characterization of the antenna impedance while it is in its normal operating height and position. The software can also be used to design stub tuners or phasing harnesses for antenna arrays.

The software uses the general transmission line equations and takes into account the attenuation of the transmission line. The software acts, in effect, as an electronic calculator to achieve the same results as would be obtained using a Smith Chart but is said to be faster and simpler to understand and use.

A comprehensive cable database is included to characterize the transmission line properties and simplify program operation. This database includes resistive and dielectric loss constants for the cables that can be used to auto calculate the approximate attenuation of the cable at the operating frequency. Instructions are provided to allow the operator to edit, add or remove cable entries in the database.

The software provides additional data entry screens for specialized impedance measuring instruments such as a vector voltmeter, the GR 916-A RF Bridge and others.

For additional information or to download a copy of the Software Installation and Operation Manual, see **www.gbronline.com/transtenna**. The program comes on CD ROM and is available by mail order for $24.95 plus shipping and handling from Don Cochran, WAØJOW, 21826 Gardner Rd, Spring Hill, KS 66083.

Amateur Contact Log

Scott Davis, N3FJP, began turning out *Windows*-based Amateur Radio software in 1997, which makes him almost ancient in the computer world. He initially attracted the attention of the contest community with affordable (often free), elegantly written applications for various contests.

With applications such as *Amateur Contact Log*, or simply *ACLog*, Scott has since expanded his market to include all amateurs who are looking for general logging software. The latest version, 2.4, offers a wide array of features at a very attractive price.

Customizable Flexibility

ACLog allows you to keep your entire amateur log electronically by entering the information for each contact, such as call sign, date, band, mode, signal report, QSL status (sent vs received) and much more, in a collection of entry fields that are conveniently located at the bottom of the main window. *ACLog* immediately indicates if the contact is a new DXCC entity, state or county for you. In fact, when you enter the state, *ACLog* will automatically list all of the state's counties in the adjacent COUNTY pull-down menu. Nice!

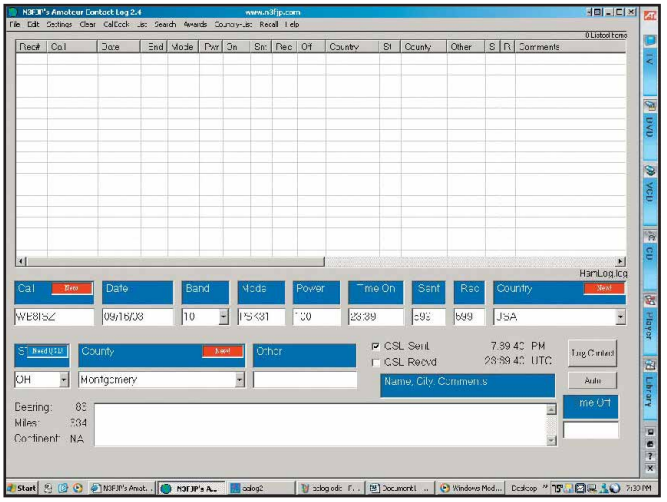
As you enter your contacts and build up your log, *ACLog* tracks your progress toward various awards such as Worked All States, DXCC, VUCC, IOTA and even Lighthouses. You can set up queries by band, mode or power level to display your log results by individual and multiple criteria.

The *ACLog* interface is completely customizable. You can choose to display any of the 29 data fields you wish, and designate where you want them to appear. By the way, the *ACLog* default is to display your last 50 contacts in the main window. This can be a little confusing when you scroll backward through the log and begin wondering what happened to the rest of your data. Fear not. Just click LIST on the top toolbar, then check ALL.

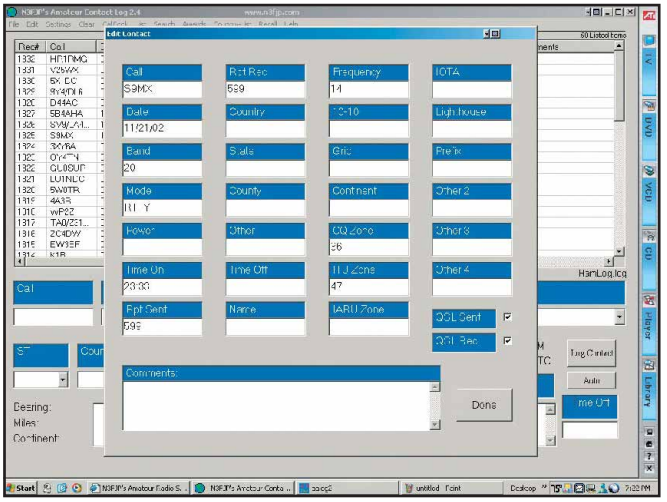
Like many logging programs these days, *ACLog* goes well beyond the task of shuffling contact information. *ACLog* offers radio control with most Elecraft, ICOM, Kenwood, Ten-Tec and Yaesu transceivers. You can send keyboard CW from your computer's COM (serial) port and play WAV audio files via your PC's sound card. *ACLog* will even monitor DX spots via the Internet (telnet) or packet radio. Interestingly, *ACLog* supports hardware packet TNCs *and* the popular sound-card TNC emulator, *AGW*.

ACLog imports and exports data in ADIF format. This is particularly important when you are swapping information between logging programs. For instance, I was able to export a RTTY log file in ADIF format from *WriteLog* and import it directly into *ACLog*. And since *ACLog* exports in ADIF, you can use your *ACLog* data for submission to ARRL's Logbook of the World.

ACLog interfaces smoothly with the QRZ and Buckmaster CD databases or from the FCC for call sign lookups. However, I opted to try the free call sign directory file that Scott offers on his Web site. It is a 22 Mbyte file containing US and Canadian call signs that Scott updates every six months. If you have a broadband Internet connection, you can grab the file in a few minutes and have it incorporated into *ACLog* shortly thereafter. With the file in place, the mailing address displays at the bottom of the main window whenever you select the DATE field while entering a contact.



You enter new contacts into *ACLog* by using entry fields at the bottom of the main window.



Editing contact information is easy in *ACLog*.

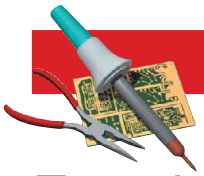
Of course, when it is time to send your cards, you can print QSL label strips and address labels directly from *ACLog*.

Try Before You Buy

I've always been a proponent of test-driving products before I purchase, be they automobiles or software. With that in mind, it is important to note that you can download a free trial of *ACLog* and use it for up to 45 days to see what you think of Scott's handiwork. If you like it, purchase the full version directly from his Web site.

Manufacturer: G. Scott Davis, N3FJP, 118 Glenwood Rd, Bel Air, MD 21014-5533; **www.n3fjp.com**. *$19. System requirements: Pentium 100 PC running* Windows 98/NT/2000/XP.

Steve Ford, WB8IMY ♦ *QST* Editor ♦ sford@arrl.org



Experiment #10—Using SCRs

Thyristors—what a strange word! What do they do? Thyristors are common components found around the ham shack in power supplies and ac control circuits. They are solid-state replacements for *thyratrons*—tubes that act as current switches. Like transistors, a small current can switch a much larger current. In this experiment, we'll use the most common thyristor—a silicon-controlled rectifier or *SCR*—to control both ac and dc.

Terms to Learn

- *Breakover* and *breakdown voltage*—the voltages at which an SCR begins to conduct current without gate drive from anode-to-cathode (forward) and cathode-to-anode (reverse), respectively.
- *Conduction angle*—the number of degrees of an ac cycle during which the SCR is conducting forward current.
- *Holding current* (I_H)—the amount of forward current required to keep an SCR conducting.
- *Latch*—to change state and remain in that state.

How the SCR Works

The SCR has an NPN transistor's layered structure of N and P-type material but adds one additional P-type layer as shown in Figure 1. Starting at the cathode and moving left, you see what looks like the three layers of a regular NPN transistor. The extra P-type layer then creates a PN-diode at the anode. The SCR "looks like" a rectifier attached to an NPN transistor.

The SCR operates in just two states: ON and OFF. When OFF, the SCR acts like an open-circuit to voltages between the anode and cathode as long as the value is less than either the breakover or breakdown voltages. The SCR will remain OFF until gate-to-cathode current reaches the *gate trigger current*, I_{GT}, or *gate turn-on voltage*, V_{GTO}, at which point forward current flows from the anode to cathode and the SCR is ON.

It's important to understand that while the SCR is turned ON by gate current, it can't be turned OFF the same way. Once ON, the SCR is *latched* ON until forward current falls below the *holding current*, I_{HO}, when it resets to the OFF state. Forward current will fall below I_{HO} when the power source stops supplying or the load stops drawing current. In an ac circuit, the reversal of voltage across the SCR stops current flow.

Demonstrating SCR Functions

This is unfamiliar territory for many electronic designers, so let's start with a simple experiment that demonstrates the basic SCR functions to discharge a capacitor into a load.

- Construct the circuit of Figure 2. Don't use your prototype board; either solder the components together or use a terminal or barrier strip. A clip lead or jumper wire can be used for the switches.
- Open S2 then close S1. Connect the 12 V power supply. Monitor voltage across the capacitor to be sure it charges to 12 V. No voltage should appear across the 100 Ω load resistor.
- Open S1, leaving the charged capacitor connected to the SCR. Monitor voltage across the load resistor while *momentarily* closing S2. (If you leave S2 closed, gate current will continue to flow, overheating the 47 Ω resistor.) You will see a pulse of voltage across the load resistor as the capacitor discharges through it. The duration of the pulse will be approximately R × C = 100 × 9400 µF = 0.94 seconds.
- Observe the trailing edge of the pulse as the capacitor discharges. You will see load voltage abruptly drop to zero as current through the SCR falls below I_{HO}. This will happen with capacitor voltage around 2.2 V due to the 1.8 V forward voltage drop of the SCR, which leaves only 30-40 mA flowing in the load resistor. (This is clearest if you are able to monitor both capacitor and load voltage.)
- As soon as load voltage drops to zero, indicating that the SCR is reset, you can close S1 again to repeat the cycle.
- Experiment with the circuit by increasing the value of the gate resistor until the SCR no longer triggers. Similarly, if the load resistance is increased, maximum current will fall below I_{HO} and the capacitor will no longer discharge through the SCR.

Designing with SCRs

The circuit you just tested is similar to over-voltage protection circuits found in dc power supplies, called *crowbars*. A heavy-duty SCR is connected directly across the power supply output and triggered to act as a short circuit if the output voltage gets too high. SCRs can handle a large surge current, so this either trips the supply's current limit circuit or blows a fuse. Either way, equipment connected to the supply is not subjected to excessive voltage.

Another popular use of SCRs is in ac circuits that control power to a load such as a light bulb dimmer or motor speed control. The circuit of Figure 3A shows a simple dimmer cir-

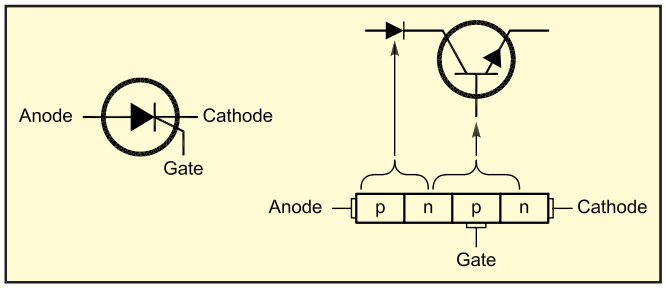


Figure 1—The internal construction shows that the SCR may be thought of as a rectifier in series with an NPN transistor.

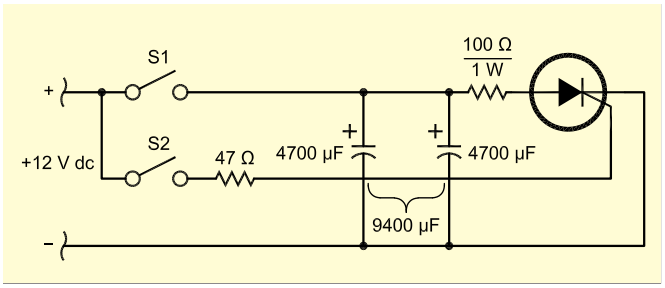


Figure 2—A simple charge-dumping circuit. The capacitor discharges through the load resistor and the SCR when a current pulse through the gate turns the SCR ON.

H. Ward Silver, NØAX ♦ 22916 107th Ave SW, Vashon, WA 98070 ♦ n0ax@arrl.org

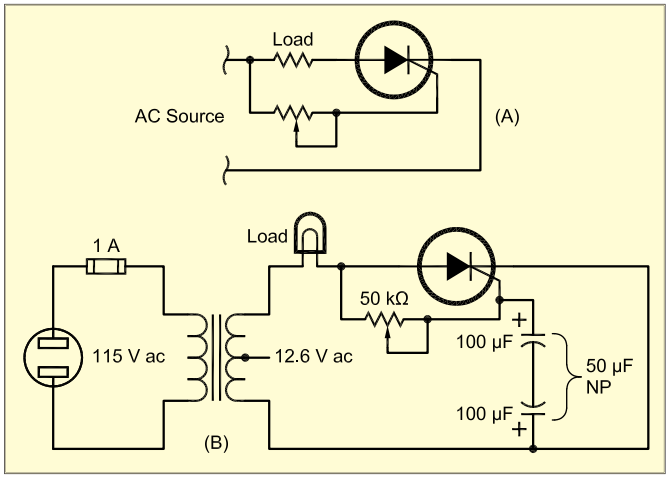


Figure 3—An RC-controlled dimmer circuit. To run this circuit at 115 V ac, the capacitor value can be reduced by a factor of 10 or more.

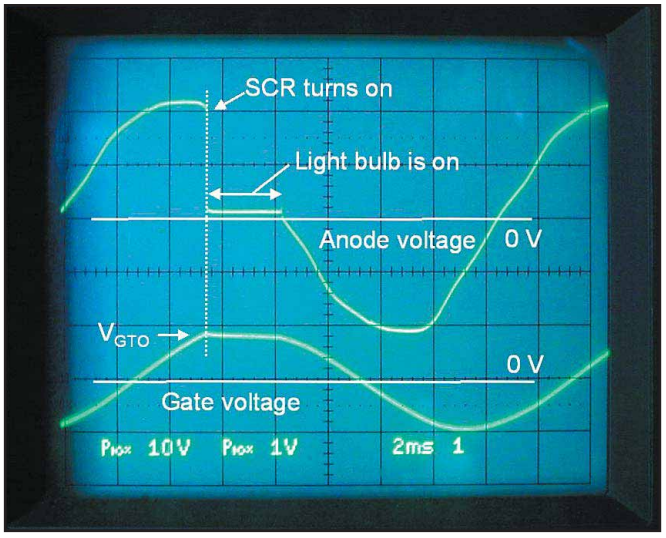


Figure 4—The SCR anode and gate voltages show a conduction angle of about 65°.

cuit. Starting with the gate control potentiometer set to a high value, the SCR remains OFF over the entire ac cycle. As the control resistance is reduced, eventually enough current enters the SCR gate at the very peak of the ac cycle, turning it ON for the duration of the positive half-cycle. As the control's resistance is reduced further, the SCR turns ON at lower and lower voltages, conducting over more of the positive half-cycle and delivering more power to the load.

In Figure 3B, the load—a light bulb—has been moved to the supply side of the potentiometer and a gate capacitor has been added. This allows smoother control of the *conduction angle*. Starting once again with the SCR in the OFF state, all of the applied voltage appears across the SCR and the gate capacitor charges through the potentiometer. When the capacitor has charged to the SCR's gate turn-on voltage, V_{GTO}, the SCR turns ON. The SCR stays ON until the voltage reverses.

By choosing the right values for the potentiometer and capacitor, the SCR's conduction angle can be varied from about 30°, turning on near the end of the positive half-cycle, to almost 180°, conducting over the entire positive half-cycle. Ready to try it for real?

Testing a Dimmer Circuit

- Construct the circuit of Figure 3B taking special care with the ac supply. All 115 V_{rms} line circuits must be insulated and fused. Use a ground-fault interrupter (GFI) circuit, if possible. The gate capacitor must be nonpolarized and is constructed from two electrolytic caps connected back to back with opposing polarities.
- Set the potentiometer to its maximum value. Monitor SCR anode voltage and gate capacitor voltage with an oscilloscope. Connect a voltmeter across the light bulb set to measure ac voltage. Power up the circuit. The light bulb should be OFF. You will observe a small ac voltage across the gate capacitor.
- Slowly reduce the potentiometer value until voltage across the light bulb begins to increase. You will see the gate capacitor voltage increasing to V_{GTO} (about 1 V) at which point the SCR turns ON. Continue decreasing the potentiometer resistance. The gate capacitor will charge to V_{GTO} faster and the SCR will conduct over more of the ac cycle, increasing bulb brightness and the voltage across it. Figure 4 shows one ac cycle of the SCR gate and anode voltage.
- Try to maximize the range of the SCR's conduction angle by changing the gate capacitor or control pot values. A 25 kΩ pot and 100 µF capacitors worked best for the SCR I used.

Suggested Reading

The amateur literature is sparse in the area of thyristors, but manufacturers offer detailed design and application information. The Teccor Electronics Web site has an excellent series of downloadable application notes on thyristors at **www.teccor.com/web/menuitems/downloads/appnotes.htm**. The classic, but old data book by RCA—the *Transistor, Thyristor and Diode Manual*—also has an excellent tutorial section on thyristor basics.

Shopping List

- SCR—RadioShack 276-1067, 267-1020 or similar.
- 115 V_{rms} to 12.6 V_{rms} power transformer—RadioShack 273-1365 or similar.
- Two 4700 µF @ 16 V or greater, two 100 µF @ 16 V or greater capacitors.
- 100 Ω-1 W, 47 Ω-¼ W resistors.
- 50 kΩ potentiometer—RadioShack 271-1716.
- 12 V incandescent lamp—RadioShack 900-2665 or similar.

Next Month

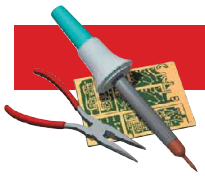
Next month we'll jump back to one of my favorite op-amp circuits—the comparator. These handy circuits are used for all sorts of detection and sensing duties, so get the prototype board and 741s dusted off!

Remember the Hands-On Radio Web site: **www.arrl.org/tis/info/html/hands-on-radio/**. QST

STRAYS

QST congratulates . . .

◊ Amateur Radio on the International Space Station (ARISS) Chairman Frank Bauer, KA3HDO, who has been promoted to the highest technical rank accorded a NASA scientist or engineer. Bauer, who works at NASA Goddard Space Flight Center in Maryland, now is a Special Technical—or ST—in recognition of his record of exceptional technical achievement in the field of guidance, navigation and control.



HINTS & KINKS

A JUNK-BOX MIC EXTENSION

◊ In my ham shack, my computer is about eight feet from my rack-mounted station. I wanted to have my mic over by the computer, so I need not keep turning around to use it. All I needed was a microphone extension cord, with a female mic plug on one end and a male mic jack on the other. The problem is there *are* no male in-line mic jacks around! My solution is what I call the "junk box mic extension cord." Yes, all the parts for the male end came from my junk box: 1 PL-259 connector, 1 chassis mount mic jack (4 or 8 pin male) and 1 mic plug (4 or 8 pin female). Figures 1 through 3 show the parts and a finished jack. Figure 4 shows the parts as they will be assembled.

The task requires few tools: a small screwdriver to remove tiny screws, two pairs of pliers (I prefer to use Channel Lock Pliers as one pair), solder, a small torch, flux and a vise. The vise is not required, but it helps keep parts aligned while soldering.

Eight-conductor mic cable is readily available. I recommend #26 AWG, seven-conductor with shield. Not all conductors will necessarily be connected for all transceivers; use your radio operator's manual or schematic diagram to determine the correct pin connections. Here's how it's done.

1. Remove the outer sleeve from the PL-259, and put the inner part (center conductor) back in the junk box.

2. Remove the phenolic (or plastic) female portion of the mic plug. It may be necessary to remove the threaded collar, too. I used my Dremel tool to saw it off. Most mic plugs do not require this step. Keep the outer case of the mic plug and discard the plastic portion (see Figure 2).

3. Check to see how well the threads of the chassis-mount mic jack (Figure 4, part 1) and the PL-259 outer sleeve (Figure 4, part 2) fit. Some "encouragement" may be necessary. I used two pairs of pliers to "assist" in the fitting. Now separate those two parts again.

4. Insert the outer case of the mic plug (Figure 4, part 3) through the "threaded" end of the PL-259 sleeve (butt end first). The outer mic plug sleeve may have a collar that bottoms out on the inside rim of the PL-259 sleeve. If not, simply insert the mic plug case into the bottom (non-threaded) end of the PL-259. Solder the "sleeve" to the mic plug outer case.

5. All that remains is to wire the chassis-mount mic jack in accordance with your transceiver's requirements (be sure to insulate the connections with tape or shrink wrap) and then thread the chassis mount mic jack into the new cable end housing you have soldered. Again some "assistance" in coupling the parts may be necessary. My rule of thumb is: Bigger pliers need less "assistance."

Figure 4—This is how the parts fit together. From left to right, they are the chassis-mount connector (1), PL-259 sleeve (2) and mic outer case (3).

6. Install a standard female mike plug on the other end and you're ready to go.

I have two extensions for my ICOM SM-8 microphone. It took two hours to build them both. Good luck and have fun making a relatively cheap microphone extension cord.—*Wilbur Jones, N8KF, 3444 Airport Rd, Waterford, MI 48329-3014;* **n8kf@arrl.org**

PIC PROGRAMMER CORRECTIONS

◊ There are several errors in the schematic of Ralph Gable's PIC programmer (Aug 2003 *QST*, p 62). The emitter and collector leads of Q1 are reversed. The emitter lead should connect to ground and U1 pin 5, and the collection should connect to U1 pin 12 and P3 pin 1. There should be a connec-

Figure 1—Parts used to build the female end of the mic extension cord. At left a PL-259, at center a chassis-mount microphone connector (four-pin shown, you can use eight-pin as well), at right a mic plug.

Figure 2—Disassemble the mic plug. Save the outer case (left) and discard the insert (center) and threaded ring (right).

Figure 3—The finished female end of the extension cord. Wire an appropriate mic plug to the other end for a complete cable.

Bob Schetgen, KU7G ♦ Senior Assistant Technical Editor ♦ h&k@arrl.org

tion where the line from P1 pin 8 crosses the collector of Q2. Finally, the PIC should be a 16F84; 16C84s are obsolete. *—Bob, KU7G*

MORE EXTERNAL KEYING FOR THE IC-706

◊ I recently read the Hint for the external keying line of the ICOM IC-706MKII (July 2001, p 72). I have a '706 MKIIG and also wanted an external keying circuit. For a more robust and generic design than the one presented by KC5VDJ, I took his design as a start and added to it with an earlier design of mine from years ago. I used my original circuit to key an external amplifier with a Kenwood TS-711.

This circuit can be used for keying or controlling any external device, and it could be adapted for radios other than the '706. The KC5VDJ circuit inverts the output of the VSEND (pin 7) or HSEND (pin 3) of the IC-706. (VSEND and HSEND provide a positive voltage on receive and go to ground when transmitting.) By adding another transistor, a relay with protection diode and one more resistor, we can achieve total isolation and control greater loads (see Figure 5).

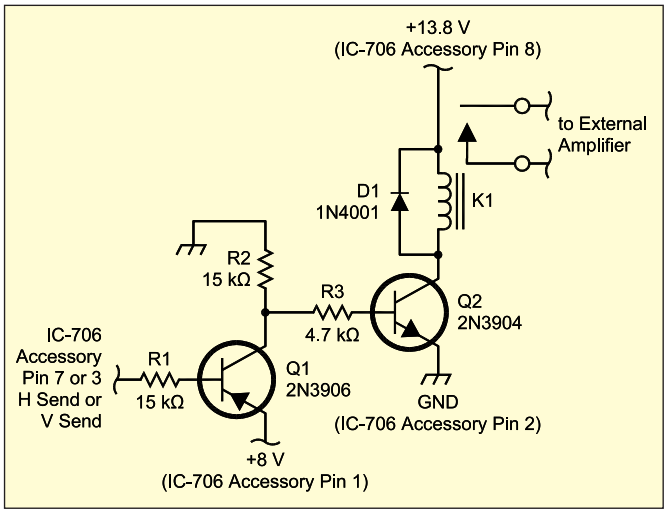


Figure 5—WB4U's circuit for keying amplifiers and heavier loads with the IC-706 and other rigs having small transistor keying circuits. K1 is a RadioShack 275-233 or equivalent (normally open SPST relay with a 12 V, 1050 Ω coil).

If there's no need to invert the incoming signal, use just the added transistor circuit by deleting R1, R2 and Q1. One need only apply +8 V to the input at R3 for Q2 to turn on and complete the ground path for the relay to operate. The diode across the relay coil prevents the counter-EMF (developed in the relay coil) on deactivation from damaging Q2. A heavier relay could be used, up to about 100 mA, without circuit changes. This circuit could also be used with an HF amplifier by adding an ALC line back to pin 6 of the accessory jack on the '706 from the external amplifier.*—Johnny Knight, WB4U, 2104 Irby Rd, Monroe, NC 28112;* **wb4u@arrl.net**

TEN-TEC PARAGON BATTERY WARNING

◊ The Ten-Tec Paragon is a wonderful transceiver, but when it's disconnected from a power supply the memories, last frequency used and clock circuits are maintained by a replaceable internal battery. The manual incorrectly states that a 9 V alkaline or NiCd battery may be used. The system has a charging circuit to maintain a NiCd battery, that will cause an alkaline battery to leak. Acids from the leaking battery drip onto the logic board directly below it. Ten-Tec replacement logic boards are no longer available.

Fortunately, Ten-Tec uses an open architecture that makes it easy to service the radio. I was able to remove the logic board and rebuild the circuits using jumpers to bypass the destroyed copper traces. The radio now works like new again.

However, the *internal* hidden battery concerned me. There is a rear-panel opening and cover plate meant for an optional EIA-232 module. I don't have that module, so I drilled a small hole in the plate. A rubber grommet allows the two wires to be brought out to an *external* 9 V NiCd in a battery holder mounted on the plate. I can now monitor the battery and replace it easily.*—Harold Keenan, KB1US, 85 Topstone Dr, Danbury, CT 06810-7037;* **kb1us@arrl.net**

A SUPER GLUE SOLVENT

◊ When working with super glue (cyanoacrylate) you should always have the solvent nearby in case you glue something that you shouldn't—your fingers, for instance. If you have run out of the solvent sold with the glues, acetone will serve. [It's also good for cleaning up epoxies *before* they've cured! *—Ed.*]*—Jim Martin, KC5ZL, 1801 Peaceable Rd, Apt 8, McAlester, OK 74501-7298*

HISTORY OF HINTS & KINKS—A TIMELINE

◊ I was recently asked when "Hints and Kinks" began. The research illuminated a long history that began with readers. The "Hints and Kinks" column appeared in 1936, but it was based on an earlier "Experimenters' Section" column that started in 1923-24. The Experimenters' Section was a part of the ARRL organization with many registered members, who worked on technical tasks of concern to hams. The column "Experimenters' Section" reported on activities of those members, but continued well after the registry ceased in 1930. Here is a brief timeline:

Jul 1923: ARRL includes a reader survey (p 126) in *QST*.

Jan 1924: "The Growth of the Experimenters' Section" on p 35 indicates that headquarters is overwhelmed by survey results. There is great interest in experimentation and technical education. Result will be an Experimenter's Section of the ARRL organization.

Feb 1924: The first "Experimenter's Section Report" appears in *QST* (p 72). It solicits readers to register with headquarters to help with experimentation concerning technical problems of the day.

May 1929: The "Experimenter's Section" (p 41) states that results of the Technical Development Program will cover many technical problems previously considered by the Experimenters' Section. Those problems not addressed are stated, with bibliographic resources, in columns from May 1929 through May 1930.

Jun 1930: "Experimenters' Section" (p 33) headquarters activities associated with the Experimenters' Section cease, but the column continues. The space is used for "ideas and kinks which experimenters find useful." The column solicits technical ideas from readers.

Apr 1936: "Hints and Kinks for Experimenters" first appears on p 59.

1978: First Hints and Kinks book is published.

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, 225 Main St, Newington, CT 06111, or via e-mail to **h&k@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

ICOM IC-703 Plus HF and 6 Meter QRP Transceiver

Reviewed by Rich Arland, K7SZ

An interesting trend in commercially manufactured Amateur Radio equipment may have started several years ago with the introduction of the Vertex/Standard (Yaesu) FT-817. This radio was a multimode full featured MF/HF/VHF/UHF transceiver designed especially for portable operation. The power level was low to allow extended operation under battery power, making it an ideal QRP backpacking companion.

ICOM has now introduced a low power version of their tremendously successful IC-706MKIIG, called the IC-703 (see July 2003 *QST*, p 61), to capture some of this market. The original '703 was a fine rig, but lacked VHF coverage. ICOM has now redesigned the '703 to provide the ham on the go with a small, easily transportable and battery friendly package covering all the HF bands (a call to ICOM will get simple instructions for adding 60 meters) and 6 meters. Note that early '703 HF versions erroneously indicated that they covered 50 MHz on the front. New production units indicate the actual supported frequency range for each type on both the box and the front panel.

I received the review radio from the ARRL Lab and immediately started setting the little rig up in my shack. The only 6 meter antenna I had handy was the Diamond D-130J discone that is used as a scanning antenna at K7SZ. This antenna will handle up to 100 W on 6 meters, so I connected the '703 to the discone and started tuning around. As usual, when I'm on 6 nobody else is! However, I was able to bring up two local 6 meter repeaters and received good audio reports using the factory default settings in the radio. I was able to do all this without consulting the manual!

The IC-703 Plus is an easy radio to get to know and use. The 96 page manual is easy to read and digest. Not being the type who likes to go to the manual unless all else fails; I spent some time just poking around to get the "feel" of the rig. The large display is definitely easy on the eyes, and much easier to read and decipher than the displays on either my FT-817 or FT-857 radios. The display is very readable from a variety of angles. This becomes extremely important when using the IC-703 Plus in a mobile environment. Since the front panel detaches and can be mounted remotely, mounting the front panel at an angle for good viewing is easy. The large display greatly simplifies this process.

The IC-703 Plus features 105 memory channels, and will operate on any voltage between 9.0 and 15.9 V dc. Power output is controllable from the front panel, via menu selection, from 0.1 W to 10 W (5 W at 9.6 V) on all bands using SSB, CW, FM and RTTY. AM output is 0.1 to 4 W (2 W at 9.6 V).

If you've ever operated portable at Field Day or on a camping trip in the bush, dragging along extra accessories like an outboard tuner, coax jumpers, etc, gets to be a real drag. The IC-703 Plus solves that problem by building the tuner right into the radio. It will match 16.7 to 150 Ω unbalanced load on HF and will tune a 20 to 125 Ω load on 6 meters. Adding a 4:1 balun allows the user to also tune into antennas fed with balanced transmission lines. You'll get a 1:1.5 match in a matter of a couple of seconds. Nice...*really* nice!

Earlier I mentioned that the IC-703 was a "battery friendly" radio. The trend in QRP today is to operate from remote locations. In order to successfully do this requires a radio that is not going to drain the battery in a couple of hours. Receiver current runs between 300 mA and 1.2 A depending upon power source and whether the receiver is quiet (squelched) or actively buzzing with QSOs and, of course, the volume level. Transmitter power output level determines the transmit current. At 5 W output the transceiver draws around 2 A, and it draws 3 A at 10 W.

Time to check 6 meters again. While the discone antenna's lower limit on 6 meters is 52 MHz, using the IC-703 Plus on-board tuner, I was able to get a match from 50.0 MHz all the way up to 54 MHz with no problems. I also coupled my 180 ft 40 meter Extended Double Zepp (fed with 450 Ω ladder line via a 4:1 balun) into the IC-703's tuner. Wow! A match! Had the band been open during the evaluation, I'm sure I would have made many SSB and CW contacts with one or the other antenna.

While the main thrust of this review was to highlight 6 meter operation, giving an old QRPer like me a radio like the IC-703 Plus and not expecting me to drop

Bottom Line

ICOM's new HF QRP transceiver adds 6 meters. This makes a great travel companion for CW and SSB operators (FM and AM too) at up to 10 W out and with a competent general coverage receiver as well.

Joel R. Hallas, W1ZR ♦ Assistant Technical Editor ♦ w1zr@arrl.org

Table 1
ICOM IC-703 Plus, serial number 151068

Manufacturer's Claimed Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.03-60 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 MHz.	Receive[1] and transmit, as specified.
Power requirement: Receive, 0.45 A (max audio); transmit, 3.0 A (10 W output).	Receive, 0.61 A; transmit, 2.6 A. Tested at 13.8 V. Receive with power reduction features turned on, 0.34 A.
Modes of operation: SSB, CW, AM, FM, RTTY.	As specified.

Receiver	Receiver Dynamic Testing
SSB/CW sensitivity, bandwidth not specified, 10 dB S/N: 50-54 MHz, <0.13 μV.	Noise floor (MDS), 500 Hz filter: *Preamp off* / *Preamp on* 50 MHz: –139 dBm / –143 dBm
AM sensitivity, 10 dB S/N: 50-54 MHz, <1.0 μV.	10 dB (S+N)/N, 1-kHz tone, 30% modulation: *Preamp off* / *Preamp on* 53 MHz: 0.88 μV / 0.47 μV
FM sensitivity, 12 dB SINAD: 50-54 MHz, <0.25 μV.	For 12 dB SINAD: *Preamp off* / *Preamp on* 52 MHz: 0.28 μV / 0.16 μV
Blocking dynamic range: Not specified.	Blocking dynamic range, 500 Hz filter: Spacing: 20 kHz / 5 kHz *Preamp off/on* / *Preamp off/on* 50 MHz: 121*/118* dB / 91/86 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range, 500 Hz filter: Spacing: 20 kHz / 5 kHz *Preamp off/on* / *Preamp off/on* 50 MHz: 81/83 dB / 74/71 dB
Third-order intercept: Not specified.	Spacing: 20 kHz / 5 kHz *Preamp off/on* / *Preamp off/on* 50 MHz: –12/–14 dBm / –23/–32 dBm
FM adjacent channel rejection: Not specified.	20 kHz channel spacing, preamp on: 52 MHz, 69 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing, preamp on: 52 MHz, 72 dB. 10 MHz channel spacing, preamp on: 52 MHz, 113 dB.
S-meter sensitivity: Not specified.	S9 signal at 50.2 MHz: preamp off, 22 μV; preamp on, 7.3 μV.
Squelch sensitivity: SSB, <5.6 μV; FM, <0.32 μV.	At threshold, preamp on: FM, 52 MHz, 0.08 μV.
IF and image rejection, 70 dB.	First IF rejection, 87 dB; image rejection, 121 dB.

Transmitter	Transmitter Dynamic Testing
Power output: SSB, CW, FM, 10 W high, 0.1 W low; AM (carrier), 4 W high, 0.1 W low.	CW, SSB, FM, typically 10 W high, <0.1 W low; AM (carrier), typically 3.7 W high, <0.1 W low.
Spurious-signal and harmonic suppression: ≥60 dB	67 dB. Meets FCC requirements for spectral purity.
SSB carrier suppression: >40 dB.	55 dB.
Undesired sideband suppression: >50 dB.	72 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	See Figure 1.
CW keying characteristics: Not specified.	See Figure 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 19 ms. Unit is suitable for use on AMTOR.
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 43 ms; FM, 18 ms.
Composite transmitted noise: Not specified.	Same as original '703.

Size (height, width, depth): 2.3×6.6×7.9 inches; weight, 4.3 pounds.

Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.
All test data is for 50 MHz performance unless otherwise noted.
*Measurement was noise-limited at the value indicated.
[1]Receive sensitivity is reduced below 250 kHz.

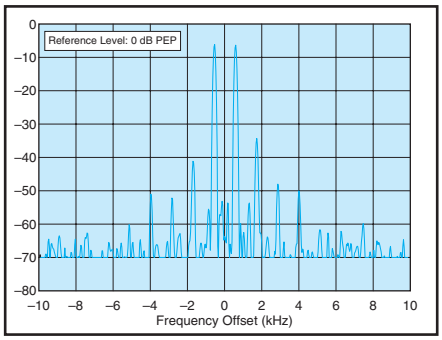


Figure 1—Worst-case spectral display of the IC-703 Plus transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 35 dB below PEP output, and the worst case fifth order product is down approximately 48 dB. The transmitter was being operated at 10 W PEP output at 50.2 MHz. The usual composite noise results are not shown since they match the earlier '703 results quite closely.

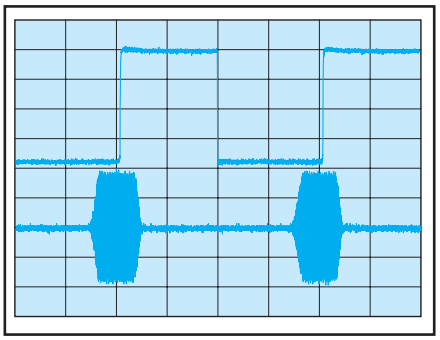


Figure 2—CW keying waveform for the IC-703 Plus showing the first two dits in full break-in (QSK) mode using external keying. Equivalent keying speed is approximately 60 wpm. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transmitter was being operated at 10 W output on 50.01 MHz. Note that the dit shortening observed in the original '703 remains; however, the earlier leading edge spike on the first dit has been eliminated.

down to the 40 and 20 meter bands for some HF QRP work is like offering someone a bag of potato chips and expecting them to eat only one. Yeah, right!

CW and SSB operation is a breeze. The manual goes into detail on how to set up the mic gain, the IF filters, DSP, tuning rate, keyer and memories via the menu. Complete operating details for each mode are also contained in this excellent manual.

I tried the IC-703 Plus on 40 meter CW and, using the combination of the FL-52A 500 Hz CW filter option and the IF SHIFT control, I easily copied QRP signals on a semi-crowded band. One very nice touch is that when using the IF SHIFT control, a graphic icon is displayed on the liquid crystal display (LCD) showing where within the passband of the IF you are actually listening.

A feature especially appreciated by a portable operator, but of potential use by all, is the adjustable dial drag. This can be adjusted by moving a small lever to the right of the main tuning knob anywhere from light to almost unmovable. If operating from a moving vehicle, a light tuning knob feel can get you off frequency pretty easily. A related feature is the LOCK button just to the left of the tuning knob. In any kind of busy environment, a push of that button upon making a contact will ensure that the station you're working is not lost the next time someone runs into your radio.

The CW keying characteristics of the IC-703 Plus are outstanding, approaching the legendary full QSK associated with the Ten-Tec QRP rigs of ancient times. I was very pleasantly surprised by how nicely the '703 keyed. It was very clean and crisp, and the receiver recovery time was excellent, allowing me to hear between characters. Good job, ICOM. Earlier keying problems referenced in the July 2003 review have apparently been remedied (see Figure 2). On air reports indicated that the '703 Plus sounded fine on both CW and SSB.

A radio's overall performance is measured by its receiver specs. On air operation can translate the lab data to real world experience. This receiver validated its solid performance numbers by withstanding the rigors of 40 meter nighttime operation. Being able to dig signals out of the cacophony of noise and QRM on 40 at night is the ultimate proving ground for any receiver, in my book. The IC-703 Plus is no slouch in the receiver department.

I was amazed by how well the noise blanker worked. I have a lot of radios with noise blankers in them and they all work to some degree. However, the '703's blanker *really* works with little or no distortion of the incoming signal. Well done, ICOM!

As long as we're talking about receiver performance, let's discuss some of the options available to increase the performance of the IC-703 Plus. If you are planning much CW operation, one of the two narrow CW filters (FL-52A, 500 Hz or the FL-53A, 250 Hz) would be a logical choice. Conversely, should you not desire to operate CW, you might contemplate installing one of the optional SSB filters: the FL-222 (1.8 kHz) or the FL-257 (3.3 kHz) instead. There is only one optional filter slot, so you must make a decision on which filter to install (these are solder-in filters, by the way, so don't plan on frequent changes), depending upon your operating style. Note that while this radio looks like the IC-706, it doesn't use the same filters.

An important standard feature is the UT-106 DSP unit, which adds audio digital signal processing to the receiver. A lot has been said recently about DSP, but one thing for sure, audio DSP is a viable option especially if used in conjunction with a good IF filtering system. Using the combination of DSP and optional IF filters, the user can turn this radio into a competitive contest machine suitable for Field Day or any of the major contests.

Meanwhile, back on 6 meters, the Lone Radio Amateur searches for a contact. Boy, things can get lonely on 6! Using the spectrum display on the '703 I was able to watch the lower end of 6 meters in hopes of spotting signals in the SSB and CW portions of the band. Unfortunately, the Gods of Propagation were out to lunch, and I was unable to make any contacts in the SSB or CW segments of the band.

Six meters is a great band for a 10 W radio and the IC-703 Plus can become your key to a whole new world of VHF DXing, once the proper band conditions are present. When the band is open it takes only a couple of watts to work tremendous distances. A simple 6 meter vertical, rotatable dipole or "halo" style omnidirectional antenna can provide many QSOs during band openings. Adding a small 3 element 6 meter Yagi will yield lots of DX during openings, but only when the propagation exists to support DX contacts.

The IC-703 Plus is geared to the ham operator who needs a portable compact rig with solid performance at a reasonable price. Its size coupled with all the bells and whistles make the IC-703 Plus an outstanding value for the money. This radio is at home in the shack as well as in a backpack or on a picnic table at a campsite. Hams who have space concerns can easily utilize the IC-703 Plus as the core piece of equipment in a compact radio shack

This radio shows us another side of ICOM: their willingness to listen to the consumer and to update a newly released radio to accommodate the desires of the end user. What will be next? Maybe a low power version of their IC-706MKIIG with full duplex capability on V/UHF for serious satellite work?

Manufacturer: ICOM America, 2380 116th Ave NE, Bellevue, WA 98004; tel 425-454-8155; **www.icomamerica.com**. Price: $750; FL-52A CW filter (500 Hz): $180; FL-53A narrow CW filter (250 Hz): $180; FL-222 narrow SSB filter (1.9 kHz): $200; FL-257 wide SSB filter (3.3 kHz): $190.

QST Compares: 222 MHz FM Transceivers from ADI, Alinco and Kenwood

Reviewed by Joe Carcia, NJ1Q
W1AW Station Manager

This was a "new" band for me. By new, I mean in my 24 years of being a ham, my only experience with 222 MHz was with the W1AW Robot BBS. Since I never had any real reason to check the *ARRL Repeater Directory* for 222 MHz listings, I didn't know what to expect on visiting this band for the first time. Imagine my surprise when I opened up the *Repeater Directory* and found a number of repeaters I could use—even in my hometown.

For the purpose of this review, I used a simple 1.25 meter dipole and an Astron RS-35 power supply for home testing. The radios were placed side by side on my bench, and I switched the power cable and antenna between them. When operating mobile, I used the power connector from my personal dual-band rig. The mobile antenna consisted of an SO-239 mounted ground-plane hung outside the truck door window.

Since these are all single-band FM transceivers, a few common observations can be made before we start comparisons. As with most radios these days, you get your standard fare of functions: auto power off, time-out timer, CTCSS/DCS encoding, DTMF tones, tone burst, channel lockout, programmable scanning, scan "skip-channel," call frequency, etc. Each of the radios received good reports on audio quality and receive audio was good as well. The rear of each radio has an SO-239 antenna connection, the power line pigtail terminating in a 2-pin standard locking power plug and a standard $^1/_8$ inch jack for an external speaker. As noted below, the DR-235T has a data connector as well. The internal speaker of each is located on the top.

Another point in common is that each radio chassis is largely a heat sink and none has a removable front panel.

Some Subtle Differences

Some features are available in only one or two of the models tested. For example, a dual watch function (ability to watch two different frequencies) is available in the ADI AR-247 and in the Kenwood TM-331A radios only. CTCSS scan decoding—the ability to have the radio scan frequencies to determine a particular CTCSS tone—is available in the ADI radio only (at least it is not mentioned in the other manuals).

The tuning step (or channel step) size varies. They all provide the standard 5, 10, 12.5, 15, 20 and 25 kHz steps. The ADI and the Alinco DR-235T also have a few others.

A priority alert function is available in the Kenwood. When activated, this function allows the user to monitor a memory channel for activity even though the user may be using a different channel.

The total number of memory channels varies with each rig, too. The TM-331A provides 20 memory channels that can serve a dual purpose. Within these channels, you can program in the upper and lower memory scan limits and odd-split repeater data. The DR-235T provides 100 channels and a pair of scan edge channels. The AR-247 provides 81 memory channels. As with the TM-331A, some of these channels can serve a dual purpose, such as dual watch or scan edges.

Power levels vary just a bit. The TM-331A and DR-235T have power levels of 5, 10 and 25 W. The AR-247's power levels are at 7, 15 and 30 W.

Another difference between radios is that the TM-331A and AR-247 do not have provisions for alphanumeric tags (the ability to assign a name to a memory channel or frequency). This is a feature that is provided in many current radios.

Bottom Line

Three commercially available 222 MHz FM transceivers make it easy for amateurs to make better use of this quiet VHF band. These radios offer function and performance comparable to 146 MHz radios at a similar price. While each offers similar performance, they differ in features provided.

First, in Alphabetical Order, the ADI AR-247

On the front panel, from left to right you have an indented tuning knob that is used to set not only the frequency, but also memory channel, frequency step, tone frequency and scan direction. Above that, there are the three buttons used to select the VFO, memory read and MHz (this allows for fast tuning). Their secondary functions are (M)emory to (V)FO, memory and lock. The $^3/_4 \times 2$ inch yellow fixed intensity display also has clear, easy to read alphanumeric characters. The five backlit (yellow) buttons on the bottom of the display allow for selecting the FUNC/SET, CALL, SHIFT, TONE and DTMF frequencies. The SHIFT and TONE buttons serve a dual purpose—reverse and dual watch. These secondary functions are also illuminated. All the knobs are hard plastic and they all have a good feel.

The '247 transmits from 222 to 225 MHz (as stated in the manual) and receives from 215 to 229.995 MHz. It is an FM-only rig. The mic gain does not appear to be adjustable.

The display is slightly smaller than the others. The display was a bit more visible, however, even off angle—possibly because of the way the display is lighted. Of course, lighting conditions did vary from day to day, and that might have played a part as well.

The microphone has a standard 16 key DTMF backlit keypad, with 4 additional buttons located above the 16. They control the CALL frequency, VFO, MEMORY and MHZ functions. On the back is a LOCK switch. The UP and DOWN buttons are located on the top. It's a relatively large microphone and fits completely in the palm of my hand. It's not programmable, so each button does exactly what is printed on it. You can use it to select operating frequencies or DTMF codes. With the exception of mimicking some of the radio's function buttons, it appears to be a straightforward mic.

Programming Functions

Programming memory channels is handled in a straightforward manner. Quite a few pages in the manual are devoted to various programming options, so a good familiarization with the manual is in order.

A Clear-Cut Manual

The 45 page manual sets out to familiarize the user with standard mounting practices, the functions of the radio and eventually operating and programming it. There are many illustrations to assist with programming.

Manufacturer: PRYME Radio Products, 480 Apollo St #E, Brea, CA 92821; tel 714-257-0300; **www.pryme.com**. Price: $210.

Table 2
ADI AR-247, serial number 31CC02B1705

Manufacturer's Claimed Specifications	Measured in the ARRL Lab
Frequency coverage: Receive and transmit, 222-225 MHz.	Receive, 215-230 MHz; transmit, as specified.
Power requirement: Receive, 0.6 A; transmit, 9.0 A (high power).	Receive, 0.77 A; transmit, 6.0 A. Tested at 13.8 V.
Modes of operation: FM.	As specified.
Receiver	**Receiver Dynamic Testing**
FM sensitivity, 12 dB SINAD: <0.18 μV.	For 12 dB SINAD, 0.21 μV.
FM adjacent channel rejection: Not specified.	20 kHz channel spacing: 67 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing: 67 dB;* 10 MHz channel spacing: 87 dB.
S-meter sensitivity: Not specified.	S9 indication: 0.5 μV.
Squelch sensitivity: 0.18 μV.	At threshold: 0.09 μV.
Receiver audio output: 2.0 W at 10% THD into 8 Ω.	4.1 W at 10% THD into 8 Ω.
IF and image rejection: Not specified.	First IF rejection, 94 dB; image rejection, 91 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output (H/M/L): 30/15/7 W.	VHF, 30/15/5.7 W.
Spurious-signal and harmonic suppression: ≥70 dB	62 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 80 ms.
Receive-transmit turnaround time (tx delay): Not specified.	98 ms.
Size (height, width, depth): 1.6×5.5×6.3 inches; weight, 2.7 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.

Up Next, the Alinco DR-235T

On the front panel, reading left to right you have the standard eight-pin mic jack, with the data terminal/theft alarm (explained earlier) jack above it. Next to that is a transmit light. The 1 × 3 inch amber display has clear, easy to read alphanumeric characters. You can vary the brightness of the display from bright to dim. The five backlit (amber) buttons on the bottom of the display allow for selecting the FUNC/SET, VFO/MEMORY/MEMORY WRITE, MHz (for fast tuning)/SHIFT, TONE SQUELCH/DCS and KEY LOCK, CALL/POWER settings and SQUELCH/PACKET operation. Each button has a secondary function that is listed above the button; ambient light is required since these functions are not backlit, however.

Next to the display are the VOLUME and MAIN TUNING knobs. Beyond them, the backlit POWER button. The VOLUME and MAIN TUNING knobs are rubber coated and have a good feel. The MAIN TUNING knob is indented, and the feel is pretty tight. This knob is also used to set the squelch level.

Using the optional EDC-37 power cable with jack, you can use the ignition switch to control power to this radio if your auto has an available auxiliary terminal. This radio includes a standard DB-9 female connector in the middle of the rear for attachment of a TNC (1200 or 9600 baud). Unlike the "pigtails" of the others, this radio has a chassis-mounted antenna connector.

The '235 transmits from 222 to 224.995 MHz and receives from 216 to 279.995 MHz. It does have an AM receive mode as well. The mic gain/deviation is adjustable between Wide and Narrow.

The DR-235T carries a few more features than its brethren. For example, even though all these radios can be wired for packet operation in one form or another, the DR-235T is the only one that has a rear connector that can be used to connect the audio and PTT signals to a TNC. If one decides, the optional EJ-41U internal TNC unit can be installed, and the back panel TNC connector becomes a serial connector to attach to a PC. With that setup, a user can operate APRS with only an external GPS required to provide the location data.

The DR-235T also has a neat feature, a theft alarm. A special jumper cable is attached to a jack on the front panel (this jack is also for packet and APRS use). This in turn attaches to a cable that's secured to the vehicle—to the steering wheel, for example. If the radio is removed, it beeps.

Cloning radio setup configuration from one set to another is available only in the DR-235T. The cloning function itself is performed by the radios. No external computer or special software is needed, just a cable with $^1/_8$ inch stereo mini plugs.

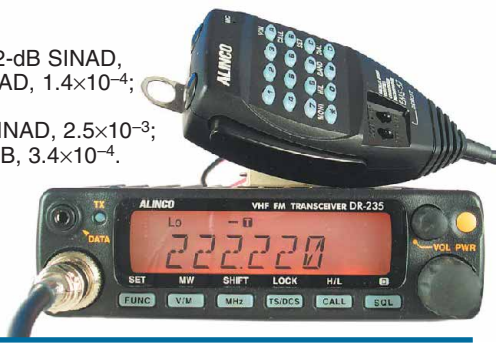
And not to rattle on, but this radio also has an auto-dialer. With this function, one need only program in a desired telephone number and the radio will transmit the DTMF tones to a repeater's autopatch from memory.

As I first brought up a local repeater, I heard nothing but noise—not white

Table 3
Alinco DR-235, serial number M101948

Manufacturer's Claimed Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 216-280 MHz; transmit, 222-225 MHz.	Receive and transmit, as specified.
Power requirement: Receive, 0.6 A; transmit, 8.0 A (high power).	Receive, 0.46 A; transmit, 5.3 A. Tested at 13.8 V.
Modes of operation: FM.	As specified.
Receiver	**Receiver Dynamic Testing**
FM sensitivity, 12 dB SINAD: <0.25 μV.	For 12 dB SINAD, 0.15 μV.
FM adjacent channel rejection: Not specified.	20 kHz channel spacing: 61 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing: 61 dB;* 10 MHz channel spacing: 90 dB.
S-meter sensitivity: Not specified.	Max indication: 5.7 μV.
Squelch sensitivity: 0.1 μV.	At threshold: 0.12 μV.
Receiver audio output: 2.0 W at 10% THD into 8 Ω.	2.3 W at 5% THD[1] into 8 Ω.
IF and image rejection: Not specified.	First IF rejection, 90 dB; image rejection, 81 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output (H/M/L): 25/10/5 W.	VHF, 25/9.2/4.2 W.
Spurious-signal and harmonic suppression: ≥60 dB	72 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 175 ms.
Receive-transmit turnaround time (tx delay): Not specified.	110 ms.
Bit-error rate (BER), 9600-baud: Not specified.	223 MHz: Receiver: BER at 12-dB SINAD, 3.8×10^{-3}; BER at 16 dB SINAD, 1.4×10^{-4}; BER at –50 dBm, 2.4×10^{-5}; transmitter: BER at 12-dB SINAD, 2.5×10^{-3}; BER at 12-dB SINAD + 30 dB, 3.4×10^{-4}.
Size (height, width, depth): 1.6×5.6×6.8 inches; weight, 2.2 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.
[1]Maximum volume.



noise, but clicks and whine. My first thought was that the repeater was feeling a bit under the weather. To be sure, I set up one of the other radios on the same frequency. All was quiet. After swapping things around a bit, I determined that the Alinco was receiving noise generated by my PC. I found that the other two radios didn't have a problem with noise from my PC. This might be a consideration when using the radio in a home/packet setting, or it could be peculiar to my PC.

Since the simplex frequency was quiet, I stayed on the repeater scene and moved to mobile operation. The display did tend to wash out a bit under bright conditions, and at the angle at which the radio was mounted, a consideration when selecting mounting location.

The supplied 16 key DTMF mic has the standard multifunction keypad with backlit buttons. Some of the functions performed by the display buttons can also be set via the microphone. The microphone also has the standard UP and DOWN keys and LOCK switch. The mic itself is larger than some of the other mics, allowing a good grip.

Programming a Function

Setting memory channels is easy to do. You start in VFO mode and select your frequency, CTCSS tones and power level. You depress the FUNC key, rotate the main tuning knob or use the UP or DOWN keys on the mic to select a memory channel, alphanumeric tag, and then depress the MW (Memory Write) key. Programming of other functions is handled in a similar fashion.

The Paper Side of Things

The 47 page manual is laid out in a straightforward and relatively easy to read format. It starts out with general mounting procedures, proceeds to basic programming steps and ends with TNC/AX-25 protocol commands. If you're looking for a particular function, you can find it if you follow the index.

Manufacturer: Atoc Amateur Distributing, LLC, 23 South High St, Covington, OH 45318; tel 937-473-2840, **www.alinco.com**. Price: $250, EDC-37 power control cable: $8, EJ-41U internal TNC: $140.

And Finally, the Kenwood TM-331A

Maybe it's me, but the TM-331A looks very similar to the ADI AR-247. Even some of the "do and don't" pictures in the front of the manual are the same. The front panel layout is similar as well, with the exception of one more button. Some of the technical characteristics are very similar, too. The few exceptions are the power levels and transmit frequency range.

On the front panel, from left to right you have the indented tuning knob that is used to set frequency, memory channel, frequency step, tone frequency, scan direction, etc. Above that, there are the

Table 4
Kenwood TM-331A, serial number 40900005

Manufacturer's Claimed Specifications	Measured in the ARRL Lab
Frequency coverage: Receive and transmit, 220-225 MHz.	Receive, 215-230 MHz; transmit, as specified.
Power requirement: Receive, 0.6 A; transmit, 6.5 A (high power).	Receive, 0.51 A; transmit, 6.0 A. Tested at 13.8 V.
Modes of operation: FM.	As specified.
Receiver	**Receiver Dynamic Testing**
FM sensitivity, 12 dB SINAD: <0.16 μV.	For 12 dB SINAD, 0.13 μV.
FM adjacent channel rejection: Not specified.	20 kHz channel spacing: 72 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing: 72 dB;* 10 MHz channel spacing: 85 dB.
S-meter sensitivity: Not specified.	Max indication: 1.5 μV.
Squelch sensitivity: 0.1 μV.	At threshold: 0.09 μV.
Receiver audio output: 2.0 W at 5% THD into 8 Ω.	2.5 W at 5% THD into 8 Ω.
IF and image rejection: Not specified.	First IF rejection, 114 dB; image rejection, 101 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output (H/M/L): 25/10/5 W.	VHF, 25/11/4.2 W.
Spurious-signal and harmonic suppression: ≥60 dB.	71 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 192 ms.
Receive-transmit turnaround time (tx delay): Not specified.	207 ms.

Size (height, width, depth): 1.6×5.5×6.3 inches; weight, 2.7 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.

three backlit buttons used to select the VFO, MEMORY READ and MHZ. Their secondary functions are M to V (transfer memory contents to VFO), MEMORY and LOCK. The 1 × 2 inch yellow display also has clear, easy to read alphanumeric characters. (It appears you cannot vary the brightness of this display.) The six buttons on the bottom of the display allow for selecting the CALL frequency, FUNC, SHIFT, TONE, REVERSE and DRS settings. The SHIFT, TONE and REVERSE buttons serve a dual purpose—the priority alert function, alternate tone function and the tuning step function, respectively. These secondary functions are not backlit. Next comes the VOLUME and SQUELCH control knobs. A standard eight-pin microphone jack, along with the POWER button and TRANSMIT POWER button round out the right side. All three knobs are backlit. In common with the '247, they are hard plastic and have a good feel to them. A tone alert system provides an alarm signal when someone is transmitting on a monitored frequency.

The tone alert system provides an alarm signal when someone is transmitting on a monitored frequency.

The '331A transmits from 220 to 225 MHz (US operators will have to be careful to stay above 222 MHz to operate legally) and it also receives from 215 to 229.995 MHz. It is an FM-only rig. The mic gain is fixed.

I was a little confused by the Kenwood's manual and its description of Tone/CTCSS operation. On one hand, it details how to set up the radio in the tone squelch mode (the squelch won't open until a tone is received on the incoming signal). And yet, under "Optional Accessories," the manual states the unit needs the subaudible tone decoder unit, TSU-6, for CTCSS Tone Squelch operation. (It may very well be the assumption is made that the TSU-6 is installed.)

Back to the Repeaters

I program in yet another repeater in my area and go to work. Now, with this one I had to wait awhile until someone came on frequency. But once there, we ragchewed a bit. All reports of audio were good. (As we have come to expect.) While test results may offer an insight into the electronic goings-on of the radio, nothing beats real on the air operating for a true sense of the radio.

The display was bright enough for mobile operation so I could see it under normal light conditions. Of course, the viewing angle played a part in it, too.

The microphone has a large standard 16 key DTMF backlit keypad, with 4 additional buttons located above the 16 keys. They control the call frequency, VFO and memory functions. A fourth button is used for programmable functions. With this radio, you can program the microphone to mimic certain functions of the radio. In the back of the mic is a LOCK switch. The UP and DOWN buttons are located on top of it. The Kenwood microphone is somewhat smaller than the other ones, but it performs as expected. With the exception of the UP and DOWN keys, one cannot use it to otherwise select operating frequencies or DTMF codes.

Programming Functions

If you've ever had to program a radio, you know that the steps can be either simple, or difficult. Thankfully, the TM-331A is simple to program. As long as you follow the steps in the manual, and

know what function you want to have, programming is a breeze. And this leads us to the manual.

The 40 page booklet details the radio in a similar fashion to those for the AR-247 and DR-235. Obviously, some functions inherent to the Kenwood are described in detail. But, reading the manual is not difficult. Users should have little difficulty following along with the instructions.

Manufacturer: Kenwood, 3975 Johns Creek Ct, Suwanee, GA 30024; tel 310-639-4200; **www.kenwood.net**. Price: $500; TSU-6 CTCSS decoder board: $50.

When All is Said and Done

I had some fun playing around with these radios. Now, I can even say with a clear conscience that I've operated on 1.25 meters. If you or your repeater or packet club are in the need of some mobile or desktop 222 MHz FM gear, these are the currently available products on the market. Take advantage of 1.25 meters. There's plenty of room for any application and potential for good use of this band! QST

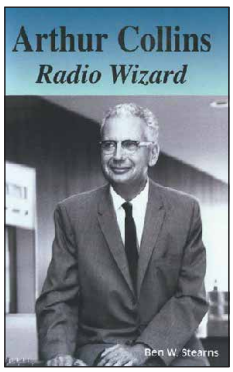
NEW BOOKS

ARTHUR COLLINS, RADIO WIZARD

By Ben W. Stearns

Published by Collins Book, PO Box 2782, Cedar Rapids, IA 52406-2782, 1-866-248-6260, **www.collinsbook.com**. *First edition, softcover, 2002, 5½ × 8½ inches with black and white photographs. ISBN 0-9716416-0-9, 394 pp. Available for $24.95 plus shipping.*

Reviewed by Gil McElroy, VE3PKD



◊*Arthur Collins, Radio Wizard* details the life and achievements of a ham who transformed his passion for radio into an electronics empire before losing it all in a corporate takeover. Art Collins started out manufacturing hand-made ham gear in Cedar Rapids, Iowa during the Depression, but first made headlines when, as a 15 year old in 1925, he provided the only communications link for an Arctic Expedition, passing information he received along to the National Geographic Society. Founded in 1931, his company rose from humble beginnings to become a leader in the field of avionics, and a major supplier to the U.S. military during World War II, Korean, Vietnam, and throughout the Cold War. The tremendous cost of developing a computer system, handicapped by Arthur Collins's single-mindedness, would lead the company into a merger with Rockwell International in 1971, and eventually to Collins's ouster as president of the company he had founded. He died in 1987.

Written by Ben Stearns, a former public relations person for the Collins Radio Company, *Arthur Collins, Radio Wizard* covers all aspects of the Collins Company, relying heavily on anecdotal accounts by many former employees of the company, as well as those who were close to Arthur Collins himself. Stearns makes no efforts to whitewash the fact that he was a difficult man to work for, but also shows that it was his perfectionism and single-mindedness of purpose that made his company the success it became. From a small company whose early achievements included providing the government of Spain with mobile radio stations during its Civil War in the 1930s, to working in the Mercury, Gemini and Apollo space programs in the 1960s, Collins Radio was at the forefront of the electronics revolution.

Stearns devotes but one chapter specifically to ham radio, covering everything from the first transmitters produced in the basement of Arthur Collins's house, to the company's introduction of SSB equipment in the 1950s which virtually revolutionized amateur communications. But throughout his book Stearns also makes evident the fact that ham radio factored in some way into virtually everything Arthur Collins did. The adoption of SSB communication by the Strategic Air Command (SAC) in the 1950s, for instance, was directly related to amateur sideband QSOs undertaken by Art Collins and other hams during a series of SAC flights testing the system's reliability (it passed with flying colors).

NEW PRODUCTS

CERAMIC MAGNETS FROM METAL & CABLE CORP

◊ Metal & Cable Corp Inc is now offering the 3.5 inch ceramic magnets employed in its multi magnet mobile antenna mounts as a separate product, from stock, for use in hobby or commercial projects.

The holding power of the magnets is specified as a minimum of 100 pounds, making them suited for attaching antenna mounts to vehicle bodies, air conditioner covers, water or liquid storage tanks—virtually any relatively flat ferrous metal surface.

The magnets are available with either white powder coated or bright chrome plated protective steel cups. A ½ inch diameter hole in the top of the cups facilitates mounting. Each magnet includes a textured pad to cover the base.

For further information and prices, contact David Klein, KE8QM, at Metal & Cable Corp Inc, 9337 Ravenna Rd, Unit C, PO Box 117, Twinsburg, OH 44087; tel 330-425-8455; fax 330-963-7246; **david@www.metal-cable.com**; **www.metal-cable.com**.

WEST MOUNTAIN RADIO RIGRUNNER 4010S

◊ West Mountain Radio has announced a new model in their RIGrunner power distribution panel line. The new 4010S dc power panel incorporates a solid state FET on/off switching system. The FET switching allows you to control the dc supply to your entire station with the power button on a selected piece of equipment. Simply plug that unit into the RIGrunner's "master" outlet and when it's turned on, all the station equipment plugged into other RIGrunner jacks will power up as well.

A RIGrunner uses the ARES, RACES and RSGB standard PowerPole connectors. These connectors exhibit very low voltage drop, as does the RIGrunner itself. This RIGrunner uses a FET switch designed for 12 V dc operation at up to 100 A, with over current and temperature protection. The FET is said to have a typical on resistance of only 0.001 Ω.

Whatever you plug in to the "master" power jack will automatically control nine PowerPole switched outlets, each rated up to 40 A with a maximum of 40 A for the entire RIGrunner. The current sensing for this circuit does not use a separate sensing resistor. Instead, it senses the voltage drop across the fuse that protects the master outlet. Using the fuse has two advantages: no additional voltage drop and increased sensitivity with low current devices. Even a QRP rig should control the automatic switching. A toggle switch is provided to select between off, auto and all on so that you can use your other equipment independently from whatever is plugged in to the "master" outlet. $109.95.

For more information, contact West Mountain Radio, 18 Sheehan Ave, Norwalk, CT 06854; tel 203 853 8080; **www.westmountainradio.com**.

NTIA Expresses "Broad Concerns" in BPL Comments

The National Telecommunications and Information Administration (NTIA) has weighed in on the FCC's Broadband over Power Line (BPL) *Notice of Inquiry* (*NOI*), ET Docket 03-104. While urging the FCC to "move forward expeditiously" with its inquiry, the NTIA expressed "broad concerns" about interference from BPL to government users. The NTIA also has launched an extensive BPL modeling, analysis and measurement program. A Commerce Department branch, NTIA administers spectrum allocated to federal government users and is the principal White House advisor on domestic and international telecommunications policy.

"Notwithstanding BPL's potential benefits, the Commission must ensure that other communications services, especially government operations, are adequately protected from unacceptable interference," the NTIA commented. "In tailoring its rules to promote BPL deployment, the Commission must be certain to provide all communications stakeholders with adequate protections against BPL emissions that may cause unacceptable radio frequency interference."

A form of power line carrier (PLC) technology, BPL would use existing low and medium-voltage power lines to deliver broadband services to homes and businesses. Because it uses frequencies between 2 and 80 MHz, BPL could affect HF and low-VHF amateur allocations wherever it's deployed. BPL proponents—primarily electric power utilities—already are testing BPL systems in several markets, and at least one already is offering the service. FCC Part 15 rules allow BPL, although industry proponents want the FCC to relax radiation limits.

The NTIA's comments reflected its apprehension regarding "radiated emission limits and other measures" that may be needed to protect the more than 18,000 HF and low-VHF federal government frequency assignments that BPL could affect.

In a related move, Frederick R. Wentland, NTIA's associate administrator in the Office of Spectrum Management, told the FCC in early July that the NTIA did not favor Current Technologies LLC's request for a permanent waiver of the field strength limit specified for Class B emissions under FCC Part 15 rules. A Maryland BPL developer, Current Technologies already is field testing and marketing the technology.

Wentland worried that the pole-mounted interfaces and outdoor power lines used for BPL could interfere with public safety communication in the 30 to 50 MHz range. He told FCC Office of Engineering and Technology Chief Edmond J. Thomas that the "unobstructed and ubiquitous nature of this BPL application, and perhaps other aspects of BPL, differs considerably from the situations presently found in typical unintentional radiators" operating under Part 15. Wentland also expressed concerns regarding compliance measurement techniques for BPL and the characterization of BPL emissions for use in compatibility studies.

NTIA's technical studies will include detailed measurements and analyses to "help determine the least constraining BPL emission limits that would preclude unacceptable interference," Wentland told Thomas. Wentland also invited the FCC to coordinate its own BPL measurement activities with those of the NTIA.

In an attachment to its comments, NTIA summarized its measurement plan, which, among other things, will take ambient noise measurements and also "quantify unknown aspects of BPL signals" at several BPL test sites. The plan noted that as a result of nonlinear elements in the electrical power distribution system, "BPL systems may radiate emissions at frequencies substantially higher than the frequencies actually used intentionally within the BPL system."

The NTIA's Institute for Telecommunication Sciences is carrying out the measurement program over a two-week period, coordinating its efforts with BPL network administrators. The data will be folded into the NTIA's BPL modeling and analysis initiative.

The NTIA said the results of its research will yield recommendations on radiated emission limits and other operational restrictions for BPL that are "necessary to preclude unacceptable interference to federal government sys-

BPL Places FCC at Regulatory Crossroad, AMRAD Suggests

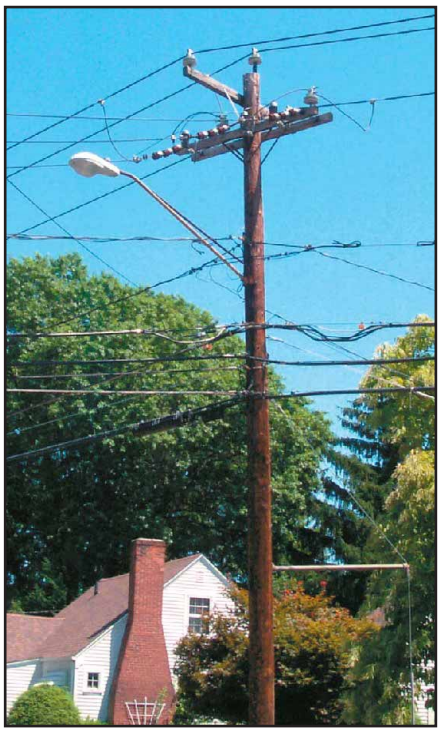
Encouraging Broadband over Power Line (BPL) technology puts the FCC at a regulatory crossroad, the Amateur Radio Research and Development Corporation (AMRAD) has suggested. AMRAD's remarks came August 20 in reply comments filed in response to the FCC's BPL *Notice of Inquiry* (ET Docket 03-104). AMRAD's comments also outlined its BPL testing and measurement efforts, which included laboratory and real-world conditions. AMRAD said any departure from the "current baseline" of Part 15 rules that govern unlicensed services would invite "troublesome unintended consequences" that could prove difficult to correct.

"The FCC is facing some serious decisions on whether to continue with past rules and historical enforcement or to dispense with their historical role and substitute rules which give the unlicensed Part 15 systems priority over the licensed systems such as the amateur radio service," AMRAD said. "Such changes to Part 15 rules would tip the responsibility of compliance so as to favor the unlicensed users and leave the FCC facing a large number of harmful interference complaints to resolve."

AMRAD recommended the FCC proceed "slowly and with caution" in advancing BPL as an allegedly viable and economical alternative to existing high-speed Internet technologies. The non-profit scientific and educational organization said its own testing demonstrated that a 20-meter amateur transmitter running as little as 10 W in the vicinity of an in-house HomePlug-standard BPL local network could seriously impair the system's throughput. A 100 W signal would cause it to collapse altogether. AMRAD said its observations and tests demonstrate that broadband BPL signals that conform to Part 15 "are well above the ambient noise and will interfere with many forms of reception." The HomePlug standard notches out all amateur bands but 60 meters.

Although the reply comment window closed August 20, the number of comments in response to the FCC's BPL *NOI* was more than 4600 as of mid-September and counting. Many comments in the BPL proceeding have come from the Amateur Radio community.

Rick Lindquist, N1RL ♦ Senior News Editor ♦ n1rl@arrl.org



BPL would use low and medium-voltage lines like these to distribute broadband services.

tems." The agency said it planned to conclude its research by year's end.

Until its filing August 13, the NTIA has been largely silent on the issue since last spring. In an April 24 letter, then-NTIA administrator Nancy J. Victory applauded the FCC's decision to launch its inquiry into BPL, but called on the Commission to make sure that BPL does not cause harmful interference to other services.

The NTIA's comments are available on the NTIA Web site, **www.ntia.doc.gov/ntiahome/fccfilings/2003/bplcomments_08132003.htm**.

ARRL President Jim Haynie, W5JBP, has called BPL "the most crucial issue facing Amateur Radio and the one that has the most devastating potential." ARRL Laboratory personnel have visited several communities where BPL field testing is under way and documented the potential for extensive interference on HF frequencies in all field trial communities visited.

The ARRL's comments, reply comments and technical exhibits are available on the ARRL Web site, **www.arrl.org/announce/regulatory/et03-104/**. There's additional information and additional video clips on the ARRL "Power Line Communications (PLC) and Amateur Radio" page, **www.arrl.org/tis/info/html/plc/**.

To support the League's efforts in this area, visit the ARRL's secure BPL Web site, **https://www.arrl.org/forms/development/donations/bpl/**.

Morse Code-Related Petitions Attract Many Comments

As of press time, hundreds of members of the amateur community had made their views known on the issue of Morse code testing. While the issue is not likely to be settled quickly in the US, the FCC began the process this summer by inviting public comment on seven separate Morse code-related petitions for rule making, some of which would altogether eliminate Element 1, the 5 WPM Morse test, from the Amateur Service rules (Part 97). As of press time, the FCC had not yet asked for comments on two other Morse-related petitions.

RICK LINDQUIST, N1RL

Filing of the petitions followed the decision of World Radiocommunication Conference 2003 (WRC-03) to make optional the requirement to prove the ability to send and receive Morse signals to operate below 30 MHz. The comment window on the initial group of petitions, RM-10781 through RM-10787, closed September 29.

A petition from Peter M. Beauregard, KI1I, RM-10781, would not eliminate Element 1 but would give all Technician licensees current Novice/Tech Plus CW privileges on 80, 40, 15 and 10 meters and limited phone and image privileges on 80, 40 and 10 meters. He proposed new Tech phone/image privileges on 3850-3900 kHz and 7225-7300 kHz.

Pete V. Coppola, KG4QDZ, and family—Tina Coppola, KG4YUM, and Pete A. Coppola, KG4QDY—asked the FCC to eliminate Element 1. The Coppolas' petition, RM-10782, would grant Tech Plus HF privileges to current Technician licensees and retain the current CW-only subbands. The Coppolas asked the FCC to make the change effective immediately on a provisional basis.

Kiernan K. Holliday, WA6BJH, asked the FCC simply to "remove all requirements for knowledge of Morse code" from the Amateur Service rules. Holliday said there is less reason to require Morse code in the Amateur Service today. His petition, RM-10783, also says the code requirement limits the ability of handicapped individuals to get ham tickets. "The Commission's policy should be to encourage the use of Amateur Radio," he said.

Dale Reich, K8AD, petitioned the FCC to delete Element 1 for General class applicants but to keep it in place for Extra class applicants. Under Reich's scheme, "no-code" Techs wanting HF privileges would have to upgrade to General. Reich's petition is RM-10784.

Eric Ward, NØHHS, seeks immediate elimination of "proficiency in telegraphy using Morse code." The "immediate removal of the telegraphy requirement from Amateur Radio licensing is appropriate and clearly in the public interest," Ward contended in his petition, RM-10785.

A petition from No-Code International (NCI), RM-10786, calls on the FCC to delete Element 1, the 5 WPM Morse code exam, "totally" from the Amateur Service rules and grant "Tech Plus" privileges to current Technicians. It also wants the FCC to act on the matter as soon as possible, preferably in a separate rule making and without further ado.

"[T]he Commission clearly has the authority to modify its rules on its own initiative and without further public notice or comment," NCI asserted in its 20-page petition. NCI said the Morse requirement is keeping newcomers away from Amateur Radio.

The National Conference of Volunteer Examiner Coordinators (NCVEC), in its detailed, nine-page petition, RM-10787, called on the FCC to delete Element 1 and give "Tech Plus" privileges to current Technician licensees. The NCVEC also asked the FCC to "take expedited action" to allow volunteer examiner coordinators (VECs) to discontinue administering Element 1 "as soon as possible."

The number of comments the NCVEC's petition attracted outstripped those filed on each of the other petitions by about three to one. The organization, the umbrella group for the 14 VECs in the US, said there's "no longer any reasonable justification for requiring an applicant to demonstrate this antiquated skill," and that most applicants never use Morse after they pass the test.

Because the ARRL represents its members directly to the FCC and not through other organizations, the ARRL-VEC abstained from voting on the NCVEC's petition question when it arose during the NCVEC's July 25 meeting in Pennsylvania. At its own July meeting in Connecticut, the ARRL Board of Directors affirmed its interest in reviewing members' input on the Morse issue as well as on other possible revisions to Part 97 arising from WRC-03 for its January 2004 meeting. In January 2001 the Board's

opinion was to retain the Morse as a testing element in the US. The League did not file comments on any of the Morse-related petitions for rule making.

To view comments submitted, visit the FCC's Electronic Comment Filing System (ECFS), **www.fcc.gov/cgb/ecfs/**, click on "Search for Filed Comments" under "ECFS Main Links" and type the complete RM number in the "Proceeding" field.

Once the FCC has compiled comments on any and all Morse-related petitions, the next step likely would be a *Notice of Proposed Rule Making* (*NPRM*), in which the FCC would use the comments filed as a basis to propose whatever changes it deems necessary to the Amateur Service Part 97 rules. Such an *NPRM* appears unlikely until sometime in 2004.

As of press time, Switzerland, Bel-

FCC News

NEW HF RFID TAG LIMITS SHOULD NOT AFFECT AMATEURS

Little or no impact to the Amateur Service was expected at the low end of 20 meters in the wake of an FCC decision to raise the power limit for radio frequency identification (RFID) tags that operate in the vicinity of 13.56 MHz. The FCC agreed in a *Second Report and Order* (*SR&O*) and *Memorandum Opinion and Order* (*MO&O*) in ET Docket 95-19 released July 17 to allow 3.5 times the previous harmonic field strength in the range of 13.710 to 14.010 MHz.

The joint *SR&O* and *MO&O* were in response to a *Petition for Declaratory Ruling* filed by M/A-COM Private Radio Systems Inc in 2001 and a *Petition for Reconsideration* filed by the Information Technology Industry Council in 1997. The FCC authorized an increase in the maximum allowed field strength of unlicensed Part 15 devices that transmit data—specifically RFID tags—in the 13.553 to 13.567 MHz band from 10,000 to 15,848 µV/m at 30 meters.

Additionally, the FCC permitted an increase in the maximum field strength of harmonics from the devices in the range of 13.110 to 13.410 MHz and 13.710 to 14.010 MHz from the current 30 µV/m to 106 µV/m at 30 meters. All other harmonics of the devices must remain below 30 µV/m at 30 meters.

While the increased strength in lower sideband harmonics of the RFID devices creeps into the lowest 10 kHz of the 20-meter CW band, ARRL Lab Manager Ed Hare, W1RFI says there is little, if any, cause for hams to worry about increased noise.

"The potential impact on amateurs from this rule change is minimal," he said. "To meet the field strength requirements at and above 14.010 MHz, these systems, in practice, would typically exhibit less than 1 dB over current FCC limits."

The FCC said the changes would allow for improved operation and spur development of the RFID tag technology, as well as bring the standards in line with those in Europe and Australia.

FCC PROPOSES RESOLUTION TO THREE-YEAR-OLD LICENSING ERROR

The FCC has proposed to correct the erroneous issuance of an Advanced class ticket to a Minnesota ham. In February 2000, the W5YI Volunteer Examiner Coordinator sent an electronic application to the FCC to upgrade the license of David L. Osterkamp, KBØWOT, of Oakdale, Minnesota, from Technician to Advanced. Almost three months later, the W5YI VEC notified the FCC that it had made a keystroke error in its earlier filing and that a licensee with a similar call sign—not Osterkamp—actually had qualified for Advanced. Osterkamp also notified the W5YI-VEC and the FCC about the error. A correction was filed, and the other operator—Jack Hanley, KBØVOT—was appropriately upgraded, but Osterkamp's privileges were never returned to Technician, prompting the W5YI VEC to urge the FCC to modify his license to show the correct privileges. The FCC concluded in a *Memorandum Opinion and Order* released July 25, 2003, that the 2000 grant of Advanced privileges to Osterkamp was improper. "Accordingly, we propose to modify the Amateur Service operator license for amateur station KBØWOT by replacing Advanced class operator privileges with Technician class operator privileges," the *MO&O* said.

Amateur Enforcement

♦ **FCC warns former licensee about alleged *ex parte* violations:** The FCC has warned a former amateur licensee to stop contacting Commission personnel regarding the disposition of his Amateur Radio application. The FCC had granted Jack Gerritsen of Bell, California, a Technician license, KG6IRO, on November 8, 2001. Acting on its own motion six days later, the Wireless Telecommunications Bureau set aside Gerritsen's license after learning that he'd been convicted the previous year in state court of interfering with Los Angeles Police Department radio transmissions. The FCC also received complaints that Gerritsen had operated without a license and caused malicious interference on amateur frequencies. Gerritsen's application reverted to a pending status, and the conviction and complaint information was referred to the Enforcement Bureau for evaluation.

"The Office of Administrative Law Judges has requested we advise you that your repeated calls to those offices are in violation of the Commission's rules against *ex parte* communications," FCC Special Counsel Riley Hollingsworth said in an August 14 letter to Gerritsen. "Those rules place restrictions on contacts with Commission decision-making personnel and provide sanctions for violations of those rules."

Gerritsen again was arrested in January 2002 after he allegedly made death threats on Amateur Radio frequencies and violated his parole following his 2000 conviction for interfering with police transmissions. Gerritsen had served one year of a five-year term, and the FCC alleges that, once out on parole, he resumed operating and caused deliberate interference to numerous amateur repeaters in the Los Angeles area.

At the time of arrest, the FCC said, Gerritsen had more than 20 radios—eight of them capable of operating on the amateur, marine, Land Mobile and Public Safety bands. He had a marine radio hidden in a closet with batteries connected to it, and a length of antenna line running outside his residence, the FCC said.

"The terms of the parole prohibited you from possessing radio transmitting equipment," Hollingsworth noted in his August 14 letter. In May 2002, Gerritsen was sentenced to three years in prison—with credit for good behavior, work time and time already served—but he was released early due to jail overcrowding, Hollingsworth told ARRL.

Now, Gerritsen faces a hearing to determine if he's qualified to hold a Commission license. Hollingsworth said that in due course, the FCC will issue a *Hearing Designation Order* setting forth the details of the proceeding, but he admonished patience on Gerritsen's part.

"Neither repeated calls to specific Commission employees nor calls to Commission employees at random will expedite this process," Hollingsworth said, adding that issues related to possible violations of FCC *ex parte* rules could come up at the hearing.

gium, the UK, Germany, Norway, Ireland, the Netherlands, Austria, New Zealand and Australia had moved to drop their Morse requirements or were expected to do so this year.

ARRL GETS SECOND-YEAR EMERGENCY COMMUNICATIONS TRAINING GRANT

The Corporation for National and Community Service (CNCS) has renewed funding to subsidize the cost of ARRL Amateur Radio Emergency Communications Level I training for another year. The federal grant of nearly $180,000 covers the second year of a three-year award. The goal of the second-year grant—which runs September 1, 2003, through August 31, 2004—is to provide basic training for about 1700 more Amateur Radio emergency communicators.

"This is a validation of our performance during Year 1 of the grant," said ARRL Chief Development Officer Mary Hobart, K1MMH. As a result of the first-year grant, ARRL was able to provide emergency communications training to 1699 volunteers. This year, CNCS will be looking not only at the course completion rate but also the "outcomes that quantify and qualify the impact Amateur Radio has on communities nationwide," Hobart added.

"The true measure of the grant's success will be in how well these volunteers serve their communities when all else fails," Hobart said. The second-year grant also places renewed emphasis on recruiting senior volunteers—those 55 and older.

"In Year 2," she said, "CNCS wants to know how certified hams have become actively involved in their communities in drills, in practices and in actual disasters—how they've aided communities when citizens, their homes and businesses are in harm's way."

Hobart called the success of the Year 1 grant "as much a testament to ARRL as to the hams who have taken the emergency communications course and who serve when called upon to do so."

A $150,000 grant from United Technologies (UTC) in large part has gone to sponsor nationwide Level II and III "leadership-level" emergency communications training. The UTC grant is for three years.

Students taking advantage of the grant-provided emergency communications training will be reimbursed for the tuition cost once they have successfully completed the course. Certified volunteers are expected to take active roles in local Amateur Radio Emergency Service (ARES) teams.

To learn more about the ARRL Amateur Radio Emergency Communications courses, visit the ARRL Certification and Continuing Education (C-CE) Web page, **www.arrl.org/cce/**.

HAM-CONCERT PIANIST-JOGGER COMPLETES 880-MILE CHARITY RUN

Concert pianist and cancer survivor Martin Berkofsky, KC3RE, has completed his 880-mile "Celebrate Life Run" from Tulsa, Oklahoma, to the Chicago area. An ARRL member, Berkofsky set out jogging on April 9, his 60th birthday, to celebrate his recovery from cancer and to raise money for research into the disease. He concluded his marathon around midday August 20 in Zion, Illinois. He performed a special concert August 21 for cancer patients, their families and staff members at Cancer Treatment Centers of America (CTCA) Midwestern Regional Medical Center.

Martin Berkofsky, KC3RE.

"How grateful I am for all of the support and help from so many radio amateurs," Berkofsky told ARRL. He singled out for special mention the Tulsa Amateur Radio Club and its president, Gregg Wonderly, W5GGW, as well as the Washington (Missouri) Zero Beaters, the Chicago FM Club, and his QSL manager Murray Green, K3BEQ. He also acknowledged "the countless radio amateurs who kept me company with on-the-road QSOs, many even driving out to meet me personally and to help me with road directions when my maps weren't clear."

Along the way, Berkofsky carried a quad-band ham radio handheld transceiver to chat with locals as he passed through their communities. He also marked his daily position using borrowed APRS gear and made some QSOs via *EchoLink*.

Berkofsky says he set a daily record of 23.1 miles on July 16. "Went through the wall, as runners would say," he said.

CTCA and the Cancer Treatment Research Foundation (CTRF) sponsored Berkofsky's run and are benefactors of the donations pledged on its behalf. CTCA says his run raised more than $80,000 for cancer research.

"How proud I am to say that Amateur Radio played such a large part in this," Berkofsky added. The run also garnered extensive media coverage along its route.

"What an incredible experience, what incredible lessons . . . what a wonderful country we have" Berkofsky said.

SOLE ARRL DIRECTOR RACE IS IN HUDSON DIVISION

The only contested seat in the current election cycle for ARRL directors and vice directors is in the Hudson Division. Incumbent Director Frank Fallon, N2FF, faces a challenge from current Vice Director and former Director Steve Mendelsohn, W2ML. Ballots went out by October 1 to all full League members in the division in good standing as of September 10. The current election cycle includes the Central, Hudson, New England, Northwestern and Roanoke divisions.

Challenger Mendelsohn—an ARRL Life Member—was elected to his first term as Hudson Division Vice Director in 1982 and became Director in 1987. The ARRL Board of Directors elected him ARRL First Vice President in 1994. Nominated for ARRL President at the Board's January 2000 meeting, Mendelsohn was defeated for the top job by Jim Haynie, W5JBP, on a nine to six vote. Later that year, he outpolled incumbent JP Kleinhaus, W2XX, to return to the Hudson Divi-sion's second slot.

Incumbent Fallon has served as director since 1997, when he took over the seat by defeating Richard Sandell, WK6R. A retired high school English teacher and a ham for 41 years, he's an ARRL Life Member. As Hudson Division Director, he's served on all standing committees, has been an elected member of the ARRL Executive Committee for four years and serves on the ARRL Foundation Board and on the Administration and Finance Committee, which oversees the League's programs and budget.

New face on the back bench: **Hudson Division Vice Director-elect Joyce Birmingham, KA2ANF.**

The lone candidate for the vice director's seat that Mendelsohn is vacating—Joyce Birmingham, KA2ANF—has been declared elected. A ham since 1979, Birmingham holds an Extra class ticket. She's vice president of the 10-70

Repeater Association in New Jersey and enjoys chasing DX. She's also a volunteer examiner.

Incumbents running unopposed and also declared elected are: Director Dick Isely, W9GIG, and Vice Director Howard Huntington, K9KM, in the Central Division; Director Tom Frenaye, K1KI, and Vice Director Mike Raisbeck, K1TWF, in the New England Division; Director Greg Milnes, W7OZ, and Vice Director Jim Fenstermaker, K9JF, in the Northwestern Division; and Director Dennis Bodson, W4PWF, and Vice Director Les Shattuck, K4NK, in the Roanoke Division.

A petition from former South Carolina Section Manager Patricia Hensley, N4ROS, for the Roanoke Division's vice director slot was deemed invalid because it did not contain enough ARRL member signatures.

Ballots in the contested race must be received at ARRL Headquarters by noon EST on Friday, November 21. The vote will be tallied and the election result announced later that day. Three-year terms of office for successful director and vice director candidates begin at noon on January 1, 2004.

NEW ARRL SECTION MANAGERS TAKE REINS IN WESTERN PENNSYLVANIA, ORANGE

ARRL Field and Educational Services Manager Rosalie White, K1STO, has appointed Rich Beaver, N3SRJ, of Jeannette, as Western Pennsylvania Section Manager. He succeeded John Rodgers, N3MSE, who stepped down for personal reasons. The change became effective September 8.

Rodgers became SM in January 2000 when then-SM Bill Edgar, N3LLR, was appointed Atlantic Division Vice Director. He was elected to a two-year term in his own right last fall. Beaver will complete Rodgers' current term, which ends December 31, 2004. An Assistant Section Manager since June, Beaver has served as Western Pennsylvania Section Emergency Coordinator since February, 1998.

White has appointed Carl H. Gardenias, WU6D, of Highland, California, to replace Joe Brown, W6UBQ, as ARRL Orange Section Manager. Brown, who stepped down September 14 because he was moving out of the section, recommended Gardenias for the position. Calling Brown "a fine leader" who has served his section well for more than 20 years, White accepted his resignation with regret and said his dedication and work would be greatly missed.

Media Hits

■ An Associated Press story in August outlined ham radio's response during the Northeast blackout in mid-August. Media outlets throughout the US and Canada picked up the AP story, which was developed with some assistance from ARRL Headquarters. The AP reporter interviewed Amateur Radio Emergency Service Section Emergency Coordinators Allen Pitts, W1AGP, of Connecticut, and Tom Carrubba, KA2D, of the New York City-Long Island Section.

■ *Webster World*, the magazine of Webster University in St Louis, Missouri featured an article on ham radio's role during the third annual Oklahoma City Memorial Marathon—held in memory of the 1995 Murrah Federal Building bombing. Tom Webb, WA9AFM, senior site director at Webster's Tinker Air Force Base, served as the public safety communications coordinator. More than 50 Amateur Radio operators assisted during the event.

■ The *Houston County News* of La Crescent, Minnesota, ran a lengthy feature article on ham radio emergency communications. The report highlighted the fact that ham radio is there when disasters knock out cellular telephone service, and it cited the August Northeast blackout and the events of September 11, 2001, as examples. Local hams interviewed included Red Haines, WOØW, Greg Hovland, KCØIKU, and Ken Eggen, WAØRBU. The three also shared how they got involved in ham radio and public service.

■ Amateur Radio on the International Space Station (ARISS) school group contacts with the International Space Station continue to make headlines. Houston National Public Radio outlet KUHF covered the ARISS contact between high school students at Incarnate Word Academy and astronaut Ed Lu, KC5WKJ. Members of the Clear Lake Amateur Radio Club helped with the radio setup.

ARRL Headquarters Hosts Section Manager Workshop

Fifteen new or incoming ARRL Section Managers, one Vice Director and one Vice Director-elect visited ARRL Headquarters September 6-8 for a Section Manager training workshop. The session offered a chance for SMs to become better acquainted with ARRL programs and services, share ideas, explore common problems and seek solutions and learn more about their responsibilities as ARRL Field Organization leaders. Several ARRL Headquarters staff members were on hand to co-host and present portions of the weekend program. W1AW was also open for operating after the workshop sessions.

(L-R) Back row: Ti-Michelle Connelly, NJ6T, East Bay; Dick Flanagan, K7VC, Nevada; Bill Weatherford, KM5FT, New Mexico; Dennis Schaefer, W5RZ, Arkansas; Phil Temples, K9HI, Eastern Massachusetts; Roy Rabey, AD5KZ, North Texas; Bob Schneider, AH6J, Pacific; Bill Hillendahl, KH6GJV, San Francisco. Middle row: Jim Boehner, N2ZZ, South Carolina; Charles McConnell, W6DPD, San Joaquin Valley; Mark Tharp, KB7HDX, Eastern Washington; John Dyer, AE5B, West Texas; John Thomason, WB5SYT, Oklahoma; Ed Bruette, N7NVP, Western Washington. Front row: Hudson Division Vice Director-elect Joyce Birmingham, KA2ANF; Sharon Harlan, N9SH, Illinois; New England Vice Director Mike Raisbeck, K1TWF. Kneeling: Steve Ewald, WV1X, and Chuck Skolaut, KØBOG, of ARRL Headquarters.

In Brief

● **Red Cross honors ARRL for Amateur Radio's tornado work:** The ARRL has received a certificate of appreciation from the American Red Cross for the "valuable service" League members provided in support of Red Cross efforts after a devastating series of tornados struck Missouri, Kansas, Tennessee and Arkansas on May 4. The certificate specifically acknowledges Amateur Radio operation in Missouri. "Your time and compassion resulted in more than 735 individuals and families being sustained in a time of crisis," wrote ARC National Coordinator of Disaster Volunteers Wendy Kaplan in an accompanying letter also signed by ARC Executive Vice President for Disaster Services Terry Sicilia. The first *Memorandum of Understanding* between ARRL and the ARC dates back to 1940.

● **South Carolina county lauds ARES/RACES:** The Aiken, South Carolina, County Council has expressed its appreciation to area Amateur Radio Emergency Service and Radio Amateur Civil Emergency Service (ARES/RACES) volunteers for their "invaluable assistance" during a communications emergency June 16. In a resolution adopted August 19, the council praised the hams for responding after a lightning strike took out communications and ambulance dispatch facilities at the sheriff's office. "A net of volunteers from ARES/RACES was established on one of the Aiken repeaters," the resolution explained. Hams were assigned to each remote ambulance location, and amateur volunteers carrying handhelds traveled with ambulances during calls and worked from emergency medical service substations and offices during the radio emergency. Other hams acted as net controllers and as relays when ambulances got outside the coverage area of the local repeater. "Without the assistance of the ARES/RACES, the communications center would have been unable to dispatch ambulances, thereby jeopardizing the lives of many Aiken County citizens," the resolution said. "County Council desires to express its appreciation to the ham radio operators who 'stepped up to the plate' in a crisis situation."—*Jim Boehner, N2ZZ*

● **Vote on *QST* Cover Plaque Award:** The winner of the *QST* Cover Plaque Award for August was Mike Loukides, W1JQ, for his article "A Dipole Curtain for 15 and 10 Meters." Congratulations, Mike! The winner of the *QST* Cover Plaque award—given to the author—or authors—of the best article in each issue—is determined by a vote of ARRL members. Voting takes place each month on the *QST* Cover Plaque Poll Web page, **www.arrl.org/members-only/qstvote.html**.

● **Past New Mexico SM Joe Knight, W5PDY, honored at convention:** Former New Mexico Section Manager Joe T. Knight, W5PDY, has received the Knight Distinguished Service Award August 23 for his 27 years of outstanding service as an SM. The ARRL Board of Directors created the award at its July meeting and named it for Knight to recognize "exceptionally notable contributions" to the "health and vitality" of the League by a section manager. The presentation, by ARRL Rocky Mountain Division Director Walt Stinson, WØCP, occurred during the ARRL Forum at the New Mexico State Convention in Albuquerque, where Knight received a standing ovation. In creating the award, the ARRL Board said that Knight "has distinguished himself as a leader among leaders" who often has "gone above and beyond the call of duty" by volunteering to train and orient new SMs. Knight, who stepped down July 2 because of ill health, for years shared his leadership perspectives and vast experience with newcomers at the annual ARRL Headquarters workshops for new section managers.

● **W6JAY named *Newsline* Young Ham Of The Year:** Jay E. Thompson, W6JAY, of Santa Ana, California, was named *Amateur Radio Newsline*'s Young Ham of the Year (YHOTY) for 2003. A 17-year-old Amateur Extra class licensee and ARRL Life Member, Thompson enjoys a favorable reputation within the Amateur Radio Direction Finding (ARDF) community and has competed internationally in foxhunting events. He's also heavily involved in emergency communications and is a member of the Orange County Hospital Disaster Support Communications System (HDSCS). ARRL Southwestern Division Vice Director Tuck Miller, NZ6T, called Thompson "a magnet for other young hams to become actively involved." Thompson also is the youngest person to ever become certified as an ARRL Official Observer (he was 15 at the time). In addition to his Amateur Radio accomplishments, he's received numerous academic awards and now attends the University of California at Irvine. The *Amateur Radio Newsline* Young Ham of the Year award was presented in August at the Huntsville (Alabama) Hamfest. Thompson received a gift of Yaesu ham gear as well as an expenses-paid week at Spacecamp Huntsville, courtesy of *CQ*.

● **Helen L. Grauer, NØBCI, SK:** Helen Grauer, NØBCI, of Wilson, Kansas, died August 24 after a period of failing health. She was 94 and the widow of longtime ARRL Midwest Division Director Paul Grauer, WØFIR, SK, whom she often accompanied to hamfests across the division. The WØFIR call sign is now held by the couple's son, Charles. Helen Grauer was an ARRL Life Member and had served on the board of the ARRL Foundation for many years. The family invites memorial donations to the Wilson United Methodist Church, Wilson, KS 67490, or to the Grauer Scholarship Fund, c/o The ARRL Foundation, 225 Main St, Newington, CT 06111.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Eastern New York, Eastern Pennsylvania, Louisiana, North Carolina, Pacific, San Diego, South Dakota and Virginia sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 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 & Educational 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 December 5, 2003. Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before January 2, 2004, to full members of record as of December 5, 2003, which is the closing date for nominations. Returns will be counted February 24, 2004. Section Managers elected as a result of the above procedure will take office April 1, 2004.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 2004. If *no* petitions are received from a section by the specified closing date, such section will be resolicited in the April 2004 *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 & Educational Services Manager. You are urged to take the initiative and file a nomination petition immediately.—*Rosalie White, K1STO, Field & Educational Services Manager* QST

ARRL SKYWARN Recognition Day

By David Floyd, N5DBZ
Warning Coordination Meteorologist, NWS, Goodland, Kansas
david.l.floyd@noaa.gov

The fifth annual SKYWARN Recognition Day (SRD) will take place this year on Saturday, December 6, 2003. This is the day that Amateur Radio operators visit National Weather Service (NWS) offices and contact other operators around the world. The purpose of the event is to recognize Amateur Radio operators for the vital public service they perform during times of severe weather, and to strengthen the bond between radio amateurs and their local National Weather Service office. The event is co-sponsored by the American Radio Relay League and the National Weather Service.

Traditionally, hams have assisted the National Weather Service during times of severe weather by providing real-time reports of severe events and storm evolution. "You simply can't put a price tag on it," says Scott Mentzer, NØQE, organizer of the event and Meteorologist-In-Charge at the NWS office in Goodland, Kansas. "The assistance that radio amateurs provide to the NWS throughout the year is invaluable."

This year, radio amateurs once again proved their worth. On May 4, after tornadoes knocked out all communications in Stockton, Missouri, temporary ham radio stations were set up and staffed by volunteers, with licensed NWS employees forwarding specific forecasts to hams at the Stockton Emergency Operations Center (EOC). In August, an Amateur Radio storm spotter in Iowa tracked a tornado until it lifted, providing the local NWS office in the Quad Cities with ground truth. This resulted in more specific information being disseminated to the public, and also earlier warning.

The story doesn't stop there. Hams in Fairbanks, Alaska, deployed during a winter storm last March and reported pinpoint locations of freezing rain and snow. The information was relayed on 2 meters, which allowed the local NWS office to pinpoint the warning area and provide detailed statements of ice accumulation. In Wisconsin, a volunteer operator reported to the office at 6 AM and solicited snowfall reports from amateurs across the region, allowing the NWS to produce a detailed snow graphic and Public Statement summarizing the storm. Amateur Radio success stories such as these occur every year, all across the country.

SKYWARN Recognition Day this year will be held from 0000 UTC to 2400 UTC on December 6, 2003. Scott Mentzer, the creator and promoter of the event, strives to involve more NWS offices and Amateur Radio operators each year. In 2002, participants logged nearly 23,000 QSOs during the 24-hour event. Last year nearly 70 countries were contacted. To learn more, check out the Web site at **hamradio.noaa.gov.**

KENTUCKY ARES ASSISTS IN SEARCH FOR MISSING AIRCRAFT

Amateur Radio Emergency Service (ARES) members from Kentucky ARES districts 1 and 2 assisted in efforts to locate a private aircraft that was reported missing June 14 with two men aboard. Responding to a request from the emergency manager in Calloway County to Assistant ARES Coordinator Bill Call, KJ4W, ARES members set up the county's mobile communication trailer at the Murray Airport to support the search.

Amateurs supported the Civil Air Patrol (CAP) in the search. Attempts to locate the missing plane continued for several days and eventually involved responders from four states. Calloway County ARES Coordinator Mark Garland, K4SDI, and ARES District 1 Coordinator Bill Slayman, KY4NU, headed up the ham radio support and recruited additional amateurs for duty. "We had a full activation in communications support of the CAP mission and a total of 22 ARES members participated in various roles," Slayman said. CAP flew some 280 missions.

Watercraft also were involved after debris from the plane was found June 23 in a lake in Tennessee. The Tennessee Emergency Management Agency took over the incident at that point, and the ARES activation ceased. Calloway County's Office of Emergency Management extended "heartfelt appreciation" to ARES members from Calloway and Hopkins County, Garland said. "Their support filled a gap that otherwise would have delayed operations and cost in excess of $70,000." *—Pat Spencer, KD4PWL/Kentucky Amateur Radio News*

THE 2002 MARINE CORPS MARATHON

By Richard Bunn, N4ASX, Alan Bosch, KO4ALA, and Alan Wormser, N5LF

2002 marked the 27th year for the Marathon, which is *the people's marathon* and all are welcome to apply. Ham radio provides the "eyes and ears" for the course, the links be-

K4QKY

Mark Garland, K4SDI (left), volunteered some 90 hours in supporting the effort to locate a downed aircraft in mid-June.

COURTESY N4ASX

Amateur Radio provided support for the 2002 Marine Corps Marathon in the Washington, DC, area.

tween the aid stations, the lead medical officer and the Marine Corps LAN as well as an added communications backup for race security.

APRS is used to follow the last runner, "Tail End Charlie." Tail End Charlie is the vehicle that follows the last runner. As Tail End Charlie passes a point on the course, the TOP DOC can allow Aid Stations to close. Supplies and personnel can then be moved elsewhere or relieved of duty. Last year we used APRS and voice operators on the lead vehicle and the five straggler buses as well as Tail End Charlie. When a runner boarded a straggler bus, his or her ID was sent to the net and they are logged out of the race. If there are any problems on the bus, the voice capability allows a link to the medical net or when the bus is full and needs to return to pickup point, the bus operator will pass this traffic via the race net.

Organizing it All

Today, given the complexity of the operation and the added need for security, we can no longer just invite operators to show up and make assignments at the last minute. Our planning for the October marathon now starts in June. In 2002, The Marine Corps' race director asked Rick, N4ASX, to be the ham radio coordinator. Rick works for the Marine Corps, was the coordinator for the last two years and has been participating since 1983.

First step is an e-mail sent to prospective volunteers, local ham radio publications and to radio clubs in the area. Rip Smith, K3XO, created a signup Web site. Volunteers were asked to help in organization and planning: net control, APRS, packet ops, bicycle ops, aid station and racecourse ops.

Packet Operations and Voice Nets

Our packet / LAN manager for the last several years was Ben Gelb, KF4KJQ, a 17 year old, with one of the most demanding assignments in support of the Marathon. He developed the interface software that allows for easy entry of the data entered on packet to be directly transferred to the Marine Corps LAN. Ben was also the packet ops coordinator. All voice communications are handled on two voice nets. The Aid Stations, Top Doc, the Straggler Buses, Tail End Charlie and Prime Medical are included on medical net using 440 MHz repeaters. Rich Adamy, KA4GFY, was the medical net control station. Rich made sure that the net control station was equipped and that all of the nets operators were ready to go. Putting the medical net on UHF prevented interference to the VHF packet stations also located at Net Control and at each aid station.

The Race Net is on VHF and was run this year by Mike Rhodes, KD4LQS, with operators at each mile marker, food stop, water stop and other key points along the course. Helping out was one volunteer, Greg Gutierrez, who did not yet have a license, but is now KG4WMS. The other backup op was Jim Lehnert, N3CLL. These two net control stations are colocated at Mile Marker 21 (Aid Station 7 because it is in the geographic center of the race course) to allow sharing of information between the nets.

The Race Nerve Center

The start/finish area is located at the Iwo Jima Memorial. This is also where the Marine Corps set up its operations center and the main field hospital (Prime Medical). George Coyne, N1BV; Gene Jenkins, N4JEE, and Alan Bosch, KO4ALA were assigned to prime medical and Harry Jones, N4CWP, was assigned to the Marine Corps operations center. His job was to provide the APRS display and allow the Marine Corps management to link into out nets. Terry Hines, N4ZH, was assigned to work as the police liaison. With seven jurisdictions and the security of the course, Terry played a very important role.

In addition to these operators, The TOP DOC shadow, Shawn Stokes, KA3RQR and LAN link Ben Gelb, KF4KJQ, are also located at Iwo Jima. Harry was also assigned coordinator duties for this area. It's important to note that the majority of the operators working with the Marine Corps at the Iwo Jima ops center were requested by the Marine Corps by name.

Operations on the Course

Many ops began to volunteer before the word went out! Usually the early birds are the veterans who have worked the marathon for many years. Early volunteers have first choice of assignments. Care is given in assignments to make sure the equipment the volunteer listed is sufficient to operate at the given assignment. In many assignments, a backup operator for one year will become the lead the next year. We also have many new or newly licensed operators. An attempt is made to make these new volunteers comfortable with the operation; in some cases a veteran will be asked to Elmer the new volunteer.

Net Setup

For 2002 we had 94 operators. Primary operation is over local repeaters, but attention is paid to the ability to use simplex should it be needed. The ham radio coordinator is responsible for requesting the use of local repeaters. For 2002, the Department of State volunteered their repeater, W3DOS, on 145.19, and the Voice of America club volunteered K3VOA on 147.045. CCARS volunteered the W3ETX repeater on 145.11. For the UHF nets, we used two repeaters: The KC3VO repeater on 448.875 was volunteered by Bob Curry, KC3VO, and the Pentagon Amateur Radio Club volunteered the 444.55 repeater at the Pentagon. All of these repeaters worked well. For talk-in, we picked the 145.47 repeater in Arlington volunteered by Bob Miliken, KI4MB, and Randy Kelly, WB4MJF. A separate talk-in repeater was to allow the net control stations time to set up without traffic.

The Briefing Package

Due to the complexity of the operation, a briefing package was developed many years ago by Frank Mackey, K4EC, and updated in the past by Bart Bartholomew, N3GQ. Each year the package is updated and a final copy is sent out a day before Race Day (October 27). Last year's brief included a packet and APRS supplements.

The Marine Corps Marathon is one of the biggest events in the Washington DC area. Security is very, very tight. Two weeks prior to the race, the list of volunteers and vehicle information is given to the Marathon Office. The Marine Corps provides vehicle passes and ham radio ID badges for all operators. In addition, those assigned to the Iwo Jima Memorial are provided either medical badges or Op Center badges. All participating police departments are also briefed on the role played by ham radio.

Race Day Minus 1

After 4 months of preparation, the last few days before the race are critical. A final poll of volunteers is made, either by phone, e-mail or both, to make sure that they all have the brief, know their assignments or have the equipment they will need. The Iwo Jima Volunteers set up antennas and become familiar with the start/finish area the day before.

The ham radio coordinator is responsible for picking up the box lunches and T-shirts provided by the Marine Corps. Last minute frequency coverage checks are done, the APRS system are exercised and all of the subteam leaders brief the coordinator on readiness and equipment.

Race Day

At 0500 the lunches were picked up at the local Safeway Food Store. At 0600 all the volunteers assembled near the Pentagon, picked up their T-shirts, the briefing package, lunch and directions and were logged into the event. At 0645 the straggler bus operators (APRS and 440 voice) set up the stations on the buses. By 0700 all the volunteers headed for their assignments. By 0730 all ham radio operators were in position. The weather for 2002's race was wonderful with few calls for serious help and most of our operators had very little traffic to send. At 3 PM the DC police reopened the roads and bridges to traffic. The runners all know that once the traffic is flowing, the race is over for that part of the course.

All 27 of these races have had lessons learned and after-action items to report back to the Marine Corps. This feedback was sent to the ham coordinator who consolidated the inputs and forwarded them to the Marine Corps. All who volunteered did an outstanding job and the United States Marine Corps was impressed by how well ham radio worked.

A TEMPORARY MOBILE GROUND-PLANE FOR EMERGENCY RESPONSE USE

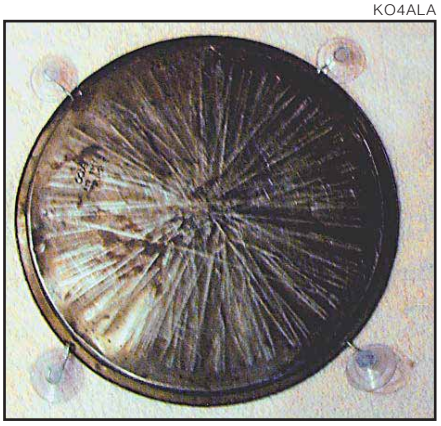
By Alan Bosch, KO4ALA
ARES Emergency Coordinator, Arlington, VA

This accessory for ARES work sprang from a recent deployment in Northern Virginia in support of a mass-casualty hospital exercise which involved vehicles with fiberglass bodies. Even their hoods—the usual place for sticking mag-mounts in such cases—were nonmetallic.

The inspiration came in the form of a battered 12 inch pizza pan my wife was discarding. Fitted with a 3 inch mag-mount and a 144/440 MHz cellular lookalike antenna, it yielded SWRs of under 2:1 on both bands and let me hit repeaters 10 miles away while sitting at the table on my screened porch.

But how to attach the thing to a vehicle? Velcro patches first suggested themselves, but their inherent liability was pretty obvious. Velcro adhesive is tenacious enough without rolling a nice, warm hood into the equation, so removing them without marring paint threatened to prove tedious at best.

KO4ALA



Pizza pan temporary mobile ground-plane.

The "Eureka!" moment came when I noticed the vinyl suction cups holding the stained-glass sun-catchers on the window above our kitchen sink. It only takes four (1.5 inches or larger but not too big) spaced 90° apart. But there are tricks to using them.

The first is to configure the unit with the pan upside down. The second is to make sure you get suction cups which have a lift-up tab. Without a tab, a cup attached with the SOP lick-and-stick must be slid around, twisted, yanked on and cussed at before it will let go. The third is to acquire those with semi-circular metal clips rather than V-shaped ones. They will swivel much more freely to adjust themselves to curved surfaces. (If you must use V-shaped ones, put the holes for their clips as close to the edge of the pizza pan as possible.)

The acid test, of course, was to test the gadget on an emergency vehicle. The Arlington fire station nearest us also houses an ambulance with a great, big fibreglass hood. The pan stuck readily and SWRs improved on both 2 and 440—ranging from 1.05 to 1.5:1, depending on the band and the portion of it checked.

So go forth now, and fear not fibreglass vehicles.

NETS VS BAD BAND CONDITIONS

By Denny Rybicke, K9LGU, ARRL Wisconsin Section Traffic Manager

Bad band conditions give us an excellent proving ground to test our skills and equipment. The use of relays, precise sending, accurate receiving and savvy net controls will help us fight even the worst aurora, the noisiest atmospherics and even the extra-long skip if we can get help from our neighbors. If band conditions are bad and you don't hear a net on frequency, don't hesitate to ask. Perhaps we're just missing a net control. Maybe you're in just the right spot to act as liaison. Sideband doesn't cut it? Try CW. The nets will continue to meet on schedule despite band conditions and your participation might make an even bigger difference. It's a challenge, but we're up to it.

ADDITIONS TO 2002 SET RESULTS

Please note these additions to the 2002 Simulated Emergency Test Results that appeared in the July 2003 issue of *QST*. This follows up the additions/corrections that appeared in the September *QST* announcement of the 2003 SET.

Area	*Reporter*	*Points*
North Carolina		
ARES Activity		
Guilford Co	KE4IAF	860
Net Activity		
Guilford Co ARES	KG4IYH	602

The North Carolina Section's newly combined ARES Activity total for the 2002 SET is 5127 points. In Net Activity, the newly combined North Carolina Section total is 3881 points.

Field Organization Reports

Compiled by Linda Mullally, KB1HSV

Public Service Honor Roll
August 2003

This listing is to recognize radio amateurs whose public service performance during the month indicted qualifies for 70 or more total points in the following 6 categories (as reported to their Section Managers). Please note the maximum points for each category:
1) Participating in a public service net, using any mode. — 1 point per net session; maximum 40.
2) Handling formal messages (radiograms) via any mode. — 1 point for each message handled; maximum 40.
3) Serving in an ARRL-sponsored volunteer position: ARRL Field Organization appointee or Section Manager, NTS Net Manager, TCC Director, TCC member, NTS official or appointee above the Section level. — 10 points for each position; maximum 30.
4) Participation in scheduled short-term public service events such as walk-a-thons, bike-a-thons, parades, simulated emergency tests and related practice events. This includes off-the-air meetings and coordination efforts with related emergency groups and served agencies. — 5 points per hour (or any portion thereof) of time spent in either coordinating and/or operating in the public service event; no limit.
5) Participation in an unplanned emergency response when the Amateur Radio operator is on the scene. This also includes unplanned incident requests by public or served agencies for Amateur Radio participation. — 5 points per hour (or any portion thereof) of time spent directly involved in the emergency operation; no limit.
6) Providing and maintaining a) an automated digital system that handles ARRL radiogram-formatted messages; b) a Web page or e-mail list server oriented toward Amateur Radio public service — 10 points per item.

Amateur Radio stations that qualify for PSHR 12 consecutive months, or 18 out of a 24 month period, will be awarded a certificate from Headquarters upon written notification of qualifying months to the Public Service Branch of Field and Educational Services at ARRL HQ.

798 N5NAV
596 AB2IZ
530 N2LTC
505 W2MTA
455 W7TVA
450 N9TVT
385 W5ZX
335 KA2ZNZ
330 WA2YL
318 N2YJZ
300 KC4YGB
255 KB2SNP
250 KB2KOJ
240 W2LC
230 K9JPS
223 KA2GJV
216 NN2H
215 N2ECR W9RCW
205 AC5XK
194 KK3F KB2CCD
182 W5RIP
180 K5SFM
175 K8KHZ K2ABX
172 WA1QAA
167 N2RTF
166 KBØDTI KB2ETO
165 WI2G
160 KA2BCE
159 KB5ILY W7TC
155 W4WNY
154 N5OUJ
153 W4AUN
152 NN7H
151 W8QOI
150 K9LGU
149 KD5YMW
145 N2JBA
140 K4RLD W5IM
138 K4YVX
135 W3YVQ
131 N1IST WB2KNS AC5VN
130 KB2VRO N2GJ WA9ZTY
129 W5OMG KD4EFM
128 W5PY
127 KB2RTZ
126 N4TAB
125 AG9G KB3GFC
122 W8MMH
120 W8YS K4BEH KA4FZI KD1LE KW1U N1LKJ W1GMF WX4J KC5OZT AB4XK WB2UVB W4EAT K4IWW
KG4OQA KØIBS KA5KLU N2JRS W6IVV
118 K3JL K4FQU
114 W6QZ
112 N3RB
110 W7GHT K6YR N8NMA W7GB WA5OUV NJ5M WD9F AF4NS N2AKZ KD4GR AG4DL W4ZJY N3SW W3ZQN W7QM W7ZIW KB5TCH K5UPN N7YSS K2UL KE4JHJ W9BHL W5GKH N8FPN NF5B K5MC WNØY
107 KE2SX KA9RZL
105 N5BSD WA1JVV
104 N5IKN
103 N6NKO
102 N7TOD
101 W4CC K5DPG WA2GUP
100 N8OD WA8SSI WA2YBM KK5GY WØHXB KB2KLH KG4CHW WA4EIC WA9VND N1IQI N1LAH NR2F N9MN W4NTI N7EIE W7LG AD5KE K4SCL N7DRP ABØWR KG4OTL K3SS W3BBQ W9CBE AA8SN KA4UIV W1QU K5IQZ N5KWB AF2K WB2QIX
99 W5JYJ
98 WB6UZX W2DSX N3WAV WD9FLJ
97 KO4OL
96 N1TPU
95 N7CM KV4AV W1ALE
94 W2CC
N2LJD
92 WB4BIK AA4BN
91 KE3FL
90 KF6OIF WD8DHC KA8WNO WB4GGS W4WXA K4FUM WB2GTG KC2GOW WB4PAM W1PLW W8IM K1JPG K4KAM KF4WIJ W4CKS N3KB N1JX KC7SGM AA2SV KC2IYC WA2CUW K2VX K3CN WA4MIY N3OR W4DLZ KG2D WB2IJH
87 W5RXU N2VQA WD4LSS
86 W5ARS KC3Y N2ULY
85 W6JPH
84 W9NXC W4LN NØENO WB5NIC
83 ABØUY
N3WK
82 KC6NBI N8FXH
81 KB1CVH
80 NB4K WW8D KC8UTL KG4MLD W4DGH KL7OR WAØLYK KA4YEB K8KV W3CB W5NK
79 KG4ZXK
78 K7GXZ K1FP
77 K4ZC KG4MLC W7DPW W2QOB
76 K4WKT KG4FXG K2PB
74 AA3GV KD5ITA
73 WB7VYH KC6SKK N8DD KK7TN
72 N8QVT K5ER
71 KB8NDS WJ2F WB8RCR KA4LRM
70 W9RSX K1TSV

The following stations qualified for PSHR in previous months, but were not recognized in this column: (July) AD5KE 200, W5RIP 196, K6YR 120, W5OMG 120, KC5OZT 115, W3YVQ 110, K5UPN 110, KB5TCH 110, KF6OIF 108, W1QU 100, N6NKO 92, KC6NBI 70, (May) N2ECR 110, (April) N2ECR 85.

Section Traffic Manager Reports
August 2003

The following ARRL Section Traffic Managers reported: AK, AL, AR, EB, ENY, EPA, EWA, GA, IL, KS, KY, LA, MDC, ME, MI, MO, NC, NE, NFL, NLI, NNJ, NNY, NTX, NV, OH, OK, OR, SB, SC, SFL, SJV, SNJ, STX, TN, VA, VT, WCF, WI, WNY, WPA, WV, WWA, WY.

Section Emergency Coordinator Reports
August 2003

The following ARRL Section Emergency Coordinators reported: AK, AR, AZ, ENY, EWA, GA, IL, IN, KY, LA, MN, MO, NC, NFL, NLI, NNJ, NV, OH, SFL, SJV, SNJ, SV, TN, WMA, WNY, WPA, WTX.

Brass Pounders League
August 2003

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*
KK3F	30	2182	2128	54	4394
W4ZJY	0	2112	2031	0	4143
W1GMF	0	1116	2014	90	3220
WB5ZED	67	1267	998	18	2350
W4EAT	0	1121	1125	5	2251
N2LTC	0	837	811	53	1701
KA5KLU	2	658	838	40	1538
KW1U	1	654	673	19	1348
K7BDU	22	577	569	6	1174
WX4H	0	649	498	2	1149
ABØWR	0	440	358	2	800
KF4WIJ	10	296	298	23	627
WB4GGS	0	255	278	1	534
W6DOB	0	255	278	1	534
W7QM	45	237	240	4	526
K5UPN	21	279	210	3	513

BPL for 100 or more originations plus deliveries: W9RCW 158, NJ5M 147, KK5GY 130, and W9IHW 116.

Day-to-Day Operating: Activity Nets

The marvelous propagation of last summer will soon be just a pleasant memory. No more E skip, not enough ionization for 6 meter F2, the end of the equinoctial auroral peak and soon the cold weather that spells the end of the tropo season. So now what are we to do? Go back into our dens and hibernate until next spring? I hope not.

Last February I described the large number of resources that exist in the form of clubs and other organizations that can help newcomers learn about the fascinating VHF+ world. But let's assume that you have a radio that works on one or more of these bands and some horizontally polarized antennas. We discussed the apparent loss of activity in the VHF contests a few months ago. Although it is much more difficult to measure, what we didn't mention was that daily activity on the weak-signal bands appears to have been dropping as well.

The concept of activity nets is well-known throughout the HF bands—DX nets of varying types, two-letter-call WAS nets, special-interest nets that discuss almost any ham radio subject under the sun, including discussions of VHF+ subjects like propagation and EME. The same is true on the VHF+ bands. There are nets at regular times and frequencies, usually on a weekly basis, where you can be assured of a contact. If the net control and some members are far enough away but still reachable, you may get a bit of DX as well.

Lest you think these nets have no real impact, I'll give an example. When I returned to 2 meter SSB in 1981, after a hiatus of some 15 years, I noticed that Al, K4CAW (SK), was net control of a 2 meter net every Tuesday night from Greensboro, North Carolina, about 380 km from me. I listened and he was pretty loud at my location and what was even better, he heard my 100 W and mediocre 2 λ Yagi quite well. Often more than 20 stations checked into his net. I also remember a number of years later when he shut down his net. Activity dropped almost immediately and has never really returned to what it was.

This month we will discuss activity nets—where and when you can find them, how most of them operate and some of the organized efforts to provide such nets. Finally we will provide a list of activity nets (see Table 1) where you know there will be people with like interests to yours and places where you can test the latest upgrades to your equipment and antennas.

How does an activity net work? Activity nets follow a variety of procedures but to one extent or another they all involve similar structures. There is a net control station (NCS), who often has good equipment, better than average antennas and a decent or superior location. This is in contrast to HF traffic nets, where the NCS may not have a commanding signal, although he is almost always a very good operator. At the beginning of the net the NCS calls for check-ins often beginning with his antenna pointed towards the area of highest population density and then turning his beam at intervals. Many nets "follow the clock" in their directions—pointing north on the hour, east at 15 minutes past the hour, south at half past the hour and so on. There may be several calls for check-ins and each station gets a chance to transmit, in turn. The discussion covers areas of interest to weak-signal operators, subjects such as band conditions, what has recently been worked, equipment changes, upcoming hamfests and conferences and operating events such as meteor showers and contests. If there are stations in the net that you would like to work, just ask the NCS and he will arrange for you both to go off frequency. At that point you can also arrange schedules on other bands. It is quite possible to work new grids and even new states through these nets particularly if you are just starting out.

Sidewinders on Two (SWOT): Len Hoops, W5JTA (now KN6OJ), founded SWOT in the Dallas/Fort Worth area. The current Chairman is Art Jackson, KA5DWI. Throughout its existence it has supported 2 meter activity nets in all parts of the US. The many active SWOT nets are listed in Table 1. Some of these are sponsored in collaboration with local or regional clubs.

This Month

November 13	Possible early Leonids peak 1300-1900 UTC
November 15-16	ARRL International EME Competition
November 16*	GOOD EME Conditions
November 19	Normal Leonids peak 0150-0530 UTC

*Moon Data from W5LUU

VHF Clubs: Some of the VHF+ clubs listed in the February column have on-the-air activity nets. A few of these are quite extensive and deserve special mention. The Mount Airy VHF Radio Club (Pack Rats) sponsors a series of Monday night nets starting on 6 meters and culminating on 13 cm and above in a three-hour period on Monday nights. You can thus test on several bands in one evening. The Northern Lights Radio Society (NRLS) sponsors a series of Sunday night nets on 6 meters through 70 cm. The Rocky Mountain VHF+ (RMVHF+) group covers 6 meters through 23 cm on different days of the week from Sunday through Friday. The Pacific Northwest VHF Society (PNWVHFS) covers 144, 222, 432 and 1296 MHz on Sunday nights. Finally the Western States Weak Signal Society (WSWSS) sponsors a series of nine different nets, six on 2 meters, one on 222 MHz, two on 432 MHz and one on 1296 MHz. They also have a participation program for checking into their nets and offer certificates to anyone for 50/100/250 and increments of 250 check-ins regardless of whether they are WSWSS members or not. Paul, KA6CHJ, maintains the database.

Activity Hours: What if there is no convenient net near you on a particular band? The concept of activity hours on the less-occupied bands has fallen into disuse in recent years—and this is a pity. Until a few years ago, stations tried to get on 222 MHz at 8 PM local time on Tuesdays; on 432 MHz at 9 PM local time on 432 MHz; and 902/903 and/or 1296 MHz on Thursday nights at 10 PM local time. We have little enough activity as it is—these activity hours could be a shot in the arm!

What about digital activity? The WSJTGROUP on Yahoo Groups sponsors WSJT Random Hours to encourage meteor-scatter operators to make random contacts. You are encouraged to download their complete description of these events and their operating procedures at **www.qsl.net/wa5ufh/WSJTGROUP/WSJT%20Random%20Hour%20Manual.doc**.

Please note that their moderator,

Gene Zimmerman, W3ZZ ♦ 33 Brighton Dr, Gaithersburg, MD 20877 (tel 301-948-2594) ♦ w3zz@arrl.org

Table 1

VHF+ Activity Nets

Notice that many nets are associated with VHF clubs (see the World Above 50 MHz for February 2003). Grid squares are indicated in addition to net control call signs to provide directional information.

Day	Time (Local)	Name/Location	Frequency (MHz)	NCS	Grid
50 MHz					
M-F	2100	Alabama	50.150	various	–
Sun	0930	California Award Hunters	50.175	–	–
Sun	2000	Tennessee	50.150	N3AH/4	EM66
Sun	2000	San Diego Six Shooters	50.200	–	–
Sun	2030	Northern Lights RS	50.175	WØAUS	EN35
Mon	1930	Pack Rats	50.150	WA3EHD/K3EOD	FN20/FM29
Mon	2000	San Diego Six Shooters	50.200	–	–
Mon	2015	"PNWVHFS/Portland, OR"	50.140	KC7QIK	CN85
Mon	2030	SEVHFS/Georgia	50.145	WA4NJP/W4KXY	EM84
Tues	2000	Sandlappers	50.250	K4IRT	EM94
Tues	2000	So California 6M Club	50.150	–	–
Wed	2100	Hole in the Wall Gang	50.135	KE4UWJ	EM83
Thurs	2000	Downeast 6M SSB	50.200	KJ4RB	FM15
Thurs	2100	NW Ohio	50.260	K8PLF	EN81
Sat	0800	North Carolina 6M SSB	50.200	KD4MYE	FM05
Sat	1400-1500Z	WSJTGROUP	50.260	–	–*
Sat	2130	Low Country Rag Chew	50.213	KF4GLE	EM92
144 MHz					
All	0600	Rural Ohio	144.190	–	EM89
All	2200	Mid South	144.260	N4LGY/KU4WW/ WA4HFN	EM54/55
All	2000	Seattle Ragchew	144.220	(none)	CN87
Sun	0800	Pacific NWVHFS	144.240	"W7MQY, KO7N, W7FHI"	CN82/84/96
Sun	0830	Arizona SWOT	144.250	N7SQN	DM41
Sun	1030	East Coast VHFS	144.250	K2SMN	FN20
Sun	2000	East Tennessee	144.180	K4UR	EM86
Sun	2000	Northern California SWOT	144.250	W6OMF	CM98
Sun	2000	WSWSS	144.240	KI6FF	
Sun	2030	East North Carolina	144.220	N1GMV/4	FM05
Sun	2100	Roadrunners Microwave Gp	144.150	K5LLL	EM10
Sun	2130	Michigan SWOT	144.155	K8NFT	EN62
Sun	2100	Twin Cities	144.250	KAØPQW	EN33
Mon	1930	New Mexico SWOT	144.200	N5XZM	DM65
Mon	2000	Pack Rats	144.150	N3ITT	FN20
Mon	2000	Tennessee	144.210	N3AH/4	EM66
Mon	2000	E Michigan SWOT	144.250	W8IDT	EN83
Mon	2000	N Central Missouri SWOT	144.250	NØPB	EM39
Mon	2000	Rocky MT VHF+/SWOT	144.220	"NØVSB, W6OAL, NØPOH"	DM79
Mon	2100	Tidewater Weak Signal	144.230	WB4GCS	FM17
Mon	2100	Wasatch Front	144.250	NJ7A	DN30
Mon	2100	Pacific NWVHFS	144.240	KK7N	CN85
Mon(1/3)	2130	Southeastern 2M SSB	144.215	WB4JGG/N4ION	EM75
Mon(2/4)	2130	Southeastern 2M SSB	144.215	N4ION	EM62
Tues	2000	Central Louisiana SWOT	144.250	K5MQ	EM31
Tues	2000	NORCAL	144.250	KF6BXH	CM87
Tues	2000	Pacific NWVHFS	144.240	"W7MQY, KO7N, W7FHI"	CN82/84/96
Tues	2100	Ottawa Valley	144.250	VE3XK	FN15
Tues/Thurs	2100	PNWVHFS/Portland (cw)	144.140	AB7TU	CN85
Wed	2000	Yonkers ARC/New York	144.185	–	FN30
Wed	2000	Tri State [IA/MO/IL]	144.250	WZ9D/N9CXO	EN51
Wed	2000	"Wichita, Kansas"	144.215	KCØHFL	EM17
Wed	2000	WSWSS	144.240	KG6HMN	DM14
Wed	2030	Mobile ARC	144.225	KF4NEM/N4UXY	EM50
Wed	2100	North Texas SWOT	144.250	W5FKN	EM13
Wed	2130	Multistate 2M SSB	144.220	WB4PCS	EM95
Thurs	1930	Southwest Oklahoma SWOT	144.250	W5SSG	EM04
Thurs	2000	WSWSS	144.240	KB6KQ	DM09
Thurs	2000	NORCAL	144.250	KA6CHJ	CM98
Thurs	2030	NEWS/New England	144.250	W1COT	FN31
Thurs	2030	Georgia	144.235	–	EM81
Thurs	2100	Upper Cumberland SWOT	144.225	N2BR/4	EM76
Sat	0700	Pineywoods SWOT	144.250	K5LOW	EM22
Sat	1400-1500Z	WSJTGROUP	144.140	–	–*
Sat	2000	Central Kansas	144.250	NØXFI	EM29
222 MHz					
Sun	0800	Pacific NWVHFS	222.100	–	–
Sun	2015	Northern Lights	222.120	NØKP	EN34
Mon	2000	WSWSS	222.110	K6IBY	DM13
Mon	2000	Northern California	222.1000	WA6QAK	CM98
Mon	2030	Pack Rats	222.125	W2SJ/N3EXA	FM20/FN20
Tues	2000	Rocky MT VHF+	222.100	various	DM79
Tues	2000	Pacific NWVHFS	222.100	–	–
Tues	2030	Ohio	222.150	K8TQK	EM89
Sat	2030	EM86 Ragchewers	222.110	–	EM86
432 MHz					
Sun	0800	PNWVHFS	432.100	–	CN87
Sun	2000	NLRS	432.120	KØSHF	EN34
Mon	1930	WSWSS	432.100	K6NC	CM98
Mon	2100	Pack Rats	432.110	W3RJW	FN20le
Tues	2000	PNWVHFS	432.100	–	CN87
Wed	2000	Rocky MT VHF+	432.100	–	DM79
Wed	2100	East Coast 70 cm	432.090	W4ZPG	EM73
Thurs	2000	WSWSS	432.120	KE6GFF	DM13
Thurs	2000	Greater Portland Area 70 cm	432.125	K7DLT	CN85
903 MHz					
Mon	2200	Pack Rats	903.125	AA3GN	FN20ig
Fri	2000	Rocky MT VHF+	902.100	–	DM79
1296 MHz					
Sun	0800	PNWVHFS	1296.100	–	CN82/84/96
Mon	2130	Pack Rats	1296.100	WA3NUF	FN20le
Tues	2000	PNWVHFS	1296.100	–	CN82/84/96
Thurs	2000	Rocky MT VHF+	1296.100	–	DM79
Fri	2000	WSWSS	1296.100	K6LGL	DM04
2304 MHz					
Mon	2230	Pack Rats	2304.085	W3KJ	FN20hg

*US-wide FSK441 meteor scatter mode.

WA5UFH, has indicated that the frequency for 6 meter random contacts has moved to 50.260 MHz as of mid-September 2003. Operation currently occurs weekly on Saturdays at 144.140 MHz (1400-1500 UTC) and 50.260 MHz (1500-1600 UTC). Additional activity (KAOS—Keep Activity on Scatter—not listed in Table 1) can be found the last Tuesday evening local time between the months of October and March at 0100-0200 UTC (Wednesday morning UTC) on 50.260 MHz and 0200-0300 UTC (Wednesday morning UTC).

The List: Table 1 has been assembled by asking for input on the Stanford VHF Reflector, by checking VHF club sites and by data mining the Internet using search engines. By nature, VHF is a rather localized pursuit. I know of most but not all of the nets within my normal 700 km space-wave range from Washington, DC, but I have to depend on others to tell me about nets in places like Texas and California. Thus, it is certainly possible that I have missed some nets. It is also quite possible that the Internet information I have is out of date. If so, I apologize. I am indebted to the following individuals for this information: K1DS, WZ1V, KC2CMQ, K2SMN, ND2X, W4VHF, W4KXY, KA5DWI, W6OAL, KA6CHJ, NJ7A, KB8NNE, N8WWM, NØLL, NØPOH and WØZQ. Thanks also go to the many club Web sites mentioned in the February World Above 50 MHz column and their links.

Table 1 lists VHF+ activity nets. Please use this information. Keep a copy of Table 1 near your operating position so you can find organized activity when you put up a new antenna or get on a new band. Resolve to get into an activity net or two that you haven't checked into before or get active in a local net that you have been neglecting.

ON THE BANDS

August marks the end of the summer E_s season but ushers in an increase in tropospheric ducting. As the autumnal equinox approaches, the number of auroras should also increase. Let's see what goodies August brought us. My thanks go to the DK5YA VHF Page, the GoodDX DX Robot, DX Summit and WZ1V, W3DHJ, K3TKJ, N3DB, K4KLK and G4UPS not otherwise mentioned.

6 Meters

This has been a great summer for 6 meter E_s DX. Perhaps Bob, VE1YX, summarizes it best: "The season was excellent here. Over 3500 6 meter QSOs since 8 May. One new country, 4U1ITU. I worked about 30 new grids as well. Can you see my smile?" Just to see how good this year was, I counted the number of days with E_s in August using the propagation reflectors and e-mail reports as sources. Only eight days in August appeared to have no reports of E_s in the US. Europe was worked on five days: August 3, 8, 9, 10 and 17. Bob K6QXY (CM88) worked KLØRG (CO45) on the 17th; and the Caribbean and points south appeared on August 1, 7, 8, 9 and 17. Much of the transatlantic DX was in the upper Northeast (for example, W1JJ, K1TOL, K7BV/1, VE1YX) and in Florida (W4SO among others). Several days featured double-hop continental E_s including August

12, where Eric, N7EPD (CN87), worked 14 new grids, many in New England. Contact of the month belongs to Andy, VE9DX (FN75), who used the westward multiple-hop propagation to work JR2HCB (PM85) at 0145 UTC on August 12. The 17th included a number of contacts between W1, 2 and central Europe like 9A8A and LZ1KV. Jon, NØJK, notes numerous double-hop contacts on August 17 from W6, 7 to southeastern W4s. At the same time Jay, KA9CFD (EN40), reports his first auroral-E contact to Europe on August 18 to GWØEWX (IO67). Ian, N8IK, took time out from a cruise on August 9 for a short low-power stint as C6AMK (FL15)—50 QSOs, 5 countries, 21 grids and 12 states. Meanwhile, the Europeans were entertained by the likes of 3A2MD, TZ6RD and a group of YIs led by YI/S56R and YI/ON5NT.

2 Meter E_s/FAI

Two meter E_s in August? Why are you surprised? Here in the US Al, K7ICW (DM26), is the only confirmed beneficiary of a short opening on August 2 to EM31 and EL29. However, early on August 8 we had a long and unusual FAI opening from Texas and Louisiana to the Pacific Southwest California/Nevada/Arizona. Al, K7ICW, reports that skewed headings were unusually far south for him. To the east, stations ranging from NN5DX (DM80) to K5QE (EM31) were involved, while to the west stations ranged from the Pacific Coast (DM03) northeast to Las Vegas (DM26) and east to DM33 and 43. Top performers appeared to be N6RMJ (DM14), K7ICW and W5UWB (EL17). I was unable to verify another short E_s opening on August 11.

The Europeans ended an amazing 2 meter E_s season in August with three short openings. On August 8 UA/UB was into central Europe (I, 9A, OK, DL, HA). On August 11 UA/UB stations reached 9A, DL and OZ. Finally the season came to an end on August 15 when a large cloud formed over southern France supporting contacts from Spain to I, DL and HB9 and orthogonally from EA6 to PA and 7X to northern France.

Perseids Meteor Shower

How many ways can you say mediocre and disappointing? According to most accounts, the Perseids are headed towards minor-shower status. For many, this was the worst Perseids in memory. At the same time, high digital activity and the ability of FSK441 to make use of short, weak bursts has led to a major shift in operating practices. Most of the activity is now digital and some of those folks did very well with dozens of contacts on 2 meters. Most memorable were Europeans—PAØJMV (JO21) with four contacts over 2100 km distance and EA3DXU (JN11) with 78 contacts. On the other hand, a "rarish" grid still brings out the analog players: The LAØBY/p expedition to JO39 yielded over 70 contacts, mostly on SSB. According to W5UWB, WØAH and others, long-distance contacts were scarce in the US. However, FSK441 produced 222 MHz success for KC6ZWT (1/3), W7XU, KR7O and WØAH (3/5), while some like Gary, WØGC, made their first MS contacts ever using digital. Nonetheless, Arliss, W7XU, says that 45 hours of prearranged schedules on 222 yielded not a single contact; his one success was a spur of the moment trip to Ping Jockey. My special thanks go to Shelby, W8WN, for his excellent summaries.

Aurora

The geomagnetic field continued to be highly active in August, while generating only a modest number of purely auroral contacts, especially on the bands above 6 meters in the US. More high-band activity was reported in Europe, most of which is at a higher latitude. High K/A values existed on August 2 (A=36); 6 (A=45); 18 (A=65); 21-23 (A=51, 35, 42). The peak K value appeared to be 7 on August 18. Auroral reports here were often confined to the more northerly latitudes as well. Jim, KB8GOY (EN72), reached the upper tiers—EN25, 27, 34, 37, 44 and 52—on August 6 on 6 meters. Dennis, K7BV/1 (FN31), relays an interesting note from VE3IKV who worked five stations mobile from FN03 with 100 W and a whip antenna on August 18.

Tropospheric Ducting

August is typically the beginning of the tropo season because the amount of sunlight decreases and both large colder high-pressure systems and tropical storms begin to develop. Conditions this August already seem promising. Ron, NN5DX (DM80), reports 432 MHz contacts with EM31 and EM20 on August 5. Russ, K4QI (FM06), found enhanced 432 conditions to the north in EM74 and EN82 on August 20-21. But the big news was a long and strong opening between the Southwest/Midwest across the Appalachian Mountains on August 24-26. Sam, K5SW, penetrated well into the Midwest—EN41, 52, 60, 70 and 71—and toward the end of the opening as far as K4QI in FM06. From the other direction, Carl, AA4H (EM86), reached Arkansas and Oklahoma on the 25th and K4QI worked 116 contacts during those days including 42 grids on 2 meters in such areas as EM25, 26, 37, 39 and EN31. Russ was also active on the UHF bands with contacts on 222 into EM25, 44, 45 and on 432 into those grids plus EM35 among others. His long-distance contacts on 1296 MHz were further to the north—K9MRI in EN70 and K2DRH in EN41.

The unusually hot and stagnant weather in Europe has led to massive and almost continuous tropo openings in July and August. I have very little detailed information, but contacts exceeding 1000 km appeared common between G/PA and points east. For example Oliver, DH8BQA/p (JO74), on the Polish border worked 52 grids and 12 countries on August 5 and 6 over distances up to 1265 km, mostly to his west. The period from August 8 to 11 involved the Iberian Peninsula (CT, EA) and stations as far northward as Norway (LA), over 1600 km distant. Contacts from EA8 (IL18) to England (IO71 and others) were in evidence.

Microwaves

Conditions during the UHF contest do not appear to have been enhanced in any measure from the reports I've seen. While there was some good rover participation, most reports were not particularly excited by the level of activity on either the UHF or microwave bands. On the other hand, there appeared to be substantial activity in the 10 GHz and up Cumulative contest at least on both coasts. In particular, Roger, K6LMN, relays comments from Gordon, WB6NOA, praising loads of activity in the contest. Here in the east, there were interesting rain scatter QSOs on 10 GHz between K1UHF (FN31fh) and K2AXX (FN12cs) off a storm in northeastern Pennsylvania and K1RZ (FM19jh) to southern New England (FN31). Using a borrowed 600 mW system on that band, Bill, KØAWU (EN37ed), relates contacts with VE4MA (EN19) WØGHZ (EN34) and KØFQA (EN35). The PackRats' newsletter *CheeseBits* relates substantial success from Camelback (FN21hb) with W3KJ reaching 392 km in FN43 and Rich, K1DS, working up to FN34 at 440 km.

Meanwhile Mike, KMØT (EN13vc), and Gene, NØDQS (EN22ge), have laid claim to the North American 24 GHz rain scatter record at 119 km on August 26 at 0246 UTC. Mike reports that the reflection was off a cell southeast of him and north of Gene. Signals had an auroral quality much like 6 meters, were Doppler shifted down 1 kHz and required that both dishes be slightly elevated. Quality was sufficiently good to support a sideband contact for some 20 minutes.

HERE AND THERE

Brendan Trophy

Sean Nolan, EI7CD, forwards the decision of the Irish Radio Transmitters' Society concerning the claim from Alex, N2PIG, and Debra, VA3PIG, of the first terrestrial transatlantic 2 meter contact on March 19, 2002 at 2215 UTC. N2PIG was located in Newfoundland at GN38lc and VA3PIG was in Ireland at IO41ut; FSK441 was the mode used. The decision was based on an insufficient level of proof and on the applicant's failure to provide adequate information within the prescribed three-month time period although the IRTS Awards Committee extended the deadline by six weeks.

Bermuda Beacons

Chris, W3CMP, reports that he brought a new beacon transmitter for VP9DUB/b. These beacons operate on 50.027 MHz omnidirectional and 144.300 MHz beaming toward Europe.

Leonids

The great Leonids saga is unfortunately coming to an end. The nominal peak this year will be on November 19 between 0150 UTC and 0530 UTC depending on whom you believe. Maximum rates (ZHR) are likely to be up to 50 meteors/hour. This is still a good shower with large, fast meteors that support long-distance communication. However, be alert for a possible encounter with the 15-revolution dust trail *on November 13* at 1300-1900 UTC with a ZHR of up to 250 of smaller meteors *if* (and this is a big if) it occurs as predicted. The best advice is "be prepared." Predictions here at the beginning of September are not firm enough to give me very much confidence.

ARRL International EME Competition

The second weekend of the ARRL EME Contest is from 0000 UTC on November 15 to 2359 UTC on November 16. Additional information is available at **www.arrl.org/contests/rules/2003/rules-eme.html**. QST

Missionary DXpeditioning—A Source of Satisfaction

By Martti J. Laine, OH2BH

In the aftermath of the 2003 World Radiocommunication Conference, it is nice to take stock and look at things from another perspective—DX-wise, that is. There is still time to shorten the 40 meter beam elements until our new frequency allocation becomes available in 2009. Actually it is very interesting to learn who did what, and whether all resources were used to gain that victory—a new 40 meter band allocation that will soon bring amateurs together the world over in a clean segment of the spectrum.

A great deal has been reported about how the impossible was made possible—Amateur Radio operators cleared a valuable short-wave segment for themselves and moved another service away. We all have our share in it, both as beneficiaries but also as the ones who made it happen. That is all obvious due to the fact that we are members of our national society, such as the ARRL. Part of our membership dues was given to support the International Amateur Radio Union (IARU) delegation's travel to Geneva there to work for us tirelessly for several weeks. So far so good.

The next conference will be here sooner than one can expect, and protecting the Amateur Radio spectrum is a never-ending mission which requires that work be done at all times. Herein lies an opportunity for us DXers in a way that can satisfy ourselves but also make the DX community another valuable resource in ensuring that Amateur Radio and its frequency allocations will be available to many future generations.

Background

Our ultimate success with these frequency allocations is highly dependent on those countries that are rarely in the mainstream of anyone's regular travel itineraries. Many of our bands are shared and/or face pressure from the world's developing countries that use the short waves for broadcasting, land mobile and other similar services. In the same way, they use 432 MHz for their domestic needs, mainly because Amateur Radio equipment is reasonably priced and no one is seemingly using those frequency bands because Amateur Radio does not exist in those countries. These countries can be grouped not only as developing countries but also as rare or semi-rare DXCC countries. Who visits them more often than us DXers! So, our travels take us there with no hectic business commitments, and if nothing else—when our favorite bands are closed—we may have a minute or two to do some good.

OH2BH

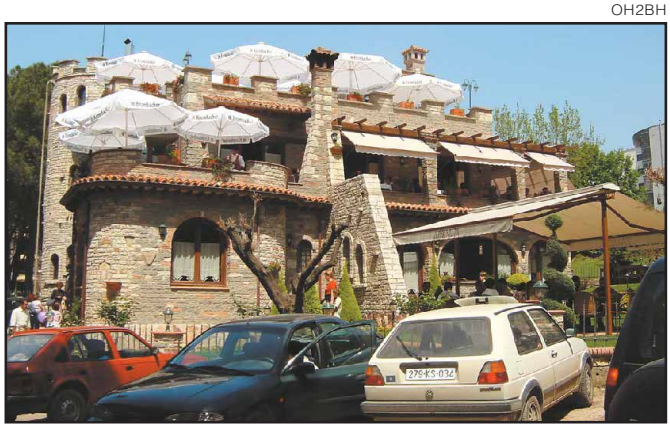
Carsten, DL6LAU, is very much involved with both elements of the program—the actual training program and the operating events in Durres. Here Carsten is handing out ZA1A QSOs in the IARU HF World Championship from the Albanian IARU HQ station.

Along my travels I have had those minutes more than once and have discovered those opportunities to do our share in protecting the radio spectrum in two ways: either working directly for the benefit of telecommunications or just acting in a way that may leave a feeling behind that Amateur Radio can be a valuable national resource and thus gain support indirectly over a longer time span. Each and every country seems to provide some opportunities, often different from country to country, for conducting *Missionary DXpeditioning*. Hence, there does not exist any single proven recipe that will work in each case. Keen observation locally is needed while your innovation can do the rest. Just seize the opportunity when your travel takes you to one of those DX countries off the beaten track.

Project Goodwill Albania

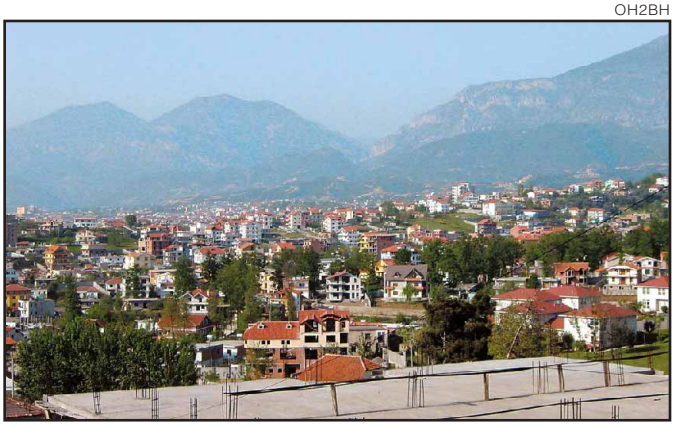
When you read this, you are only a few weeks away from another *Missionary DXpeditioning* approach at ZA1A. The original launch of Amateur Radio in Albania marked its 10th anniversary recently. This time, the mission is to look around and examine the future prospects of Amateur Radio and see whether the

OH2BH



Major progress is visible along the streets of Tirana. Many small businesses and idyllic restaurants dominate the scene. This one is only a walk away from the program site, next to the university.

OH2BH



Tirana, the capital, a city of 400,000, is actually a pretty sight, surrounded by mountains and boasting a lot of new construction. Another ZA1A site is located in the city of Durres, some 50 km away.

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org

SMØWKA

The Polytechnic University of Tirana faculty is very much involved in the ZA1A program: Dean Gezim Karapici (3rd from left) and Associate Professor Rozeta Miho (3rd from right). Mrs Loreta Andoni (2nd from right), is overseeing the program from the Ministry of Telecom point of view. Pertti Simovaara, OH2PM (left), Martti Laine, OH2BH (middle) and Geni Mema, ZA1B (kneeling in front), are also in the photo.

OH2BH

The entire ZA1A group of 1992 is featured at the Skanderbeg statue. Here you can locate your favorite ZA signal. From the left: ZA1G, ZA1K, ZA1D, ZA1E, ZA1B, ZA1L, ZA1J, ZA1M, ZA1C, ZA1Z, ZA1I and ZA1H. (See the stories about ZA1G and ZA1B in the June 2003 issue of *QST*.)

missing domestic frequency allocations can be freed for Amateur Radio and furthermore set an example for integrating Amateur Radio into Albania's overall education system.

We, as amateur operators, have to do these things; there is no one else to do them for us. During the November 2002 CQWW contest operation at ZA1B, we tentatively discussed these options with the Ministry of Telecommunications. We were welcomed with open arms to support them in the field of Amateur Radio and also to identify any additional resources that Amateur Radio may need in their evolving society. Emerging right here was an approach to help ZA-land organize future Amateur Radio training and, in return, get the country to protect the spectrum needed to carry this service.

With the Telecommunications Ministry's endorsement in hand and with their natural liaison with the Ministry of Education, a framework was agreed to in no time. Further discussion with the Technical University of Tirana opened the doors for the best possible young people in ZA-land, who will ultimately provide Amateur Radio with a needed long-term presence and immediately cut the average age of radio amateurs in Albania. These are issues that trouble every country, no matter where they are. The impossible became possible when an Amateur Radio course was integrated into their standard study programs not only for regular study credit but double credit for this being a foreign language course.

Tune in to this New World

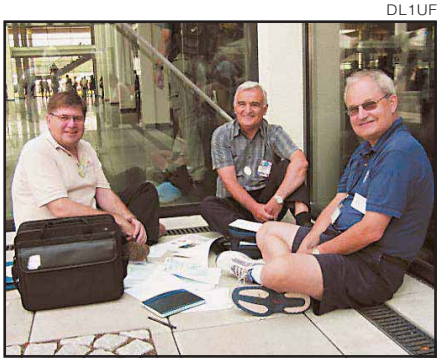
The ZA case is an extension and a wider version of what all of us can do. Yes, it is an educational program as such but it is done with the essence of another DXpedition. That is why it is presented here. For the Albania project, almost all instructors are DXers and they enjoy being DXers. Both in Tirana and in the city of Durres on Albania's Mediterranean coast, this multinational group activates ZA on a variety of modes in the frequency spectrum that we are there to protect. In addition to regular HF bands, this combined training course and major operating event will bring on 2 and 6 meters for the first time; RTTY will be activated as well as satellite, and finally the group of instructors will race in the CQWW contests at ZA1A in a multi-multi configuration. All this activity is to take place with the regulatory authorities and ZA students present as a "hands-on" part of the program.

The program will bring many IARU society representatives and a variety of nations into Albania to do their part as each week is going to be dedicated not only to the "Theme of Radio" but also to a supporting nation. It is expected that Albanian, American, British, German, Finnish, Italian, Hungarian and Swedish DXers will be seen in the streets of Tirana together and heard on the bands during the month of November.

Summary

Missionary DXpeditioning can be your personal approach in the country you visit—at the very least give a friendly smile to the local licensing administrators. You may extend your visit for a sociable lunch with them, or maybe you can get greater satisfaction by leaving some Amateur Radio related material with the local education administrators. By doing all this, you will have created your own

DL1UF



Several planning sessions were needed to formulate this multinational undertaking. In Friedrichshafen the program coordinators (from the left): Martti, OH2BH, and Roger, G3LQP, team up with RSGB President Bob, G3PJT, for another planning session.

support program for the spectrum that we all need. As a home-based DXer, you can certainly do your share as an addition to your national society membership; you may join any of those DX foundations that make DXpeditioning happen, such as the Northern California DX Foundation (**www.ncdxf.org**).

A highly respected DX scholar and ARRL Director, the late Jim Maxwell, W6CF, once ended his chapter to my book with words that remain stuck in my mind and have served me well ever since: "I'm *proud* to be a DXer—aren't you?"

CORRECTION

In the September column, EA5BY was listed as the contact person for the October 3CØ Annobon Island DXpedition. Any contributions for this DXpedition should go to DX Club Tabarca Island, President Elmo, EA5BYP, PO Box 3097, 03080 Alicante, Spain, e-mail **cayuco@telefonica.net**.

24 GHz

Over the last decade we have seen a significant increase in activity on 10 GHz. Available components, kits, and the activity itself has spurred more hams to give narrow-band microwave operation on 10 GHz a try. Those who were "early adopters" have since moved on to 24 GHz, and the activity there, and appearance of some surplus components are raising activity levels on 24.

Getting on 24 is much like getting on other bands, and in some ways different. Just as with all transverters, you need to connect a mixer, local oscillator, antenna and IF radio. However, unlike the lower bands, 24 GHz poses some challenges. Dimensions, for instance, need to be kept more precisely. In some cases, a few thousandths of an inch can make a measurable difference in performance.

Keeping on frequency is also more (twice) as difficult as on 10 GHz. Conventional LO "bricks" that usually are found to operate at frequencies up to about 13 GHz can be used in a frequency-doubling configuration and after sufficient warm-up are usually accurate and stable enough for narrow-band operation.

Circuit board materials are more specialized. Because of this, and the need to keep PCB line widths very precise, most amateurs opt to use pre-manufactured circuits or components.

SMA connectors are near or beyond their limit at 24 GHz, and more sophisticated connectors are rare and expensive. Coaxial relays, and coax for that matter can be very lossy on this band and should be avoided. Therefore, the vast majority of interconnects at 24 GHz are waveguide. The size that best matches this band is WR-42. Shown in Figure 1 are a coaxial to WR-42 transition (left) and an isolator (right). Isolators are one-way paths for RF, made from a three-port circulator fitted on one of the three ports with a load.

Transverters

There are two circuits in common use for 24 GHz transverters. The first, perhaps less common employs a conventional mixer, where an LO of 24.048 GHz is mixed with an IF of 144 MHz to produce 24.192 GHz. With an LO at about 12 GHz connected to a ×2 multiplier and subsequently to a mixer, a simple 24 GHz transverter can be constructed (see Figure 2). Along with an IF radio, this transverter, built by W1FKF, has been used to make contacts over 200 km. The components are mounted to an aluminum plate on the back of the dish. The upper left object is a "brick" LO operating at 12.012 GHz. It is followed by a doubler, which is connected to the mixer in the center. Below that is a 12 V dc to 24 V dc converter to supply the negative 20 V dc to the surplus brick. The black object on the right is for mounting.

Because it is quite difficult to produce LO power at frequencies near the operating band, and because fundamental mixers for this band are also rare, harmonic mixers are often employed—usually at half the LO. Mixers can be occasionally found that are designed to operate in a harmonic mode, and some mixers will perform this way even though they were originally designed for non-harmonic operation. Some packaged upconverters and downconverters have been found in abundance at flea markets. Examples are shown in Figure 3 where each converter is connected to an isolator. These packages each contain ×2 LO multipliers, amplifiers and filters. Power output levels in the order of a quarter watt are common.

In very simple transverters (such as Figure 2), no TR switching is required because the same mixer is used for both up and down conversion. In other low power systems, a circulator can be used to direct energy correctly between transmitter, antenna and receiver circuits. For example, in Figure 4 an LO "brick" is surrounded by an upconverter on the right and downconverter on the left. A WR-42 filter is connected to the upconverter. In this photo, the antenna connection comes up from a circulator. In a perfect world, all the energy leaving the transmitter would be radiated—however, there is always some power reflected from the antenna, and this will be fed (by the circulator) directly into the downconverter. To protect it, a waveguide shorting solenoid is employed in front of the downconverter and energized during transmit.

Filters are used in transverters to remove unwanted mixer products. This results in receiver noise improvement of up to 3 dB and prevents transmission on more than one frequency. Sections of waveguide with various pins and screws

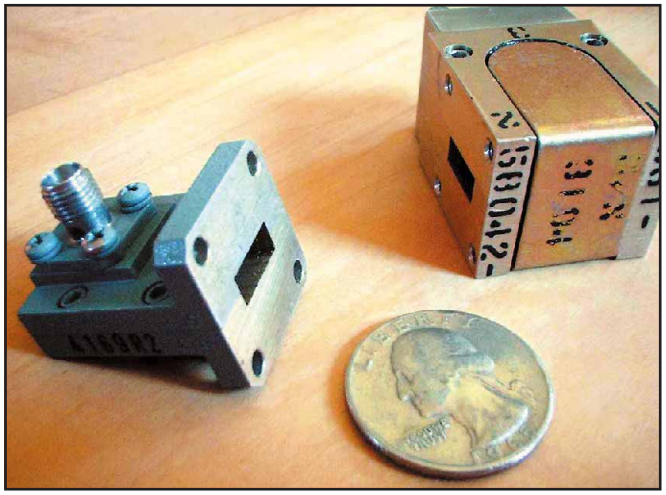


Figure 1— A coaxial-to-WR-42 transition (left) and an isolator (right).

Figure 2—This transverter, built by W1FKF, has been used to make contacts over 200 km.

Tom Williams, WA1MBA ♦ wa1mba@arrl.org

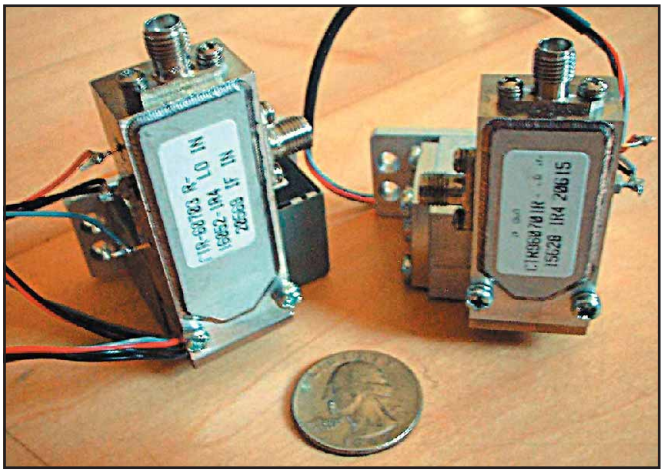


Figure 3—You can often find packaged upconverters and downconverters at flea markets.

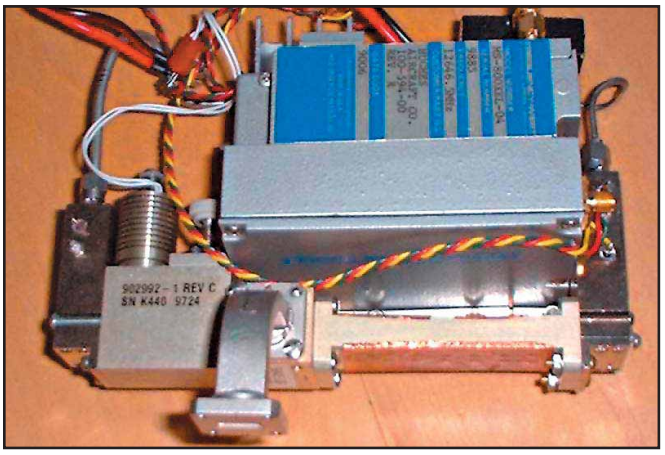


Figure 4— This LO "brick" is surrounded by an upconverter on the right and downconverter on the left. A WR-42 filter is connected to the upconverter.

function as a band-pass filter.

For TR switching in systems that have high power—such as a half to many watts—reliance on a circulator is not advised. Low loss coaxial relays that are effective at 24 GHz are very rare and prohibitively expensive. Furthermore, most components have waveguide interfaces and would have to be converted to coax using transitions that take space and present some loss. These switches are also rare, but when using high power some type of relay is necessary. There have been some enterprising amateur fabrications of WR-42 switches.

Kits, components and entire transverters have been described in *DUBUS* magazine, and offered by DB6NT (follow the links in the resources). Although they are somewhat costly, amateurs often report excellent results with these components and systems—designed and built by amateurs.

Amplifiers

Only recently have 24 GHz power amplifiers become available to amateurs. Some are surplus from the communications industry attempt to develop LMDS—a broadband RF system. Some amplifiers from these developments have been sold through popular on-line auctions and occasionally on microwave e-mail reflectors. Without an amplifier, a mixer is likely to produce no more than –10 dBm or 100 mW, whereas a modest amplifier could deliver a quarter of a watt or +24 dBm. This results in being heard with a 34 dB improved signal to noise ratio. Although this can easily make the difference between being heard and not, remember that both ends of a contact would have to be amplified in order to get the full DX advantage that the improved system margin provides.

A group of amateurs recently put together a small quantity development of 1 W amplifiers. This turned out to be a very tedious process, due to the difficulty in precise mounting of components and performing wire bonding to RF components. Such capability is out of the scope for most amateur assembly.

Low noise amplifiers, much like power amplifiers, are usually found either as surplus or from special collaborative efforts. They are at least as much if not more rare than power amplifiers. A top performing LNA at 24 GHz might provide a noise figure of 2.5 dB, whereas a top-performing mixer may operate with a noise figure of 8 dB. The difference, about 5.5 dB, ends up in improved signal to noise ratio.

Dishes, Operating and Propagation

Most 24 GHz stations are tripod-mounted for hilltopping operation. Dishes are often used, and range in size from about 8 inches to 2 feet with 1 foot diameter being very common. Many dishes are surplus and fully constructed with feed systems for use in communications systems. Construction of a feed, and placement for optimum focus is very challenging.

Most upper-band contacts are made using liaison radios. In the US, we usually gather at 144.260 SSB, moving off from there to coordinate the 24 GHz contacts. Quite often stations will use liaison to establish contact at 10 GHz, and then move on to 24 GHz or higher bands during contests or other activity periods. Most systems have smaller diameter dishes on 24 GHz than on 10 GHz, resulting in similar pointing requirements.

Unfortunately, water vapor has an absorption line at 22 GHz that has an effect on the 24-GHz band. Therefore, the long-haul DX only happens when the air is dry. Although this can give disappointing results, there are many surprises where signals are quite strong. There is rain and snow scatter at 24 GHz, and in very light drizzle, when scattering is not effective on 10 GHz, rain can provide very good propagation at 24 GHz.

Getting Started

As with all microwave exploration, the best way to get on is to find someone else to work with. I advise you to get on 10 GHz first. With luck, there is a club or an organization in your area that has interest, or perhaps someone who has already managed to put together a 10 or 24 GHz system. Usually this happens in at least pairs! Join a microwave e-mail reflector, subscribe to microwave newsletters, get a copy of microwave experimenter's books from the ARRL.

Next Issue

This issue completes two years of publishing this column. The ARRL has continued to show support in the more technically advanced parts of our hobby by publishing this and other columns in *QST*, and in its technical publication *QEX*. As of this writing, I am not sure where the next column will lead me, but I anticipate that the next year will be as much fun as the last two have been. QST

Resources

For microwave related information on waveguide sizes, connectors and links to other sites with information, newsletters and commercial sources, set your browser to **www.wa1mba.org/**.

You can also find information in *The ARRL UHF/Microwave Experimenter's Manual,* "Antennas, Components and Design" (Newington: ARRL, 1990-1997) Available from the ARRL Bookstore, **www.arrl.org/shop/**. ARRL order no. 3126.

IARU Administrative Council Looks to the Future

PAUL RINALDO, W4RI

The IARU Administrative Council: (L-R) Don Beattie, G3BJ, David Sumner, K1ZZ, Ole Garpestad, LA2RR, David Wardlaw, VK3ADW, Tim Ellam, VE6SH, Larry Price, W4RA, Fred Johnson, ZL2AMJ, Pedro Seidemann, YV5BPG, K. C. Selvadurai, 9V1UV, Yoshiji Sekido, JJ1OEY, Hans Blondeel Timmerman, PB2T, and Rod Stafford, W6ROD.

The focus was on the future when the International Amateur Radio Union (**www.iaru.org**) Administrative Council met September 6-8 in Amsterdam, the Netherlands. The council reviewed in detail the results of World Radiocommunication Conference 2003 (WRC-03) as they affected the Amateur and Amateur-Satellite services and congratulated and thanked all individuals and organizations contributing to the "satisfactory outcome."

A compromise to move broadcasting from 7100 to 7200 kHz by early 2009 was a major result of WRC-03. In Amsterdam, the council began considering the prospect of further progress on the 40-meter issue during the next World Radiocommunication Conference, tentatively set for 2007. "While considerable progress was made at WRC-03 toward fulfilling Amateur Service spectrum requirements at 7 MHz, the requirements were not fully satisfied and there may be an opportunity to revisit the issue at WRC-07," the IARU said. The IARU's goal is for a 300 kHz worldwide allocation at 7 MHz.

Four hours of the meeting were devoted to a strategic planning session that scanned the horizon out to 2010. Among issues in the near term, the IARU plans to participate in International Telecommunication Union Radiocommunication Sector (ITU-R) study group sessions concerning the interference potential of high data rate telecommunication systems using power lines—known in the US as Broadband over Power Line (BPL) or power line carrier (PLC) technology. Looking further ahead, discussion dealt with Amateur Radio-related topics that could come up at WRC-07. The WRC-07 agenda includes two items of interest to the Amateur Service—a review of allocations between 4 and 10 MHz and a possible secondary low-frequency amateur allocation in the vicinity of 136 kHz.

In the aftermath of WRC-03, the council urged IARU member-societies to call to the attention of their administrations "the desirability of adopting specific changes in their domestic regulations for the amateur and amateur-satellite services, so that they will be consistent with the revised Article 25 of the international *Radio Regulations*." In that vein, the IARU governing body called for the removal of Morse code as an examination requirement to operate on HF. The council reiterated its stance first taken in 2001 that Morse code proficiency "as a qualifying criterion for an HF amateur license is no longer relevant to the healthy future of Amateur Radio."

"IARU policy is to support the removal of Morse code testing as a requirement for an amateur license to operate on frequencies below 30 MHz," the IARU Administrative Council resolved. At the same time, the council's resolution recognized Morse code as "an effective and efficient mode of communication used by many thousands of radio amateurs." It also took into account ITU Radiocommunication Sector (ITU-R) *Recommendation M.1544*, which sets down the minimum qualifications of radio amateurs. World Radiocommunication Conference 2003 left it up to individual countries to determine if they want amateur applicants desiring to operate below 30 MHz to first demonstrate Morse proficiency.

The council also reviewed and updated a working document that describes the spectrum requirements for the Amateur and Amateur-Satellite services, particularly to reflect the results of WRC-03.

In other business, the council:

- received reports of volunteer IARU international coordinators and advisers. At the request of the IARU satellite adviser, Hans van de Groenendaal, ZS5AKV, the council clarified policies concerning frequency coordination of satellites operating in the Amateur-Satellite Service. The council also created the new volunteer position of IARU Disaster Communications Adviser in response to the increased emphasis on emergency and disaster relief communications in Article 25 of the international *Radio Regulations.*
- endorsed nominations from the International Secretariat for 2004-2009 officeholders. Past ARRL President Larry Price, W4RA, was nominated for a second term as IARU president. Timothy S. Ellam, VE6SH/G4HUA, was nominated as vice president. IARU member-societies must ratify the nominations. New terms of office begin May 9, 2004. The council recognized retiring IARU Vice President David Wardlaw, VK3ADW, for his long and devoted service to the IARU.

VERON President Frank Van Dijk, PA7F (right), accepts a small gift of appreciation from IARU President Larry Price, W4RA. VERON—the Netherlands' IARU member-society—hosted a dinner in honor of the Administrative Council during its Amsterdam meeting to thank the IARU for what was accomplished at WRC-03.

In addition to those shown in the group photo, Paul Rinaldo, W4RI, served as recording secretary.

Originally set to be held in Taipei, Taiwan, in conjunction with the IARU Region 3 Conference, the Administrative Council session was moved to Amsterdam after concerns about SARS forced the postponement of the Region 3 gathering to next year. The IARU Council is to meet next October in Trinidad & Tobago following the IARU Region 2 Conference. QST

1922 Armstrong Transatlantic Letter Found

You never know what you're going to find or where you will find it.

I purchased the remnants of a ham's estate a couple of years ago. He had become a SK about 20 years earlier and most of his station and collection was sold shortly thereafter. His home was now being sold and the few remaining ham items and more than a few boxes were offered for sale from the cellar. I purchased all that was left from the family a few days before the sale, and just before the dumpster.

Cleaning out a cellar is hard and dirty work. After 20 or 30 trips up the stairs with heavy boxes, you tend to want to get done and get out of there. This day was no different.

The larger items were loaded into my van and we were bringing up the cartons of parts he had on shelves. We were almost done when I noticed one more shelf with small boxes, including a nice looking cigar box. I had room in the last carton, so in they went. I looked into each box first, and if it wasn't radio related, it went back on the shelf. Some had wood screws and nails and other heavy odds and ends. The cigar box went in last because there were two old tubes in it along with some paper junk. I figured I would sort it later, throw away the junk and just keep the tubes.

It took a few months to get around to sorting that last carton. When I finally opened the cigar box I was sitting on my couch and watching TV with my wife. After the tubes were removed, I started going through the paper. There were several interesting letters, a few 1920s QSL cards, some pins and a couple very old hamfest tickets. About half of the box contained papers that once belonged to Homer E. Nichols, W1BM, Life member of ARRL, Director of Nichols Manufacturing Company and Section Communications Manager of Connecticut, 1926-1928.

FROM *THE STORY OF THE FIRST TRANS-ATLANTICS*

***Pupin comes to visit the station*—Professor Michael I. Pupin of Columbia University came to Greenwich with Mr William Deegan of the Postal Telegraph Co "to see what you boys are doing," as he put it. Front row, left to right—Armstrong, Burghard, Dr Pupin, Cronkhite, Grinan. Standing rear, left to right—Tex McBain of the Greenwich Fire Department, George Brillhart, John Hobe, Carl Trube, William Deegan, R. H. McMann, V. A. Hendrickson, Jack McWilliams. Far rear—John Cullen, Fire Department. Photo used with permission from the Radio Club of America.**

I started to read the letters. One was in response to a letter that W1BM must have written to Edwin Armstrong about the December 1921 Transatlantic Tests. It was hand-written on January 5, 1922 and signed by Armstrong. It read:

> My Dear Nichols,
>
> I hope you will pardon my delay in answering your letter—I have been absolutely buried and I did not remember, after reading it the first time, that you asked about coming over to see the station. I am particularly sorry because we had a visitors day the Sunday following the tests when Prof. Pupin, Sarnoff, Goldsmith and a bunch of radio boys came up to look us over. Right now the station is down—the transmitter is at Columbia and will probably be on exhibition in N.Y. for a while but if you ever hear 1BCG on the air again at any time give us a call and make your own arrangements for coming over. We will be glad to see you any time up to 5:30 A. M.—or was it 5 A. M.
>
> In respect to 1AAY it appears that there was an error in the coding of this call and that it should have read 1AAW. This station, however, did not transmit, so I don't yet know the answer.
>
> Best of 73's and hope next time I see you will be after 6 A.M. at least.
>
> Sincerely,
>
> (signed) E. H. Armstrong

I read and reread the letter. What luck to have saved this from the dump—what a historic letter! I was so excited I called a few friends right away. Everyone thought it was great.

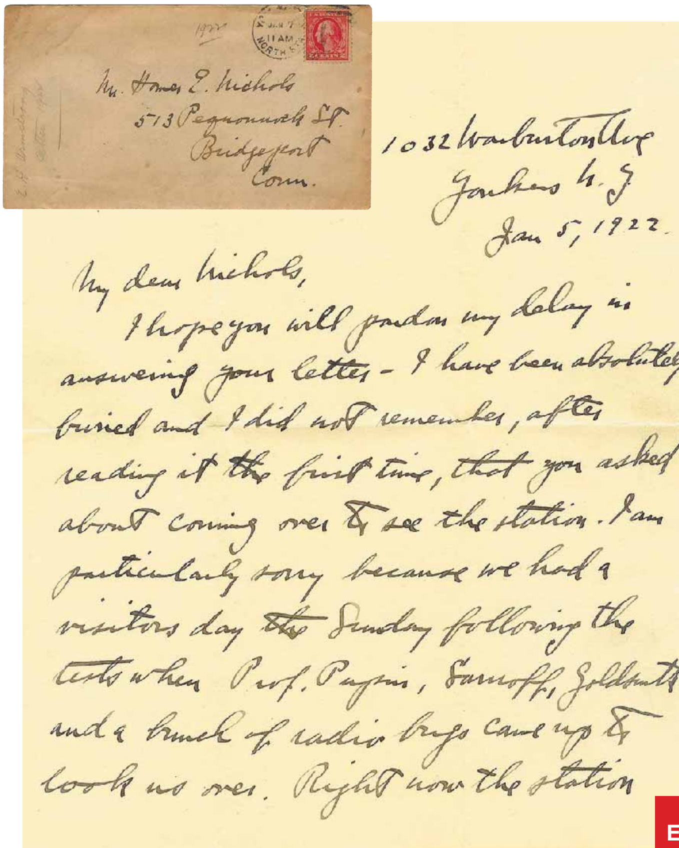
Next, I dug out my book on the Transatlantic Tests and read it again. Yes—the things mentioned in the letter Armstrong later put into writing for the Radio Club of America's *Proceedings*. You might want to get a copy of this book for yourself; it is available from the Museum of Radio and Technology.[1] This book has the whole story from several different publications and from many notable radio hams who were there. It includes an introduction from Armstrong, the history of 1BCG including many great photos of the station and radio equipment, recollections of a Member of the Engineering Staff of 1BCG, the electronic details and schematics of 1BCG and the Superheterodyne receiver Godley used, Paul Godley's story from the other side, a complete reprint of the February 1922 *QST* article, clippings from newspapers and magazines, and much more.

Homer Nichols, W1BM

I have learned a little more about Homer Nichols, W1BM, since then but not a whole lot. Thanks to Bob Merriam, W1NTE, of the New England Wireless and Steam Museum, I

[1]1640 Florence Ave, Huntington, WV 25701. I paid $10 for mine at a radio meet, but I suggest that you check with them first for actual cost, shipping, etc. This is a good quality 8½×11, 78 page reprint whose title is *The Story of the First Trans-Atlantic Short Wave Message, Proceedings of the Radio Club of America, Inc, 1BCG Commemorative Issue, October 1950.*

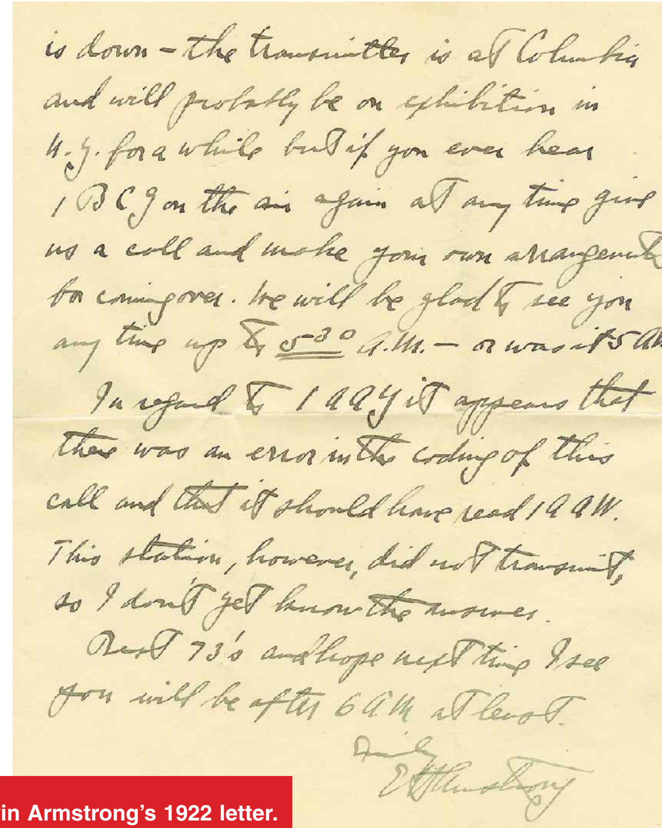
John Dilks, K2TQN ♦ 125 Warf Road, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org


Mr. Homer E. Nichols
513 Pequonnock St.
Bridgeport
Conn.

1032 Warburton Ave
Yonkers N.Y.
Jan 5, 1922.

My dear Nichols,

I hope you will pardon my delay in answering your letter - I have been absolutely busied and I did not remember, after reading it the first time, that you asked about coming over to see the station. I am particularly sorry because we had a visitors day the Sunday following the tests when Prof. Pupin, Sarnoff, Goldsmith and a bunch of radio bugs came up to look us over. Right now the station


is down - the transmitter is at Columbia and will probably be on exhibition in N.Y. for a while but if you ever hear 1BCG on the air again at any time give us a call and make your own arrangements for coming over. We will be glad to see you any time up to 5-30 A.M. - or was it 5 AM

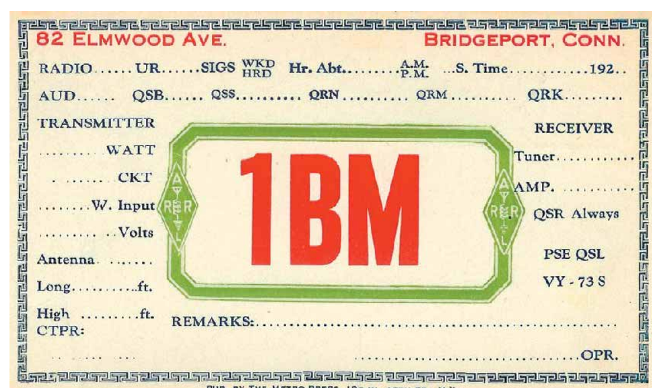
In regard to 1AAY it appears that there was an error in the coding of this call and that it should have read 1AAW. This station, however, did not transmit, so I don't yet know the answer.

Best 73's and hope next time I see you will be after 6 AM at least.

Sincerely
E H Armstrong

Edwin Armstrong's 1922 letter.

The cigar box that contained the Armstrong letter, among other interesting items.



Homer Nichols' 1922 QSL card.

received a copy of a QSL card Homer had sent to Stew Perry, W1BB, in 1950. In part he said on the card, "BM was assigned to a ham in Bridgeport back in 1912 but he went to college and after 1st World War I fell hair [sic] to it. Hiram P. Maxim was the 21st ham in New England District to get a license and mine was 23rd." Clearly, Homer Nichols was a very early ham and his call changed to 1BM after the War.

In 1950 he was running a Collins 30J at 400 W and using a National HRO-5 receiver. He worked Stew on 3535 kHz. He still had the same station in 1959, as indicated on another card.

Homer was also a mentor. I received an e-mail message from Seth Horen, K1LOM, that said:

> Homer Nichols was my Elmer. When I got interested in ham radio at age 12 (1957) he was the one who helped me get my novice license and even gave me the test! He also came to my house and put up my first antenna, climbing ladders and trees at about age 65! He also was responsible for my father getting his license a couple of years later.

If anyone knew Homer Nichols, W1BM, has a photo of him or can add to this story, please e-mail me. I'll share the information with K1LOM.

I'm not sure why the SK had the cigar box with Homer's papers; perhaps he had purchased them from W1BM's estate years earlier.

There are still a couple of other items in the cigar box to tell you about, but I'll save them for another day.

Look for my hat at the hamfests and say hello.—*K2TQN* QST

Resurrecting a QRP Classic—*Part 2*

Without a doubt, finding a classic QRP rig like a Ten-Tec PM Series or Heathkit HW-7 or 8 at a flea market can be a thrill. However, many of these classic QRP rigs have been "modified" (and I use that word *very* loosely) by previous owners and, more often than not, they don't work and are relegated to the dumpster after being lugged around from hamfest to hamfest without being sold.

Last month I briefly described the two modifications I performed on my newly acquired HW-8. This month, I have decided to detail these mods and provide some additional information regarding replacement parts for these older rigs.

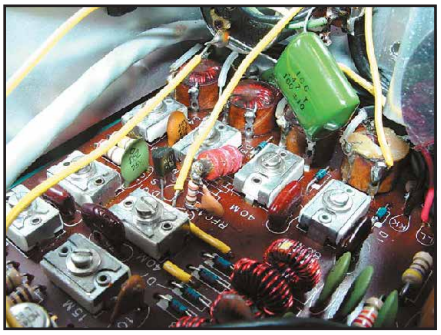


Figure 1—Two parts and five minutes = a cure for transmitter motorboating.

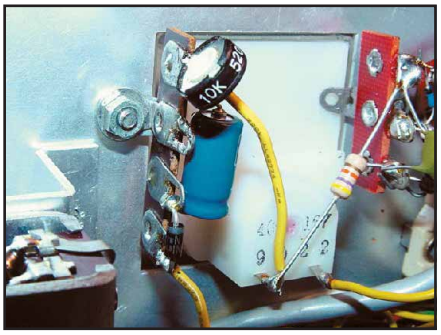


Figure 2—The audio-derived S-meter modification.

Oops!

As part of the HW-8 restoration I decided to perform a by-the-book alignment of the transceiver to ensure that all systems were working optimally. Everything was going well *until* I hooked up the dc power cables to the radio. You guessed it; I swapped the positive and negative leads totally by accident and my cherry little HW-8 became a nonworking $125 paperweight!

I was in total shock! Recovering from my initial disbelief, I started to look over the HW-8 schematic to try to pinpoint the active devices that would need replacement. First there was IC1, the product detector, an MC-1496G. Then there was Q9, the PA transistor and ZD2, the overvoltage SWR protection diode connected from the PA collector to ground. The more I wandered around the schematic, the more things I found that connected directly to the V_{cc} supply line I had reverse polarized. Man, this was definitely not a good day!

Researching the MC-1496G I found that this device was no longer being produced. My local electronics parts supplier had a direct replacement—some NOS (new old stock) RCA SK3233 devices ($4 each)—so I bought two. I also found the higher power replacement for the stock 2N4427 final amp, an NTE-488 PA transistor ($13) along with the ECG-222 dual gate MOSFET used in the HW-8 as a mixer amplifier (Q4, Heath part no. 417-240). Dual gate MOSFETs are getting harder to find, so I picked up two at $11 each. I unearthed several other replacement transistors: an NTE 133 (used for the RF amp, Q1, and the VFO, Q2, Heath part no. 417-169 at $1 each) and a NTE 159 (keying transistor Q11, Heath part no. 41-116, and the relay driver, Q13, Heath part no. 417-201, also about $1 each). The rest of the active devices in this rig are run-of-the-mill small signal NPN transistors that will directly sub with an NTE-123AP, 2N2222 or 2N3904 transistor.

The "Call for Help"!

In desperation, I called Mike Bryce, WB8VGE (**prosolaratsssnet.com**), who publishes the *HW-8 Handbook*, *the* source book for everything you ever wanted to know about any of the Heath QRP rigs) and explained the situation to him. He stopped laughing after a few minutes and asked me what I had done, so far, in the way of troubleshooting. I listed the symptoms: no receiver noise, no transmitter output, no smoke and the power supply was going into overload protection once the rig was turned on. I had gone so far as to remove the V_{cc} from point "D" on the PC board to no avail.

Mike suggested the first place to look was overvoltage/SWR protection zener diode, ZD2 and the final amplifier, Q9, since both devices were directly connected to the V_{cc} line and were the most likely candidates to short and load down the supply. He also encouraged me saying that if I was *really* lucky, the zener diode had shorted first, taking out the PA transistor, and the rest of the rig should be fine. One could only hope.

Sure enough, I checked ZD2 and it was shorted. Ditto for the PA transistor. I powered up the HW-8 without these two devices and was rewarded with a working receiver! Now I wasn't feeling so bad. I replaced the zener diode and the PA transistor and found the transmitter had RF output. Things were beginning to look up.

After proceeding with a full alignment the HW-8s were perking along like new. The receiver was hot and RF output with the new PA was 2.75 W on 80, over 4 W on 40 and 20 and 2.5 W on 15 meters.

And yes, I soldered a 1N4001 silicon diode in reverse bias across the power leads coming in to the power connector for polarization protection. Of course I did this *after* I had reversed the power leads.

The moral of the story: do the reverse polarization modification *first* on these older rigs that don't offer this feature. It certainly saves a lot of anguish, hair pulling and unnecessary troubleshooting.

Now for the two mods: Figure 1 shows a picture of the 390 Ω resistor in parallel with the 0.01 µF disc ceramic capacitor soldered between the low end of RFC1 and ground. This mod is fully reversible and definitely tames the transmitter motorboating with only two parts and five minutes' work.

Figure 2 shows the audio derived S-meter circuitry bolted to the left side of the meter and connected between the high side of the AF gain control and the positive side of the relative signal meter. The 10k potentiometer allows adjustment to where really loud signals are set for maximum deviation on the S meter. The electrolytic cap, a 47 µF at 50 V, is used to select a relatively slow decay on the meter. You can choose a smaller value (like 16 µF or 33 µF) cap to provide faster decay time, resulting in a much more lively S meter. QST

Rich Arland, K7SZ ♦ 25 Amherst Ave, Wilkes Barre, PA 18702 ♦ k7sz@arrl.org

Let's Put *Radio* Back in Ham Radio

By Sumner Weisman, W1VIV

With great interest, I read the article by Paul Cassel, VE3SY, "From Ether to Ethernet" [May 2003, pp 28-32]. His thorough description of IRLP, the Internet Radio Linking Project, intrigued me enough to go back and reread the previous article by Steve Ford, WB8IMY, "VoIP and Amateur Radio" [Feb 2003, pp 44-47], which described IRLP and several other systems.

All of these configurations have one thing in common: communication via the Internet, with a VHF or UHF FM transceiver providing a radio connection at each end. The more I thought about it, the more I marveled, "These are all clever schemes, but they are *not* ham radio!" In his article, VE3SY talks about the many technological changes in the last 85 years; from spark to CW to AM to SSB to VHF FM to the Internet linking of VHF/UHF Amateur Radio repeaters, as if they are all equal. In my opinion, he is ignoring the one basic difference. Up to the present time, all our communication methods were *over the air*. Now, hams are having QSOs on the Internet. The Internet is simply a worldwide system of interconnected *wired* computer networks. These hams, in other words, are talking over wires and calling it ham radio!

"Yes," they would reply, "but there is a VHF or UHF transceiver and repeater at each end. That makes it ham radio." Let me present some reasons why it isn't. Let's say that I, near Boston, have an IRLP QSO with a ham in Australia, a distance of about 10,000 miles. At each end, there is a 5 mile distance between the operator's radio and a repeater tower. This QSO, which consists of 10 miles of radio and 10,000 miles of wired networks, has a ham radio content of 0.1%. In other words, 99.9% of this contact is simply talking on the telephone. That's not ham radio by any present definition.

We make thousands of telephone calls using similar configurations every day. And, we correctly call them phone calls, not radio. For example, if I were to telephone a relative in California, cell phone to cell phone, is that radio? After all, the signals travel by RF to the local cell towers before being connected to wired telephone networks. For another example, if I were to telephone the same person and we each use a cordless phone, is that radio? Again, the signals travel by RF some short distance from handset to base unit before the wired network connection. What's the difference between these systems and IRLP? There is no difference at all except for the use of other frequencies; they are all simply telephone calls.

So, the question is, where do you draw the line? Should a contact with only 5% of the distance via RF be called ham radio? 25%? 50%? I propose that a ham radio QSO be defined as one where at least half the distance is covered by an RF signal. I'm sure that some purists would insist that the entire contact must consist of a radio signal only, but I believe that there is certainly a place for the Internet in our hobby.

It's interesting to note that the *opposite* of these radio-connected telephone contacts were popular years ago, when hams were running overseas or cross-country phone patches. A telephone call was made at each end, through the phone patch at each ham's station, which allowed two non-hams to have a long-distance conversation by radio. Of course, it had to be controlled by the licensed ham operators. These contacts certainly met my 50% criterion, since the caller was generally within 100 miles or less of the ham's location, and the radio connection was often thousands of miles. Today, we've gone to the other extreme and substituted the Internet for what used to be the long-distance "over-the-air" portion.

There is another reason why I find the use of IRLP disturbing. Suddenly, a newly licensed Technician-class ham with a shiny new 5 W handheld transceiver can work DX all over the world. Where is the incentive to improve? To gain further knowledge? To learn about the challenges of antennas and transmission lines and matching networks and transceivers and linear amplifiers? Why bother upgrading to a General or Extra class license? There is no longer a reason for further study in the interest of self-improvement. IRLP may be an easy and quick way to attract more people to ham radio, but the overused term "dumbing down" certainly seems to apply to these new variations of our hobby.

One of the reasons governments around the world have given hams the valuable frequencies we now enjoy is so that a large pool of citizens would have skills in the technical aspects of radio communication in case of emergencies, war or other times of need. If our new hams only have the skills to talk into their handhelds as far as their local repeaters, then we no longer meet that need and our ham bands could be gradually given away to other more valuable services. The pressure to share our frequencies with others is already increasing every year.

I can hardly wait to see what comes next. Internet QSL cards? IRLP DXCC? We proudly call ourselves ham radio operators, but lately we've been going astray. Let's put the "radio" back into ham radio.

QST Op-Ed Policy

The purpose of Op-Ed is to air member viewpoints that may or may not be consistent with current ARRL policy.

1) Contributions should be approximately 950 words in length.

2) No payment will be made to contributors.

3) Any factual assertions must be supported by references, which do not necessarily have to be included in the body of the article to be published.

4) Articles containing statements that could be construed as libel or slander will not be accepted.

5) The subject matter chosen must be of general interest to radio amateurs, and must be discussed in a way that will be understandable to a significant portion of the membership.

6) With the exception that the article need not be consistent with League policy, the article will be subject to the usual editorial review prior to acceptance.

7) No guarantee can be made that an accepted article will be published by a certain date, or indeed, that it will be published at all; however, only articles that we intend to publish will be accepted, and any article we have decided against publishing will be returned promptly.

8) Send your contributions to ARRL Op-Ed, 225 Main St, Newington, CT 06111. QST

A Spirited 30th Milestone!

This past September the ARRL Foundation marked its 30th year of charitable service to hams. Our success could not have been possible without the thousands of generous hams (and their family members) who have understood and appreciated the simple benevolent equation of hams helping hams. Here, by decade, we note where we have gone:

1973 to 1983—Satellites, WARC and Scholarships

- Founded as separate nonprofit 501(c)(3) organization September 21, 1973, with office at 225 Main St, Newington, Connecticut.
- Launched fundraising on behalf of AMSAT for OSCAR 6 and OSCAR 7.
- Voted to support World Administrative Radio Conference (WARC) preparations.
- Administered first dispersal of scholarship funds (two at $250 each) on behalf of Long Island School Scholarship Fund.
- Funding approved to assist AMSAT's Phase III satellite program.
- Administered YL ISSB Memorial scholarship fund.
- The ARRL Scholarship Honoring Barry Goldwater, K7UGA, created.

1983-1993—Incentives for Youth, Scholarship Growth and Public Awareness

- The Victor C. Clark Youth Incentive Program created.
- The Perry F. Hadlock Memorial Scholarship founded.
- The Paul and Helen Grauer Scholarship founded.
- "You Have a Friend In Pennsylvania" Scholarship founded.
- L. Phil and Alice J. Wicker Scholarship founded.
- The Edmond A. Metzger Scholarship founded.
- The Donald Riebhoff, K7ZZ, Memorial Scholarship fund founded.
- The Edward D. Jaikins Memorial Scholarship founded.
- Council of Eastern Massachusetts Amateur Radio Club's Boston Museum of Science display supported by grant.
- Shuttle Amateur Radio Experiment (SAREX) support grant given to Johnson Space Center ARC.
- The Dr James L. Lawson Memorial Scholarship founded.
- The Bill Bennett, W7PHO, memorial Scholarship fund founded.
- The Charles N. Fisher Memorial Scholarship founded.
- "At the Foundation" debuts in *QST*.
- Simple Will Kit made available for hams.
- Grant to fund Courage Systems HANDIHAM Equipment loan program.
- Grant to fund emergency communications repeater system for Hurricane Hugo response.
- The Irving W. Cook, WAØCGS, Scholarship founded.
- The Mississippi Scholarship founded.
- The PHD-ARA Scholarship founded.
- The Jesse Bieberman Meritorious Membership Program created.
- The Martin J. Green Sr, K2TEO, memorial Scholarship founded.
- The Earl I. Anderson Memorial Scholarship founded.
- The Federation of Eastern Massachusetts Amateur Radio Clubs founded FEMARA Scholarships.
- Grant to National Museum of American History—Smithsonian Institution to support station NN3SI.

1993-2003—Helping Scouts and Disabled Hams, International Efforts and a Really Big Project!

- The Fred R. McDaniel Memorial Scholarship founded.
- The Six Meter Club of Chicago Scholarship founded.
- Funded ARRL's Archie Amateur Radio Comics for youth.
- The L. Phil and Alice J. Wicker Scholarship founded.
- Grant to IARU Beacon Project.
- The NEMAL Scholarship founded.
- The Tom and Judith Comstock Scholarship founded.
- The F. Charles Ruling Scholarship founded.
- ARRL's Program for the Disabled "Sourcebook" funded.
- The Michael J. Flosi Scholarship founded.
- The Charles Clarke Cordle Memorial Scholarship founded.
- The Chicago FM Scholarship founded.
- The Mary Lou Brown Memorial Scholarship founded.
- The Morse 2000 Outreach Project with University of Wisconsin funded.
- Grant to Don Wallace Museum of Amateur and Broadcast Radio.
- Grant to fund ARRL/TAPR Digital Conference "Best Paper" Award.
- The NTX/Bob Nelson Memorial Scholarship founded.
- Grant for AMSAT—Phase 3-D Project.
- Grant for ARRL Scout Handbook.
- The Eugene "Gene" Sallee Memorial Scholarship founded.
- The Albuquerque ARC/Toby Cross Memorial Scholarship founded.
- Grant to International Telecommunication Union 4U1ITU Station in Geneva, Switzerland.
- The Henry Primm Broughton, K2AE, Memorial Scholarship founded.
- The William R. Goldfarb Memorial Scholarship founded.
- The IDEA (Indiana Digital Experimenters Scholarship) founded.
- The Francis Walton Memorial Scholarship founded.
- Grants to Center for Amateur Radio Learning at Arizona Science Center — Phoenix.
- Funding for Club 2000 Achievement Awards.
- Grant to kick off ARRL Education and Technology Project—The Big Project.
- Grant to New York Hall of Science innovative Amateur Radio project.
- The Central Arizona DX Association Scholarship founded.
- Funding for US youth participants to World Radiosport Team Championship in Finland.
- The Norman E. Strohmeier Memorial Scholarship founded.
- The Bill Orr Memorial Technical Writing Award founded.
- Grant to Southern Appalachian Radio Museum.
- Funding to assist World ARDF Championships in Slovakia in 2002.
- Grant to SETI League, Inc, for Very Small Array project.
- Grant to African Telecommunications Union, Nairobi, Kenya.

Mary E. Lau, N1VH ♦ Secretary, ARRL Foundation Inc ♦ n1vh@arrl.org

COMING CONVENTIONS

LOUISIANA STATE CONVENTION

November 14-15, Monroe

The Louisiana State Convention, sponsored by the Twin City Ham Club, will be held at the Barak Shrine Temple, 6620 Frontage Rd; from I-20 take Exit 120 (Garrett Rd), go S to first stop light, turn left (E) on Frontage Rd, go approximately 1 mile to Shrine Temple on the right. Doors are open Friday 5-8 PM, Saturday 8 AM. Features include vendors; VE sessions (9 AM sharp); forums (ARRL, QRP, Digital, MARS, ARES); special guest from ARRL HQ Margie Bourgoin, KB1DCO, Club and Educational Correspondent; limited RV/trailer hookups available ($16 per night); free parking; refreshments. Talk-in on 146.85. Admission is $5. Tables are $10 (electricity $10 additional). Contact Carolyn Morris, KM5YL, 224 Lonnie Malone Rd, Downsville, LA 71234; 318-982-7528; **km5yl@arrl.net** or **info@monroehamfest.com**; **www.tchams.org**.

INDIANA STATE CONVENTION

November 15-16, Fort Wayne

The Indiana State Convention (31st Annual Fort Wayne Hamfest and Computer Expo), sponsored by the Allen County AR Technical Society, will be held at the Allen County War Memorial Coliseum Exposition Center, 4000 Parnell Ave, at the corner of Indiana 930 (Coliseum Blvd) and Parnell Ave; I-69, Exit 112, go S to Coliseum Blvd, E to Parnell Ave. Doors are open for setup on Friday evening and Saturday morning; public Saturday 9 AM to 4 PM, Sunday 9 AM to 3 PM. Features include over 1000 commercial and flea market tables; new and used radio, computer, and general electronics items; vendors; several international ham equipment manufacturers; forums and meetings; special guest speaker Riley Hollingsworth, FCC Special Counsel for AR Enforcement; VE sessions (Saturday); parking ($3). Talk-in on 146.88. Admission is $5, under 12 free with adult (good both days). Tables (8-ft) are $20 for flea market, $40 for premium, $27.50 for electricity. Send SASE to AC-ARTS/Fort Wayne Hamfest, Box 10342, Fort Wayne, IN 46851-0342; or contact James Boyer, KB9IH, 260-489-6700; or 260-484-1314; **kb9ih@arrl.net**; **www.fortwaynehamfest.com**.

October 17-19
Pacific Division, San Ramon, CA*

October 18
W0DXCC, Bloomington, MN*

October 31-November 1
Michigan State, Holland/Zeeland*

November 1-2
Georgia Section, Lawrenceville*

November 8
South Carolina Section, Myrtle Beach/Conway*

***See October *QST* for details.**

WEST CENTRAL FLORIDA SECTION CONVENTION

December 6-7, Palmetto/Tampa

The West Central Florida Section Convention (28th Annual Tampa Bay Hamfest), sponsored by the Florida Gulf Coast AR Council, will be held at the Manatee Civic Center, 1 Haben Blvd; at US-301/US-41 and Haben Blvd; Exit 43 off I-75, just N of the Manatee River; about halfway between downtown St Petersburg and downtown Sarasota. Doors are open Saturday 9 AM to 5 PM, Sunday 9 AM to 3 PM. Features include tailgating ($15 per space); commercial booths; forums on numerous topics; VE sessions (both days); DXCC card checking; special guest Ed Hare, W1RFI, Lab Supervisor from ARRL HQ; handicapped accessible; free paved parking. Talk-in on 145.43, 442.95. Admission is $7 in advance, $8 at the door; under 12 free with adult. Tables are $20. Contact Dan Johnson, W4BNC, Box 48725, St Petersburg, FL 33743; 727-343-9879; **w4bnc@arrl.net; www.fgcarc.org**.

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

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 **November 1** to be listed in the **January** 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 (Mesa)—Dec 6**, 6 AM to 2 PM. *Spr:* Superstition ARC. Mesa Community College, SW corner of Southern and Dobson Sts; take Exit 177 off US 60 Freeway, go N 1/4 mile to SW parking lot on E side of Dobson, watch for hamfest signs. Vendors, exhibits, displays, VE sessions (walk-ins only; 602-738-0027), ARCA meeting, refreshments. *TI:* 147.12. *Adm:* $2 per walk-in or vehicle. Tables: $10 for 2 parking spaces. Ron McKee, KD7FGY, 775 W Tumbleweed Rd, Gilbert, AZ 85233; 480-539-5596; **kd7fgy@aol.com**; or Ed Cole, KB7RMO, 480-218-9109; **www.wb7tjd.org**.

Florida (Coral Gables)—Nov 15. Bill Moore, WA4TEJ, 305-264-4465.

†**Florida (Okeechobee)—Nov 29**; set up Friday 5 PM; public Saturday 8 AM to 4 PM. *Spr:* Okeechobee ARC. Okeechobee County AG Grounds, SR 441, across from high school; 1 1/2 miles N of SR 70 on W side of Highway 441. Free tailgating with paid admission, ARRL booth, Okeechobee JCs famous catfish dinner, free parking, refreshments. *TI:* 147.195 (100 Hz). *Adm:* advance $4, door $5. Tables: Bring your own ($5 per space). Al Berryman, AD4RZ, Box 368, Okeechobee, FL 34973-0368; 863-467-0516; **ad4rz@arrl.net**; **www.flweather.com/oarc**.

Florida (Palmetto/Tampa)—Dec 6-7, West Central Florida Section Convention. See "Coming Conventions."

†**Florida (Titusville)—Nov 22**; set up 6:30 AM; public 8 AM to 4 PM. *Spr:* North Brevard ARC. Fox Lake Park Main Pavilion, 4400 Fox Lake Rd; Southbound I-95 take Exit 220, go E to Singleton Ave (first light), then S to South St, turn right to Fox Lake Rd, then W over I-95 to Fox Lake Park (3/4 mile); Northbound I-95 take Exit 215, merge onto SR 50 E to SR 405 (first light), turn left (N) onto SR 405 (South St), proceed to Fox Lake Rd, go W over I-95 to Fox Lake Park (3/4 mile). Vendors, tailgating ($5 per space, located on helicopter pad, on grassy area next to pavilion on S side), VE sessions, ample parking, refreshments. *TI:* 145.49. *Adm:* Free. Tables: $15 first, $12 each additional; commercial $50. Bob Jones, N6USP, 4743 Cambridge Dr, Mims, FL 32754; 321-264-2622; **n6usp@gnc.net**; **www.northbrevardradioclub.org**.

Georgia (St Simons Lighthouse)—Oct 18. Jim Buffington, K5JIM, **jim@jimbuffington.com**.

Illinois (Litchfield)—Nov 16. Scott Millick, K9SM, 217-324-2412 (Banquet/Swap).

†**Indiana (Evansville)—Nov 29**; set up Friday 5-9 PM, Saturday 6-8 AM; public 8 AM to 2 PM. *Sprs:* EARS and The Ham Station. Vanderburgh County 4-H Fairgrounds Auditorium, 201 E Boonville-New Harmony Rd; take US 41 to N side of Evansville, 3.1 miles N of Airport, turn W at stoplight at Boonville-New Harmony Rd next to Buy-Low, look for entrance gate on left just past railroad track. Indoor flea market, free tailgating (with admission ticket, weather permitting), commercial vendors, VE sessions, free parking, refreshments. *TI:* 145.15, 146.925, 443.925, 145.11 (107.2 Hz on all frequencies listed). *Adm:* $5. Tables: advance, before Nov 15, $8 (8-ft, flea market, includes chairs), $10 (wall space); after Nov 15 $10 (flea market), $12 (wall space). Neil Rapp, WB9VPG, 2744 Pinehurst Dr, Bloomington, IN 47403; 812-333-4116 or 812-327-0749; **ears@w9ear.org**; **w9ear.org/hamfest.htm**.

Indiana (Fort Wayne)—Nov 15-16, Indiana State Convention. See "Coming Conventions."

†**Kentucky (Hazard)—Nov 15**, 8 AM to 1 PM. *Spr:* Kentucky Mountains ARC. Hazard National Guard Armory, Armory Rd; at junction of KY Rte 15, the end of Daniel Boone Parkway, and Rte 80, on N side of Hazard, turn onto Village Ln near Super 8 Motel, immediately turn right onto

†ARRL Hamfest

Gail Iannone ♦ Convention Program Manager ♦ giannone@arrl.org

Dawahare Dr, go up hill past Hazard Hotel, turn left onto Armory Dr, go 1/2 mile to Armory. Indoor flea market, VE sessions (walk-ins), ARRL forum, DX forum (Friday eve, Nov 14; Joe Pater, W8GEW, from recent Montserrat expedition). *TI:* 146.67. *Adm:* $3. Tables: $3. John Farler, K4AVX, 109 Hall St, Hazard, KY 41701; 606-436-5354; **k4avx@arrl.net**; **www.qsl.net/k4avx/kmarc.html**.

Louisiana (Alexandria)—Oct 18. Johnnie Wages, KD5MDQ, 318-641-6635.

†**Louisiana (Minden)—Dec 6**, 8 AM to 2 PM. *Spr:* Minden ARA. Minden Civic Center, 520 Broadway St; from I-20 take Minden/Sibley Exit 47, turn N on US Hwy 371, go 1 1/2 miles to US Hwy 79/80 E, turn right, go 1/4 mile to Civic Center on right. Christmas Hamfest and Computer Show, VE sessions (all levels). *TI:* 147.3. *Adm:* $4. Tables: $5 (swap), $10 (dealers). Bill Sullivan, KB5PKW, 6018 Fox Chase Trail, Shreveport, LA 71129; 318-687-6405; **kb5pkw@aol.com**; **www.bayou.com/~k5dlh/mara.html**.

Louisiana (Monroe)—Nov 14-15, Louisiana State Convention. See "Coming Conventions."

†**Massachusetts (Framingham)—Nov 2**; set up 7:30 AM; public 9 AM to 1 PM. *Spr:* Framingham ARA. Walsh Middle School, Brook St; Rte 9 to Edgell Rd, go N 1.3 miles to Brook St, take right onto Brook St, go approximately 1 mile to school on left. Flea market, Amateur Radio equipment, electronics and computer hardware and software, VE sessions (Jim, W1EQW, 508-435-6487), free coffee and donuts. *TI:* 147.15. *Adm:* $5, under 12 free with adult. Tables: 6-ft advance $10, door $15. Beverly Lees, N1LOO, 31 Ridgefield Dr, Framingham, MA 01701; 508-626-2012; **b-blees@juno.com**; **www.fara.org/fleamarket**.

†**Massachusetts (Newtonville)—Nov 15**; sellers 9 AM; public 10 AM to 3 PM. *Sprs:* Waltham ARA and 1200 RC. Newton Masonic Hall (second floor), 460 Newtonville Ave; at the corner of Walnut St and Newtonville Ave, near the Star Market that stands astride the Mass Turnpike. Amateur Radio and Electronics Auction, free parking in municipal lot across Walnut St, refreshments. *TI:* 146.64. *Adm:* $5. Eliot Mayer, W1MJ, 24 Hamilton Rd, Belmont, MA 02478; 617-484-1089; **w1mj@arrl.net**; **www.wara64.org/auction/**.

†**Michigan (Harrison Township)—Dec 7**; set up 6 AM; public 8 AM. *Spr:* L'Anse Creuse ARC. L'Anse Creuse High School, 38495 L'Anse Creuse Rd; I-94, exit Metro Beach (Exit 236), Metro Parkway to Crocker, left on Crocker to Reimold, right on Reimold to last school building. Amateur Radio/Computer Swap 'n Shop, trunk sales ($5 per space, weather permitting), vendors, new and used equipment, electronic components, computers, software, accessories, forums, VE sessions (9 AM; Don, WA8IZV, **donols@provide.net**; walk-ins welcome), free parking, refreshments. *TI:* 147.08, 146.52. *Adm:* $5. Tables: $12 (8-ft). David Herrington, N8NLK, 165 Crocker Blvd, Mt Clemens, MI 48043-2546; 586-465-2797; **n8nlk@arrl.net**; **www.n8lc.org**.

†**Mississippi (Ocean Springs)—Nov 14-15**; Friday 5-9 PM, Saturday 8 AM to 2 PM. *Spr:* Jackson County ARC. St Martin Community Center, Lemoyne Blvd; from I-10 take Exit 50 S (Hwy 609) to second stop light, turn right (W) onto Lemoyne Blvd, go approximately 1 mile to Community Center on right. VE sessions (Saturday, 9 AM), forums. *TI:* 145.11. *Adm:* $3. Tables: $7. Wendell McCollom, WM5W, 14017 Suburban Dr, Ocean Springs, MS 39565; 228-875-4720; **mac@datasync.com**; **www.jcmsara.org**.

†**New Jersey (Toms River)—Nov 30**. *Spr:* Jersey Shore ARS. St Joseph No 4969 Knights of Columbus, Tennyson and Whitter Aves; Garden State Parkway Exit 82 at Rte 37 E, after 4 traffic lights get into right lane, take Washington St, go to light and go straight across Washington to Whitter, go 3 blocks, on right. Tailgate hamfest, VE sessions. *TI:* 146.91 (127.3 Hz). *Adm:* Free. Tables: $10. Ed Genoino, WA2NDA, 1429 Island View Dr, Forked River, NJ 08731; 609-971-2792; **wa2nda@aol.com**; **www.jsars.org**.

†**North Carolina (Benson)—Nov 16**; set up 6 AM; public 8 AM to 3 PM. *Spr:* Johnston ARS. American Legion, 605 N Wall St; located on US Hwy 301 N. Indoor flea market, dealers, tailgating (opens at 6 AM), VE sessions (10 AM), refreshments. *TI:* 147.27. *Adm:* advance $4, door $5, under 12 free with adult. Tables: $10. Bill Lambert, AK4H, 8917 NC 50 N, Benson, NC 27504; 919-894-3352 (7-10 PM); **blambert1@mindspring.com**; **www.jars.net**.

†**Texas (Austin)—Nov 14-15**; set up Friday eve and Saturday 7 AM; public 8 AM to 2 PM. *Sprs:* Austin ARC and Austin Repeater Organization. St Louis Catholic Church, 7601 Burnet Rd; from MoPAC in Austin, take Anderson Ln Exit, go E on Anderson Ln about 1 mile, turn S on Burnet Rd, church is on left 1 block down. Swapfest, tailgating, VE sessions, dinner banquet (Friday eve), overnight parking. *TI:* 146.94. *Adm:* $1. Tables: $10. Lori Schmidt, KM5MQ, 903 Fieldstone Pl, Round Rock, TX 78664; 512-255-6753; **km5mq@arrl.net**; **www.austinhams.org/swapfest.html**.

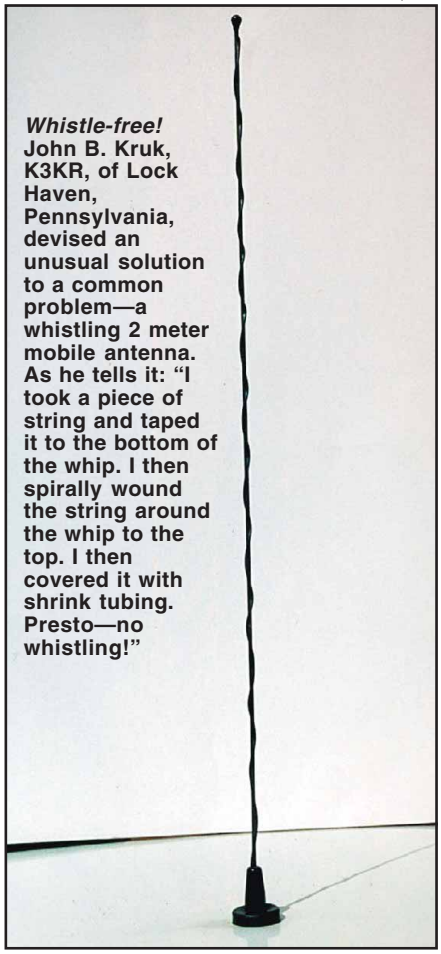
†**Washington (Lynden)—Nov 8**; set up Friday eve and Saturday 6 AM; public 9 AM to 2 PM. *Spr:* Mount Baker ARC. Northwest Washington Fairgrounds Exhibition Hall, 1775 Front St, 12 miles N of Bellingham; northbound I-5, Exit 256 (Hwy 539), proceed 12 miles to Lynden, turn right on Front St to Fairgrounds; from Canada cross at Aldergrove crossing N of Lynden, then 5 miles S to Front St. Hamfest/Electronics Flea Market, commercial vendors, country store, dealers, vintage radios, computers, seminars, VE sessions, overnight RV parking on site with hookups ($12.50), free parking, refreshments. *TI:* 146.74. *Adm:* $5 (US), $6 (Canadian). Tables: $15 each; 4 or more $12 each. Al Norton, K7IEY, 1008 Liberty St, Lynden, WA 98264; 360-354-4622; **k7iey@netscape.net**; **www.qsl.net/k7skw/**.

STRAYS

QST congratulates...

◊ Edgar H. Callaway, Jr, N4II, whose book, *Wireless Sensor Networks: Architectures and Protocols*, has been published by Auerbach Publications, a division of CRC Press. The book includes an introductory chapter that discusses how early and mid-20th century amateur CW traffic nets, including the National Traffic System, solved many of the network organization and channel access problems that were independently solved again by packetized data networks some decades later, often in identical ways.

JOHN B. KRUK, K3KR



Whistle-free! **John B. Kruk, K3KR, of Lock Haven, Pennsylvania, devised an unusual solution to a common problem—a whistling 2 meter mobile antenna. As he tells it: "I took a piece of string and taped it to the bottom of the whip. I then spirally wound the string around the whip to the top. I then covered it with shrink tubing. Presto—no whistling!"**

ED ALBRECHTSEN, WB6LAI

Is it a tree or a stealth vertical antenna? **A little of each, perhaps...**

SILENT KEYS

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

WQ1A, Pete D. Sorensen, Lake Oswego, OR
W1BKG, Milton A. George, Pittsfield, MA
K1BKS, Norman A. Witherell, Attleboro, MA
*WB1DUQ, Thomas M. Brigham, Calais, ME
N1FLY, James E. Fowler, New Boston, NH
W1FTZ, Winston L. Blake, Concord, NH
W1GWC, James A. Wilson, Vergennes, VT
WA1JCF, Donald A. Loranger, Charlton, MA
KA1LJG, Roy E. Wentworth, Northwood, NH
W1LMT, Walker H. Merritt Jr, Westford, MA
KA1LZT, Harry J. Lysak Sr, Ansonia, CT
WA1MWL, Stephen R. Hall Jr, East Sandwich, MA
K1MYF, William B. Simmons, Brooklyn, CT
W1OW, Albert A. Leverone, Norfolk, MA
AL1T, Craig A. Ratchner, Anchorage, AK
N2KMM, Emmeran A. Arnst, Caroga Lake, NY
WA2LMY, Thomas J. Diamond, North Port, FL
N2NLU, John A. Grdinich Sr, Sea Isle City, NJ
W2OJS, Clifford E. MacAdams, Schenectady, NY
W2RRV, Raymond K. Ruggiero, Cedar Rapids, IA
WA2VFY, Marion S. Escallon, White Plains, NY
N2WIB, William R. Wyatt Sr, Berlin, NJ
N3BNC, Henry G. Dale, New Castle, DE
W3IDO, Howell N. Babbitt, Mesa, AZ
K3MNI, Le Roy G. Flamm, Mohnton, PA
KD3XT, John S. Warner, Pottsville, PA
W4AOY, Eugene B. Jones, Johnson City, TN
K4AXB, Charles L. Allen, Orlando, FL
W4AZD, Porter B. Orr Jr, Knoxville, TN
KI4BH, Lyle T. Palmer, Roanoke, VA
KB4BVC, William P. Byrd Jr, Orlando, FL
KD4CPB, Billie Mills, Columbus, GA
KE4CYY, Davidson C. Miller, Arlington, VA
KF4GGM, Lester E. Kennedy Sr, Spartanburg, SC
K4HVV, Thomas F. Shirley, Hinesville, GA
KD4LFO, Tommy M. Bennett, Wetumpka, AL
KO4LI, Harlan N. Wilson, Olive Hill, KY
KF4NNK, Gary O. Parker, Hopkinsville, KY
WB4NXG, George J. Eickler, Martinez, GA
KK4OZ, William E. Sloan Sr, Hoover, AL
W4PMV, Alric H. Erickson, Brandon, FL
W4PYV, Marvin S. Friedland, Melbourne, FL
N4TVA, William W. Brown, Salem, AL
KF4VS, Roy P. Nelson Jr, Huntsville, AL
KE4WAC, Thomas C. Pistone, Naples, FL
KD4YZD, James D. Powers, Trenton, TN
W4ZCS, Albert C. Oelschlager, Orlando, FL
WA5AID, Russell D. Williams, Van Buren, AR
KC5CJE, Justin A. Morris, Minden, LA
K5DGT, James C. Doughtie, Richards, TX
KD5EFR, Claude C. Ankeny, Albuquerque, NM
W5ERU, Bennie E. Gray Sr, Philadelphia, MS
KF5HN, Donald C. Frantom Sr, West Monroe, LA
K5IHR, Ralph E. Martin, Franklinton, LA
K5KYD, Sidney Freidin, Laredo, TX
AD5LE, Jessie C. Hisaw, Louisville, MS
N5LIU, Ira L. Blankenship Sr, Albuquerque, NM
WA5NOT, R. V. Wells, Jasper, TX
W5NPU, Charles F. Williams, Houston, TX
W5OHA, Frank Rowton, Albuquerque, NM
W5ORW, Donald F. Brooks, Palestine, TX
N5QB, William J. Mewhorter, Midland, TX
KC5QHZ, Bryan W. Barnett, Dona Ana, NM
W5QQ, William R. Johnson, Shallowater, TX
W5VCR, Le Roy E. Dilger, Colgate, WI
*WB5ZIP, Paul D. Dooley, Victorville, CA
KN6AJ, Don E. Stacy, Corvallis, OR
K6ASB, Glenn E. Davidson, Mena, AR
AC6B, Conrad E. Bluhm, Yerington, NV
W6BUA, Guido Pedretti, Chowchilla, CA
K6DUE, Roy Neal (Hinkel), High Point, NC
W6JAB, William Brooks, Oceanside, CA
W6LGM, Carl R. Moore, Palmdale, CA
W6MTY, Fred S. Howell, Yucaipa, CA
WB6PNL, Wady J. Andary, Apple Valley, CA
W6RLG, Howard S. Simpson, Stockton, CA
KF6RO, Albert Watkins, Huntington Beach, CA
WA6TPN, Ralph C. Kalbfleisch, Huntington Beach, CA
KH6TQ, Sam A. Canevali, Hilo, HI
WA6ZLP, John D. Watters, Stockton, CA
KL7GNP, John C. Bierman, Anchorage, AK
AB7OU, Everett P. Vincent, Silverdale, WA
W7RCM, Leland L. Strong, Hillsboro, OR
WB7WUN, James A. Haven, Sun City, AZ
K7ZAU, George V. Lyle, Carson City, NV
W8BEU, Henry W. Patton, South Lyon, MI
W8DXT, William G. Hessler, Cuyahoga Falls, OH
*W8JIU, Russell M. Pickelmann, Harrisville, MI
KB8LEZ, Tonawanda Metro, Pinckney, MI
W8LP, James D. Richey, Portsmouth, OH
W8LSU, Carl J. Oxford Jr, Rochester, MI
K8SGJ, Mark L. Longfield, Linden, TN
WB8SRN, Alfred W. Dixson, Columbus, OH
W8UPQ, Woodrow L. Gill, Charleston, WV
W9FDC, Clyde L. Brookshire, Marion, IN
K9FED, Alan F. Smith, Versailles, IN
WA9FWO, Frank Kolar III, Greenwood, SC
W9GMS, Edgar L. Conant Jr, Norwich, VT
KF9HQ, Russel C. Fritz, Roswell, NM
K9KKX, Raymond A. Gomes, Skokie, IL
K9MCM, Donald J. McMorrine, Indianapolis, IN
W9ODV, Joseph E. Ash, Sheboygan, WI
N9PB, Jackie L. Horner, Kingsport, TN
KB9VIO, Terry A. Haima, Fond Du Lac, WI
W9VWX, Lloyd L. Lear, Waupaca, WI
W9ZTP, Raymond Redlin, New Berlin, WI
WDØAKU, Charles D. Ward, Chanute, KS
WØAWA, Donald R. Davis, Prairie Village, KS
WØLX, Alfred M. Gowan, Sioux Falls, SD
VP9DR, Frederick Rider, Southampton, Bermuda
VA3HEA, Hugh E. Allen, Minden, ON, Canada
VE3MA, P. J. Plummer, Ottawa, ON, Canada
VE3NGN, Edward Ward, Windsor, ON, Canada

*Life Member, ARRL
**Charter 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 or to ARRL. 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

Kathy Capodicasa, N1GZO ♦ Silent Key Administrator ♦ n1gzo@arrl.org

STRAYS

JAN SLAMA, OK2JS

Youngest?: **ARRL member Jan Slama, OK2JS, of the Czech Republic, claims his 11 month old granddaughter Hanicka (daughter of Jiri, OK2BKR) is the youngest reader of *QST* in the world. Any takers?**

RUTH YOUNCE, W1MOM

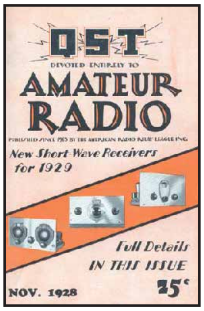
Welcome! **Elisabeth (KD7WOL—age 7) and Jonathan (KD7WOK—age 10) Younce, of Pullman, Washington, sport their newly minted Technician tickets. Using *Now You're Talking!* their mom, Ruth, W1MOM, provided the home schooling after regular school hours for 2½ weeks. Both passed on their first attempt. Their proud dad is Frank, KD7EWV.**

BILL HINDS, W3HEA

He's a ham! **Bill Hinds, W3HEA, of Bridgeville, Pennsylvania, has some people scratching their heads as he drives around town, but those in the know have no difficulty deciphering his license plate.**

75, 50 AND 25 YEARS AGO

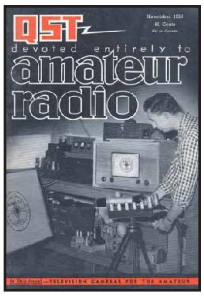
November 1928



♦ The cover photo shows "New Short-Wave Receivers for 1929 … Full Details in This Issue." The editorial reports on the fine work done by amateurs following the recent hurricane in the West Indies and Florida. Those amateurs received commendations from the Red Cross, U.S. Navy, and U.S. Army.

Ross Hull tells about "High-Frequency Receivers for the Coming Year," reporting that they feature "thoroughly practical and satisfying selectivity, open scales, and a new ease in handling." Clair Foster, W6HM-W2QW, tells the fascinating story of "sj5BX," on Pablo Island in Central America. The operator, Haskell Watson, was on an expedition and built an amateur station for communication. After several encounters with "brigands," Haskell and his wife Donna were captured. Luckily, a friendly native cut them loose at night and they literally shot their way out of the predicament. Harold Westman discusses "Frequency Stability by Magnetostriction Oscillators." In "A 28-Megacycle Crystal-Controlled Transmitter," Howard Chinndescribes the transmitter used at nu1XM for wave-propagation experiments. "Now We're in the Air!" by Wallace Wiggins, W6CHZ, tells about hams providing radio communication for the 1928 National Air Races in Los Angeles. George Hart, 8DK, describes his "160-Meter Low-Power Transmitter."

November 1953



♦ The cover photo shows "W3NDB-TV, Sunbury, Pa." transmitting a test pattern to a nearby receiver. The editorial discusses "TVI—Color," now that the advent of color TV has brought new and different TVI problems to hams' doorsteps. A second part of the editorial tells that TV manufacturers are using "channel strips" (converters) to cover the u.h.f. TV channels—the output of some of these strips is near 144 Mc, bad news for the 2-meter ham.

John Keller, W3NDB, tells about building "An Amateur Television Camera" around an RCA iconoscope tube. Vern Chambers, W1JEQ, describes a "Compact R.F. Assembly for 50- and 144-Mc Mobile." To stabilize VFO control on the higher HF bands, Charles Faulkner, W6FPV, built "A Simple Heterodyne Exciter for 10 Meters." Carl Eckhardt, W7BBK, tells about "The Single Side-Saddle Linear," a 75-meter Class B linear that uses a single 807 tube at 75 watts input. Lew McCoy, W1ICP, presents his "Novice 80- and 40-Meter One-Tube Rig." George Grammer, W1DF, discusses the bugaboo of color TVI, in "Color Television and the Amateur." Ed Tilton, W1HDQ, and Mason Southworth, W1VLH, present "A 220-Mc Station for the Beginner, Part II—The Transmitter." A photo in "Strays" shows nine-year-old twins Peter and Michael Blumenfield, WN1YZZ and WN1ZAA, respectively, "most probably the youngest licensed-amateur twins in the world." The Iron Lady of traffic handling, Mae Burke, W3CUL, is pictured in "YL News and Views."

November 1978

♦ The cover photo shows the impressive Field Day setup of N6CW/6. The editorial, "VHF Phone for Novices?" discusses the ARRL petition to the FCC to allow Novices to use phone on 220 MHz.

Part 1 of "A Baseband Communications System," by Richard Harris and J. F. Cleveland, WB6CZX, tells the amateur how narrow-band voice modulation works. Don Upp, WB8STQ, tells about participating in ARRL "Frequency-Measuring Tests Using a Product-Detector SSB Receiver." Jim Bartlett, W1TX, takes us back to basics with "Calculating Component Values," telling how to determine the values of unmarked capacitors and inductors. Wayne Overbeck, K6YNB/N6NB, describes how to "turn your meek 10-watt [220-MHz] rig into a roaring monster," in "Shoes, Size 220 AB or C." Margaret Koerner, KØIQ, also takes us back to basics, with antenna talk about "The Aerial Performers of the Radio Circuits." Photos of two new YL hams are shown in "YL News and Views"—HH2YL, Haiti's first YL op, and J3AM, Grenada's first YL op. A "Strays" item shows a beautiful photo of two of the three replica 35-foot replicas of Spanish galleons that recently sailed from Mexico to Spain as the "El Hombre y la Mar" retracing of the 16th century gold and silver route. Amateur Radio provided communication for the five-month voyage. QST

Al Brogdon, W1AB ♦ Contributing Editor

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 2001 *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 K6YR. See "Contest Corral" in this issue. 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. The fee structure is $10 for a certificate, and $7.50 for endorsements.

♦ **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 and the following day. QST

CONTEST CORRAL

W1AW Qualifying Runs are 9 AM EST Monday, Nov 3 (1400Z Nov 3) (35-10 WPM), and 7 PM EST Monday, Nov 17 (0000Z Nov 18). The K6YR West Coast Qualifying Run will be at 9 PM PST Wednesday, Nov 12 (0500Z Nov 13). Check the W1AW Schedule elsewhere in this issue for details.

Abbreviations

SO—Single-Op; M2—Multiop—2 Transmitters; MO—Multiop; MS—Multiop, Single Transmitter; MM—Multiop, Multiple Transmitters; AB—All Band; SB—Single Band; S/P/C—State/Province/DXCC Entity; HP—High Power; LP—Low Power; Entity—DXCC Entity

No contest activity on 30, 17 and 12 meters. Refer to the contest Web sites for information about awards. Unless stated otherwise, regional contests only count QSOs with stations in the region. Publication deadline for Contest Corral listings is the first of the second month prior to publication. In order to publicize the maximum number of contests, readers will be referred to an earlier issue of *QST* if the rules have been published within the past year.

Nov 1-3

ARRL November Sweepstakes—CW, 2100Z Nov 1-0300Z Nov 3. (Phone from 2100Z Nov 15-0300Z Nov 17; see Oct *QST*, p 107, or **www.arrl.org/contests/rules**.)

North American Collegiate ARC Championship—CW (Phone, Nov 15-17). This is a competition based on Sweepstakes results between club stations at institutions of higher education beyond the high school level. Clubs enter Sweepstakes in any of the valid entry categories. Separate champions will be determined for CW, Phone and Combined scores. For more information: **www.collegiatechampionship.org**.

High Speed Club CW Contest, sponsored by the Radio Telegraphy High Speed Club (HSC) from 0900Z-1100Z and 1500Z-1700Z Nov 2. Frequencies: 80-10 meters, 10-30 kHz above band edge. Categories: SOAB-LP (<150 W), SOAB-QRP (<5 W), SWL. Exchange: RST + serial number + HSC member number (if available). QSO Points: own continent—1 pt, diff cont—3 pts. Score: QSO points × DXCC entities and WAE countries. For more information: **www.hsc.de.cx**. Logs due 6 weeks after the contest to **hsc-contest@dl3bzz.de** or Lutz Schröer, DL3BZZ, HSC Contest-Manager, Am Niederfeld 6, 35066 Frankenberg, Germany.

IPA Contest—Phone/CW, sponsored by The International Police Association Radio Club. CW from 0600Z-1000Z and 1400Z-1800Z Nov 1, Phone from 0600Z-1000Z and 1400Z-1800Z Nov 2. Frequencies: 80-10 meters with 15 minute band change rule. Categories: SOAB, MS, MM and SWL. Exchange RST + serial number (IPARC members send IPA + state if US). QSO Points: 1 pt/QSO, IPARC members—5 pts/QSO. Score: QSO points × DXCC entities + US states counted once per band. Multipliers are only counted for QSOs with IPARC members. For more information: **www.ipa-rc.de**. Logs due Dec 31 to **dl8kcg@darc.de** or Uwe Greggersen, DL8KCG, Hurststr 9, D-51645 Gummersbach, Germany.

Ukrainian DX Contest—CW/SSB/RTTY, sponsored by the Ukrainian Amateur Radio League and the Ukrainian Contest Club from 1200Z Nov 1-1200Z Nov 2. Frequencies: 160-10 meters, with 10 minute band change rule. Categories: SOAB, SOAB-QRP (<5 W), SOAB-RTTY, SOSB, MS, MM, SWL. Exchange: RST + serial number (+ Ukrainian region). QSO Points: same country—1 pt, same continent—2 pts, different cont—3 pts, Ukrainian station—10 pts. Score: QSO points × DXCC entities + WAE countries + Ukrainian regions. For more information: **www.qsl.net/ucc**. Logs due 30 days after the contest to **urdx@tav.kiev.ua** or to Ukrainian Contest Club HQ, PO Box 4850, Zaporizhzhe, 69118, Ukraine.

DARC 10-Meter Digital "Corona"—RTTY/AMTOR/PACTOR/PSK31/Clover, sponsored by Deutscher Amateur Radio Club from 1100Z-1700Z Nov 2. Frequencies (MHz): 28.050-28.150, work stations once per mode. Categories: SO, SWL. Exchange: RST + serial number. QSO Points: 1 pt/QSO. Score: QSO points × DXCC entities + WAE countries + JA/VE/W call districts (all counted only once). For more information: **www.darc.de/referate/dx/cqdlcont/corona03. htm**. Logs due 4 weeks after the contest to **df5bx@darc.de** or Werner Ludwig, DF5BX, PO Box 1270, D-49110 Georgsmarienhuette, Germany.

Nov 8-9

Japan International DX Contest—Phone, from 0700Z Nov 8-1300Z Nov 9 (see Jan *QST*, p 97, or **www.jzap.com/je1cka/jidx/jidxrule-e. html**).

European DX Contest (WAEDC)—RTTY, from 0000Z Nov 8-2359Z Nov 9. Same rules as WAEDC Phone and CW, except everyone works everyone. QTC can only be exchanged between continents (see Aug *QST*, p 91, or **www.waedc.de**).

OK/OM DX Contest—CW, sponsored by the Czech Radio Club (CRC) from 1200Z Nov 8-1200Z Nov 9. Frequencies: 160-10 meters. Categories: SOAB-HP (>100 W), SOSB-HP, SOAB-LP, SOSB-LP, SOAB-QRP (<5 W), MS, SWL, packet spotting allowed for all categories. Exchange: RST plus serial number or OK/OM district. QSO Points: EU to OK/OM—1 pt, non-EU to OK/OM—3 pts. Score: QSO points × OK/OM districts (OK/OM stations use WPX prefixes) counted once per band. For more information: **okomdx.radioamater.cz/rules03en.htm**. Logs due Dec 1 to **okomdx@crk.cz** or OK-OM DX Contest, CRK, PO Box 69, 113 27 Praha 1, Czech Republic.

1st Annual Radio Club of America CW QSO Party, 2300Z-0700Z Nov 8. Frequencies: 3.650 to 3.700 MHz, 100 W max. Exchange: RST, QTH, name, equipment used. RCA members sign their calls /RCA. For more information: **www.radio-club-of-america.org**. Logs to **mraide@rochester.rr.com** or Mike Raide W2ZE, 21 Canandaigua St, Shortsville, NY 14548.

Nov 15-17

ARRL November Sweepstakes—Phone (see Nov 1-3).

ARRL International EME Contest, 0000Z Nov 15-2359Z Nov 16 (see Sep *QST*, p 104 or **www.arrl.org/contests/rules**).

North American Collegiate ARC Championship—Phone (see Nov 1-3).

RSGB 1.8 MHz Contest—CW, from 2100 Nov 15-0100Z Nov 16. Frequencies (MHz): 1.820-1.870. Categories: SO only. Exchange: RST + serial number + UK district. QSO Points: 3 pts/QSO + 5 bonus points per UK district. Score: QSO pts. For more information: **www.rsgbhfcc.org**. Logs due 16 days after the contest to **2nd160.logs@rsgbhfcc.org** or RSGB—G3UFY, 77 Bensham Manor Rd, Thornton Heath, Surrey CR7 7AF, England.

Nov 22-23

LZ DX Contest—CW/SSB, sponsored by the Bulgarian Federation of Radio Amateurs from 1200Z Nov 22-1200Z Nov 23. Frequencies: 80-10 meters with 10-minute mode change rule. Categories: SOAB (CW, Phone, Mixed), SOAB-QRP Mixed, SOSB-Mixed, MS-Mixed, SWL. Exchange: RST + ITU zone or 2-letter LZ district. QSO Points: same continent—1 pt, different cont—3 pts, LZ station—10 pts. Score: QSO points × ITU zones + LZ districts counted once per band. For more information: **www.qsl.net/lz1fw/contest**. Logs due 30 days after the contest to **lzdxc@yahoo.com** or BFRA, PO Box 830, 1000 Sofia, Bulgaria.

Nov 29-30

CQ WW DX Contest—CW, from 0000Z Nov 29 to 2400Z Nov 30 (see Oct *QST*, p 100 or **cqww.com**). QST

H. Ward Silver, NØAX ♦ 22916 107th Ave SW, Vashon, WA 98070 ♦ n0ax@arrl.org

STRAYS

HAM RADIO: IT'S A FAMILY AFFAIR!

♢ It's really raining hard today, my wife is out of town, and I have a new camera to try out. In other words, it's a perfect day for a hamfest! Lucky for me the Roseland (NJ) Amateur Radio Club is holding their annual hamfest today. How perfect!

As soon as I entered the gym in the West Orange High School, I knew my theme: ham radio and youth. Much to my delight, I met quite a few people where Amateur Radio was a family affair. In the Rogacki family everyone is a licensed Amateur Radio operator. Donald Bellamy, KB2UZU, traveled to the hamfest from Brooklyn, New York to share his hobby with his 7 year old nephew, Marlon. Marlon told me he hopes to become a ham in the future.

As I walked around, I encountered more proof that Amateur Radio and the family are alive and well. Steve Devine, KC2GFP, proudly told me that his son Phil had passed his Tech exam just two days earlier. Phil told me he was anxiously waiting to receive his call sign from the FCC. (He's now KC2LJK!) Elio Casqueira, KB2SJC, was shopping the flea market with his son Sam, age 11. Sam was clearly excited to be there and indicated he hopes to obtain his license soon.

It soon became clear that the Roseland Club takes pride in encouraging young folks to pursue Amateur Radio. In addition to Field Day activities, where all, regardless of age, are welcome, club President Harvey Moskowitz, W2YWC, tells me the club is very active with the Boy Scout program in the community. In addition to merit badge instruction, they offer electronics class and VEC testing. They also work closely with the Roseland Office of Emergency Management.

Clubs would do well to follow the example of the Roseland ARC—involve our youth. If you are a member of an Amateur Radio club, ask yourself: "Can we as a club do more to attract younger members to our ranks?" As individuals, let's focus on our families and pass along the joy we experience daily. Let's keep in mind that we can influence members of our immediate as well as extended families to pursue this wonderful hobby.—*Ronnie M. Hirsh, N2YP*

SPECIAL EVENTS

Stuart, FL: Martin County Amateur Radio Association, K4ZK. 1400Z-2000Z **Oct 25**. Treasure Coast Vintage Car Club show. 21.255 14.255 7.255. Certificate. Ron Tagg, KD4PQQ, 8629 SW Tropical Ave, Stuart, FL 34997.

Columbus, OH: Central Ohio ARES, WA8RES. 1500Z-2000Z **Nov 1**. Ohio Bicentennial. 28.450 21.300 14.500 7.260. Certificate and QSL. Frank Piper, 496 Hillview St, Pickerington, OH 43147-1197.

Lafayette, LA: Acadiana Amateur Radio Association Inc, KE5LP. 1300Z **Nov 1**-2400Z **Nov 2**. Bicentennial of the Louisiana Purchase. 28.465 21.365 14.265 7.240. QSL. Roland Guidry, NA5Q, 118 W Betty St, Rayne, LA 70578. **www.w5ddl.org/clubsite/**.

Panama: Radio Club de Panama, HP1ØØRCP. **Nov 1**-**Nov 3**. 100 years of the Republic of Panama. All bands. QSL. Radio Club de Panama, PO Box 10745, Panama 4, Panama. **www.radioclubdepanama.org**.

Whitefish Point, MI: Stu Rockafellow Amateur Radio Society, N8F. 1700Z **Nov 7**-1700Z **Nov 9**. Remembering the *Edmund Fitzgerald*, lost November 10, 1975. 28.465 21.325 14.265 7.265. Certificate. Richard Barker, W8VS, 264 N East St, Brighton, MI 48116. **www.qsl.net/w8njh/**.

Birmingham, AL: D&G Amateur Radio Association, W4V. 1500Z-2200Z **Nov 8**. Celebrating the restoration of the Vulcan statue. 14.250. QSL. Daryl A. Isbell, W4DAI, PO Box 51, Alton, AL 35015-0051.

Hackensack, NJ: USS *Ling* SS297/10-70 Repeater Association, NX2ND. 1400Z-2100Z **Nov 8**. Honoring Veterans Day, and USS *Ling*, NX2ND, 3rd anniversary. 21.380 14.280 14.055 7.040. Certificate. Bill Satagg, KC2BLN, 38 Rutgers Dr, Oakland, NJ 07436. **www.10-70.org**.

Chandler, AZ: Central Arizona DX Association, K7UGA. 0000Z **Nov 8**-2359Z **Nov 9**. K7UGA Special Event. CW up 32 kHz from band edge, SSB 5-10 kHz up from General class band edge, 6 m, WARC. QSL. CADXA K7UGA Special Event, PO Box 11042, Chandler, AZ 85248. **www.cadxa.org**.

Arlington Heights, IL: Armored Force Amateur Radio Net, KA9NLX. 1800Z **Nov 8**-2200Z **Nov 11**. To honor military veterans. 21.375 14.325 7.283 7.040. Certificate. John Paskevicz, 1423 North Ridge Ave, Arlington Heights, IL 60004.

Denton, TX: Choctaw Nation of Oklahoma, W5B. 1201Z **Nov 8**-2400Z **Nov 11**. Choctaws—The Original Code Talkers. 28.460 21.375 14.270 3.850. Certificate. Paul J. Cowan, 4056 Hartlee Field Rd, Denton, TX 76208.

Baton Rouge, LA: USS *Kidd* ARC/Baton Rouge ARC, W5KID. 1500Z-2300Z **Nov 11**. Veterans Day. General class bands, 14.250 to 14.320; CW QRP subbands. QSL. W5KID, c/o USS *Kidd* Museum, 305 S River Rd, Baton Rouge, LA 70802.

Fort Monmouth, NJ: Robert D. Grant United Labor Amateur Radio Association, N2UL. 1200Z-2400Z **Nov 11**. Labor ARS remembers those who served our nation. 28.420 21.360 14.260. Certificate. RDGULARA, c/o WA2VJA, 112 Prospect St, Nutley, NJ 07110-0716.

Albuquerque, NM: Albuquerque Amateur Radio Club, N5VA. 1500Z **Nov 11**-0300Z **Nov 12**. Veterans Day from Albuquerque VA hospital. 28.560 21.360 14.260 7.260. QSL. Tom Lea, 1009 Clancy Dr NE, Albuquerque, NM 87112. **www.qsl.net/albuquerquearc/index.html**.

Guthrie, OK: Edmond Amateur Radio Society, K5EOK. 1400Z-1900Z **Nov 15**. Celebrating OK Statehood Day. 28.389 21.289 14.289 7.289. QSL. Edmond ARS, PO Box 48, Edmond, OK 73083-0048.

Lakeland, FL: Lakeland and Tampa Amateur Radio Clubs, W4B. 1300Z-2200Z **Nov 15**. Gulf Ridge Council BSA Bi-Annual Council Camporee. 28.425 21.320 14.265 7.265. QSL. Bill Bode, 14302 Capitol Dr, Tampa, FL 33613.

Watson Lake, Yukon Territory, Canada: North Country DX Association, VY1/K7ICE. 1700Z **Nov 17**-2300Z **Nov 23**. ARRL November SS Contest (phone) and USI 10th Anniversary. 28.450 14.250 7.250 3.950. QSL. John Reisenauer, PO Box 4001, W Richland, WA 99353.

Attleboro, MA: Sturdy Memorial Hospital ARC, W1S. 0000Z **Nov 19**-2359Z **Nov 23**. Sturdy Memorial Hospital ARC's 25th anniversary. 21.400 14.300 14.050 7.250. Certificate. Sturdy Memorial Hospital ARC, 64 Scout La, North Attleboro, MA 02760. **www.w1smh.com**.

Columbus, OH: Central Ohio ARES, WA8RES. 1500Z-2000Z **Nov 22**. Ohio Bicentennial. 28.450 21.300 14.500 7.260. Certificate and QSL. Frank Piper, 496 Hillview St, Pickerington, OH 43147-1197.

Franklin, TN: Williamson County Rescue Squad ARC, W4F. 1500Z **Nov 22**-2300Z **Nov 23**. Civil War Battle of Franklin. 28.480 21.380 14.280 7.280. QSL. W4SQD, PO Box 408, Franklin, TN 37065.

New York City, NY: Monster Island Amateur Radio Society, W2W. 0000Z **Nov 23**-2400Z **Dec 4**. 40th Anniversary of *Doctor Who*. 28.348 21.348 14.240 7.248. QSL. Monster Island ARS WW2MI, c/o Barry A. Schwartz, N2SHP, 52-15 65th Pl Apt 1C, Maspeth, NY 11378-1310.

Hyder Island, AK: US Islands (USI) Awards Program, KL7USI. 1700Z **Nov 25**-2300Z **Nov 28**. 10th anniversary of USI. 28.460 21.360 14.260 7.260. QSL. John Reisenauer, PO Box 4001, W Richland, WA 99353.

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9×12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information.

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 an SASE (send to Special Requests, ARRL, 225 Main St, Newington, CT 06111, and write "Special Events Form" in the lower left-hand corner). You can also submit your special event information on-line at **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; that is, a special event listing for **Jan** *QST* would have to be received by **Nov 1**. Submissions may be mailed (Attn: Maty Weinberg), faxed (860-594-0259) or e-mailed (**events@arrl.org**) to ARRL HQ. QST

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

STRAYS

COUSINS' NET CELEBRATES 40TH ANNIVERSARY

◊ How often has it happened? A group of hams get together one day on a particular frequency and comment on each other's day and events of interest to them. They repeat it and eventually create what becomes a "net." Happens all the time, you say? Well how about this happening every night of the year...with no interruption...for 40 years?

To celebrate, The Southern Section of the Country Cousins Net will hold a six-week "special event" from October 21-December 1, 2003. Three different calls will be used by the various net controls: W4C, N4C and K4C will be offered to all who check in...but only during net time, 9-10:30 PM Eastern Time.

QSL cards will be sent to all contacts who enclose an SASE with their request. A certificate will be issued to those making contacts for all three call signs. Those who complete the requirements for membership in this six week period will receive a 40th Anniversary Membership Certificate.

Today, membership in all Country Cousins Net(s) totals well over 3000, including Canada, Puerto Rico, Mexico and some Caribbean countries. Rich in an ongoing commitment to serving our fellow man, the group continues its heritage and pledge of service in everyday life. "The Southern...Cousins" has remained organized and focused with the dedication of its consistently loyal membership.—*Bill Ronay, KM4LS*

Congratulations! **ARRL Roanoke Division Director Dennis Bodson, W4PWF, presented a special certificate to the Rappahannock Valley ARC recently to commemorate the club's 50 years as an affiliated ARRL club.**

2003 ARRL 10 Meter Contest Announcement

Date: 0000Z December 13-2400Z December 14.

How to participate: You can work any amateur station on 10 meters and you may contact the same station on both Phone and CW (all phone modes are equivalent). There are both Single Operator and Multioperator classes. As a single-op, you can enter as QRP, Low Power or High Power. Single-ops also choose to operate Phone Only, CW Only or Both Modes (mixed).

What to say: W/VE stations should give a signal report and your state or province. DX stations give a signal report and sequential number for the contact. Since everyone can work everyone, even smaller stations can try calling "CQ Contest." On phone, be sure to give your full call and use standard phonetics.

Special Interest: There are a number of expeditions to DX countries just for the contest. Check out the ARRL DX bulletins (**www.arrl.org/w1aw/dx/**) or log on to NG3K's Web site that contains a list of preannounced contest expeditions (**www.cpcug.org/user/wfeidt/Misc/adxo.html**). K2KW writes a regular column in the *National Contest Journal* that covers upcoming contest expeditions (**www.ncjweb.com**). This is also a great time to work on your 5 band Worked All States (**www.arrl.org/awards/#was**), 10 meter specialty awards and DXCC.

Quirks: The District of Columbia counts separately from Maryland in this contest, with those stations sending DC. KH6 and KL7 participate as state entities rather than DX entities. Novices and Technicians signing /N or /T count double on CW QSOs. You may operate 36 out of the 48 hour contest period.

Rule changes this year: Actually, there is only one clarification: Any off time must be a minimum of 30 minutes in length to be considered valid.

Best reason to participate: If you think 10 meters sounds dead, it's usually because everybody's listening. Wait until the clock rolls over on Friday! Also, by spending a lot of time on the band, you'll experience all the unusual propagation that this nearly-VHF band has to offer: sporadic-E, skew, F-hop or skip, ground-wave, tropospheric—it's all there! Listen for propagation beacons before the contest to get an idea of where the band is open (**www.ten-ten.org/beacons.html**).

Relative challenge: With declining sunspots, this year's event will be hard-pressed to achieve last year's record level of participation, but it is still worth the effort. It is easy to enter with lots of space to find a level of activity that suits your tastes. There are generally lots of mobile and portable stations, as well. While code speeds will be high at the low end of the band, listen around 28.090 MHz or in the Novice band above 28.100 MHz for slower CW contacts.

Scoring: CW contacts count four points each. Phone contacts count two points each. Multipliers are US states (and DC), Canadian provinces (and territories), and DXCC entities. Multipliers count once per mode. Your final score equals QSO points times your multiplier total. You earn eight points for each Novice or Technician signing /N or /T on CW.

How to report your score: You must send in your entry by January 14, 2004. E-mail Cabrillo format log to **10meters@arrl.org** while paper logs are submitted to 10 Meter Contest, ARRL, 225 Main St, Newington, CT 06111.

Complete Rules: The complete rules may be found at **www.arrl.org/contests/forms** where you will also find links to the General Rules for all ARRL Contests, General Rules for ARRL Contests on bands below 30 MHz (HF) and other forms and operating aids, log sheets for submitting your entry. If you don't have Web access, you can obtain the complete rules and forms by sending an SASE with postage for 2 ounces to 10 Meter Contest Rules, ARRL, 225 Main St, Newington CT 06111.

For more information: E-mail **contests@arrl.org** or phone 860-594-0232. QST

2003 ARRL 160 Meter Contest Announcement

Date: 2200Z December 5 (Friday evening)-1600Z December 7 (Sunday afternoon).

How to participate: An all-CW contest, W/VE stations work any station on 160 meters with activity concentrated below 1875 kHz. DX stations may only work W/VE stations. There are both Single Operator and Multioperator classes. Single-op stations can enter as QRP, Low Power or High Power. If you make use of any packet spotting assistance, you are a Multioperator station.

What to send: W/VE stations, including KL7 and US Pacific or Caribbean islands, give a signal report and their ARRL/RAC section. DX stations give only a signal report. If maritime or aeronautical mobile, give your ITU region.

Special Interest: Entries are almost always received from all 50 states, which makes it possible to work a 160 Meter WAS with some effort and luck. In addition, an average of 20 to 30 DXCC entities are active, providing a great start to chasing DX on the band.

Quirks: The frequencies 1830 to 1835 kHz (the "DX window") should be used only for long-distance intercontinental QSOs such as W/VE to Europe or South America. JA stations can only operate from 1815 to 1825 kHz and 1907.5 to 1.912.5 kHz.

Rule changes: **The section abbreviation for the Canadian section that encompasses the Northwest Territories, the Yukon and Nunavut has been renamed the Northern Territories with a new section abbreviation of NT.**

Best reason to participate: "Top Band" is one of the biggest challenges around, but it also provides some of the most satisfying contacts. In the period of declining sunspots, conditions and propagation on 160 meters will continue to improve, making for interesting openings and opportunities.

Relative challenge: Hearing and being heard are a real test for many participants. Good antennas are a strong plus for contacts on 160 meters, but with all the activity, even a small antenna will give surprising results.

Scoring: Contacts with W/VE QSOs count 2 points. W/VE stations count 5 points for each DX QSO. Each ARRL/RAC Section worked is a multiplier. In addition, W/VE stations each DXCC entity worked as an additional multiplier.

How to report your score: You must send in your entry by January 7, 2004. E-mail Cabrillo format logs to **160meters@arrl.org** or send paper logs to 160 Meter Contest, ARRL, 225 Main St, Newington, CT 06111.

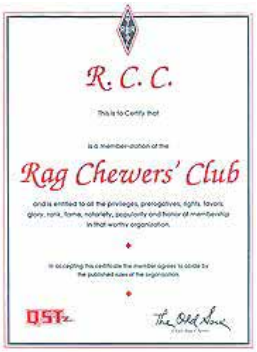
Complete Rules: The complete rules may be found at **www.arrl.org/contests/forms** where you will also find links to the *General Rules for all ARRL Contests, General Rules for ARRL Contests on bands below 30 MHz (HF)* and other forms and operating aids, log sheets for submitting your entry. If you don't have Web access, you can obtain the complete rules and forms by sending an SASE with postage for 2 ounces to 160 Meter Contest Rules, ARRL, 225 Main St, Newington CT 06111.

For more information: E-mail **contests@arrl.org** or phone 860-594-0232. QST

STRAYS

RAG CHEWERS CLUB: ARE YOU A MEMBER?

◊ Novice, Technician or Extra—start off right, where just about every awards hunter begins, with the Rag Chewers Club certificate. The RCC encourages friendly, meaningful contact, rather than the impersonal hello/good-bye QSO. Chew the rag for at least 30 minutes, report that QSO to ARRL HQ, 225 Main St, Newington, CT 06111, and enclose a fee of $10. Your Rag Chewers Club certificate will be sent to you by return mail. Your first contact as a licensed amateur could enable you to earn your first award!



By Dan Henderson, N1ND

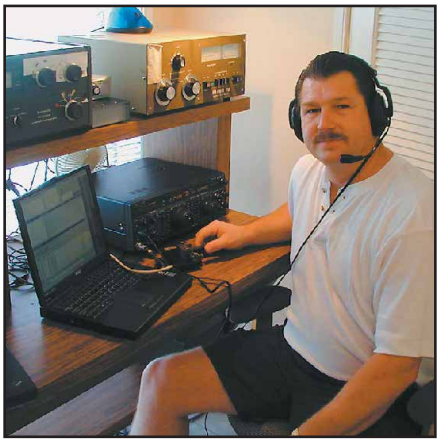
Changes to the 2003-2004 ARRL Contest Rules

A few new rules—and a strong emphasis on Good Operating Procedures.

During the spring and summer months, many of us have been busy repairing antennas, adding new aluminum to already packed towers, replacing radials damaged over the last year, or laying new Beverage antennas for better operating results.

Now that fall is in the air, there is a renewed energy for many amateurs. For some, the annual maintenance is to improve the odds of catching rare DX. Others are interested in getting ready for working traffic nets or ragchewing with old friends. And for yet another core group of dedicated amateurs, the purpose is to lay the groundwork for another successful contest season.

This year there are only a few changes in store for the thousands of amateurs who participate in the 15 contests sponsored by the ARRL. In fact, the rule changes for 2003 affect only a small portion of ARRL contests.



Dave, K3LP, takes a break from operating VP5LP during the ARRL International DX Contest.

Affiliated Club Competition

We are pleased to add the RTTY Roundup to the list of events that are now ARRL Affiliated Club Competition events. Held the first weekend in January, the Roundup is one of the premier HF digital events. When you participate, be sure to include your club name in the appropriate field of the Cabrillo log file header so the score will be credited properly.

Off-Time Length Defined

For years the standard for determining required off-times in ARRL sponsored events has been that it must be a minimum of 30 minutes in length. So, the formal addition of this standard to the *General Rules for All ARRL Contests* is not a change, but rather a clarification. This only applies to the few ARRL operating events (November Sweepstakes, 10 Meter Contest and RTTY Roundup) that require off-time during the operating period.

Name Change for the Northwest Territories Multiplier

In contests that use ARRL/RAC sections as multipliers, the name of the Northwest Territories multiplier has been changed. NWT never quite accurately described the area covered, as neither the Yukon nor Nunavut are part of the Northwest Territories. *Beginning with the 2003 November Sweepstakes, the new name for this sometimes-rare multiplier is simply the Northern Territories, with the abbreviation "NT."* This does not affect contests where each of the three territories is a separate multiplier, such as the annual ARRL International DX Contest. These three territories will continue to be classified together as NT for the purposes of ARRL contest awards.

Share and Share Alike

Each year there are complaints from both contesters and non-contesters alike about "poor operating practices" by the other. First and foremost all amateurs need to remember that our frequencies are allocated to us to share with others who are licensed and share an interest in operating. As with any limited resources (in this case spectrum) it takes a concentrated effort by all operators in order for all to enjoy the maximum benefit and enjoyment of our hobby. A few simple reminders…

- LISTEN and then LISTEN again before transmitting.
- Make sure you have a "clean signal."
- Avoid on-the-air arguments or "frequency wars."
- No individual or group "owns" a frequency.
- Make sure you use the correct transmitting VFO when operating split.

As we head toward the bottom of Sunspot Cycle 23, fewer openings on the 10 and 15 meter bands will mean more crowded conditions on the lower bands, especially 20 meters. Take pride in your skills and put your best operating foot forward. It will allow all amateurs to continue to flourish in our hobby.

Where do I Find…?

Be sure to visit the ARRL Contest Branch Web site (**www.arrl.org/contests**), where you will find links to the complete "General Rules for all ARRL Contests," "Rules for ARRL Contests on Bands Below 30 MHz," and "Rules for ARRL Contest on Bands Above 50 MHz." You will also find links to the complete rules for the contest-specific rules for all ARRL events, as well as downloadable versions of all ARRL contest forms. If you don't have Web access, simply drop us an SASE along with a note indicating what rules or forms you need.

And don't forget the expanded contests results available on-line to all ARRL members. By visiting **www.arrl.org/contests/results**, you will be able to read more in-depth contest write-ups, browse a wide array of participant-submitted comments and photographs in the "On-Line Soapbox," and use the on-line database.

If you have questions, please contact the ARRL Contest Branch at **contests@arrl.org** or phone 860-594-0232. QST

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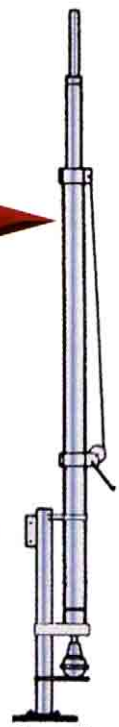

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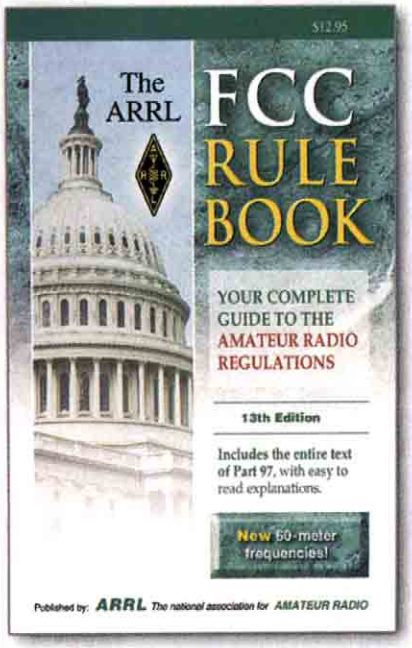

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IC-T7H Powerful output and ample receive audio. (left) A 6W amp circuit provides superior transmit on both VHF and UHF when 13.5 V DC is supplied. In addition, a full 500mW of AF is output from the speaker – easy to copy in noisy environments. Separate CTCSS tone encoder and encoder/decoder are standard. Single push action makes it simple. This 2M/440MHz meets MIL SPEC. 2.25"w x 4.34"h x 1.06"d, 10 oz..... © **$179.99**

IC-T90A Surprisingly compact, full featured. The T90A 50/144/440MHz HT offers 5W with wideband receive. It features 555 alphanumeric memories with Icom's DMS scanning technology. The T90A also provides DTCS/CTCSS, DTMF encode, PC programmability and weather resistance. 2.53"w x 3.44"h x 1.16"d, 8.47 oz..... © **$259.99**

IC-2100H-25N Durable 2M rig with superior RX IMD, performance. The 2100H25N offers 50W on transmit, extending its range. It also features CTCSS tone enc/decode, tone scan and 100 alphanumeric memories. It can be remote controlled using the new backlit mic. 5.5"w x 1.56"h x 7.09"d, 2 lbs, 10 oz© **$149.99**

IC-208H High power dualbander, wideband receiver. This 2M/70cm mobile provides a stable 55/50 Watts for long distance communications, plus reduced power for local. The 208H covers 118-173, 230-549 and 810-999MHz (cell blocked) receive as standard. With improved DMS, detachable front panel, 500 alphanumeric memories and user friendly design, mobile communications just got better. 5.56"w x 1.56"h x 7.31"d, 2.65 lbs..... © **$309.99**

IC-2720H Twice the versatility, twice the fun! The 2M/440MHz, 50/35W 2720H offers simultaneous receive capability, independent controls for each band, and DMS with 212 memories. It also features CTCSS/DTCS, weather alert, auto repeater, remote control mic and compact remote head. Mount controller to unit with optional MB-85. 5.5"w x 1.56"h x 7.38"d, 3 lbs (main)..... © **$359.99**

IC-718 Origin of the HF transceiver. With performance found in the HF all-band 718, such as wide dynamic range, high S/N ratio, and full duty operation, making distant contacts is easy. Experience its combo of the latest RF and digital technology. 9.44"w x 3.75"h x 9.41"d, 8 lbs, 6 oz ..... NOW! FREE UT106 included © **$529.99**

IC-706MKIIG Base station features, mobile size. The 160-10M + 6M, 2M, 70cm Mark II G is constructed for stable, quality output with low IMD and spurious emissions. It features tone squelch, DSP, auto repeater, and 107 alphanumeric memories. 6.56"w x 2.28"h x 7.88"d, 5 lbs, 6 oz.... NOW! FREE RMK706 included © **$779.99**

IC-756PROII A leap forward for the digital revolution. An all-mode, HF, 50MHz transceiver full of revolutionary functions designed to provide an advantage, and backed by performance that will keep the competition on their toes. The 756PROII is equipped with a 32-bit Floating Point DSP, providing much wider and precise processing ability. With the inclusion of digital DSP filtering, no additional filters or crystal oscillators are needed. It also features a built-in 24-bit AD/DA converter, enhanced backlighting, selectable IF shape, adjustable noise blanker, and improved audio. 13.38"w x 4.38"h x 11.19"d, 21 lbs, 1 oz..... NOW! FREE PS-125 included ©© **$2299.99**

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KENWOOD

TH-G71A Sharp Distinction: The brighter side of handy communications. (right) This FM dualbander (144/440MHz) boasts an illuminated keypad and LCD, high-performance antenna, and a stylish yet ergonomic design. The 5W G71A also offers convenience with menu mode, PC compatibility and 200 memories. 2.31"w x 4.44"h x 1.44"d, 11.6 oz **$229.99**

TH-F6A Unique features the competition is still scratching their heads over. The FM 144/220/440MHz F6A offers dual-channel RX capability, 16-key pad, multi-scroll key, 5W, and no fewer than 435 memories. Other attractive features include built-in ferrite bar antenna for AM, backlit LCD, lithium-ion battery, and a MIL-STD design. 2.3"w x 3.44"h x 1.18"d, 8.8 oz..... **$329.99**

TH-K2AT A triumph of advanced engineering and design. (middle) This 2M 5W handheld is equipped with internal VOX, weather alert/RX, automatic simplex checker, auto repeater offset and multiple scanning functions. The K2AT also offers built-in CTCSS, DCS and 1750Hz tone burst. The K2AT charges up to 3X faster than others and meets MIL-STD-810 for resistance to rain, vibration, shock and humidity. 2.44"w x 4.38"h x 1.13"d, 12.5 oz. **$159.99**

TM-261A Fully equipped, supremely user-friendly 2M mobile. The 261A puts out an impressive 50 Watts with mid- and low-power settings. For quick access, essential data can be stored in 62 "memory name function" memory channels. Other features include DTSS selective calling, multi-scan capability, and a case built to MIL-STD. 5.5"w x 6.56"h x 1.56"d, 2.2 lbs **$149.99**

TM-G707A The essence of ease. From the extra-large panel to Kenwood's Easy Operation mode, the G707A is extraordinarily user-friendly. In addition to its regular profile, it can store four others for instant recall. This 50W/35W, FM dualband (144/440MHz) offers 180 multi-function memories with name function to identify each. 5.5"w x 1.56"h x 7.44"d, 2.65 lbs **$269.99**

TM-V7A Cool Blue: The look of mobile communication. The V7A 144/440MHz FM transceiver marks a departure in ergonomic design with its easy-to-operate control panel and reversible LCD. The "5-in-1" programmable memory, 50/35W, DTSS and pager functions, and dual receive on one band make it a pace-setter. 5.5"w x 1.56"h x 7.44"d, 2.65 lbs **$399.99**

TM-D700A Harnessing APRS®, GPS and SSTV. This FM 144/440MHz mobile features a built-in TNC offering options including simple packet. However, the brightest spot of the 50/35W D700A is its ability to enable APRS® without a computer. It also has 200 memories, dual receive, built-in CTCSS/DCS, and DX cluster monitoring. 5.5"w x 1.58"h x 7.68"d, 3 lbs **$519.99**

TS-50S Compact milestone. One of the most compact HF (160-10M) transceivers, the 50S can be mounted in a vehicle, taken on DXpedition, or installed as a base station. Despite its compact dimensions it packs a hefty 100W punch. Features include DDS with "fuzzy" control, AIP, and dual VFOs. 7.06"w x 2.38"h x 9.19"d, 6.4 lbs..... **$649.99**

TS-570D(G) Affordable DSP without compromise. High-end technology doesn't mean a high-end budget. With 16-bit DSP, untouchable digital filtering, heavy-duty transmitter design, and central frequency control, the 570D provides 160-10M operation. 10.63"w x 3.75"h x 11"d, 15 lbs. NOW! FREE Heil mic..After *Rebate **$989.99**

TS-570S(G) Same as the 570D(G) above, with the addition of 6M. NOW! FREE Heil mic .....After *Rebate **$1159.99**

TS-2000 Distinctive, packed for performance. The all-mode, HF, 2M, 6M, 70cm 2000 is serious about DSP. Its advanced digital technology converts analog waveforms into digital data, enabling digital processing like IF filtering, slope tune, and auto notch. 10.63"w x 3.75"h x 12.5"d. NOW! FREE Heil mic **$1699.99**

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YAESU

VX-150 Designed to perform under the most difficult conditions. (right) This 2M 5W HT provides exceptional receiver performance with clean, clear transmit. Built to withstand outdoor use, the 16-key 150 is constructed to MIL-STD standards, with high-output, commercial-grade speaker and Omni-Glow™ keypad. 4.3"h x 2.3"w x 1"d, 11.5 oz.....© **$109.99**

VX-7R/VX-7RB The first submersible amateur handhelds. (left) Protected against water by gaskets and weatherproofing techniques, the 50/144/430MHz, 5W 7R/7RB are rated for a 3-foot, 30-minutes submersion. Tough magnesium bodies make them ideal for the outdoors. They include dual/wide-band receive, status strobe, and "internet" key for access to the new WIRES™ system. 7RB sports a black case. 2.4"w x 3.5"h x 1.1"d, 9.2 oz .....© **$319.99**

VX-2R Smallest HT dualband! (right) This 1.5/1W dualband (144/440 MHz) offers VHF, UHF, shortwave, marine and aircraft bands, and WIRES™. The 2R's wide band receive includes AM broadcast, continuous HF shortwave, VHF/UHF up to 729MHz, 800-960MHz (cell blocked). Over 1000 memories, CTCSS/DCS enc/decode and auto repeater shift. 1.9"w x 3.2"h x 0.9"dAfter *Rebate! © **$129.99**

VX-5R/VX-5RS Toughest HTs setting water resistance standards. (left) Boasting 5W (4.5W on 430MHz), the 5R/5RS cover 50/144/430MHz while offering shortwave to microwave reception. Perfect for outdoor activities, they feature an optional barometric pressure unit. The black or silver units are built with alphanumeric memories and CTCSS/DCS. 2.3"w x 3.4"h x 1.1"d, 8.9 oz .....© **$239.99**

FT-2800M Cool and quiet 65W operation. The most rugged 2M transceiver ever provides 65/25/10/5W with an extensive 221 memories, alphanumerics and CTCSS/DCS. The 2800M also features NOAA with weather alert, WIRES™ access, SmartSearch™, and excellent receive. With a bullet-proof front end and direct keypad entry, it's a dream come true. 6.3"w x 2"h x 7.3"d, 4 lbs .....© **$139.99**

FT-1500M A masterpiece of RF engineering. This 144MHz FM mobile is the quietest and most efficient radio transceiver ever built. 50-tone CTCSS encode/decode, direct keypad frequency entry, alphanumeric memory, 50W, and 6-pin mini-DIN data port are just the start. 5"w x 1.4"h x 4.9"d, 2.2 lbs.....Closeout © **$119.99**

FT-8800R Easy operation, ultimate dualband. This 144/430MHz 50/35W mobile offers simultaneous monitoring of one band while operating the other. Besides extended receive, the 8800R provides 1000 memories, cross band repeat, versatile scan and CTCSS/DCS. 5.5"w x 1.6"h x 6.6"d, 2.2 lbs.....After *Rebate © **$329.99**

FT-857 The world's smallest HF/VHF/UHF multimode. The 100W (HF/6M), 50W (2M), 20W (70cm) 857 provides wide frequency coverage, outstanding receive, and convenient remote-head use (optional). Includes 200 memories, easy feature access, advanced DX, and CW operating flexibility. 6.1"w x 2"h x 9.2"d, 4.6 lbs FREE DSP2 thru 12/31/03.....© **$769.99**

FT-920 Dedicated to the enhancement of Signal-To-Noise ratio. The 160-6M 920 is optimized for noise reduction, wide dynamic range and audio tailored to the operator's voice. This 100W rig also features dual watch, extensive menu, keyboard frequency entry, 127 alphanumeric memories and versatile scanning. 15.2"w x 5.3"h x 12.5"d, 24 lbs. NOW! FREE FM board with purchase .....© **$1049.99**

MK V FIELD Reach the HF Summit! The Mark V Field brings the technology of the 1000D and Mark V to you in a 100W, self-contained design. This HF all-mode features Class-A (25W) PA operation, interlocked digital bandwidth tracking, a variable RF front-end filter and the ergonomics of the Mark V along with an auto antenna tuner and internal switching-regulator power supply. 16"w x 5.3"h x 13.7"d, 33 lbs.....© **$1789.99**

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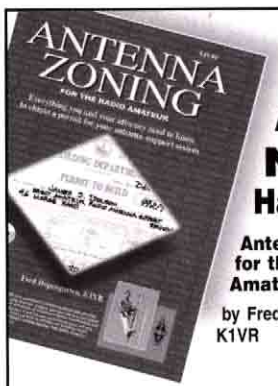

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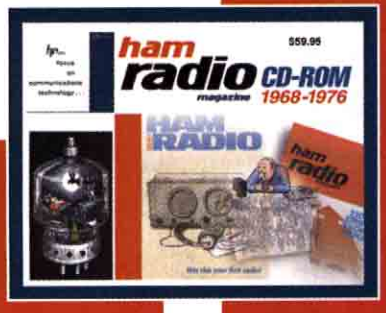

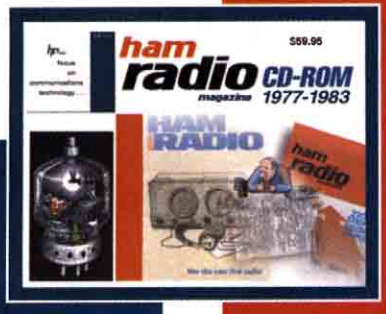

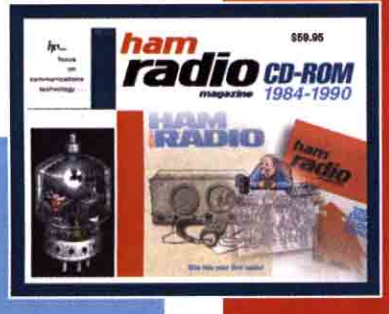

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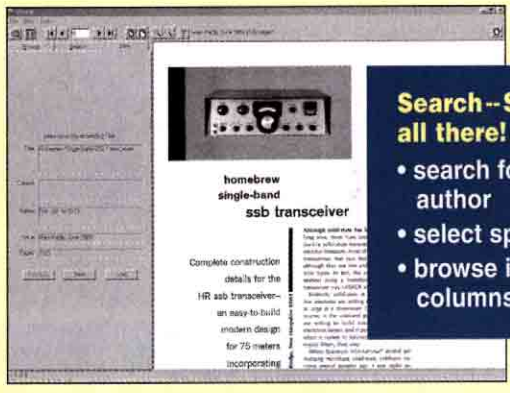

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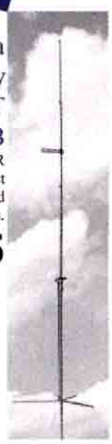

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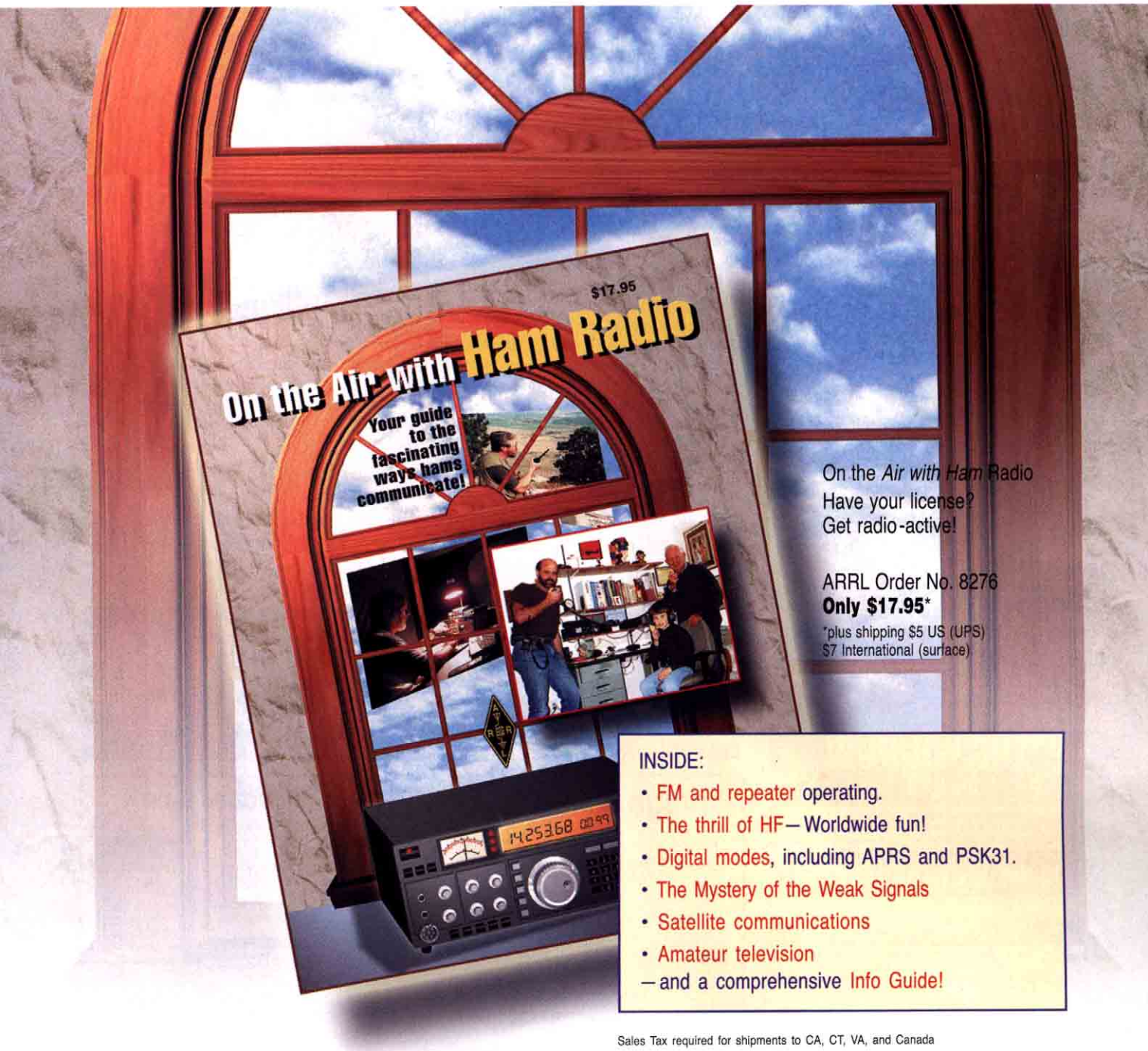

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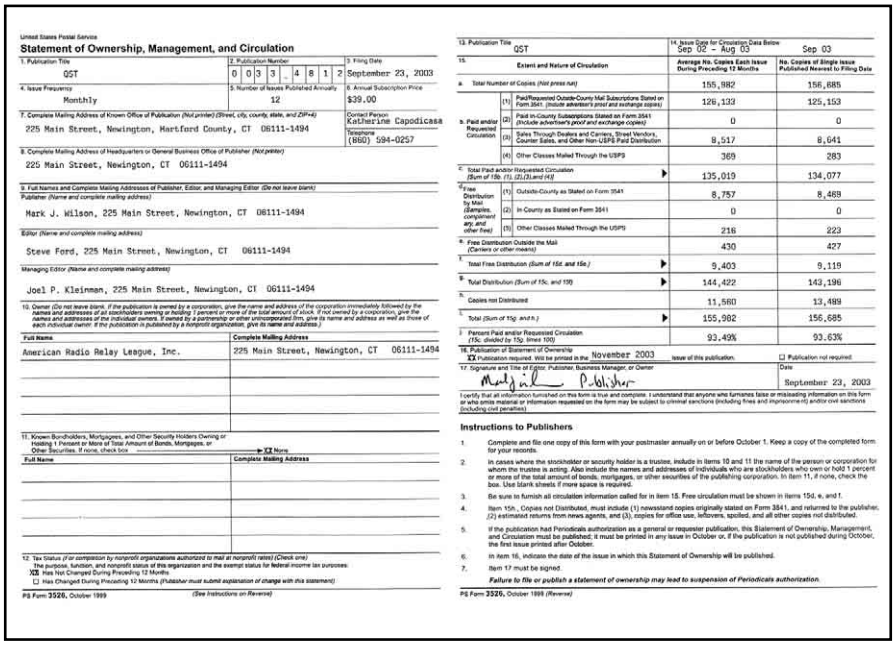

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1. Publication Title	2. Publication Number	3. Filing Date
QST	0 0 3 - 4 8 1 2	September 23, 2003
4. Issue Frequency	5. Number of Issues Published Annually	6. Annual Subscription Price
Monthly	12	$39.00

7. Complete Mailing Address of Known Office of Publication (Not printer) (Street, city, county, state, and ZIP+4): 225 Main Street, Newington, Hartford County, CT 06111-1494 — Contact Person: Katherine Capodicasa; Telephone: (860) 594-0257

8. Complete Mailing Address of Headquarters or General Business Office of Publisher (Not printer): 225 Main Street, Newington, CT 06111-1494

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Editor (Name and complete mailing address): Steve Ford, 225 Main Street, Newington, CT 06111-1494
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15. Extent and Nature of Circulation	Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
a. Total Number of Copies (Net press run)	155,982	156,685
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(4) Other Classes Mailed Through the USPS	369	283
c. Total Paid and/or Requested Circulation (Sum of 15b. (1), (2),(3),and (4))	135,019	134,077
d. Free Distribution by Mail (Samples, complimentary, and other free) (1) Outside-County as Stated on Form 3541	8,757	8,469
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f. Total Free Distribution (Sum of 15d. and 15e.)	9,403	9,119
g. Total Distribution (Sum of 15c. and 15f)	144,422	143,196
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j. Percent Paid and/or Requested Circulation (15c. divided by 15g. times 100)	93.49%	93.63%

16. Publication of Statement of Ownership: XX Publication required. Will be printed in the November 2003 issue of this publication. ☐ Publication not required.

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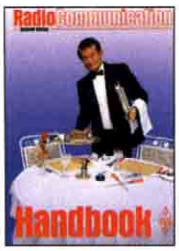

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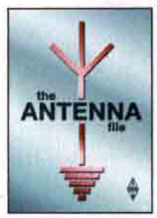

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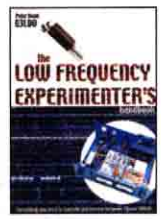

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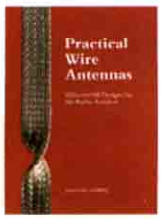

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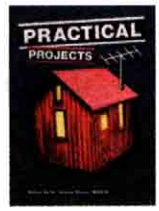

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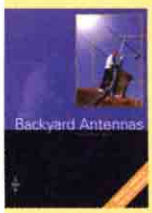

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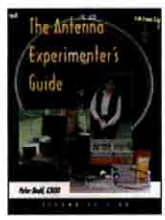

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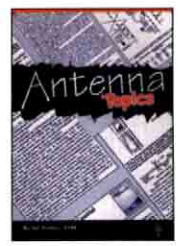

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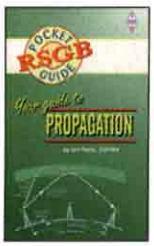

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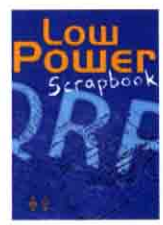

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TECH TALK

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IC-2720H

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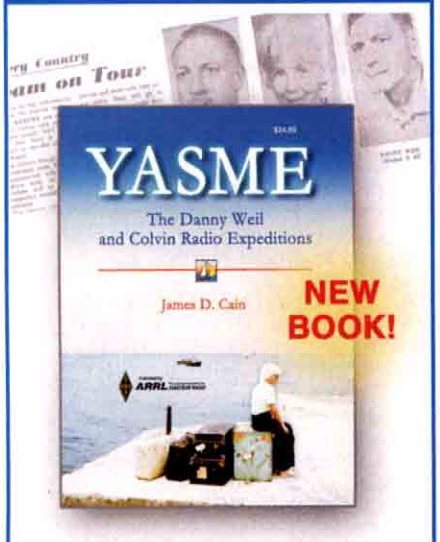

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G6-144B/G7-144B	$109/179

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ANTENNA ROTATORS

M2 OR-2800P	$1249
Yaesu G-450A	$249
Yaesu G-800SA/DXA	$329/409
Yaesu G-1000DXA	$499
Yaesu G-2800SDX	$1089
Yaesu G-550/G-5500	$299/599

ROTATOR CABLE

R62 (#18)	$.32/ft.
R81/82	$.25/ft./.39/ft.
R84	$.85/ft

PHILYSTRAN GUY CABLE

HPTG1200I	$.45/ft
HPTG2100I	$.59/ft
PLP2738 Big Grip (2100)	$6.00
HPTG4000I	$.89/ft
PLP2739 Big Grip (4000)	$8.50
HPTG6700I	$1.29/ft
PLP2755 Big Grip (6700)	$12.00
HPTG11200	$1.89/ft
PLP2758 Big Grip (11200)	$18.00

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PW-1..... In Stock!
The Icom PW-1 is a 1000 watt solid state linear amplifier for HF and 6m operation, featuring a high power automatic antenna tuner, built-in power supply, and a removable front control panel, and more.

IC-746PRO..... In Stock!
The Icom IC-746PRO is an all mode HF/6m/2m XCVR with 32-bit IF level DSP. The radio features a built-in auto tuner, built-in RTTY demodulator and decoder (reads out on the radio's LCD display), auto notch, digital twin PBT, and more. Supplied hand mic and DC power cord.

IC-910H..... In Stock!
All-mode 2m/70cm dual band transceiver, featuring dual data inputs, CTCSS encode/decode, CW keyer, satellite mode, scan, sweep display function, optional 23cm module, optional DSP, and more. Supplied with hand mic and DC power cord.

FT-1000MP-V..... Yaesu Special!
Competition class HF DSP transceiver with auto tuner, 200 Watts RF output, and more!

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Low power (100W) version of the FT-1000MP-V, with built-in power supply.

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All mode HF/6m XCVR featuring DSP, auto tuner, built-in power supply, and more. With up/down hand mic and DC power cord.

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Great all-mode XCVR covering HF/6m/2m/70cm! The radio is perfect for satellite operation, and features DSP, CTCSS tone encode/decode, and more. Supplied with microphone and DC power cord.

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IC-703PLUS..... New, In Stock!
The Icom IC-703 is a compact HF XCVR, with built-in auto tuner, DSP, and more! The IC-703PLUS adds 6m coverage.

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Dual band 2m/70cm FM XCVR. Features remote control panel, CTCSS tone encode/decode/scan, cross band repeat, data jack, dual RX, extended RX, 212 memories, and more. Supplied with a DTMF hand mic, separation cable, mounting brackets, and a fused DC power cord.

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Great 75W 2m mobile XCVR. Features CTCSS tone encode/decode/scan, 207 memories, front panel mounted speaker, and more. Supplied with a DTMF hand mic, mounting bracket, and DC cord.

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Quad band mobile XCVR covers 10m/6m/2m/70cm, with cross-band repeat.

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Ultra-compact all mode XCVR for HF/6m/2m/70cm. Features CW memory keyer, CTCSS encode/decode, 200 memories, optional DSP, and more. Supplied with a hand microphone, a fused DC power cord and mounting bracket.

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A truly tiny self-contained all mode HF/6m/2m/70cm QRP XCVR featuring tone encode/decode, 200 memory channels, VOX, and more! With hand microphone.

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IC-208H..... Great Low Price!
A great 2m/70cm dual band mobile XCVR, featuring CTCSS tone encode/decode, 500 memories, removable control panel, and more. With a back-lit DTMF hand mic, mounting bracket, and a DC power cord.

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