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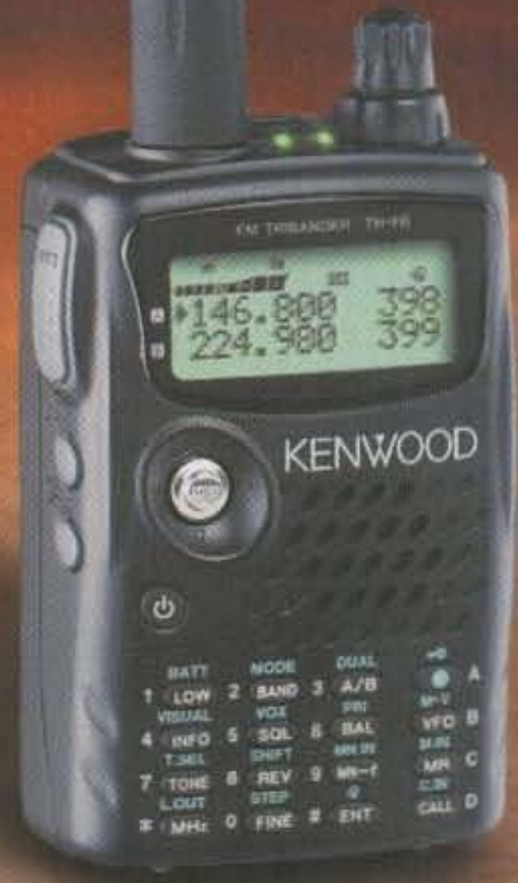

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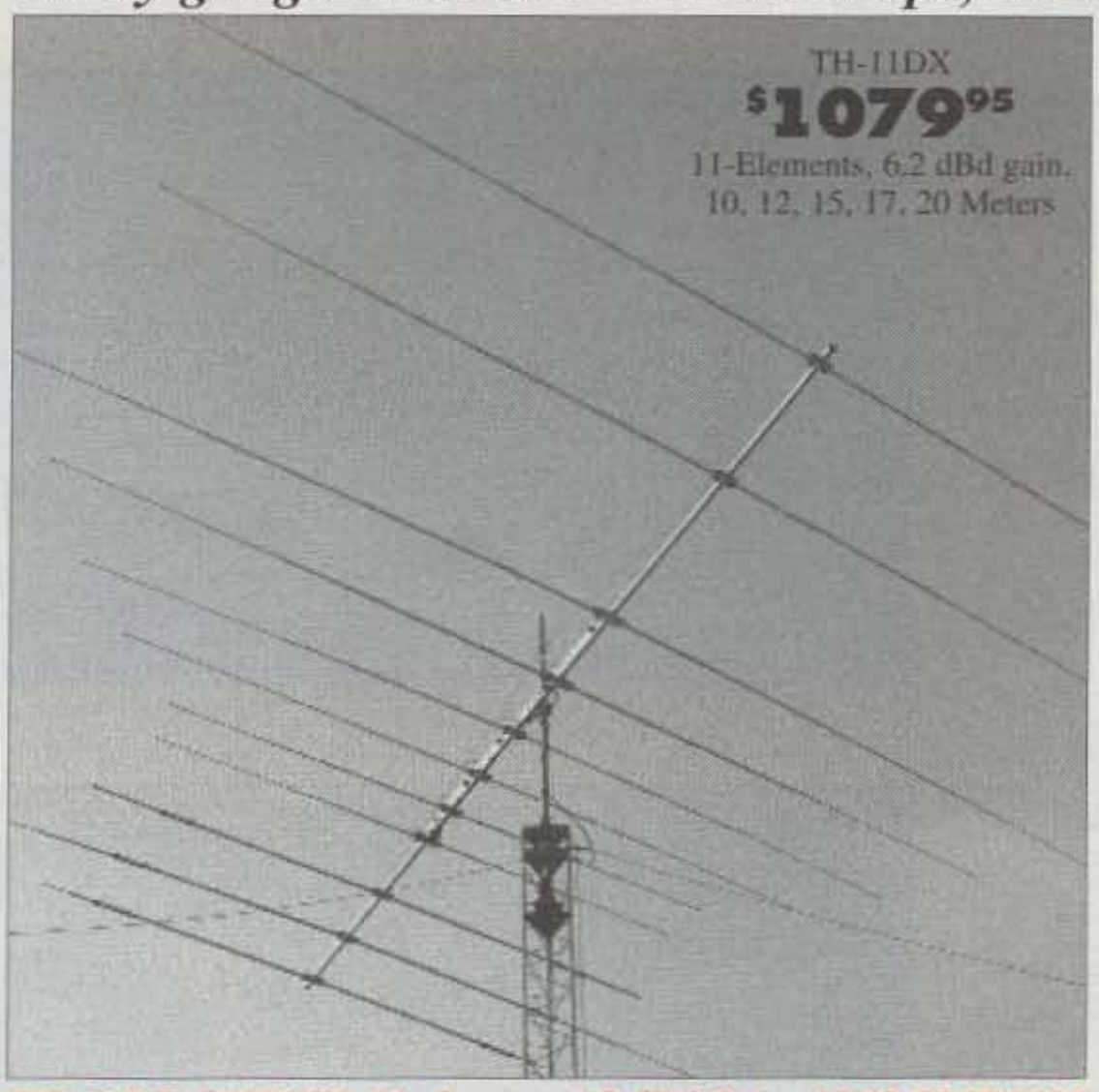

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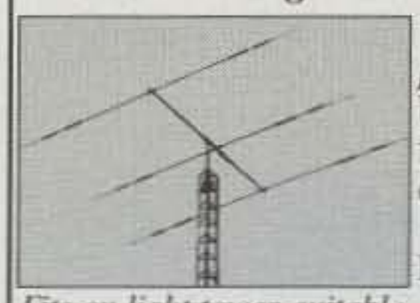

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TH-7DX	**7**	**6.57**	**21**	**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**	**75**	**1.5-2.5**	**HAM-IV**	**$819.95**
TH-5MK2	5	6.1	20	1500	10, 15, 20	7.4	100	19	31.5	18.42	57	1.5-2.5	HAM-IV	$699.95
TH-3MK4	**3**	**5.8**	**25**	**1500**	**10, 15, 20**	**4.6**	**95**	**14**	**27.42**	**15.33**	**35**	**1.9-2.5**	**CD-45II**	**$439.95**
TH-3JRS	3	5.8	25	600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$329.95
TH-2MK3	**2**	**3.4**	**15-20**	**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$339.95**
EXP-14	4	5.9	25	1500	10,15,20 (30/40)	7.5	100	14	31.5	17.25	45	1.9-2.5	HAM IV	$549.95

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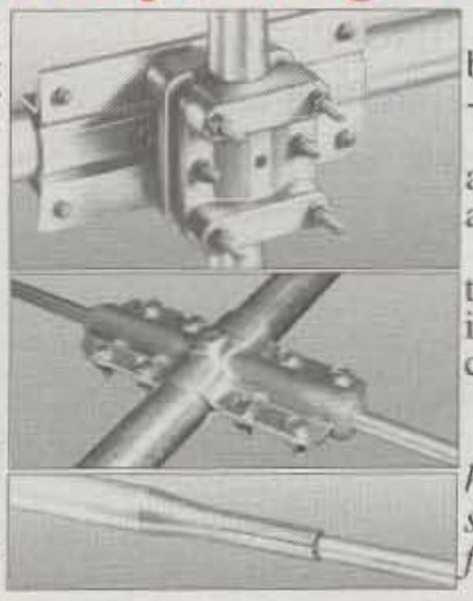

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CQ Amateur Radio

DECEMBER 2002 VOL. 58, NO. 12

FEATURES

11 **GIVING RADIO ITS VOICE:** The evolution of radiotelephony
By Ronald R. Thomas, W8QYR

16 **TELEGRAPHY AND THE DOUBLE-SPEED KEY:** The early days of Morse Code and building your own "Cootie Key"
By Bob Shrader, W6BNB

20 **RESULTS OF THE 2002 CQ WW DX 160 METER CONTESTS**
By Dave Thompson, K4JRB

28 **BUILD YOUR OWN "VINTAGE" RADIOS:** A transmitter and receiver project
By Clarke Homoly, WØRPC

32 **BUILD A REGULATED SOLID-STATE POWER SUPPLY FOR VINTAGE TRANSMITTERS:** A high-voltage power supply using the latest available components
By John V. Karasz, WB2GMY

36 **ANNOUNCING: THE 2003 CQ WW WPX CONTEST**

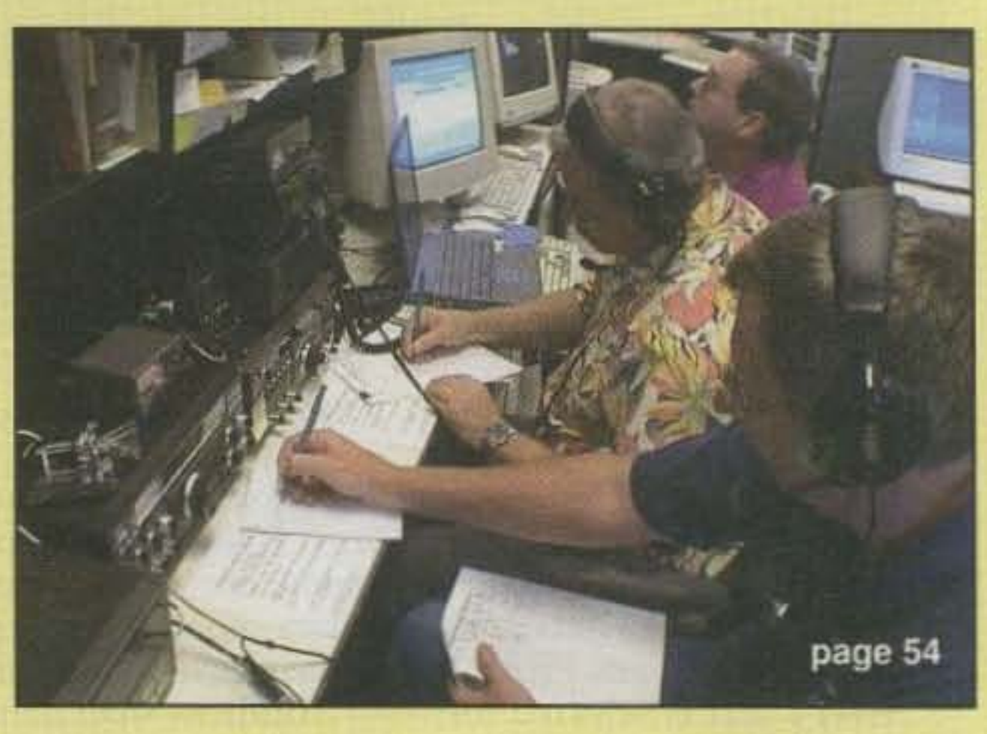
50 **HAM SHACK IN A CLOSET:** Here's one answer for those who are space deprived or financially challenged!
By George Murphy, VE3ERP

60 **MATH'S NOTES:** Optical power measurements
By Irwin Math, WA2NDM

62 **WORLD OF IDEAS:** Ham treats for the holidays
By Dave Ingram, K4TWJ

79 **QRP:** Mobile, rolling out with QRP
By Dave Ingram, K4TWJ

88 **COMPUTERS AND INTERNET:** Computers—why bother?
By Don Rotolo, N2IRZ



DEPARTMENTS

40 **WASHINGTON READOUT:** New amateur bands proposed by FCC run into opposition
By Frederick O. Maia, W5YI

54 **PUBLIC SERVICE:** Storms, memories, and MARS
By Bob Josuweit, WA3PZO

70 **WHAT'S NEW:** Holiday goodies galore
By Karl T. Thurber, Jr., W8FX

74 **BEGINNER'S CORNER:** Simplex—the other FM
By Peter O'Dell, WB2D

84 **VHF PLUS:** *Transequatorial propagation*
By Joe Lynch, N6CL

90 **AWARDS:** WG6X, USA-CA #1043; awards from around the world
By Ted Melinosky, K1BV

93 **DX:** The old days and the new—the Southern Appalachian Radio Museum
By Carl Smith, N4AA

97 **CONTESTING:** Contesting for newcomers, Part I
By John Dorr, K1AR

100 **PROPAGATION:** CQ WW DX CW Contest forecast, progress of solar Cycle 23; DX Charts for December 15, 2002 to January 15, 2003
By Tomas Hood, NW7US

110 **2002 ANNUAL INDEX**

4 **HAM RADIO NEWS**

6 **ZERO BIAS**

8 **ANNOUNCEMENTS**

8 **OUR READERS SAY**

112 **CQ HAM SHOP**

ON THE COVER: Eric Owen, KD4MZM, of Sarasota, Florida, normally uses this setup on his truck for working mobile moonbounce (!) . . . except for one day a year when he and other hams around the world become essential parts of Santa's communications network. Happy Holidays from all of us at *CQ*! (Cover photo by Larry Mulvehill, WB2ZPI)

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Ham Radio News

From The CQ Newsroom

Congress Goes Home Without Acting on CC&R Bill—ARRL Optimistic for Next Year

Members of Congress finished up their business and headed home for the pre-election recess in mid-October without acting on HR-4720, the bill that would require private land-use regulators (such as condominium boards) to "reasonably accommodate" amateur radio antennas in the same way that municipal regulators must already. There may be one or two "lame-duck" sessions before Congress formally adjourns at the end of the year, but according to the ARRL, League officials doubt there will be any action on the bill before next year. Since this is the end of a two-year session of Congress, the bill will have to be reintroduced next year and will be given a new bill number. ARRL President Jim Haynie, W5JBP, says he's pleased with the progress that was made in attracting co-sponsors and that the League will continue to press for the bill's passage. "This is probably the most important thing the League has done in a long time," said Haynie, referring to the effort.

Meanwhile, HR-4720's sponsor, Rep. Steve Israel (D-NY) and the only two licensed amateurs in the House of Representatives, Reps. Mike Ross, WD5DVR (D-AR), and Greg Walden, WB7OCE (R-OR), have sent a letter to all of their House colleagues, urging them to sign on as co-sponsors. According to the *ARRL Letter,* the "Dear Colleague" letter said, "Your co-sponsorship of this bill is an opportunity to show your support for more than 670,000 licensed radio amateurs throughout the United States."

Also on Capitol Hill, Rep. Walden was appointed in late September to fill a vacancy on the House Subcommittee on Telecommunications and the Internet, part of the Energy and Commerce Committee. The subcommittee oversees spectrum management and other telecommunications issues.

Ex-FCC Official Prose Walker, W4BW, SK

A. Prose Walker, W4BW, who headed the FCC's Amateur and Citizens Division from 1971 to 1975, died last summer at the age of 92. It was several months before word of his passing reached the amateur community.

The ARRL's obituary remembers Walker as the "godfather" of the 30, 17, and 12 meter bands, noting that it was he who made the initial proposal for the new bands in the mid-1970s and helped lead efforts to get approval for the bands from the International Telecommunications Union at the 1979 World Administrative Radio conference, or WARC-79 (that's why the bands are called the "WARC bands").

Other amateurs have additional memories of Walker, not all of them positive. "Newsline" pointed out that Walker was behind the very strict repeater regulations of the early 1970s that required such extensive engineering studies before a repeater license was issued that very few applications were made over a 4–5 year period. In addition, *CQ* Publisher Dick Ross, K2MGA, remembers Walker as the leading force behind the FCC's "Incentive Licensing" decision of the mid-1960s, a license restructuring program that took away operating privileges from many hams and over which many are still bitter today, four decades later.

Ham Cited for Interference To Hurricane Net

A ham in Colorado has been cited by the FCC for allegedly interfering with the Hurricane Watch Net during Hurricane Isidore. According to a letter from amateur enforcement chief Riley Hollingsworth, K4ZDH, Merle Garbe, WØSBE, of Morrison, Colorado, first refused to share 14.325 MHz with the hurricane net, then allegedly called his own net on an adjacent frequency that caused interference to the hurricane net.

In other FCC enforcement news, a Toledo, Ohio ham was told that if he was asked by a repeater owner not to use that repeater—as he apparently was—he may not use it. "We expect you to abide by the request" to stay off the repeater, Hollingsworth told Billie Marshall, N8ORF, in a letter, adding that "your failure to do so after receipt of this letter will jeopardize your Amateur license."

Additional and updated news is available on the Ham Radio News page of the CQ website at <http://www.cq-amateur-radio.com>. For breaking news stories, plus info on additional items of interest, sign up for CQ's free online newsletter service. Just click on "CQ Newsletter" on the home page of our website.

ARRL Opposes Use of 70 cm For Unlicensed Radios

The ARRL has opposed a petition filed by a Virginia ham to permit visitors from Europe to use unlicensed Family Radio Service-style transceivers on 446 MHz. This is where the European Personal Mobile Radio (PMR 446) units operate, as the 70 centimeter amateur band in Europe does not extend above 440 MHz. The League said such an action might "foster international goodwill," as petitioner Michael Trahos, KB4PGC, suggested, but that it doesn't justify making rules changes that would, as the ARRL put it, be contrary to the fundamental regulatory structure of the Amateur Service, the Communications Act of 1934, and the International Radio Regulations.

• • •

FCC Makes No Changes At 2300 MHz

The FCC has turned down both an ARRL request to give amateurs primary status on 2300–2305 MHz, and a pair of petitions from commercial companies seeking to share that same spectrum with hams. Two companies wanted space there for a Personal Location Monitoring Service and a satellite messaging service.

In a related matter, the Commission did approve a plan for personal locator beacons, or PLBs, which operate at 406.025 MHz. They would be similar to the emergency locator beacons now used on airplanes and ships. These beacons would each have to be registered with the National Oceanic and Atmospheric Administration (NOAA), whose satellites would pick up and retransmit distress signals sent out by the units.

• • •

National Antenna Consortium Chooses Leaders

Fred Baumgartner, a broadcast engineer and ham radio operator from Denver, Colorado, has been elected the first Chairman of the National Antenna Consortium, an organization seeking "uniform, fair and reasonable regulation for antennas and towers, and a national policy that protects the rights of all RF spectrum users..." The group was formed in 2001 as a coalition of commercial and amateur antenna users seeking a uniform national policy. Other hams elected to the group's board of directors include Fred Hopengarten, K1VR; Clay Freinwald, K7CR; and Chris Hudgins, N5IUF. For more information, visit the group's website at <http://www.antenna-consortium.org>.

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6m/2m/70cm

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Can be customized for volume control or channel selection

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BY RICH MOSESON, W2VU

An Editorial

"Ham Radio Moments"

One of the things I've been "preaching" recently at club and hamfest talks is the need to share with each other our excitement about whatever it is we're doing in ham radio at the moment. The licensing numbers show a troubling trend toward non-renewals when licenses expire.

Some of this, of course, is due to Silent Keys whose family members are not aware that they should return the deceased amateur's license for cancellation, but the numbers of non-renewals recently have been far in excess of the numbers of Silent Keys. Fortunately, the number of new people coming into the hobby each month is holding steady or growing, so our numbers continue to grow overall and ham radio continues its half-century long tradition of "successfully dying."* But it's obvious from these numbers that we have a growing problem with people dropping out of ham radio after either 10, 20, who knows, maybe 30 years or longer. Whatever it was that excited them about ham radio when they first got licensed somehow has gotten lost and they don't even retain enough interest to renew their licenses once a decade. What can we do? How can we reverse this trend? After all, these are people whose names and addresses are listed in the FCC database. We know who they are and how to find them. How can we bring them back or, better yet, keep them from dropping out in the first place?

There's a variety of answers to that question, all of them correct, but one answer lies in the hands of every active ham and every club made up of active hams—*share the excitement!* If you're enjoying amateur radio right now, then you've found some aspect of the hobby that gets you excited, that makes it worthwhile for you to flip on the power switch on your rig. Maybe it's DXing, maybe it's contesting, maybe it's one of the hot new digital modes on HF, maybe it's working meteor scatter on VHF with WSJT new computer software that's changing meteor scatter from a highly specialized mode into an everyday propagation mode on VHF, letting you work out to 1300 miles on 2 meters any time of day or night (what's that about 2 meters being a local-only band?). Maybe it's CW. Yes, CW—if you look at the results of the CQ World-Wide 160 Meter Contest in this issue, you'll see that for the second year in a row, more stations were worked on CW than on SSB; looks like this "antiquated" mode is "successfully dying" just like the rest of ham radio. *You* know you're having a good time on the air, but it won't do the hobby any good if you keep that excitement to yourself.

I'd like to see every radio club include as part of its regular meeting agenda— and perhaps its newsletter in order to reach those who can't make the meetings—a few minutes for "Ham Radio Moments," in which members are asked to share an interesting or exciting ham radio experience from the past month (or longer). It could be a special contact, qualifying for an award, a real interesting repeater QSO, anything *fun and exciting* in their ham radio lives. It doesn't have be to earth-shattering, just fun. If it's the kind of contact that makes you run up (or down) from the shack and tell your spouse, "Guess who I just worked?" That's the kind of contact you should be telling your fellow hams about as well. We're going to have a hard time spreading enthusiasm for what we enjoy about ham radio if we keep that excitement to ourselves, so don't limit it to club meetings. Tell people on the air, tell them in person, tell them in print.

A couple of examples (since I try to practice what I preach): Back in early October, I worked Gary, KG4VBL/AG, in Alabama on 20-meter PSK-31. It was his first PSK-31 QSO. Apparently, Gary used to be a ham—a WA9—but let his license lapse for whatever reason. Recently he not only came back, but brought both of his sons with him! Good job, Gary, and welcome back. I also met a semi-neighbor; K2RMC lives two towns south of me and works two towns north of me. Chances are we'll get together in person someday. On 15-meter SSB, I worked former *CQ* VHF Editor Steve Katz, WB2WIK, and some folks at the Alaska FAA (Federal Aviation Administration) Employees ARC club station, KL7FAA. Back on 20-meter PSK-31, I worked PJ4/W9NJY operating with just 8 watts from Bonaire! Finally, on 17-meter SSB, I had a fun QSO with VO1ONE, operating mobile from Signal Hill, Newfoundland, the easternmost point on the North American continent. Are any of these enough to make someone contemplating dropping out change his/her mind? Doubtful. What about the combination of all of these contacts, plus yours and those of your friends? Maybe. The key is that if we show people that *we're* excited about what we're doing in ham radio, then there's a good chance that they'll get the message that there's fun and exciting stuff out there to do, even if what they've been doing in the hobby has lost its spark. In my view, anyone who says ham radio is boring hasn't seen very much of ham radio. But it's our responsibility as active hams to make sure we're not keeping our own fun and excitement a secret.

Changes

Over the next few months, we're going to be making some changes in what you see in *CQ* and in the people both on our pages and behind the scenes. To start with, we'd like to welcome Worked All Zones Award Manager Paul Blumhardt, K5RT, to the CQ staff as Director of New Business Development (WAZ Manager is a volunteer position). Paul brings us not only a world of ham radio experience but also 30 years experience in the commercial telecommunications field. While he'll be working mostly behind the scenes, don't be surprised to see Paul representing CQ at hamfests and conventions. Next, Edith Lennon, N2ZRW, who was Managing Editor of *CQ VHF* when it was a monthly, has rejoined our staff and is working on *Popular Communications* plus some of CQ's book projects.

This issue contains the final "Beginner's Corner" column by Peter O'Dell, WB2D. Peter has been writing the column since 1996, both here and in *CQ VHF*. Thank you, Peter, for six years of sharing your "ham radio moments" and helping encourage new hams to get on the air and get active. Peter will be succeeded by Wayne Yoshida, KH6WZ, as of the January issue. Helping new hams get their feet wet has been a *CQ* tradition since the magazine was founded in 1945, and *CQ* was the first amateur magazine to introduce a Novice

** For those of you who believe ham radio is dying, some numbers to consider: In 1980, there were just under 382,000 licensed hams in the United States. At the end of September 2002, there were just over 683,000, a 22-year growth rate of an astounding 79%! Looking at more recent numbers, there were just under 675,000 licensed hams in the US in March of 1999, so we're up nearly 10,000 in three and a half years—even with a growing problem of veteran hams not renewing their licenses. We've been averaging about 18,000 newly-licensed hams in each of the past five years. Add it up and we've got 90,000 new licensees in a five-year period. As I've said here in the past, ham radio has been successfully dying for the past half century and if current trends continue, we'll be successfully dying for next half century as well. Tnx to AHØA for the number-crunching.*

column when that entry-level license class was created back in 1951. Such ham radio luminaries as Herb Brier, W9EGQ; Don Stoner, W6TNS; and Bill Welsh, W6DDB, have carried the tradition of the *CQ* beginners' column through the decades. Today, as in 1951, *CQ* stands alone with its level of dedication to helping newcomers ... as the *only* US ham magazine with a monthly column dedicated to the new ham. We remember what it was like to be starting out, and we continue our half-century-old commitment to making the path easier. Maybe if more new hams were helped to get off to a good start, we wouldn't have the dropout problem we talked about at the beginning of this column.

Another forthcoming change ... since the worlds of ham radio (particularly digital ham radio), the internet and computers are becoming ever-more intertwined, we've decided to merge our "Digital Wireless" and "Computers and Internet" columns. As of the February issue, Don Rotolo, N2IRZ, will be here every two months to explore some facet of this intertwined world, from PSK-31 on HF to IRLP (the Internet Repeater Linking Project), WSJT (see above) and more. Former "Digital Wireless" Editor Steve Stroh, N8GNJ, will be devoting his time to his day job and his responsibilities at TAPR, Tucson Amateur Packet Radio. Thanks, Steve, for your contributions to *CQ*.

Jeff Reinhardt, AA6JR, will be writing a quarterly mobiling column starting with the February issue. This is in addition to his "Magic in the Sky" column, which we run periodically.

Two more personnel changes, both in our contest management area. Steve Merchant, K6AW, joins us as the new CQ World-Wide WPX Contest Director. Steve succeeds Steve Bolia, N8BJQ, who has decided to turn over the reins of our very popular WPX contest after 20 years at the helm. Steve, your contributions to not only the WPX contest, but to CQ as a whole are incalculable, and a simple "thank you" seems insufficient. We hope you will remain part of the CQ "family" for many years to come.

As you may have heard, Gene Zimmerman, W3ZZ, has been named VHF editor of *QST* magazine (Congratulations, Gene!). As a result, Gene has stepped down as Director of the CQ World-Wide VHF Contest to avoid any possibility of conflict. Gene has reinvigorated our VHF contest over the past two years, and we greatly appreciate his leadership. Gene's successor will be well-known VHF contester and former ARRL Communications Manager John Lindholm, W1XX. Welcome aboard, John.

Finally, we're adding a new feature to our website, a photo gallery that's starting out with images from our own travels to hamfests and other events around the country. We'll also be creating space there for photos from readers who are involved with interesting activities for which a photo pretty much tells the whole story. Look for a link to the photo gallery from our home page at <http://www.cq-amateur-radio.com>.

Happy Holidays

It's that time once again when children's thoughts turn to new toys and hams try to make dreams of new radios appear in giftwrap. Commercialism aside, may we all enjoy the true spirit of this holiday season and look forward to a year in which, perhaps, we can work to solve the world's problems without blowing each other up. It's an area in which the rest of the world can learn quite a bit from the world's hams. Happy holidays to all and best wishes for a peaceful 2003.

73, Rich, W2VU

Our Readers Say

QRP Safety Concerns

Editor, *CQ:*

I think Dave, K4TWJ, needs to do a bit more research for his articles. In his August "QRP" column, page 60, he talks about converting an AC-DC table radio from the '50s for use as a ham transceiver. First, AC-DC sets do not have isolated power supplies. This can create a real safety hazard, as one side of the power line can be connected to the chassis. A much better choice would be an "AC only" set, using something like a 5Y3 or 6X4 rectifier tube.

Secondly, AM table radios *never* had 12AX7 tubes in them. The standard lineup was a 12BE6 converter, 12BA6 IF amp, 12AV6 detector/audio pre-amp, 50C5 audio output, and 35W4 rectifier. The 12AX7 was used as a pre-amp in "hi-fi" sets in the '50s, and also as a microphone amp in AM ham transmitters.

Lest I sound too critical, I must say I read Dave's columns with great enthusiasm and enjoy most of his stimulating ideas. I hope that *CQ* will continue running articles on QRP and vintage radios, as these kinds of projects can actually be constructed by beginning and experienced hams. We can get to experience a part of the hobby that goes beyond plugging in our microprocessor-controlled behemoth transceivers or logging on to the internet with our "appliance" computers. Ham radio has many facets, but the core values have always been centered on experimenting and learning. We can learn from the past, so keep up the "nostalgia" articles, and we can "learn by doing," so keep up the basic construction and QRP articles.

73, Rich, W3HWJ

National Hurricane Center

Bob, WA3PZO:

I just received my CQ magazine and read the article on the National Hurricane Center (September "Public Service" column). It is the best and most comprehensive article I have seen yet about what we do at NHC before and during hurricanes. The article really covers many aspects of NHC Public Service duties, from our history to the latest hurricane we operated.

Thanks again.

73, Julio Ripoll, WD4JR
W4EHW Assistant Coordinator

Computer Programming

Don, N2IRZ:

Greetings! Just wanted to say that I really enjoyed your "Computers and Internet" column regarding programming in the September issue of *CQ*. Before I got interseted in amateur radio, I was into writing code, and your column brought back a lot of memories. I also learned something new—namely, how easy it would be to play with PICs and Basic Stamps, which is something I've been curious about for a while.

Anyway, even though it might be a little "off-topic" (or not), I would enjoy further discussions about computer programming in future columns.

73, Art, AB4RL

Cortlandt Street Remembered

Editor, *CQ:*

When I first got started in ham radio, my father, W2BON (later W6CRX), took me to Cortlandt Street. It was an amazing place, especially to a young boy. I recall picking up a random piece of electronic surplus and asking the store owner what it was. "That's an epis," he said. I replied, "What's an epis?" As my father looked on with a broad grin, the owner told me, "It's an epis, because if I knew what it was, I'd have to charge you more."

Thanks for the reprise of the wonderful Cortlandt Street article ("A Look Back in TIme," September *CQ*, p. 26).

Steve Lawrence, WB6RSE

Announcements

NWS/ARRL SKYWARN Recognition Day: Members of SKYWARN will sign **K2U** from the New York City NWS Region Office in Upton, New York from 0000–2400Z Dec. 7, SSB 80–10 meters in the General portion of the bands. Color QSL for SASE to: K2U, P.O. Box 1356, West Babylon, NY 11704.

N1CC Special Event: N1CC (Number One Christmas Carol) will be on from Hickory Creek, Texas, 0000Z Dec. 24 to 2359Z Dec. 25 on 28.475, 21.395, 14.285, and 7.240 MHz. Actual times posted at <http://users.aol.com/N1CC/n1cc0.htm>. For QSL send SASE to Jim LaPorta, N1CC, 147 Shasta Drive, Hickory Creek, TX 75065.

W2W Pearl Harbor Commemoration: The Historical Electronics Museum ARC (W3GR) will be on from Baltimore, Maryland, Dec. 7 & 8 from 1400–2200Z in the General portion of the HF bands, SSB and CW; Navy TBL-13 on 40 meters CW. Send a large SASE for certificate and QSL, small SASE for card only. QSL to: HEMARC W2W, P.O. Box 746, MS 4015, Baltimore, MD 21203. (info <w3gr@arrl.net>).

WX3MAS: Season's Greetings from Bethlehem-Nazareth, Pennsylvania, Christmas City ARC and Delaware-Lehigh ARC; 1400Z Dec. 14 to 0200Z Dec. 15, and 1400Z Dec. 15 to 0200Z Dec. 16 on 3.970, 7.270, 14.265, 21.365, 28.465. For certificate send QSL and 9×12 SASE to CCARC/DLARC WXMAS, Greystone Bldg., Gracedale Complex, RR 8, Nazareth, PA 18064-9211.

KC5OUR Christmas Celebration: The Valencia County ARA, KC5OUR, will celebrate Christmas from Bethlehem, New Mexico, 1400Z Dec.18 to 2300Z Dec. 26 on 7.270, 14.270, 21.370, 28.370 MHz. For QSL send SASE to VCARA, P.O. Box 268, Peralta, NM 87042.

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Radio and the human voice are inextricably intertwined, but that wasn't always the case. W8QYR takes us back to the days of yesteryear, when hearing a voice on your radio, especially on the ham bands, was something new and different.

Giving Radio Its Voice

Creating Radiotelephony

BY RONALD R. THOMAS,* W8QYR

Today hams take radio*telephony* (phone communications) for granted. However, radiotelephony for hams only became widespread in the 1950s, even though radio*telegraphy* (Morse code communications) came into existence in the early 1900s. The evolution of radiotelephony and its ultimate widespread use by hams has a long and interesting history.

The Early Years

The first radiotelegraphy communications utilized spark transmitters. Imagine connecting an antenna to a spark plug in an automobile when the engine is operating, and you have a rough idea of what spark transmissions were like. Spark was electrically dirty, noisy, and crude, but it worked, and it was king of the hill for many years.

Unlike today's modern transmitters which generate continuous amplitude waves (CW), spark transmitters generated *damped waves*. The amplitude of these waves rose and fell with the energy of the spark and died out as it is radiated into space. Spark worked for radiotelegraphy, and some crude attempts were made to utilize it for radiotelephony, but this was like trying to drive a car down a rutted cow path at 90 miles an hour; it was very ineffective, because a spark signal is just not a suitable carrier for the human voice.

Engineers quickly realized that voice communications need a continuous wave as a transmission medium. In the early 1900s, the radio alternator was created as a source of continuous waves for commercial applications. This electromechanical device rotated at speeds high enough to generate low-frequency, continuous waves that could be used for radiotelegraphy and radiotelephony.

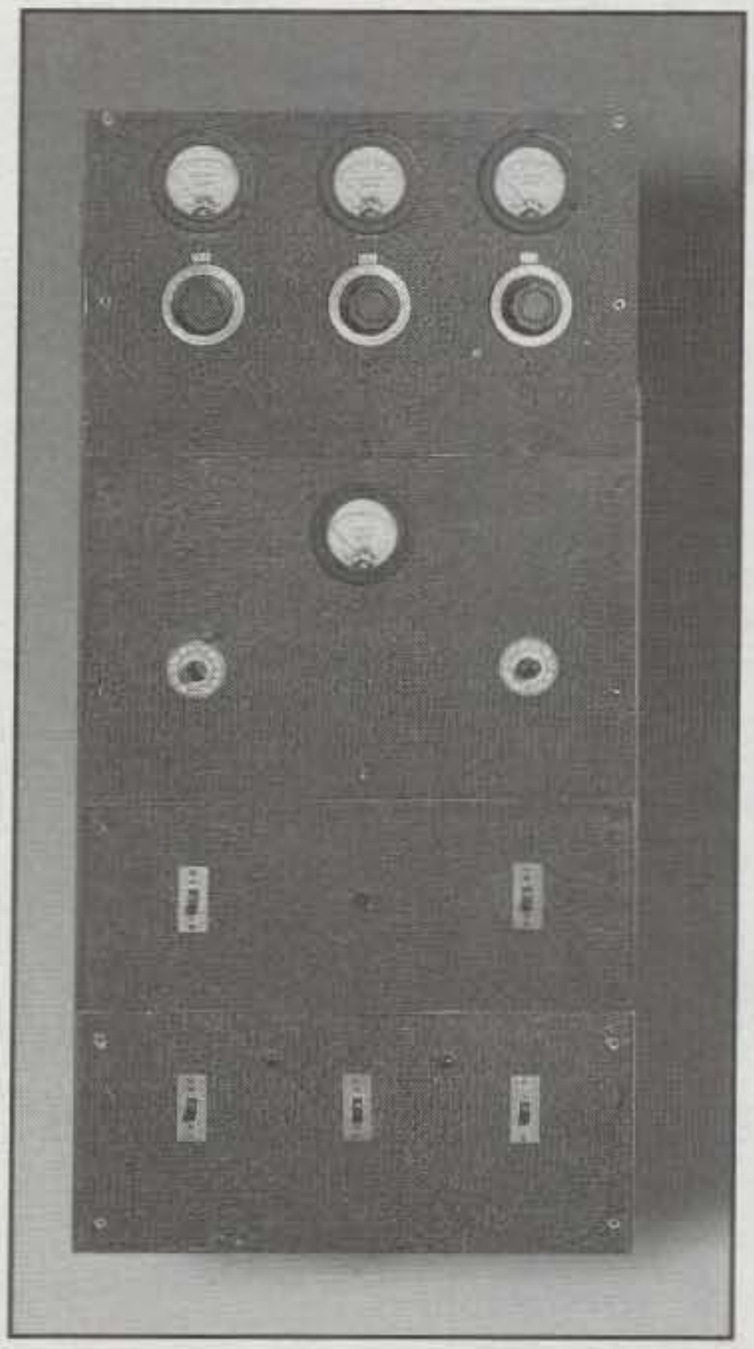
Even though the radio alternator worked for radiotelephony, there was a rather limited commercial need for voice communications. Therefore, the radio alternator was used primarily as an alternative to spark for commercial radiotelegraphy.

Also, in the early 1900s the arc transmitter was created as another means for generating continuous waves. While it was suitable for radiotelephony, it served primarily as a competitor to the radio alternator in commercial radiotelegraph operations.

The high cost of radio alternators and arc transmitters made them prohibitive for use by hams. It was the invention of the vacuum tube, and its use in generating continuous waves in the 1910s, that finally offered hams the possibility of affordable radiotelephony.

By the 1920s hams were actively experimenting with vacuum-tube transmitters and radiotelephony. They quickly realized that compared to radiotelegraphy, voice communications required complex and more powerful transmitters and the associated modulating equipment.

By the 1930s amateur radio subbands had been established for voice communications. However, only a relatively small number (perhaps 25 percent) of hams were using voice communications. In these early days, the gold standard for amateur voice communications was probably a transmitter with an input power of 300 watts, utilizing a 150 watt class B plate amplitude modulator (AM). The transmitter required a number of tubes to increase the power to 300 watts, and the modulator also needed a number of tubes to produce 150 watts of modulation. In addition, it required a large and expensive modulation transformer, plus both the transmitter and the modulator needed large and expensive power supplies that would have separate transformers for the tube filaments and the high-voltage sections. Filter chokes for each power supply further increased the cost.



Early voice rigs, such as this 1930s-vintage 150-watt AM transmitter, were homebuilt (by necessity), but even so, parts were expensive and the country was in a depression, so few hams got on phone prior to World War II. (Photos by CQ Special Projects Photographer Joe Veras, N4QB)

*6415 Chastain Drive NE, Atlanta, GA 30342

The affordably priced Heathkit DX-100 transmitter helped popularize AM phone among hams in the 1950s.

These rigs, with class B modulation, had excellent audio quality. Unfortunately, the equipment was physically large and costly for any ham to build and own. In the midst of the Great Depression of the 1930s, very few hams could afford them.

Alternative forms of modulation were developed to decrease the cost of radiotelephony. They typically utilized some form of grid modulation that needed no expensive modulation transformer and required a much smaller power supply. Unfortunately, these modulation systems were not very effective. Rather than using these relatively ineffective methods of voice communications, most hams preferred to stick with radiotelegraphy.

In the early 1940s amateur radio communications ceased because of World War II. After the war hams picked up where they had left off in the 1930s. However, by the late 1940s and the early 1950s things began to change.

The 1950s and Later

For most, but not all, Americans the 1950s saw a return of economic prosperity. Gradually more hams could afford the expense of radiotelephony, or *phone* communications as it had come to be known. In addition, the creation of the

Heath also helped lead the transition from AM to SSB in the 1960s and '70s with the HW-100 transceiver and its successor, the HW-101, shown here.

Novice class license brought in a whole new generation of hams who upgraded to General class and phone operations on the high-frequency (HF) bands. Unfortunately, they quickly realized that their low-powered Novice rigs couldn't compete on the HF voice bands.

In the 1950s there was an obvious need for a reasonably priced rig that had effective modulation and the power needed for HF phone communications. For many hams, the Heathkit DX-100 transmitter came to fill that need. It offered an *output* power in excess of 100 watts for voice operations, utilized class-B plate-amplitude modulation (AM), had a self-contained VFO, and was priced at less than $200. Once these transmitters began to go on the air, the HF phone bands soon became very crowded.

The very-high-frequency (VHF) bands, however, were still interference-free. In fact, unless you lived in a major metropolitan area, it was difficult to find anyone to talk with on the VHF bands. Some Novice class hams were utilizing their 2-meter voice privileges, though, and the introduction of the Technician class license helped to increase activity on the VHF bands.

The VHF transmitters of that era used amplitude modulation and were mostly homebuilt. Because of the lack of atmospheric interference and competition from other hams, these rigs could have relatively low power and still be effective, although a beam antenna was usually needed to communicate more than a few miles.

By the 1960s the popularity of AM phone operations on the HF bands had created a real interference problem. An AM voice signal requires a carrier and two sidebands and takes up a lot of spectrum, compared to a Morse code signal. Gradually, phone operations on the HF bands moved from AM to single side band (SSB).

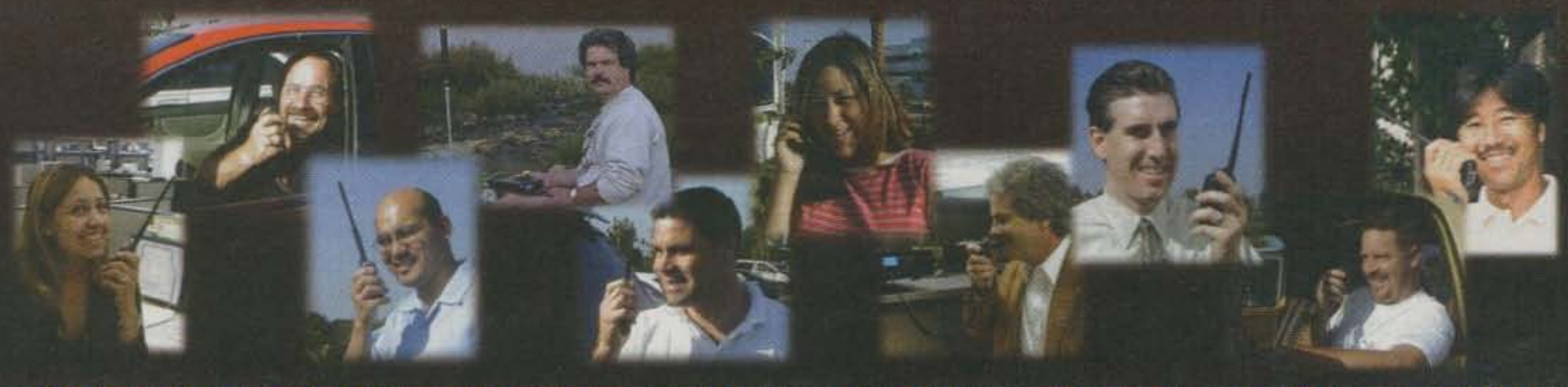
SSB theory was understood in the 1930s. However, it wasn't until around the 1960s that the technology became affordable to hams. Again, the Heath Company played a significant role in the transition to SSB, with the introduction of the HW-100 transceiver. It had 180 watts of power, contained the transmitter and receiver, and was priced at less than $300. The switch to SSB helped to make amateur HF phone operations more enjoyable. SSB also helped to make mobile operations more of a practical reality.

During the 1950s some hams had HF vacuum-tube mobile rigs. The typical one probably ran 50 watts of power into a rather inefficient mobile antenna. It was difficult to be heard with these rigs on the HF phone bands. Also, they created a tremendous power drain on the 6 volt automotive electrical systems of that era. In the 1960s the introduction of SSB rigs such as the Heathkit HW-100 made HF mobile operation much more successful.

Also in the 1960s repeaters were placed in service on the VHF bands. Repeaters prompted a move from amplitude modulation to frequency modulation (FM) and brought the VHF bands to life. The introduction of small hand-held rigs in the 1970s made VHF FM operations even more popular.

Hams who were not active in the 1950s and '60s may have a difficult time appreciating the tremendous impact of repeaters on VHF operations. Small FM rigs have now made mobile operation a practical reality for every ham. Even diehard HF operators eventually seem to end up owning a VHF/FM rig.

The 1980s and '90s saw an increase in the transition to phone operations, which today is simply taken for granted. However, while enjoying the fun of phone operations, it is worth remembering that amateur radio's roots are in radiotelegraphy, and it took a lot of hard work to make phone operations widely available to every ham. ■



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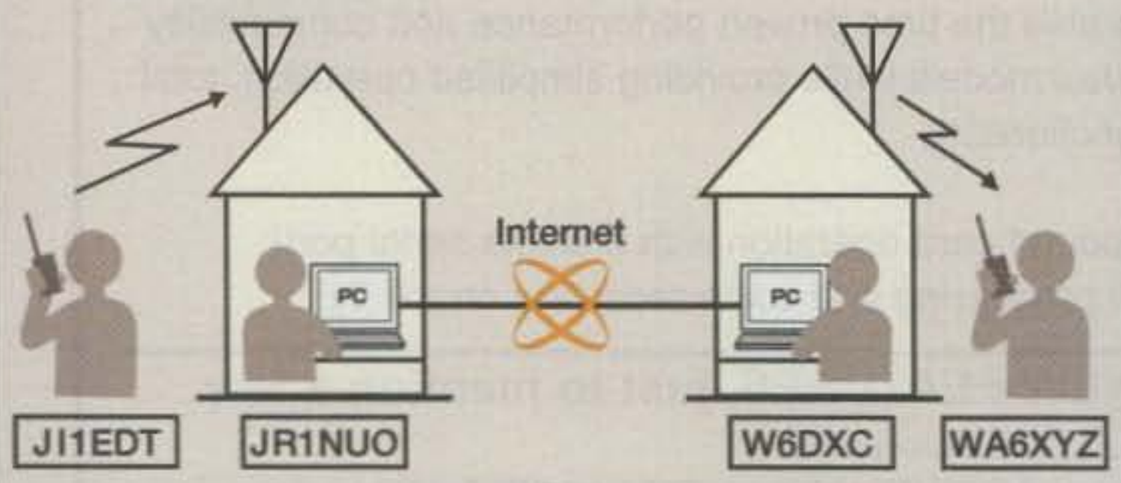

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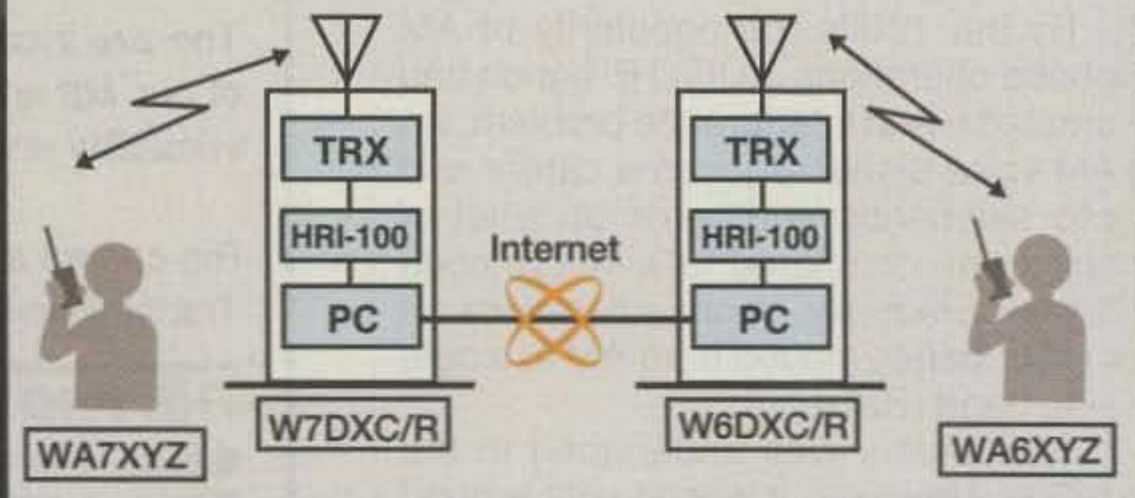

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Before there were dits and dahs, there were clicks and clunks—and "Cootie Keys." W6BNB takes us back to the earliest days of Morse Code communications, explains the origin of the term "break," and shows us how to build a Cootie key of our own.

Telegraphy and the Double-Speed Key

BY BOB SHRADER,* W6BNB

In the early days of communicating by electrical means, the mid-1800s, and long before amateur radio, all telegraphic communications were by "land-line" Morse circuits. Many of these circuits were between railroad stations. Their telegraphers used the variously termed *hand, straight,* or *Morse* key. This key required a down-up pumping of the fingers and hand to pound out the old-time American or Continental Morse Code, which differs considerably from the way we use the modern International Morse Code. Receiving American Morse was accomplished by listening to the click-ety-clunk of an electromagnetic *sounder* shown in fig. 1. No tones were heard.

Telegraph sounders were somewhat similar to modern electromagnetic relays, except that they had only one up-down moving, light-metal sounding arm, perhaps 1/4" × 5/16" × 3 1/4" in size, instead of up-down moving electrical contacts. Attached to the non-magnetic arm was a small piece of soft-iron (will not retain magnetism, whereas steel will). When the sending key was closed, the electromagnet coil was energized, attracting the iron piece and bringing the arm down hard against a solid part of the sounder. This produced a loud "click" sound. When the key opened, the bar went back up by spring action, but because the spring was not as strong as the magnetic pull, it produced a softer "clunk" sound.

A "dot" ("dit" sound to us) was made by closing the key and opening it an instant later. All the operators heard it as a "*click*-clunk" sound. A "dash" ("dah" to us) was made by holding the key down three times as long and was heard as a "*click*---clunk" sound. When the letter A was sent, a dot followed by a dash ("didah"), it was heard as "*click*-clunk-*click*---clunk." Notice the statement "all the operators" heard the sounders. This is because all of the sounders in all of the stations on that railroad line were connected in series using a common single, usually iron, wire with a ground connection at each end of the line as the return circuit (fig. 2). For diagrammatic clarity, all keys and switches are shown open. Actually, when a telegraph line was put into operation, all of the switches were

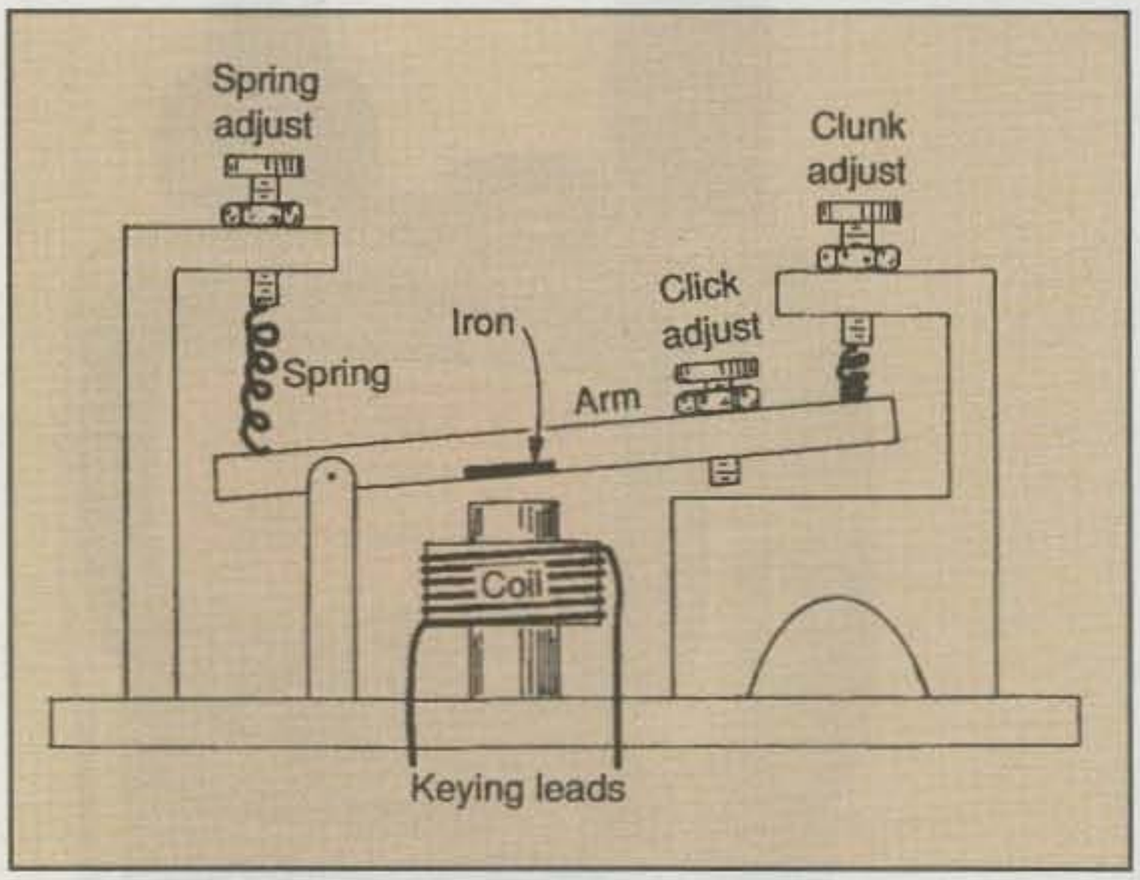

Fig. 1– Essentials of a telegraph sounder.

in a closed position, resulting in a current of perhaps 0.05 amperes through all of the sounder coils. If any telegrapher opened his switch, all sounders along the line clunked open.

The simplified basic circuit shown is for three stations: "Alpha," "Bravo," and "Charlie." Actually, in a railroad system

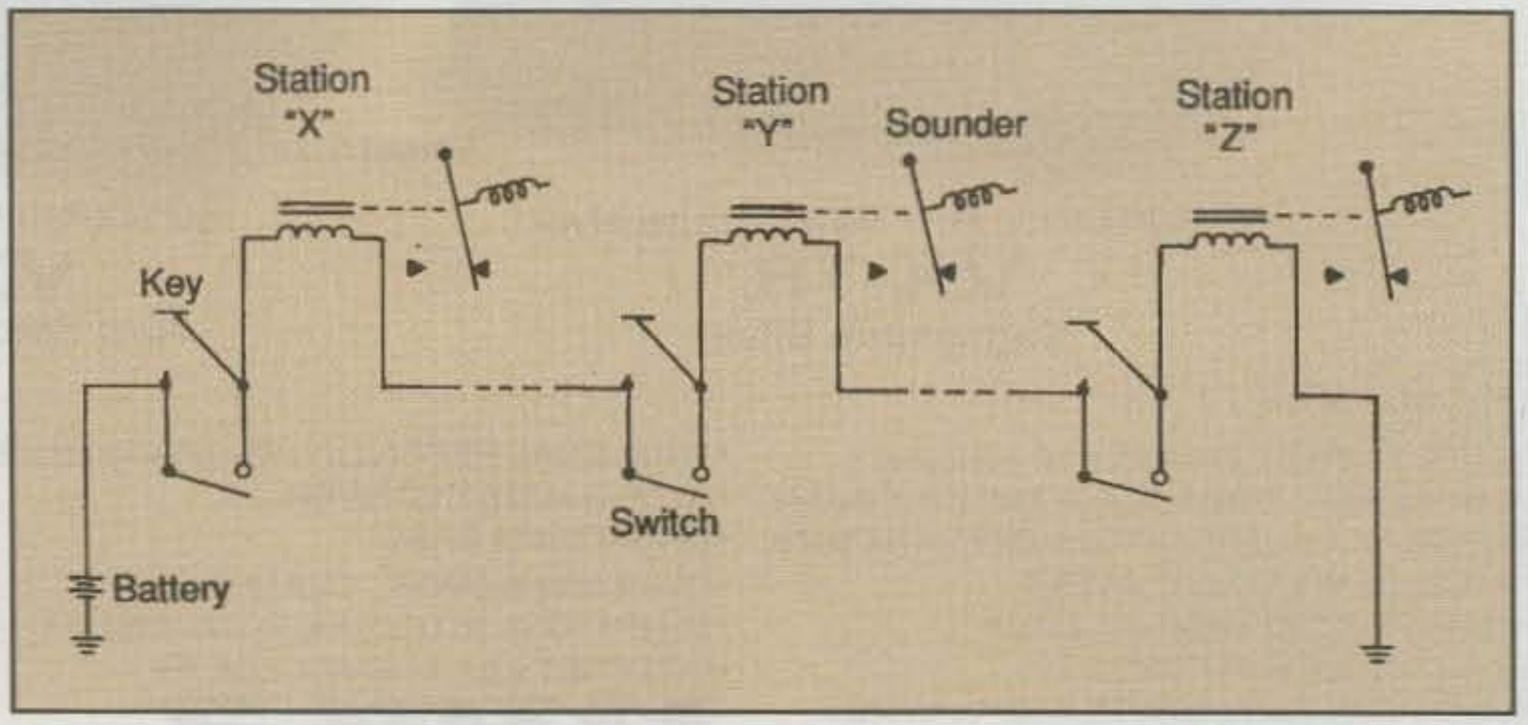

Fig. 2– Basic circuit for a three-station telegraph system.

*e-mail: <w6bnb@aol.com>

there would be many telegraph offices all connected in series, with one or more batteries somewhere in the circuit to provide the required current to operate all of the series-connected sounders. With perhaps 140 ohms in one of the sounder coils and 0.05 amperes to flow through it, the required battery voltage would be about 7 volts. The total line battery voltage for three stations would have to be three times 7 volts, or at least 21 volts in our simplified circuit. If each station used a 7 volt battery of its own in series with the line, no high-voltage batteries were required.

The Morse Telegraph Key

A Morse telegraph key consists not only of the key itself, but also a shorting switch attached to the right-hand side of it to provide a means of leaving that key's contacts shorted (fig. 3). Actually, in the very early days separate switches were used. The finger knob was flat-topped and about an inch in diameter.

Later keys made for "wireless" or radio transmissions might not have a shorting switch, although one is handy when tuning a transmitter or antenna, rather than placing a book on the key knob.

Sending and Receiving

Suppose the operator at station Alpha had a message for station Bravo. When the Alpha operator opened his shorting switch, line current was interrupted and all the sounder arms clunked up along the circuit. When the Alpha operator sent station Bravo's callsign, all of the sounders along the line *clickety*-clunked the callsign. After calling, Alpha closed his key switch, or held his key closed. If Bravo recognized his call, he opened his switch and indicated he was ready, and then closed his switch again. Only the operator at station Bravo bothered to copy the message that followed. All other operators resumed their normal railroad office business while their sounders rattled on.

When station Alpha finished sending his message, he closed his switch and listened for an acknowledgment. Station Bravo opened his shorting switch, sent an acknowledgment that the message was received, and closed his switch again.

Sometimes in the middle of a message the operator at Bravo may have missed a word. All he had to do was open his shorting switch to break the continuity of the line, stopping all sounders. This told station Alpha that station Bravo was "breaking" him (a term we still use today on CW, and even on phone). The Alpha operator stopped trying to send and closed his shorting switch, or held down his key. Station Bravo advised Alpha the reason for the break and then closed his shorting switch. Alpha sent the requested information and continued with the remainder of the message. After an acknowledgment, both stations closed their shorting switches and all circuit sounders *clicked* down again.

Fig. 3– Morse key with switch.

The Actual Circuit

The simple sounder circuit described above worked well enough for a few stations, but the current in longer lines tended to vary in strength due to variation of the resistance in the line wire, plus the ground conductivity change during different hot and cold or wet and dry weather conditions. If the current was too low, the click and the clunk tended to sound the same, or perhaps even were reversed. This was corrected by connecting sensitive, many-turn-coil relays in place of the sounders. The relays operated adequately over a relatively wide variation of current values, perhaps 15 to 40 mA of line current. When messages were being sent, the sensitive relay's contacts closed and opened a local battery and sounder circuit (fig. 4). Now the loudness of the sounder depended only on the current supplied by the local station's sounder circuit battery, not on any possibly varying current strengths in the main line. If a 7 volt line battery was used at each station, it could also be used as the local sounder battery. The batteries were usually three or four old-time vitriolic-type wet cells that required cleaning and refilling every day or every few days by the telegraphers.

Since telegraph lines were on poles high above the ground, they were efficient at collecting lightning-induced static voltages. To prevent such voltages from damaging the telegraph instruments, small lightning arrestors were added to both the incoming and outgoing line wires. These consisted of grounded, sharp-pointed machine screws (the two grounded arrowheads in the diagram) brought close to the line wires. High induced voltages on the line sparked across the tiny gap to ground, producing very little voltage across the sounder or relay.

A Better Key?

As anyone who has ever operated a straight key knows, after a short time the sender's hand and arm begin to tire. It can be imagined that during some of the many hours during which no messages were being handled, one of those early-day telegraphers, like one of our early-day experimenting radio hams, decided to try to develop an easier-to-operate key. He might first have tried rotating his Morse key 90 degrees to see if it would be easier on his hand and arm to push his finger horizontally instead of vertically. He found it was. It also allowed his hand and arm to rest on the desktop while sending. A next step might have been to fasten two keys together, base to base, as the author has done, and mount them on the table with their bases standing vertically. Now, pushes with either finger or thumb could make dots or dashes. By making a dot with the finger, then with the thumb, and then with the finger again, the three-dot letter S was produced. That was easy. No more up and down pumping of the hand and arm! Here is a key that was easy to operate. Not only

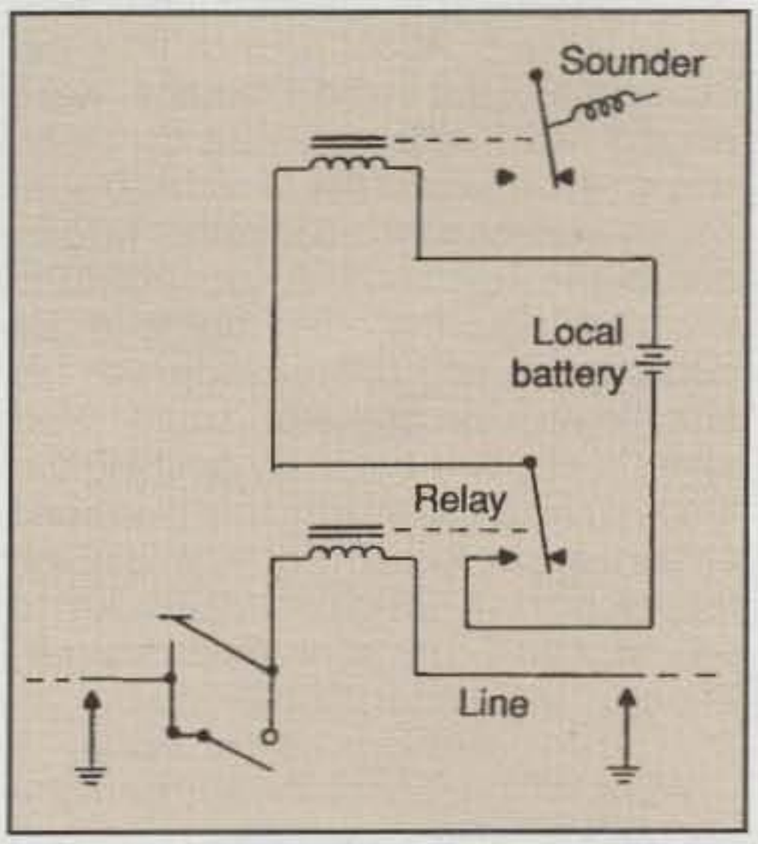

Fig. 4– Sounder circuit using an inline relay.

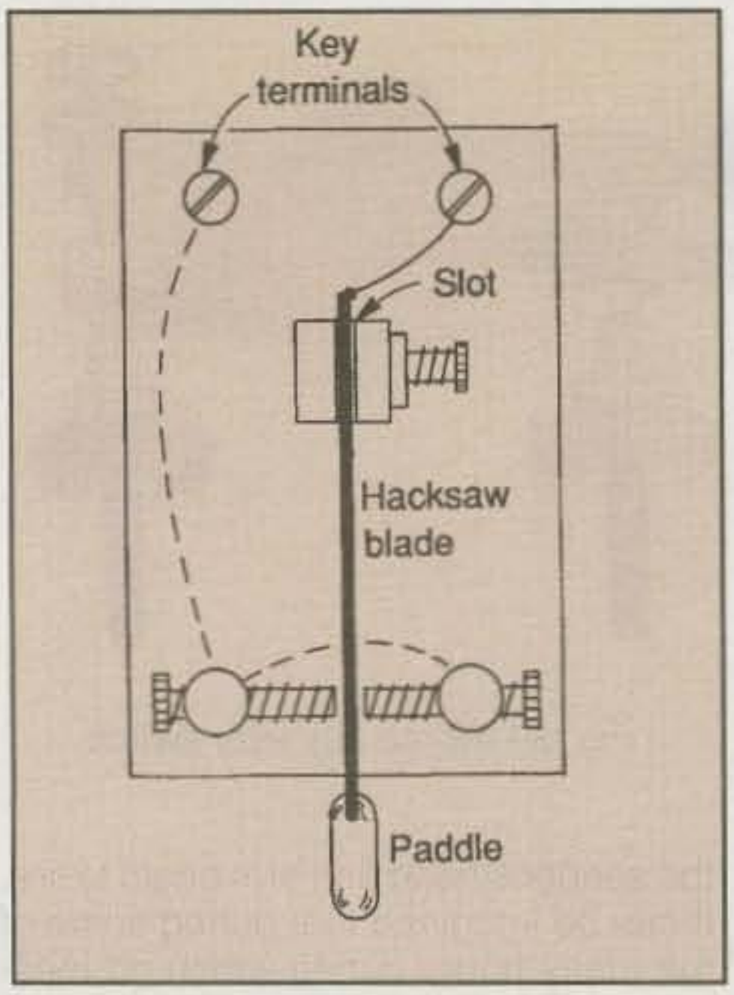

Fig. 5- Hacksaw cootie key.

was it easier to send with, it resulted in faster sending! That is why it was first known as a "double-speed" key. Apparently, no authentic history of how or by whom this key was first developed is known for sure. It even might have been developed by or named for an operator named *Cootie*. Today the key is probably best known as a *sideswiper,* another name given to it back in the 1880s.

Simplifying the Key

Rather than using two telegraph keys base-to-base, a much simpler key was produced by using a short piece of spring steel, perhaps a piece of hacksaw blade about 4 inches long. One end of this blade was fastened to a fixed, upright metal member, mounted on a solid base piece, with the free end of the blade projecting out toward the operator as in fig. 5. About an inch from the front edge of the vertical member were placed two fixed, insulated contacts, one on each side of the movable blade. These were connected together to form one of the key leads. A connection to the blade was the other key lead. By pushing one end of the blade with his first finger, an operator could send either a dot or a dash. By pushing the blade with his thumb he could also send either a dot or a dash. For example, the letter K is dash-dot-dash ("dahdidah" to us). It could be sent thumb-finger-thumb, or finger-thumb-finger, as *click*...clunk *click*-clunk *click*...clunk.

While in high school, the author made such a key using a wooden base with two wood screws as the fixed contacts, using a common lead from the two screws and one from the hacksaw blade as the two key leads. Crude, but it sent faster and easier than a hand key did.

Operating with Morse Code

To add to the complexity of telegraphing, the old American Morse Code was used. It had not only the normal dots and dashes we know, but it also spaced-out characters. To send the two letters EI, which in both codes is a dot and then two dots (dit didit to us), an operator would send it as *click*-clunk...*click*-clunk *click*-clunk. However, the Morse letter R is spaced out and is sent "dit—didit" for us. The two letters IE are sent as "didit-dit." The spaced-out Morse letter C is sent as "didit..dit." The Morse letter I is "didit," but O is "dit..dit." T is a normal dash, but L is a long dash. The letter Z was sent "dididit—dit." Obviously, a good sense of timing is helpful in sending and receiving any telegraphic code. Could this be why musically inclined people seem to learn CW more easily?

Cootie Keys

In 1888 the J. H. Bunnell Company began producing and selling double-speed keys, including a shorting switch on their right side (fig. 6). They were essentially the same as the hacksaw-blade key above, except that the part of the thin spring attached to the arm that went into the slotted upright piece was made adjustable in length to control its tightness and thereby the "feel" of the sending. Operators also referred to such keys as *sideswipers.* Being light in weight, these keys usually were made to be screwed down or bolted to the operating tabletop.

When and why the double-speed key became known as a *cootie key* is not known for sure. In 1904 the Vibroplex Company came out with its first horizontal-operating "semi-automatic" key. A few years later they added a six-legged bug trademark to it. Did Vibroplex come out with its "bug" to differentiate it from the simpler, horizontally-operated cootie (another kind of bug, a *louse*) type key, or was it the other way around? Did horizontally operated double-speed keys become known as cootie keys to differentiate them from the horizontally operated Vibroplex with its "bug" trademark, or was it that an operator named Cootie won a speed sending competition with a double-speed key? Again, history is not too definite on this subject. In any case, the single-arm sideswiper, or cootie key, can be used to send fairly easily at speeds up to 20 words per minute. Experienced operators can send more than 30 wpm with it. A straight key is usually used to send at 5 to perhaps 20 wpm, although one old-time operator apparently holds the record of sending error-free at 35 wpm for 5 minutes in International Morse Code with one. Since there are more dots in the American Morse Code, operators can send somewhat faster (15 %?) with that code.

Making a Double-Speed Key

These keys are not generally available commercially anymore, but constructing one of the hacksaw-blade keys shown in fig. 5 is an interesting and fairly simple project. A 3" × 4" or larger, 1/2 inch thick, heavy piece of iron should be used as the base if the key is not going to be screwed down to the operating position. A 1/2 inch or larger square metal bar or round rod about an inch high can be slotted with a hacksaw at the top end. The bottom end should be machine-screwed to the base about two thirds of the way toward the back of the base, as illustrated. A 4 inch end piece of a hacksaw blade with a hole in it should have its teeth filed or ground smooth except at the hole end. The end without the hole can be slipped down into the slot in the metal bar or rod and be anchored there with a screw running up against it through a threaded hole. Two adjustable fixed contacts, insulated from the base, should be mounted about 1 1/4 inch forward of the vertical member. They should be about one inch apart, with threaded adjustable contact screws in them as shown. The two contact holders must be insulated from the base and electrically wired together to form one of the key leads. The other key lead is to the blade through the base and the metal vertical member.

Some kind of a wood or plastic finger/thumb paddle about 1" × 2" in height and length, rounded at the corners, possibly 1/4 inch thick, should be slotted to fit on the hole end of the hacksaw blade and bolted there. It might help to glue as well as bolt the paddle to the blade.

Two 1/4 to 3/8 inch thick rubber feet about 3/4 inch in diameter should be cemented or bolted under the base at its two front corners. A third can be fixed to the middle of the back edge of the base. If this, or any type of paddle-operated key, tends to slide on the operating tabletop while being used, a bit of rubber cement on the bottom of the feet will anchor it nicely. Such cement may be removed fairly easily and should leave no marks on the tabletop.

A cootie key can also be made using a wood base, but such a light device

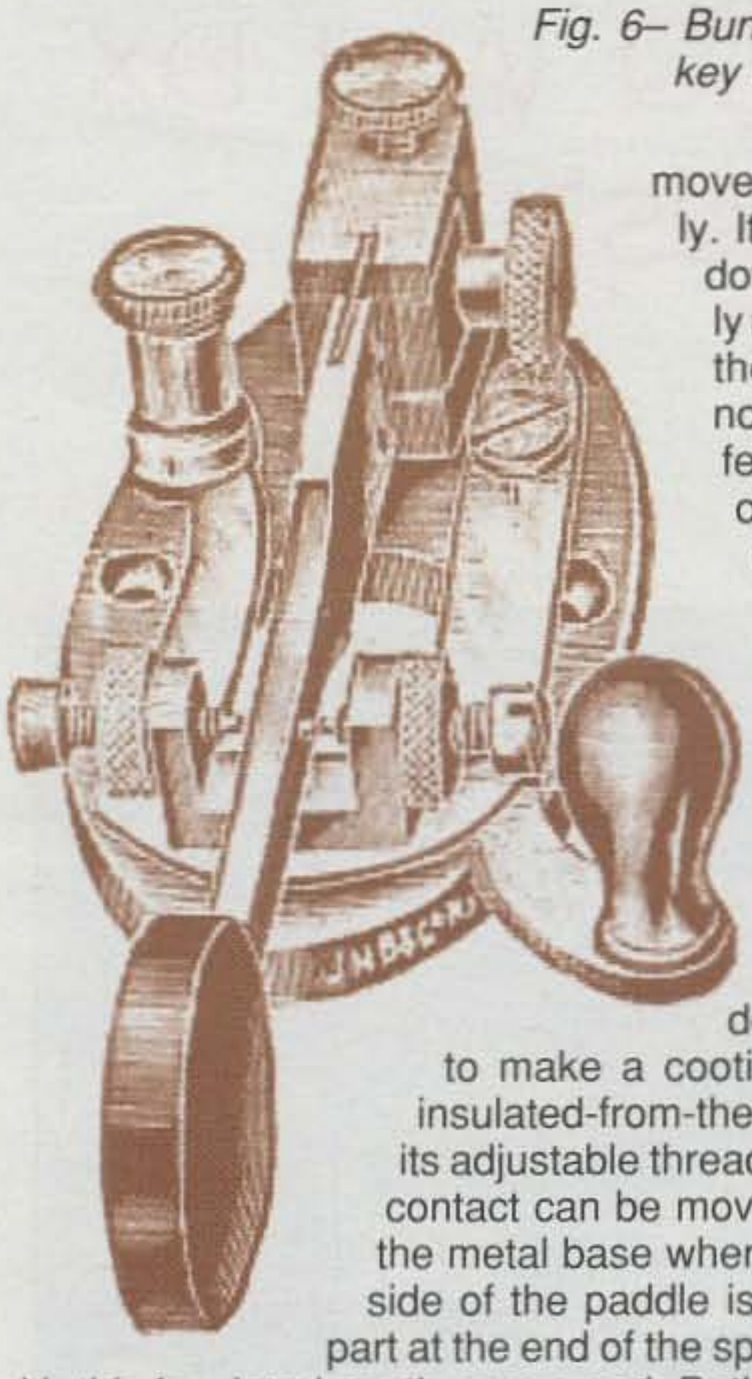

Fig. 6– Bunnell double-speed key with switch.

moves around too easily. It requires screwing down or being liberally rubber cemented to the tabletop. It may not look quite as professional as a metal one, but it should work just as well.

If an old, unusable bug is available, its vibrating weight-holding arm can be sawed off about 1/4 inch past the far end of the main arm's flat spring. (Please don't ruin a good bug to make a cootie key!) The metal insulated-from-the-base dot post with its adjustable threaded machine-screw contact can be moved to a position on the metal base where, when the thumb side of the paddle is pushed, the short part at the end of the spring makes contact with this insulated post's screw end. Both it and the original dash contact must be connected to the ungrounded key lead terminal. The metal base and the movable metal arm form the grounded key terminal.

A bug can be made to operate as a cootie key by fastening the end of the vibrating arm with a tight rubber band to its stop device and then adjusting the dot contact so it just makes contact when the thumb is pushed. Many electronic keyer paddles can be rewired to operate as a cootie key.

Using the Cootie Key

You have a working cootie key. Now comes the most interesting part of all—learning how to operate the thing! If you are a person who enjoys conquering challenges, you will find that learning to send well with a cootie key is a first-rate challenge!

Don't go on the air with it right away. It takes time to teach your finger, thumb, hand, and wrist to make all the newly required timed motions needed to produce good dots and dashes with both thumb and first finger. If you are familiar with operating a bug or keyer it may not be too difficult. Do not use your thumb and first finger alone to do the sending. Let your hand and wrist get into the act by rolling them back and forth when keying. You will tire a lot less if you do it that way. To learn to send with a cootie key using a buzzer, audio oscillator, or sounder, practice the following line until you can send it without error, both forward and backward, making sure to space properly between letters and words. (A dot is the unit of measurement for code letters and words. A dot is one unit. A dash is three units long. The space between dots and dashes is one unit. The space between letters is three units. The space between words is seven units.)

THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS—1234567890

From the beginning of amateur radio, up through the 1930s, double-speed keys were quite popular, especially for many of the faster amateur CW operators who couldn't afford bugs. It is too bad that today many hams have no idea what a double-speed, sideswiper, or cootie key is, let alone how to use one. We are losing too many of the interesting historic phases of amateur radio.

Get in the Swing of Things

Most old-time operators who use bugs, cooties, or hand keys wind up sending CW with a "swing." This is usually produced by making dashes of certain letters a little long or short. For example, they may send the second or last dashes of Q or the first and last dashes of Y a little long—or a little short. It is hard to use any of these keys, particularly a cootie key, without developing a personal keying characteristic with an interesting sounding swing. Essentially all operators have some kind of a CW swing, unless they use machines or electronic keyers. Many operators can be identified by their swing, even before they sign their calls. Of course, hams who rely only on a computer and its screen for copying code may not make perfect-reading copy, but CW operators copying by ear will have no trouble making solid copy of any fairly good cootie key or bug sending, swing or not. That's assuming, of course, that the letters and spacing are reasonably normal. GL! ■

Results of the 2002 CQ WW DX 160 Meter Contests

BY DAVID L. THOMPSON,* K4JRB

Conditions were good for both the CW and SSB weekends of the 2002 CQ WW 160 Meter Contest, with low noise levels on SSB for a change. You can still tell that the sunspot count is high, as contestants ran out of stations to contact on Saturday night and Sunday morning. Looking at the logs, the number of stations working between continents has grown dramatically over the past few years. Even on SSB many contacts were made between Europeans and North America. Modest European stations worked VY2ZMM for their first-ever North America on CW. On SSB a number of DX stations worked W1NA and other U.S. and Canadian stations for their first overseas DX contacts. W1NA worked 52 different countries on SSB, which is the highest count since the 160 Meter SSB Contest was started in 1982.

Most logs were sent in via e-mail, with the majority being in the Cabrillo format. Some hand-written logs came in via fax to the *CQ* offices, and only 14 logs were received on diskette, down from three boxes full just four years ago.

The master CW log contains 5098 calls and the SSB log 4856. This is the second year in a row that CW accounted for more calls. There were 134 countries on CW and 132 on SSB, so the potential for a weekend DXCC remains. The callsign count is probably more accurate than in the past due to eliminating busted calls and the unverified uniques that added calls to the total count in the past.

The number of low-power entries is always amazing, and again this year the number of QRP entries increased dramatically. Just look through the Top 10 box and see the number of low-power stations in the list.

Reminders: There is no Assisted category for the CQ 160 Meter Contests, so please mark your logs Multi-Operator for packet or web spot assists. Multi-Op entries are all considered to be high power, so using low power or QRP gains you nothing! Remember to count DXCC and WAE countries for multipliers. Make sure your country file is updated so your claimed score can be compared to the final adjusted score.

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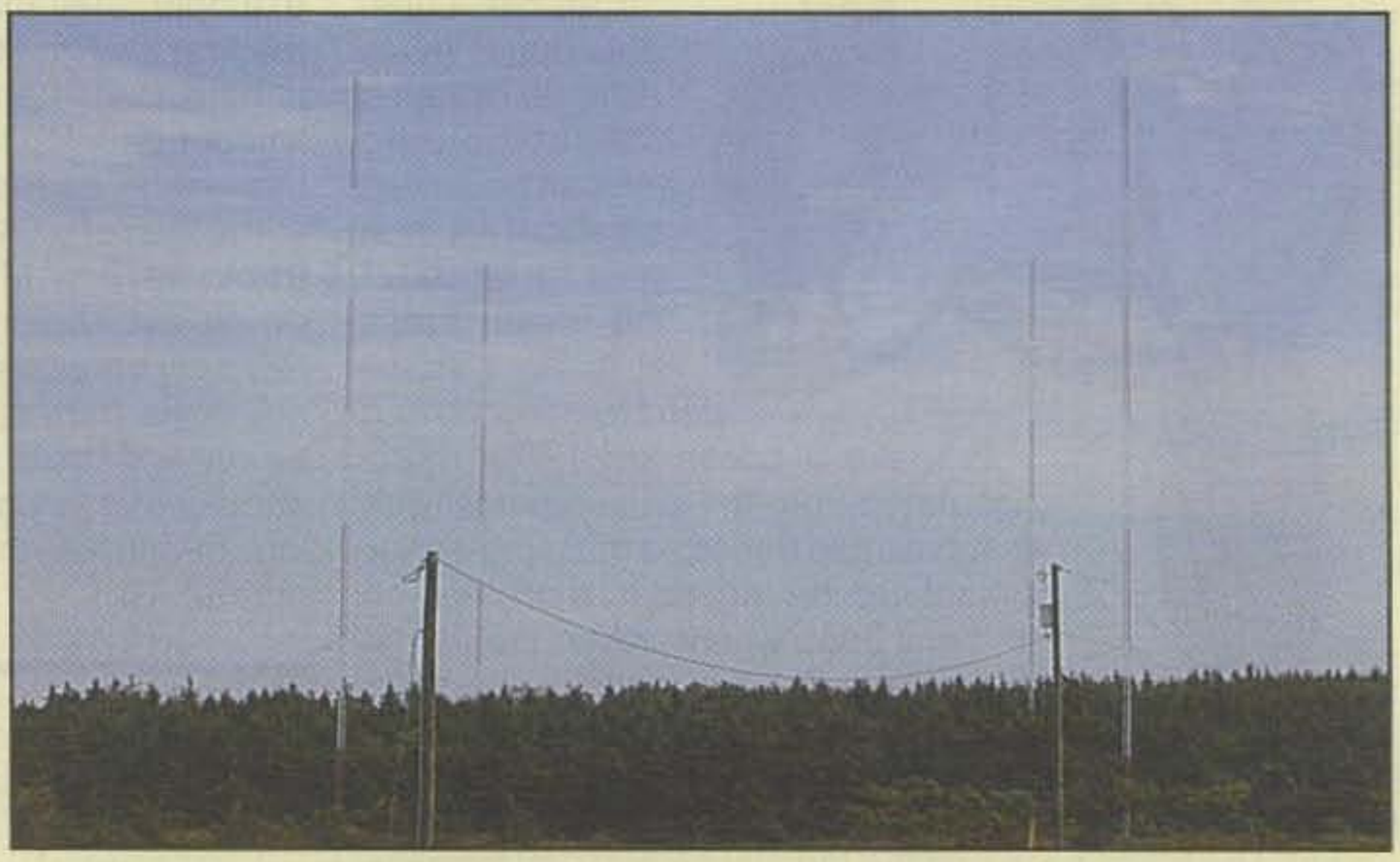
e-mail: <thompson@mindspring.com>



VY2ZMM (ops. K1ZM, K2WI, and WW2Y) was CW world high multi-operator. Shown here is the 160 meter array at VY2ZMM, which consists of two pairs of full-size radiators spaced 1/4 wave apart. The antenna is a WW2Y/K2WI design and produces up to 8 dB of forward gain in multiple directions, depending on the phasing employed. (Photo via K1ZM)

CW

EA8AH operated by OH1MA topped 1 million points and was the World High Single Operator score. ON4UN operating as OT2T was the runner-up with 729K and made the high DX QSO total with 1077. Rounding out the top 5 DX scores were C4A, CT3FN, and ZF2NT. Good to see North America in this group.

W8JI with W4AN at the key (or maybe we should say the "controls") was the top U.S. Single Operator. Bob, W4MYA, placed second on both modes and has to be awarded the iron-man award. Note that four of the top 10 were in Virginia (W4MYA, W4RX, K4ZW, and K4OAQ).

The top Canadian was VA3UZ, and all of the top 5 Canadians resided in Ontario this year. TA3D was the World High Low Power scorer, and SN3E placed first in the QRP category with 110K. WK3I led the USA QRP entries and placed 5th World High. Four of the QRP scores surpassed the winning 2001 QRP score.

K1ZM and crew led VY2ZMM to the World High Multi-Operator score. The score breaks all existing U.S. and Canadian Multi-Operator records. I5JVA was runner-up, and W2GD placed third while leading U.S. entries. It's good to see a mix of old and new calls on the top 10 list. Eleven stations made more than 1000 QSOs, led by W8JI (1318) and VY2ZMM (1234). Only OT2T (ON4UN) made more than 1000 QSOs outside of North America. Hungarian multi-op HGØHQ worked 71 countries to lead all entries. VY2ZMM with 68 led North American stations. OT2T was the top single operator with 69 countries, and John says this was an off year for him. W2GD led U.S. stations with 58 countries, but did not even break the top 25.

Expect conditions to be about the same for the 2003 CW section of the contest as sunspots continue to plateau. Join the fun in the 2003 CW contest, January 25–26. Remember, **both the CW and SSB contests are now 48 hours and start 2 hours later than in previous years. Single operator stations may only operate 30 out of the 48 hours.** Be sure

to send in your log no matter how small your score may be.

SSB

In North America the SSB weekend was quiet compared to the past two years where QRN reigned. W1NA took advantage of this and worked 52 DXCC countries for a new U.S. high. His score is also the World High overall SSB score, topping even the multi-operators. Bob, W4MYA, placed second about 40K behind, with Jerry, WB9Z, nipping at his heels.

SV8CS was the high DX Single Operator with 259K, with low-power entrant TA3J second. TA3J was the world high Low Power entry by over 100K more than runner-up VA3RU. KB1EAX with WA1LNP at the mic was the top U.S. Low Power entry and placed 4th world.

VY2MGY/3 again topped all QRP entries, while Larry, WØETC, switched to QRP on SSB and led U.S. entries while placing second world. S57IIO was the top DX QRP station and placed 4th in the world. Multi-operator entries UU7J and XE1RCS went at it again in 2002, with UU7J turning the tables and coming out as World High. Five stations topped 1000 QSOs in 2002, with Jerry, WB9Z, at 1406 for the top QSO total on either mode. This is long way from his record of over 1700 SSB QSOs. UU7J recorded 1074 QSOs for top DX total. UU7J also had the top country count with 67, beating the next highest by 10 countries! W1NA set a U.S. record, and his 52 countries was also 9th high on SSB which was again dominated by Europeans.

The 2003 SSB weekend is February 22–23. Remember the new 48-hour format and 30-hour single operator limit. This is an excellent opportunity to finish off Worked All States and add a country or two to Top-band DXCC.

Clubs

The Frankford Radio Club (FRC) again regained the top club slot with the difference coming on the VY2ZMM two-third split. The Potomac Valley Radio Club finished second. The biggest jump in club total was the Society of Midwest Contesters, who placed third. The Bavarian Contest Club and the Yankee Clipper Contest Club rounded out the top 5. The top 12 clubs finished with over 1 million points. The club contest is a friendly but competitive portion of the CQ 160 Meter Contests. To enter your club at least three logs must be submitted. Club DXpeditions count, so send out the DX!

The 2003 160 Meter Contests

For the 2003 contests a Cabrillo log must be submitted via e-mail to <cq160@kkn.net>. A Cabrillo log can be created from your logging software. Please name

PLAQUE WINNERS AND DONORS

SINGLE OPERATOR
CW

WORLD BY W4ZV (DJ8WL MEMORIAL): Winner Pekka Kolehmainen, EA8AH (OH1MA Operator)
USA BY K4TEA: Winner Charles T. Rauch, Jr., W8JI (W4AN Operator)
CANADA (TBA): Winner Yuri Onipko, VA3UZ
ZONE 3 BY N5IA: Winner Earl W. Cunningham, K6SE
ZONE 4 BY K4WA: Winner John W. Battin, K9DX
ZONE 5 BY N4XMX: Winner Robert S. Morris, W4MYA
AFRICA (TBA): Winner Hermann Stein, CT3FN (HB9CRV)
ASIA BY K4SX: Winner Ivo Pezer, C4A (5B4ADA)
EUROPE BY K9UWA: Winner John Devoldere, OT2T (ON4UN)
OCEANIA (TBA): Winner Michael Gibson, KH6ND
SOUTH AMERICA BY W4NU (W4UUH Memorial): Winner Andre Cavalcante Sampaio, PY0FF
JAPAN BY W4ZV(JA1XAF Memorial): Winner Masaki Okano, JH4UYB
NORTH AMERICA BY CQ (N4IN Memorial): Winner Bruce B. Sawyer, ZF2NT

SSB

WORLD BY N4NX: Winner Oier L. Lovino, W1NA
USA BY K4JRB: Winner Robert S. Morris, W4MYA
CANADA BY W0ETC: Winner Kenneth Wayne Asmus, VA3KA
ZONE 3 BY N4TMW: Winner Robert C. Wertz, NF7E
ZONE 4 BY N4PN: Winner Jerry W. Rosalius, WB9Z
ZONE 5 BY K4ODL: Winner Kenneth Ramirez, N4UK
AFRICA BY WB4ZNH: Winner Martti Laine, EA8BH (OH2BH)
ASIA BY NT4TT/AH2BE: Winner Berkin Aydogmus, TA3J
EUROPE BY K4EA: Winner Spiros Thomas Chimarios, SV8CS
SOUTH AMERICA (TBA): Winner Cedric J. Puchalski, YV1CP
NORTH AMERICA BY CQ (K2EEK Memorial): Winner Alex Aimette, V47KP (W2OX)

MULTI-OPERATOR
CW

WORLD BY N4RJ: Winner Jeffrey T. Briggs, VY2ZMM (K1ZM)
USA BY W8UVZ & K8GG: Winner John M. Crovelli, W2GD
Zone 3 BY 4X4NJ: Winner Jim Wilson, N7JW

SSB

WORLD BY SOUTHEASTERN DX CLUB: Winner Radio Club UU7J
USA BY WB9Z: Winner Peter F. Michaelis, N8TR
Zone 3 BY 4X4NJ: Winner Jacks Peak Amateur Radio Association, N7GP

the contest on your Cabrillo file CQ-160-CW or CQ-160-SSB. Any other name is incorrect! Leave the duplicates in your log, as they do not cause penalties and could cost you a multiplier. Hand-written logs (an electronic log may be requested by the Contest Committee) and logs on disk are still accepted.

2001 Contest Corrections

VE3FU was left out of the Ontario CW listing. His score was 209,050 with 564 QSOs, 54 USA/VE multsr, and 20 DXCC mults in the Low Power category. **W1AA** was actually a Multi-Op entry from MA, with K1VV + packet as operators. WA1LNP was the operator at **KB1EAX.** The operators at **KC1XX** were K1GQ, KM3T, and W1FV. **K9RB** was the Low Power winner for Florida on CW. **AA1SU** was actually a Low Power entry from Vermont, not Rhode Island; he is the overall and Low Power winner for Vermont. The operators at CW Multi-Op entry **K2NG** were K2NG and NO2R. **AB7RW** was a Single Operator entry from Washington, not Multi-Operator. On SSB A3J was **TA3J** (the Low Power World High scorer). **AF7E** was the QRP winner for Wyoming, not Washington.

Thanks to the eagle eye of K1KI for catching some of these corrections.

The dates for the 2003 CQ WW 160 Contests are CW January 25–26 and SSB February 22–23. The contests run from 0000Z the first date to 2359Z the second date **(48 hours; single-operator stations limited to 30 hours of the 48-hour contest period)**. We must hold everyone to our required log-submission deadlines of February 28, 2003 for CW and March 31, 2003 for SSB. The exception is if both are submitted together then the date is March 31, 2003. Logs mailed must bear a postmark no later than the deadline. Again, send logs to CQ 160 Meter Contest, 25 Newbridge Road, Hicksville, NY 11801 or via e-mail to <cq160@kkn.net>. Be sure to mark snail-mail logs CW or SSB. Good luck in the 2003 contests!

73, Dave, K4JRB

CW W/VE QRM

New phased verticals to Europe played nicely...**AA1K**. We tried a Labrador retriever to snag one of the last Canadian provinces...**KØTV**. Operated portable from Topsail Island, NC with a short vertical and had a great weekend...**K4HA**. Very good conditions on Friday night...**K9NR**. Just goofing around. Good to hear some European stations...**N5TW**. Pleasantly surprised at conditions,

TOP 10 SCORES

SINGLE OPERATOR

USA CW		USA SSB	
W8JI	505,620	W1NA	337,610
W4MYA	459,690	W4MYA	298.312
N1EU	280,269	WB9Z	295,391
W3BGN	263,200	N4UK	229,957
W4RX	251,136	W3TS	200,036
K9DX	243,616	ND8DX	177,744
K8DX	242,144	N3HBX	169,760
K4ZW	241,316	K9NR	162,564
K4OAQ	227,395	K4JNY	141,450
W4WA	225,971	W3BGN	130,248

VE (TOP 5)

CW		SSB	
VA3UZ	411,312	VA3KA	314,853
VX3AT	238,710	VE3PN	293,948
VE3PN	236,544	VA3RU	150,280
VA3RU	217,764	VY2MGY/3	57,319
VE3XB	188,240	VE3KP	37,488

QRP (TOP 5)

CW		SSB	
SN3E	110,160	VY2MGY/3	57,319
S57IO	90,933	WØETC	37,128
SP4TKR	85,624	KRØB	32,913
YU1RA	79,380	S57IIO	32,300
WK3I	76,416	W1TW	19,505

DX CW		DX SSB	
EA8AH	1,023,645	SV8CS	259,275
OT2T	729,174	TA3J	255,765
C4A	491,249	V47KP	252,498
CT3FN	490.336	EA8BH	200,304
ZF2NT	430,560	EA6SX	192,816
OZ7YY	387,324	S57M	158,840
S50A	380,712	CU2AF	144,342
DK6WL	355,470	OHØNL	140,766
F6BEE	336,897	LY2FY	137,700
4X3A	334,512	OY9JD	135,240

LOW POWER (TOP 5)

TA3D	331,506	TA3J	255,765
G4VGO	309,987	VA3RU	150,280
9H1ZA	240,316	CU2AF	144,342
VA3RU	217,764	KB1EAX	124,488
F8BPN	196,560	K1PX	114,570

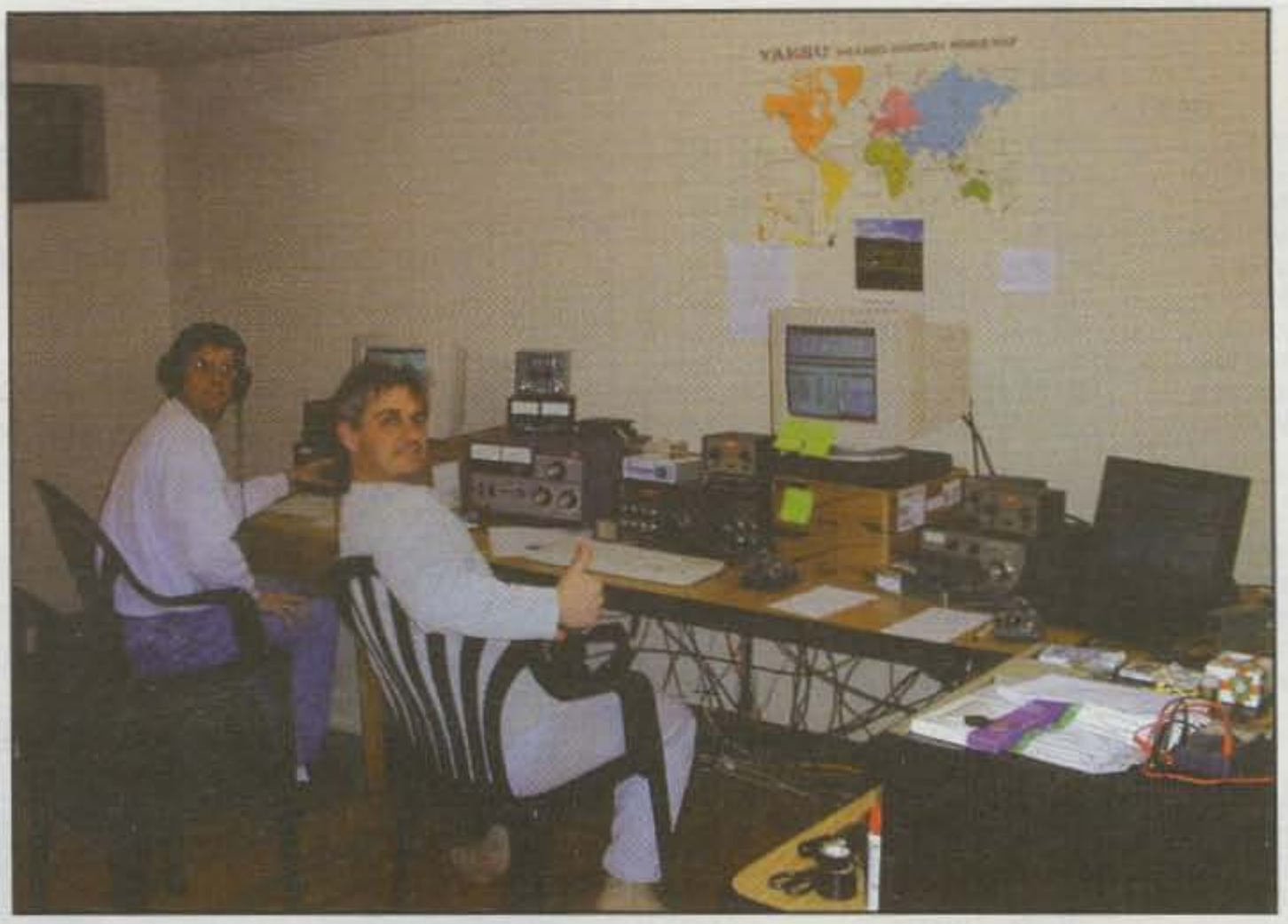
USA LOW POWER (TOP 2)

K7SV	166,415	KB1EAX	162,278

MULTI-OPERATOR

CW (WW)		SSB (WW)	
VY2ZMM	1,099,136	UU7J	306,878
I5JVA	612,439	XE1RCS	299,840
W2GD	544,388	EI7M	235,512
W1FJ	488,840	N8TR	230,760
HGØHQ	417,972	VE3DC	208,256
PA5MW	400,512	HB9FBO	194,580
FY5KE	398,880	4O6A	192,558
9A5Y	389,580	RZ9AYA	178,128
IK2NCJ	381,076	W2MF	154,917
MØABC/P	363,132	G3UEG	163,584

as the season has been miserable to this point...**N9RV**. Conditions were down from last year but we had fun anyway...**W8BAR**. Our group's best effort yet...**VE2OJ**. The new VY2ZMM station played very well and we look forward to next year...**VY2ZMM (K1ZM chief op.)**. Computer crashed so the log is in two pieces...**N7DD**. The first night was much better than the second. Not much luck working into Europe...**N1LN**. Only had a short time to play. Thanks to those who dug out my 5 watts to a K2...**VA7NT**. Wish transceivers made zero beating easier for all. Had lots of instances when the other station was a kHz or more away...**VE3PN**. Nothing heard from the northeast part of the continent this year...**VE7JKZ**. Put up a quickie antenna for the contest in a blizzard. The XYL thinks I finally flipped for sure



The VY2ZMM multi-op station with Peter, WW2Y (left), and Rob, K2WI (right). The third op, K1ZM/VY2ZM, took the photo.

now...**VO1HP**. Great to see other VO stations in the action along with the regulars on 160...**XJ1NA (VO1NA)**.

Only 100 watts and a quarter-wave sloper but still a lot of fun...**AC0W**. Used the contest to check out a new logging program and electronic submission. Had good relaxed fun...**AC9S**. BCI and line noise caused some problems for the weaker signals...**K0UK**. Good test of new shunt-feed system and tower...**K1JT**. Worked more Europe last year...**K1VW**. Just love Top band. One of these days I'll be able to put up an antenna that can actually work DX and W7's...**K4RFK**. Thanks to Lew and Terry for letting me play radio at the K4VX superstation...**K4VX (N9JF op.)**. I doubled my radials to twelve 30 minutes before the contest *(He lives in warm Texas, gang—ed.)*. Worked out well as PV8DX and KH6ND called me...**K5RA**. Nineteen Europeans made it into my log, which is not easy from Texas...**K5RX**. Great conditions to Europe on Saturday night...**K5ZD**. Band was OK until the local broadcast stions went QRO at sunrise. Never got JH4UYB although he was S6 at 1430Z...**K6DGW**. Elecraft K2 running 4.8 watts to a Butternut vertical...**K6III/QRP**. I was excited when I heard EA8ZS come to my frequency. Not quite Europe, but non-JA DX nonetheless...**K6NR**.

Used a balloon-supported quarter-wave vertical over a dry salt-bed lake. The site was extremely quiet. Ran the station on a 4 KW generator. Did have troubles with wind...**K6SE**. After 40 years in the hobby I finally got on for a 160 meter contest...**K7RE**. Can't put up any more wire so I doubled my power...**K8EI**. First major contest from deep, deep southern Colorado. No Europe at all and no Asia either...**K8FC**. Started with low power but finally turned on the amp when my calls went unanswered...**K8IR**. Although conditions were good I learned you need a good receiving antenna as well...**K9HUY**. Conditions seemed to be better this year. Still will be a couple of years before we work Europe from Montana...**KS7T**. The small shielded loop proved its worth in the contest, as I worked BV3/DJ3KR for a new one while others were battling snow static...**N0AX**. Used a 12 foot Outbacker. Nonetheless, 40 QSOs in 3 hours ...**N1CC**. My antenna tuner worked overtime ...**N1DC**. Great conditions, just wish I had more time...**N1RL**.

Why is my biggest TVI problem on Top band?...**N3ND**. Beat my country total by 7 this year (24) and last year was my previous best...**N3UM**. Conditions strange for Florida. No JA's and not as many Europeans...**N4PN**. Ran low power this year with the ARC 5, but receiver (6AC7 and BC453 IF) could be better...**W7DRA**. Not enough DX except for JA from the Pacific NW...**W7GG**. Sure differnet working the contest from the lower Rio Grande Valley...**W9YYG**. Logging program more of a challange than the contest...**WA4AOS**. Worked Italy, Caribbean, and the West Coast with a mobile antenna on a 35 foot mast with one radial... **WA8LCZ**. Five watts to a 73 foot stealth antenna up 40 feet from a fourth-floor apartment near downtown Atlanta. Thanks to AA1K for taking the time to get my call right...**WB6BWZ**. Lost my antenna at 9:30 PM local time Saturday...**WC4H**.

CW DX QRM

Had a lightning strike and repaired everything but the FT-1000D. Borrowed an older FT-902DM but the receiver is inferior to the 1000D so apologies to those who called and I did not hear...**4X3A (4X4NJ)**. Fighting noise for the first three hours spolied the usually good rates. YA5T called me on Sunday...**C4A**. Installed the 26 meter ground plane just three hours before the contest. No time to put up a receiving antenna. Sorry to those who called and I did not copy...**CT3FN (HB9CRV)**. First time in a Top band contest and the CQ 160 CW was a good choice...**EA2LU/p**. Thanks to all for their patience as I learned...**EA6SX**. A lot of fun, but had to stop after 7 hours to participate in the French REF CW Contest...**F8KCF (OM3CGN op.)**. Gales destroyed my 90 foot vertical on Saturday afternoon...**G0CKP**. 100 watts to a Windom at 20 feet. Best results ever on 160...**G0TMN**. QRM from neighbor's TV system absent so able to operate for the first time in years...**G3UFY**. Severe gales meant the tower went from 75 to 45 feet, so not as efficient ...**GU4YOX**. Very happy with results from a TS-440 at 100 watts and a small long wire...**HB9ARF**.

I QSOed all 27 stations I could hear. Sorry the antenna is so bad...**IK2AIT**. Solid North America opening Sunday morning...**IK4AUY**. Propagation was good but low power limited contacts over 1000

Happy Holidays

YAESU

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Portable/Base HF

NEW!

Mark-V FT-1000MP
Mark V Field

FT-8900R
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FT-100D

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FT-2600M

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FT-7100M

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VR-5000

VR-500

VR-120D

Rotators

G-800 DXA/
800SA

Many more models
available

Handhelds

VX-7R(B)

VX-5R

FT-50R

VX-1R

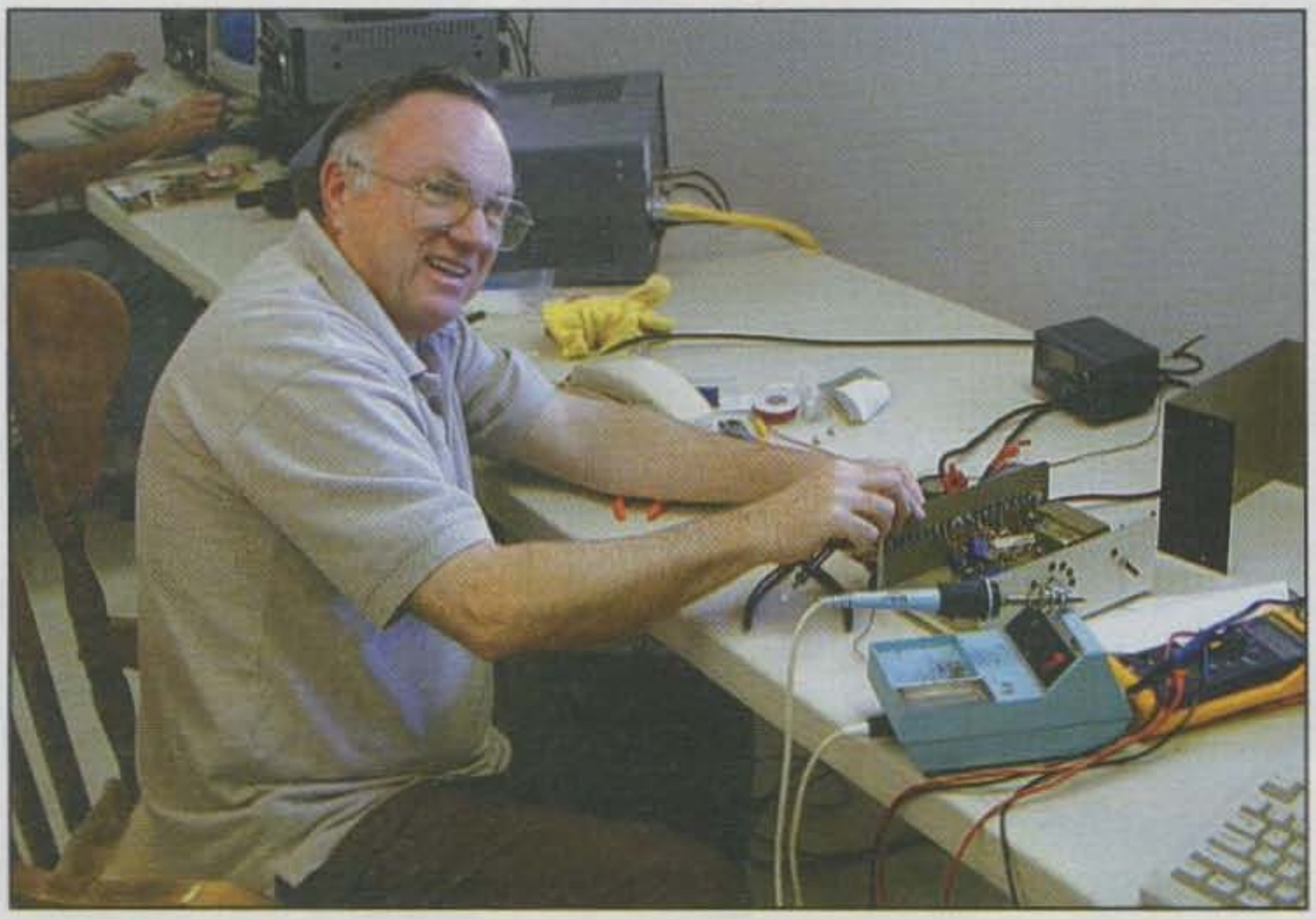
VX-150

CLUB SCORES

(Minimum of three entries required for listing.)

CLUB	SCORE
FRANKFORD RADIO CLUB	4,702,916
POTOMAC VALLEY RADIO CLUB	4,025,670
SOCIETY OF MIDWEST CONTESTERS	3,658,915
BAVARIAN CONTEST CLUB	3,120,337
YANKEE CLIPPER CONTEST CLUB	2,854,615
SLOVENIAN CONTEST CLUB	2,822,974
SOUTHEASTERN DX CLUB	2,196,196
CONTEST CLUB FINLAND	2,005,076
RHEIN RHUR DX ASSOCIATION	1,902,562
HA DX CLUB (HUNGARY)	1,736,809
MAD RIVER RADIO CLUB	1,303,880
KTU RADIO CLUB (LY)	1,219,212
UA2 CONTEST CLUB	968,522
TENNESSEE CONTEST CLUB	962,647
SP DX CLUB (POLAND)	827,989
URAL CONTEST GROUP	739,595
CROATIAN CONTEST CLUB	663,692
MINNESOTA WIRELESS ASSOCIATION.	634,207
NORTH COAST CONTESTERS	616,250
NORTH TEXAS CONTEST CLUB	544,992
RUSSIAN CONTEST CLUB	500,382
UKRAINIAN CONTEST CLUB	463,592
GRAND MESA CONTESTERS	433,133
DARC (GERMANY)	416,791
LITHUANIAN DX GROUP	410,016
URE (SPAIN)	405,986

CLUB	SCORE
MARCONI CONTEST CLUB	396,992
FLORIDA CONTEST GROUP	383,485
LNDX (FRANCE)	380,307
DAUBERVILLE DX ASSOCIATION	447,456
DIXIE CONTEST CLUB (UTAH)	321,195
VRHNIKA CONTESTERS (S5)	319,195
KANSAS CITY DX CLUB	314,547
FOX CONTEST CLUB (YU)	293,751
CACTUS CLUB (ARIZONA/CALIF.)	266,139
CENTRAL TEXAS DX CONTEST CLUB	257,930
NORTHERN CALIF CONTEST CLUB	247,392
HUDSON VALLEY CONTEST DX CLUB	240,412
LYNX (SPAIN)	229,332
VCC (YU)	224,576
BELARUS CONTEST CLUB	213,830
SOUTHERN CALIF. CONTEST CLUB	193,576
ROCHESTER DX ASSOCIATION	150,843
WWDXC (WASHINGTON)	140,351
LATVIAN CONTEST CLUB	130,852
KENTUCKY CONTEST CLUB	120,852
NO. ARIZONA DX ASSOCIATION	108,514
SP CONTEST CLUB	95,641
GREEN VALLEY ARS	70,379
WEST PARK RADIO OPERATORS	45,901
ADXG (BRAZIL)	23,474



Multi-op CW station N7JW (ops. N7JW, W7UT, and K7CA), with Jim, N7JW, doing some last-minute preparations before the contest. (Photo via W7UT)

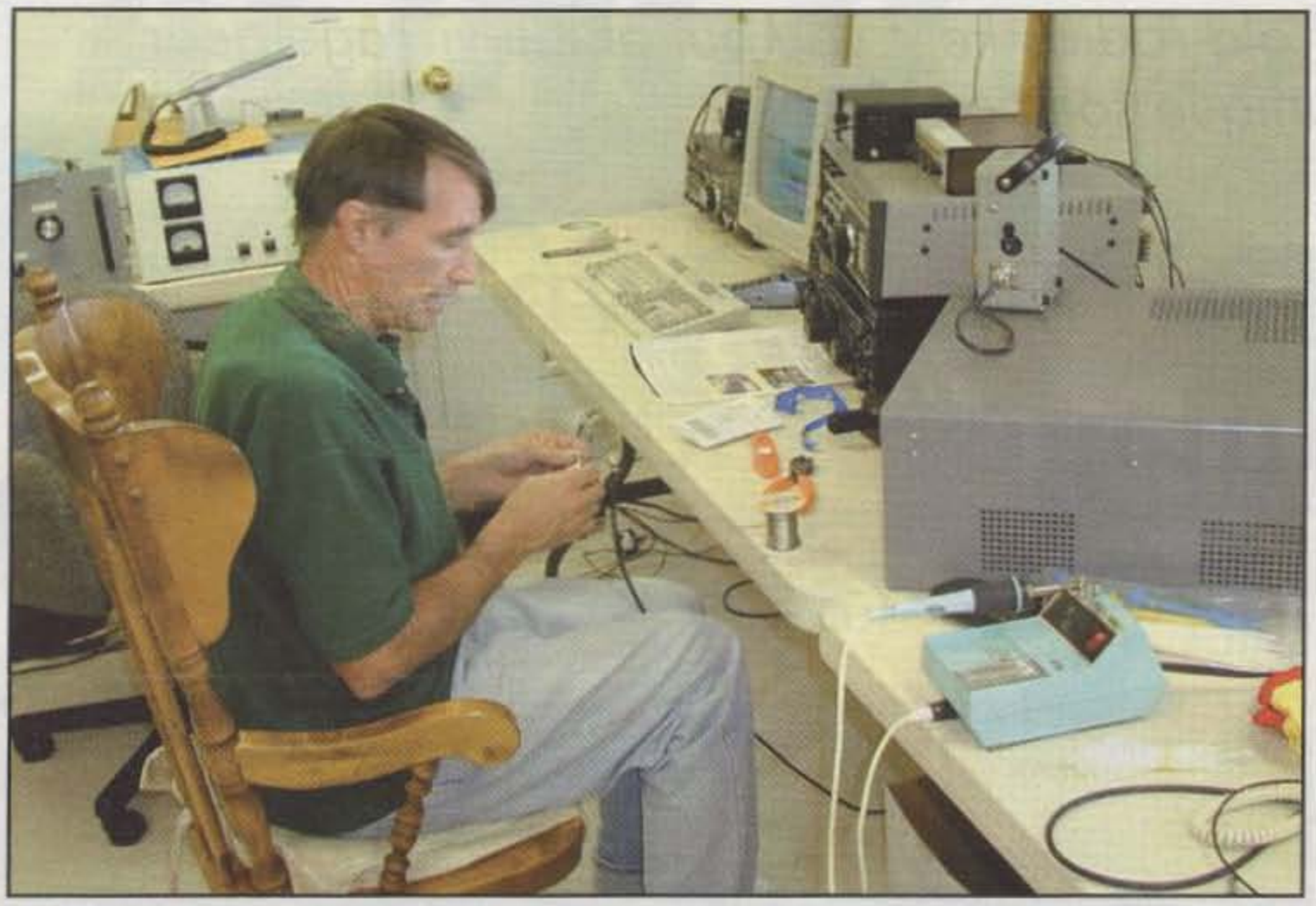
miles...**IS0/YO3RA**. Top band is always exciting...**JE1TSD**. With only 40 kHz to play with in Norway it's hard for small pistols to have a chance...**LA3BO**. I had to work on Saturday so limited time to operate...**M4T (G0VQR)**. 160 meters is hard from KH6...**NH7O**. Only weak North America signals heard in Finland this year... **OH2NN**. My FT-817 QRP rig worked well... **OK1IF/QRP**. My first electronic log...**OK1MZO**. A pleasure to participate. My rig is an old FT 757GX. I used the S&P method. At age 66 I hope to come back again...**ON6TJ**. Worked nearly 300 North American stations so cannot complain, although the score is down...**OT2T (ON4UN)**. Only North America was VY2 and VE1...**OZ8AE**.

Surprised to work North America (USA and VE) with my low dipole...**PA3AFF**. My first single op effort after years at PI4ZLD...**PA5KT**. It takes the mathematician to make such a standard format...**S56A**. Good propagation on the first night... **SV1VN**. Plenty of storms greatly reduced participation from Australia...**VK3IO**. Was on DX holiday and saw the contest was on so had a go at it. I was not ready for the QRM in this part of the world...**VP5/G4RCG**. High urban noise but greatly enjoyed my first 160 meter contest...**XE2AC**. QTH was the UN protectorate of Kosovo... **YU8/S57AW**. First time in the CQ 160. Will be back next year...**ZC4DW**. This contest was fun. Unfortunately I used the wrong transceiver. Next time I will be on with a better transceiver... **HB0/DL3OCH**. Had rig difficulties. Some did not hear my low power...**OK1DVK**. Wish I had space for a better antenna...**PA0INA**. My FL-2100 has worn-out tubes...**PA0LOU**. This was my 19th straight CQ 160 CW entry...**YU7SF** *(We bid adieu to this long-time contestant, who entered the last 18 CQ 160 CW Contests, and is now a Silent Key—ed.)*. Strong noise in Argentina (it's summer here), so was surprised to QSO with two Brazilian stations...**LU1EWL**.

SSB W/VE QRM

Lost our balloon and still worked AZ and MO with antenna wire on the next door roof...**K4YFR**. Stations were heard up to 1990, although conditions not as good as the CW weekend...**KS7T**. My neighbors reported that I blew their phone system out. They disconnected the phones and went to sleep. I decided not to operate Saturday night to save my remaining goodwill for later...**N3HXQ**. Tried QRP for a few contacts but switched to 60 watts. Life is too short for QRP on 160 SSB... **W4BCV (K4JRB op.)**. The ARRL band plan that restricts SSB activity to above 1843 made it almost impossible to work DX. It made activity spread out all the way to 1950, too...**K3IXD**. My 9-year-old daughter decided she wanted to help...**K4BP**. A computer crash and an operator not familar with the logging program so hope we didn't get things too scrambled *(no problems at the director end—ed.)*...**K5BAT**. Used the packet spotting network so operated multi-operator...**K8OQL**.

Great contest. The band plan seems to be working, and our balloon worked great too...**N7KQ**. Murphy visited the computer Saturday morning and continued with us for the remainder of the contest...**W0NO**. Fantastic conditions. Best score yet...**VE2UMS**. Quarter-wave wire between 15 and 25 feet above ground. Can't believe they heard us in PA, NJ, TN, etc...**VE7OSO**. There were



Al, K7CA, doing some repairs at N7JW before the start of the CW 160 Meter Contest. (Photo via W7UT)

numerous violators of the ARRL band plan but it worked well enough to give some Europeans a clear shot at North America...**AA1K**. The band was good and quiet but no skip to the east coast until early Sunday morning...**KØUK**. Active for the first time in a couple of years...**K5OE**. Conditions excellent, the QRN low, but only a limited effort possible...**K5RX**. Conditions to Europe fantastic. Worked 24 countries in just 80 minutes...**K5ZD**. Had a great time working with a vertical wire on a 6 foot helium balloon...**K9SG**. Great conditions. Worked 48 states, a first ever for me, and heard more Europe than I could work...**KE4SCY**. Time for a new antenna...**KQ4YY**. With both EA3URE and EA4URE on everyone got confused...**K4JRB**.

Last month's ice storm brought down part of my longwire, but I had enough left to make some contacts...**N2LQQ**. Some good European contacts but few from the west coast...**N3HBX**. First real serious Single operator effort. Outstanding conditions to Europe...**N4UK**. First 160 contest. I sure had fun!...**N7NTN**. Used a random 270 foot wire...**NS1Z**. Surprised several stations with my QRP signal. Band was in better shape than the past few years...**WØETC**. Had a lot of fun working 52 countries...**W1NA**. I usually only spend a short time in the contest but this year I decided to try it a while longer as QRN was low. Just wish for more DX contacts...**W4PV**. First time with computer and my two fingers are worn down *(join the crowd—ed.)*...**W5GFR**. Where were DC, KL7, and KH6? Europe good both nights but need to fix the transmit hole to the south...**VE3PN**. The absolute best conditions ever for the contest. Thanks to many who took the time to get my call right...**VY2MGY/3**. I have not had this much fun with ham radio in a long time. Just need to convince the XYL that antennas are things of beauty...**WB8TCT**.

SSB DX QRM

High winds but the 105 foot vertical stayed up. Missed a few stations that were working above 1900 kHz...**G3UEG**. New call for the HB9CXZ group...**HB9FBO**. The new Italian legal limit is 500 watts...**I2OKW**. Great fun. We only ran 15 hours as there was insufficient activity in Europe to work more hours...**MØABC**. Seven years as XE1RCS and every year more fun...**XE1RCS**. Good contest but some very well known European contest stations take up 10 kHz of the band...**G4WPD**. Glad to work some North America again...**LZ8T**. Very good signals on Top band this year...**DL9NDS**. Poor conditions to North America *(He worked 27 states and provinces!!—ed.)*...**EA6SX**. My first try at the CQ 160 SSB...**EA8BH (OH2BH)**.

I like the idea of a 48-hour contest with 30 hours operating time...**G3VAO**. I must get a competitive

(Continued on page 104)

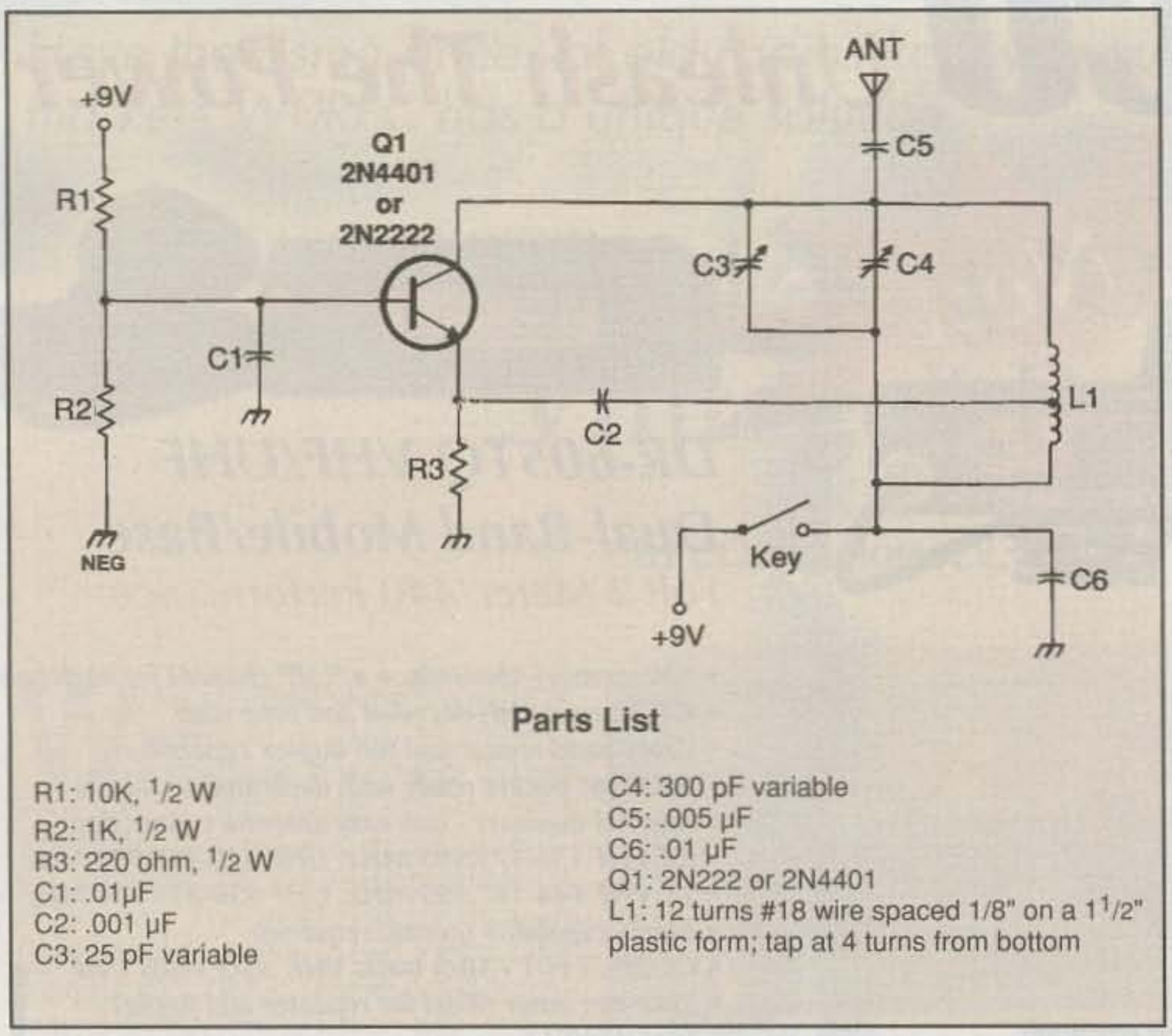
GUEST OPERATORS

CW

Call	Operator	Call	Operator
4N1A	YU1YV	OM3KXR	OM8DD
4X3A	4X4NJ	OT2A	ON5UM
C4A	5B4ADA	OT2T	ON4UN
CT3FN	HB9CRV	PI4HQ	PA3ELD
EA8AH	OH1MA	RJ1Z	RW1ZA
F8KCF	OM3CGN	RK9CZO	RX9CAZ
HG8C	HA8EK	SN8A	SP8AQA
IV3TVM	IV3NVN	SN8M	SP8MI
KØCAT	K9WIE	V47KP	W2OX
K2UG	WA2JQK	VX3AT	VE3AT
K4VX	N9JF	VX6BF	VE6BF
K8CC	W8MJ	W2ZQ	K2QM
KB1EAX	WA1LNP	W5KFT	K5PI
M4T	GØVQR	W5OT	WA5TWL
NH7O	N6KB	W7RM	KI7Y
NO4S	K9OM	W8JI	W4AN
OHØNL	OH2BYS	WD5R	N5ECT
OL1A	OK1CZ	ZF2CM	KØBJ
OM3KED	OM8DD	ZL1CMY	KM9D

SSB

Call	Operator	Call	Operator
4U1WB	AJ3M	N3NS	K3IPK
DLØSHZ	DL1ASR	P40A	KK9A
EA8BH	OH2BH	RK9CZO	RX9CGR
K3IPK	N3NS	V31AH	WØAH
KB1EAX	WA1LNP	V47KP	W2OX
KRØB	KSØT	W1CTN	W1CRS
LY7Z	LY2TA	W4BCV	K4JRB



Parts List

R1: 10K, 1/2 W
R2: 1K, 1/2 W
R3: 220 ohm, 1/2 W
C1: .01µF
C2: .001 µF
C3: 25 pF variable
C4: 300 pF variable
C5: .005 µF
C6: .01 µF
Q1: 2N222 or 2N4401
L1: 12 turns #18 wire spaced 1/8" on a 1 1/2" plastic form; tap at 4 turns from bottom

Fig. 1– Schematic of the homebrew "vintage" transmitter. Note that parts values are approximate and you have a lot of flexibility.

Parts List (fig. 2)

R1: 470K, 1/2 W
R2: 2.7K, 1/2 W
R3: 10K potentiometer
R4: 100K, 1/2 W
R5: 10K, 1/2 W
R6: 5.6K, 1/2 W
R7: 10K, 1/2 W
R8: 10 ohm, 1/2 W
C1: 50 pF variable
C2: 300 pF variable
C3: 25 pF variable
C4: 100 pF
C5: .1 µF
C6: .001 µF
C7: 10 µF electrolytic
C8, C9, C10, C11: .1 µF
C12: 10 µF electrolytic
C13: .1 µF
C14: 220 µF electrolytic
Q1: MPF-102 Motorola
Q2: 2N3904
U1: LM386 audio amp
T1: audio interstage transformer Mouser #42TL218
L1: 8 turns #18 wire close wound on 1 1/2" plastic form (insulated wire)
L2: 4 turns #18 wire close wound, spaced 1/8" above L1 (insulated wire)
RFC-1: 500 µH choke coil, Mouser #542-5800-471

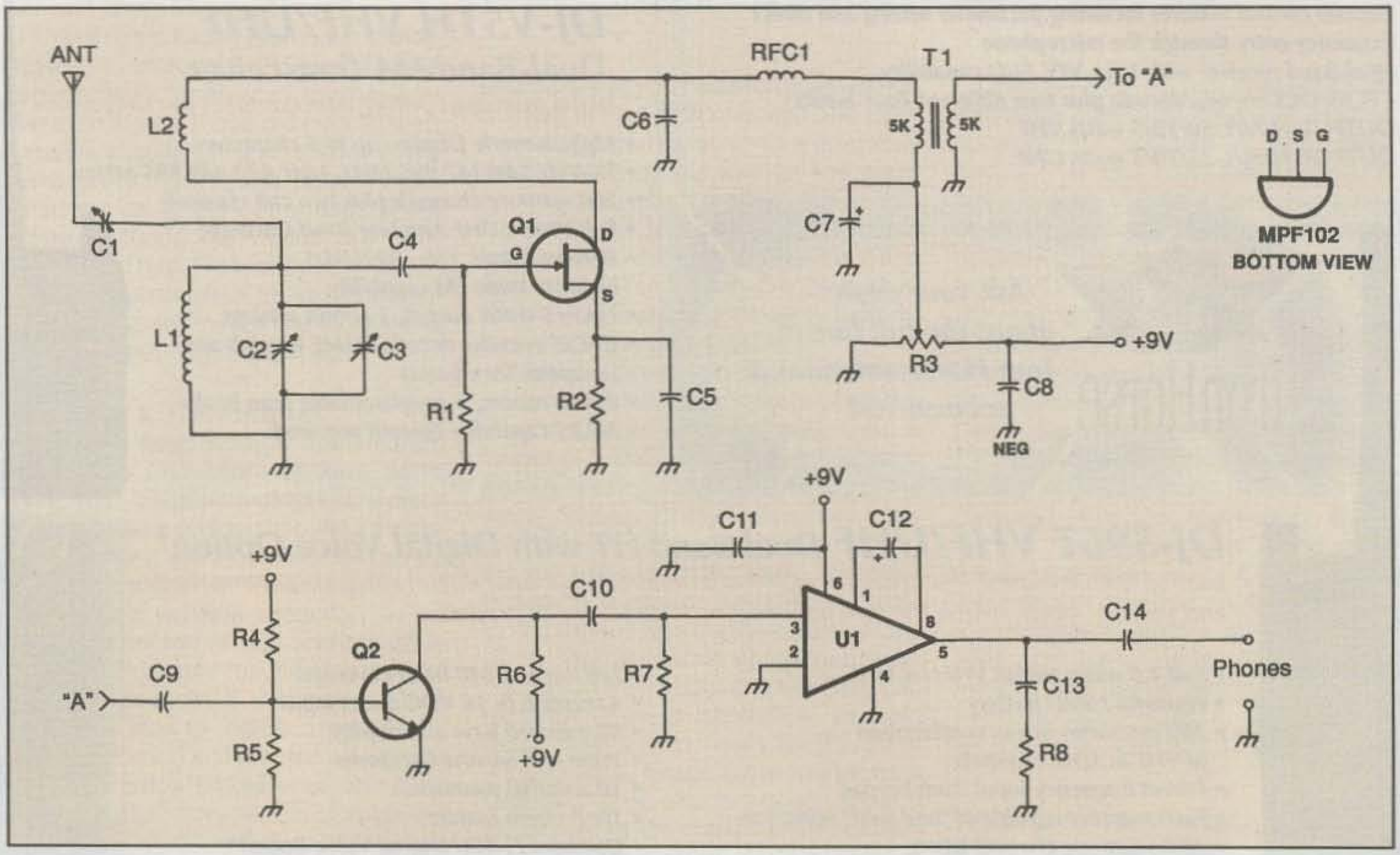


Fig. 2– Schematic of the homebrew "vintage" receiver. Like the transmitter, parts values are approximate (except for C1) and anything close that you find in your junkbox or at a hamfest should work.

Photo B– Rear view of the transmitter. Note the Fahnestock clips for added realism.

Photo C– Rear view of the receiver. Don't expect it to pick up too many weak signals, even if you DO build it right!

tube socket, and an IC audio amp built on a perf board hidden under the other socket. This circuit used every component on the board, except the tubes. It was also powered by a 9 volt battery.

The circuit is a regenerative Armstrong-type oscillator built around the FET. The coil was wound on an old Hammarlund plug-in coil form, and the other parts were as vintage as I could scrounge up. My receiver tuned from 5 to 15 MHz and required at least 50 feet of antenna wire to have decent reception.

The main technical difference between the transmitter project and this one was that for the receiver I used an oak board rather than a walnut board. You might think that this was done to improve the signal-to-noise ratio, but that was not the case. Fig. 2 shows the receiver schematic. None of the parts seems critical, so you do have some substitution freedom. If you find that the R3 regeneration control does not allow the receiver to break into oscillation, then try reversing the connections on L2. When mounting parts under the sockets, avoid using the pins connected to the tube heaters. The coil and the tube sockets were mounted above the board on 1/2 inch lengths of 1/4 inch copper tubing. This same procedure was used on the transmitter. The variable capacitors were retrieved from dusty boxes at a hamfest and were not marked with exact values. Since few values are critical, the values given in the parts lists are only approximate. Only C6 should be carefully adhered to. A wide range of impedances(1K to10K) will work for the audio interstage transformer. Whatever gives you a acceptable audio output level is suitable. These regenerative receivers are the most sensitive just before the circuit breaks into a loud squealing oscillation. You will have to play with C1 and R3 to find the best settings.

The Finished Station

Photo A shows the complete station, and photos B and C show rear views of the units. Now that everything is working, you may be tempted to try making a contact on your new rig. I would suggest that you do so with a ham across the street, since the transmitter is very low power and the receiver only picks up strong stations. This station does not meet any of today's high technical standards, so trying to Work All States is futile. You might have the urge to remove the solid-state devices and wire in the tubes with several hundred volts on the plates. I suppose a real purist would do this. Well, I am sure you can find suitable tube schematics to accomplish this, but take care to prevent your cat from stepping on the circuit board! ■

Do you need a high-voltage power supply for some of your vintage equipment? WB2GMY shows us how to build an excellent supply that uses the latest in available components...

Build A Regulated Solid-State Power Supply For Vintage Transmitters

BY JOHN V. KARASZ,* WB2GMY

My interest in power supplies began when I completed a "1929-type" Hartley oscillator transmitter and attempted to test it. Although many factors govern the stability and purity of tone of the Hartley, I felt that a regulated supply for the B+ would contribute to the stability of this type of transmitter.

My first attempt at building a regulated HV (high voltage) supply utilized a type 807 vacuum tube in a cathode follower configuration.[1] It had an output voltage range of 170–270 VDC and a maximum load current of approximately 70 mA. I gradually modified the original circuit as improved components became available, replacing the voltage regulator (VR) tube with a string of zener diodes and changing the values of the sensing network.

When I decided to increase the value of the filtered DC input to the regulator and increase the reference voltage, a friend suggested that I instead build a solid-state version of the vacuum-tube circuit. The suggestion seemed excellent, so I proceeded to dismantle the tube design and re-engineer the circuit to accommodate solid-state components. The resulting power supply is described in this article.

The supply is designed to provide regulated B+, within the range of +190 VDC to +300 VDC at 100 mA maximum current. It can also supply either 2.5 or 7.5 volts AC for tube filaments (such as the type 45 or type 10 tubes). With an output voltage of 300 V and a load current of 100 mA, the load regulation is 0.33%. One final note about the tube design: It worked and it performed very well. There is absolutely nothing wrong with using tubes to regulate high-voltage DC. For those of you who prefer the glow of tube filaments, read this article and then refer to the footnotes for some information on tube-type designs.[2]

Photo A– Front view of the power supply. Controls are simple, with an on/off switch on the left and a voltage adjustment control on the lower right. The output voltage reads out on the LED display on the upper right.

Theory of Operation

The theory of operation for the power-supply circuit is as follows: Diodes D1– D4, capacitors C1 and C2, and resistor R1 form a full-wave bridge and RC filter circuit. In this case, approximately 330 VDC, unregulated, is delivered by the filter to the linear, series pass element, transistor Q1, which operates as a source follower. The voltage gain, A_V, is given by:

$$A_V = G_m R_s / 1 + G_m R_s \approx 1$$

where G_m = forward transconductance and R_s = source resistance = load resistance.

Therefore, the voltage that appears across the load is essentially the voltage applied between the gate and ground. The current gain of Q1 is large. Q1, therefore, acts as a unity gain buffer between a low-impedance load and a high-impedance reference/control circuit. The control circuit operates in the following manner: Initially, the circuit is at equilibrium, driving a load resistance, R_L. The voltage R_L is sensed by the voltage divider network, consisting of R5–R8. A fraction of the output voltage, from the arm of potentiometer R6, is placed on the base of transistor Q2. The reference voltage, generated by the series combination of Z1, Z2, and Z3, appears at the emitter of Q2. Then, Q2 amplifies the difference between the reference voltage and the potential at its base. The circuit reaches equilibrium when the reference voltage (plus the base-emitter potential) is equal to the sampled ("sensed") output voltage at the arm of the potentiometer.

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If the load resistance, R_L, decreases, the voltage across the sampling network also decreases, causing a decrease in the collector current of Q2. Subsequently, the voltage drop across R4 becomes smaller, and the voltage at the gate of Q1 rises. The conduction of Q1 increases, driving the output voltage to its original equilibrium level. A similar process occurs for an increase in load resistance. Therefore, a constant output voltage is maintained, despite changes in the load conditions. Setting the resistance of the sampling network—between the source of Q1 and the arm of R6—to R_b; and the resistance of the network—from the arm of R6 to ground—to R_x (see box for explanation of R_b and R_x), the output voltage, V_o, can be calculated by the following formula:

$$V_o = (V_{ref} + V_{be}\ Q2)\ (R_b + R_x)/(R_x)$$

The zener diode, Z4, limits the drain current through Q1 to a level that is within the maximum ratings of the device. A momentary short circuit of the supply output will open fuse F2. However, the limiting action of the zener is faster, and it protects Q1 until F2 opens up. Also, in the event of a short circuit, the gate-source voltage of Q1 is limited to a safe value by this zener diode.

As with all power supplies of this type, the thermal limits of the pass element must be considered. The junction temperature of Q1 is given by[3]:

$$T_j = P_d(R_{\theta jc} + R_{\theta cs} + R_{\theta sa}) + T_a$$

In this case, P_d = power dissipation. The terms within the parentheses are the thermal resistances: junction-case, case-sink, and sink-air, respectively. T_a is the ambient temperature. For an output voltage of 250 V, a load current of 0.07 A, and the heat sink given in the parts list, the junction temperature is found to be 77°C for a 100% duty cycle. Here, the value of $R_{\theta jc}$ is 1.7 for a typical FET in a TO220 case. The value for $R_{\theta cs}$ is 1.2; T_a is 25°C. The maximum junction temperature for a FET is typically +150°C.

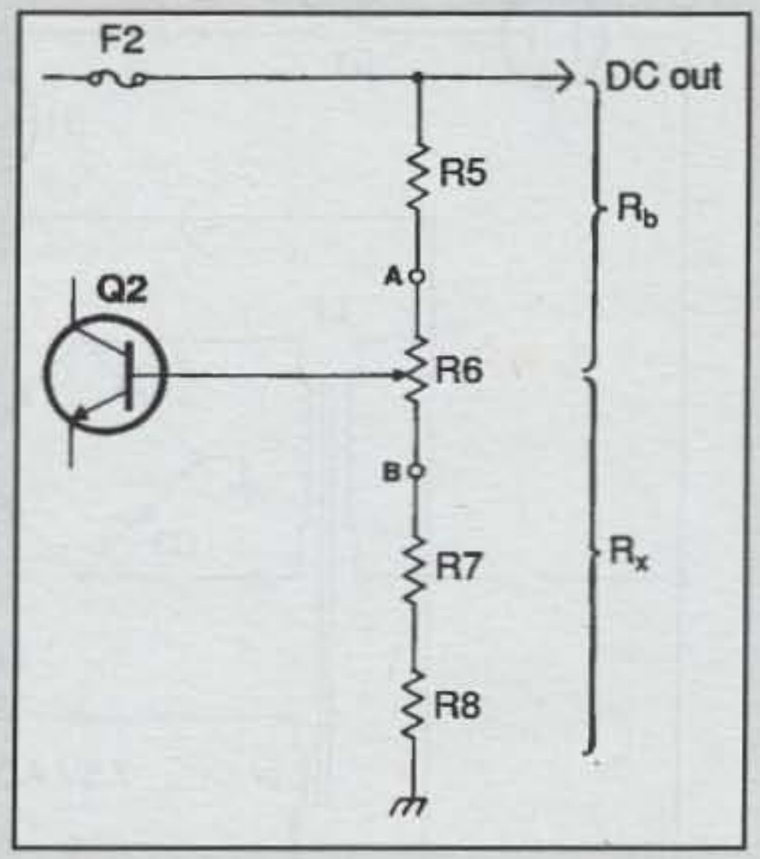
Figuring Out R_b and R_x

In the column to the left we discuss using R_b and R_x in calculating the output voltage (V_o) of the power supply. These are resistance *values*, not individual resistors—so they are not on the main schematic—and the values are variable, depending on the setting of potentiometer R6. To understand how these values are determined, please refer to the schematic excerpt shown here and the following explanation:

R_b is the series resistance value of R5 plus the portion pot R6 between point "A" and the arm of R6. Similarly, R_x is the total of the resistance between the arm of R6 and point "B" plus the values of R7 and R8.

As an example, let's assume that pot R6 is set so there is a 50 K-ohm resistance between point "A" and the arm, and 150K between the arm and point "B." Now since R5 = 75 K, 75,000 + 50,000 = 125,000 ohms = R_b. Likewise, to calculate R_x, add the value of R6 between the arm and point "B" (150 K in our example) to the values of R7 and R8, 270 K and 56 K, respectively. Therefore, 150,000 + 270,000 + 56,000 = 476,000 ohms = R_x.

Obviously, these values will change as you adjust the setting of R6. Once you have determined the values of R_b and R_x, you can plug them into the equation in the main text: $V_o = (V_{ref} + V_{be}\ Q2)\ (R_b + R_x) / (R_x)$.



Detail of schematic showing how values R_b and R_x are determined. See text for detailed explanation.

Building the Supply

The construction of the power supply is relatively straightforward. The entire assembly is built on an 8" × 10" × 2 1/2" aluminum chassis. Various views of the unit are shown in photos A, B, and C. Parts layout is not overly critical. The rectifier and filter components were secured to solder-type terminal strips. The regulator assembly was mounted on a Vectorboard, trimmed to approximately 4 1/2 by 5 1/2 inches.

Use a good-quality potentiometer in this project, because it has to withstand voltages that are considerably higher than those of modern solid-state circuits. I used sealed, Allen-Bradley, type-J pots, although there are a number of other 2 W, linear-taper, carbon pots that are suitable for the voltages encountered here.

Higher output voltages may be obtained with this circuit by using a transformer with larger "B+" output voltage value and a higher value of reference voltage, Vref. However, be sure that there is a sufficient margin of safety in the gate-source and base-emitter

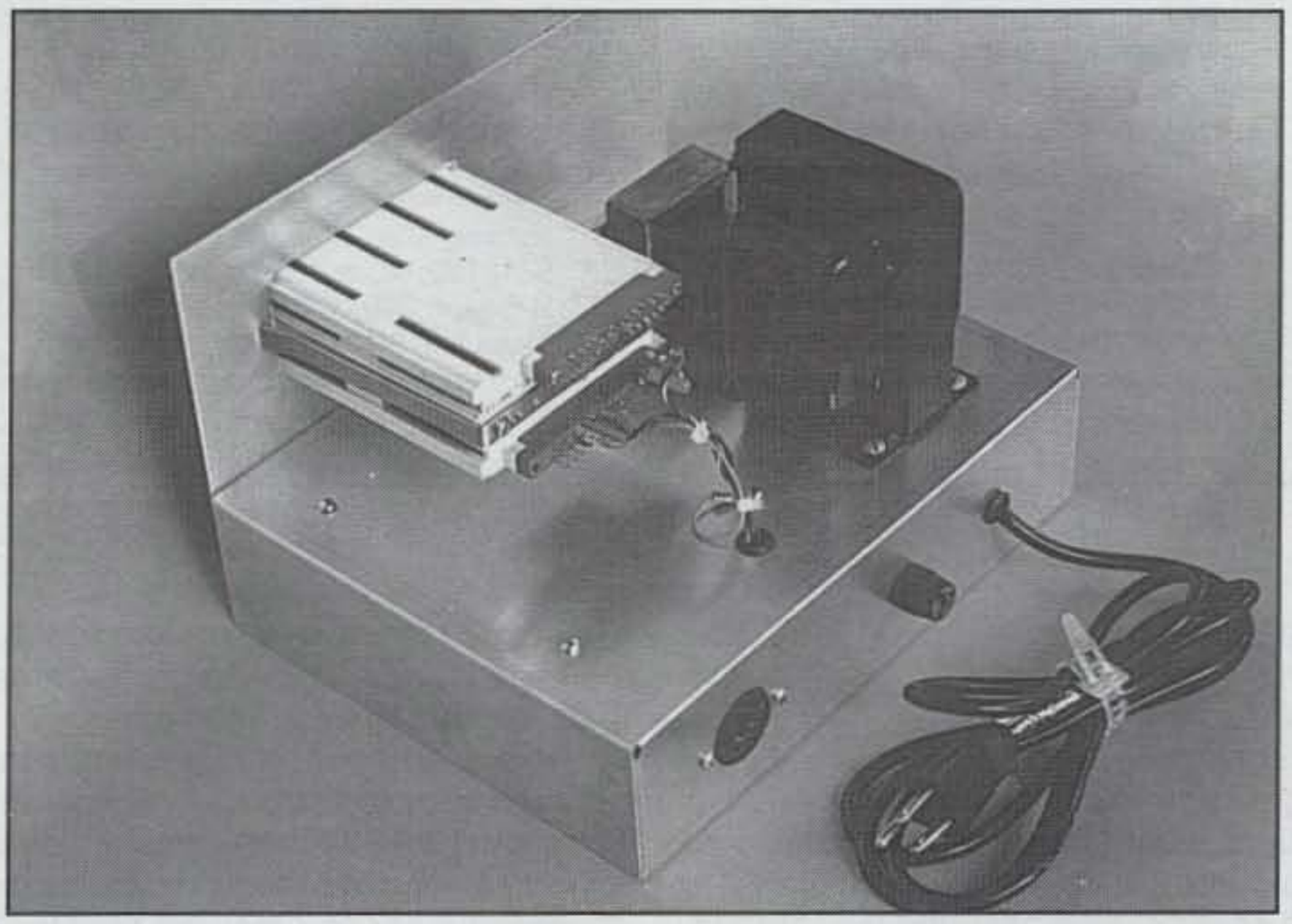
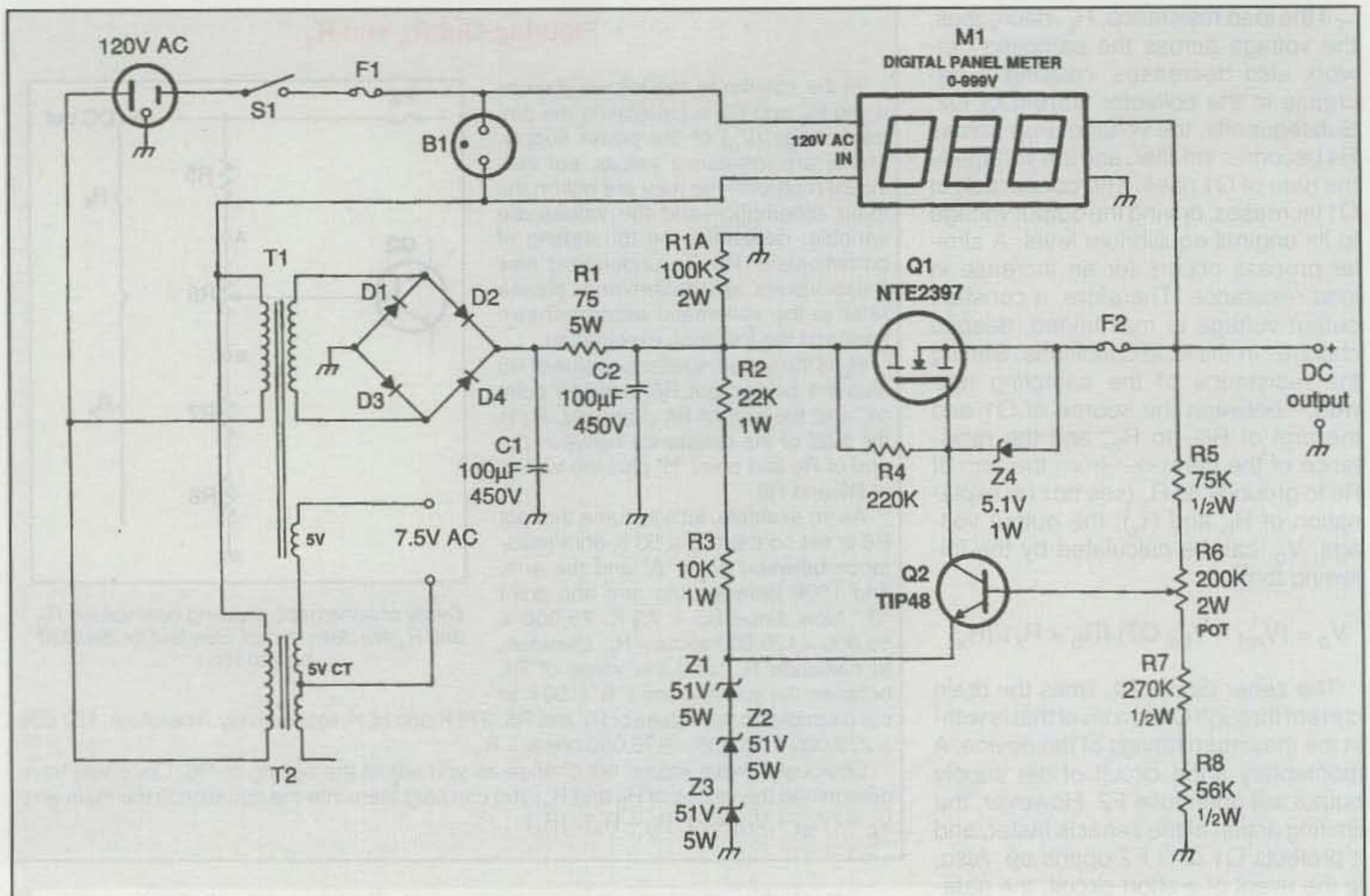


Photo B– Interior top view—not much to see except the back of the LED voltage display unit and the two transformers.



Parts List

S1: SPST switch; pushbutton: RadioShack p/n 275-617; toggle: RadioShack p/n 275-651
F1: Fuse, 2 A, type 3AG, fast acting
F2: Fuse, 0.25 A, type 3AG, fast acting
B1: 120 V neon panel lamp, RadioShack p/n 272-704
T1: Power transformer, 120V-0-120V @250 ma, 5 V @ 3 A. Stancor p/n P6140 (alternate: Hammond, p/n P-T269AX with separate filament transformer)
T2: Filament transformer, Thordarson p/n T21F03 (alternate: Hammond p/n P-T166MS)
D1–D4: 1 KV, 2.5 A silicon diodes, RadioShack p/n 276-1114
Z1-Z3: Zener diodes (qty 3) 51 V, 5 W, p/n 1N5369BT
Z4: Zener diode: 5.1 V, 1 W, p/n 1N4733AT
Q1: MOSFET transistor, p/n NTE 2397 (alternate p/n: NTE 2385)
Q2: Bipolar power transistor, p/n TIP48 (alternate p/n: NTE 198)
R1: Resistor, 75 ohm, 5 W, wirewound (alternate: 82 ohm, 5 W)
R1a: Resistor, 100,000 ohms, 2 W, metal film
R2: Resistor, 22,000 ohms, 1 W, metal film
R3: Resistor, 10,000 ohms, 1 W, metal film
R4: Resistor, 220,000 ohms, 1/2 watt, metal film
R5: Resistor, 75,000 ohms, 1/2 watt, metal film
R6 : Potentiometer, 200,000 ohms, 2 W, carbon, Allen-Bradley Type-J, p/n 5813120-14, or equivalent
R7: Resistor, 270,000 ohms, 1/2 watt, metal film
R8: Resistor, 56,000 ohms, 1/2 watt, metal film
C1, C2: Electrolytic capacitor, 100 mFd @ 450 volts
M1: Digital panel meter, Digitec p/n 277-5 (alternate: voltmeter/ammeter module—
[1] RadioShack p/n 910-4915;
[2] RadioShack p/n 910-4918)
Misc.:
Aluminum chassis: Bud p/n AC-1418, or equivalent
Aluminum panel, 10" × 6 1/2"
Solder-type terminal strips, RadioShack p/n 274-688
Prototyping board Vectorboard R p/n 64P44XXXP
Fuse holders, panel-mount, RadioShack p/n 270-367
AC line cord (3 cond.), control knob, mounting hardware
8-pin octal socket, Antique Electronic Supply p/n P-ST8-33008

Fig. 1– Schematic diagram of the WB2GMY solid-state power supply for vintage tube radios.

breakdown voltages of Q1 and Q2, respectively. Also, when the output voltage exceeds 300 volts, it is very important to properly mount the voltage-adjust pot.[4] I simply made the chassis ground connections as indicated and mounted the volt-adjust pot directly to the chassis, thus assuring the "grounding" of the case of the potentiometer. Care must be taken to ensure that the 5 V filament windings are phased so that their voltages are *added together* rather than subtracted from each other.

There are other ways to generate the required filament voltages. For example, a 12 V, 3 A filament transformer can supply lower voltages as long as the appropriate series dropping resistor is used. For a 7.5 V, 1.25 A filament, a dropping resistance of 3.6 ohms would be used in series with the 12 V output of the transformer winding. This value could be obtained by using a 3.3 ohm, 10 W resistor in series with a 0.33 ohm, 2 W resistor.

Safety Matters

In conclusion, a few words about safety are in order. Today most amateurs

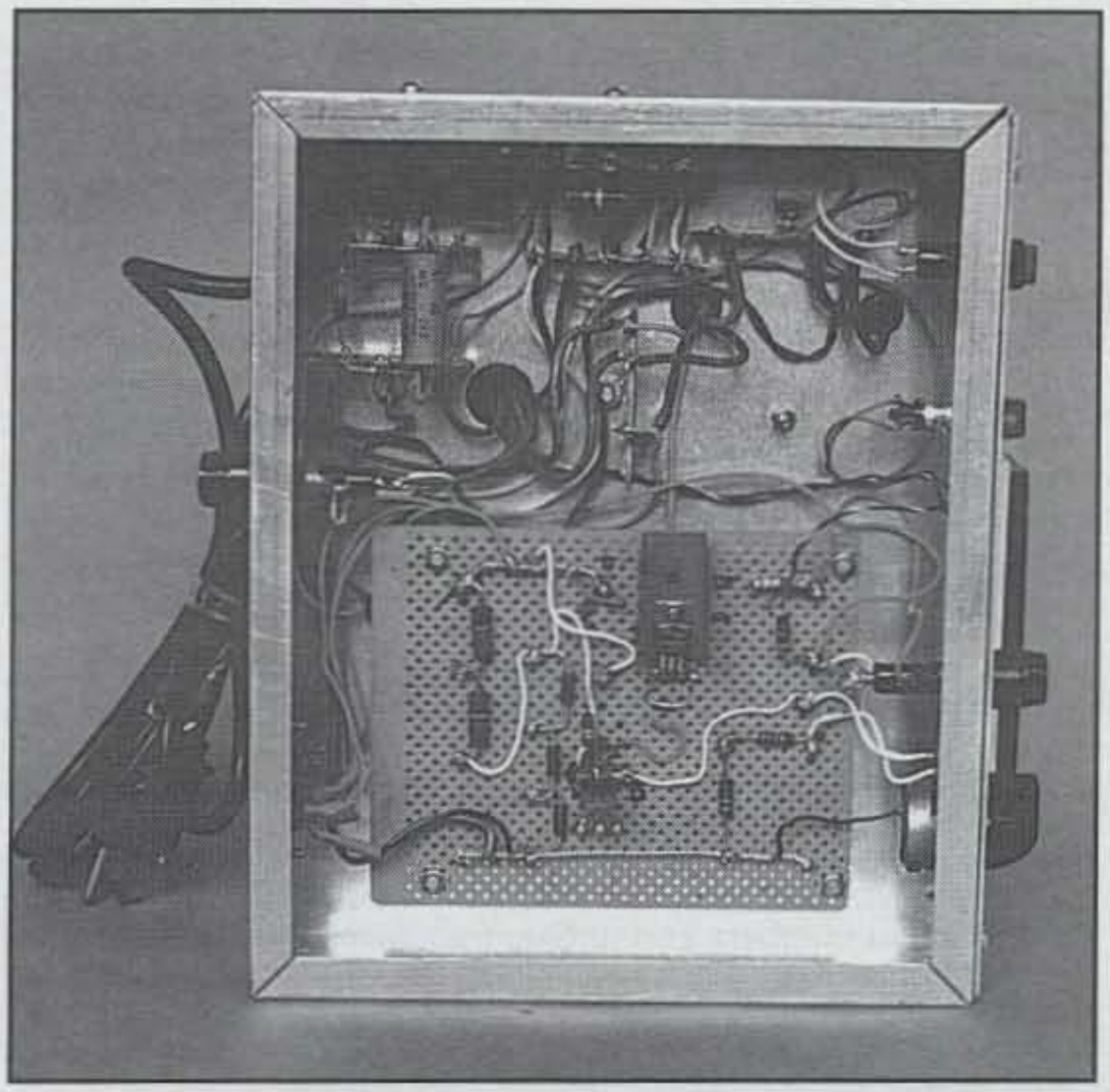


Photo C– Underside of the power supply shows both on-board and off-board wiring. Note that the author used point-to-point wiring on perfboard rather than a printed circuit board. ←

deal with solid-state circuitry in which voltages rarely exceed 20–24 volts. One can become complacent, even careless, when working with such voltages. However, years ago when tube designs "ruled the airwaves," there was no such thing as a careless attitude with respect to high-voltage safety. Please observe all of the standard precautions when working with this supply: Wear rubber-soled shoes on a dry floor; keep one hand in your pocket when the other is inside the unit; use only tools with insulated handles; test with power on only when absolutely necessary; and remember that HV capacitors may remain charged and dangerous long after the power is turned off. Be especially careful when making voltage checks and load tests.

Remember, even after the unit is turned off and unplugged, it is still not safe to work on it until the bleeder resistor has discharged the filter capacitors. This takes a finite amount of time.

When all is said and done, however, there is a great sense of satisfaction to be derived from building and operating one's own vintage tube equipment, whether for QRP or higher power outputs. The sight of those brightly glowing tube filaments when engaged in a QSO conveys a feeling of nostalgia that is difficult to describe in words. Vintage tube rigs are a "time machine," bringing the operator back to a distant, vibrant era, one which many of us consider "the golden age of ham radio."

Notes

1. Voltage stabilization, *The Radio Amateur's Handbook*—40th Edition, ARRL, 1963, pp. 233–234.

2. Marcus, John, *Electronic Circuits Manual,* McGraw-Hill Inc., 1971, pp. 639, 649, 653.

3. Motorola Power Device Data, Motorola Inc., 1980, p. 8-28

4. Voltage stabilization, *The Radio Amateur's Handbook*—40th Edition, ARRL, 1963, p. 235. ■

Announcing:

The 2003 CQ World-Wide WPX Contest

SSB: March 29–30, 2003 CW: May 24–25, 2003

Starts: 0000 GMT Saturday Ends: 2359 GMT Sunday

I. Period of Operation: 48 hours. Single Operator stations may operate 36 of the 48 hours. Off times must be a minimum of 60 minutes in length and clearly marked in the log. Listening time counts as operating time. Multi-Operator stations may operate the full 48 hours.

II. Objective: Object of the contest is for amateurs around the world to contact as many amateurs in other parts of the world as possible during the contest period.

III. Bands: The 1.8, 3.5, 7, 14, 21, and 28 MHz bands may be used. No WARC bands allowed. *Observance of established band plans is strongly encouraged.*

IV. Terms of Competition (for all categories): All entrants must operate within the limits of their chosen category when performing any activity that could impact their submitted score. Transmitters and receivers must be located within a 500-meter diameter circle or within the property limits of the station licensee, whichever is greater. All antennas must be physically connected by wires to the transmitters and receivers used by the entrant. All high power categories must not exceed 1500 watts total output power on any band. Only the entrant's callsign may be used to aid the entrant's score. No self-spotting of any form on DX spotting nets is permitted for any category. Self-spotting is defined as generating packet spots for your contest callsign by: (a) using your own callsign; (b) spotting your call while using another callsign; or (3) spotting of your callsign by other stations as a result of prearranged solicitation. A different callsign must be used for each entry.

Categories: Note—Category and Category-overlay names for the Cabrillo header are shown in *(italics)* after each category definition.

1. Single Operator (Single Band and All Band)

(a) Single operator stations are those at which one person performs all of the operating, logging, and, for the Assisted category only, spotting functions. Only one transmitted signal is allowed at any time. **Maximum power allowed is 1500 watts total output power.** *(SINGLE-OP ALL HIGH or SINGLE-OP [BAND] HIGH)*

(b) Low Power: Same as 1(a) except that output power shall not exceed **100 watts**. Stations in this category will compete with other low power stations only. *(SINGLE-OP ALL LOW or SINGLE-OP [BAND] LOW)*

(c) QRP: Same as 1(a) except that output power shall not exceed **5 watts**. Stations in this category will compete with other QRP stations only. *(SINGLE-OP ALL QRP or SINGLE-OP [BAND] QRP)*

(d) Assisted/with Packet: Same as 1(a) except the passive use (no self-spotting) of DX spotting nets or other forms of DX alerting is permitted. Stations in this category will compete with other Assisted stations only. *(SINGLE-OP-ASSISTED)*

(e) Tribander/Single Element: Tribander (any type) with a single feedline from the transmitter to the antenna and single element (TS) category. During the contest, an entrant shall use **only one (1) tribander** for 10, 15, 20 meters and single-element antennas on 40, 80, and 160. *(TB-WIRES)*

(f) Band Restricted: An eligible entrant must hold a license restricting operation to less than the six (6) contest bands (160, 80, 40, 20, 15, 10 meters) on both modes. Examples of such licenses in the USA are Novice, Technician, 4 class license, etc. Since frequency privileges differ from country to country, competition is between stations within one's own country. *(BAND-LIMITED)*

(g) Rookie: To enter this category you must have been licensed as a radio amateur three (3) years or less on the date of the contest. *(ROOKIE)*

2. Multi-Operator (All-band operation only)

(a) Single-Transmitter: Only one transmitter and one band permitted during the same time period (defined as 10 minutes), defined as starting with the first logged QSO on a band. Exception: One—and only one—other band may be used during any 10-minute period if—and only if—the station worked is a new multiplier. **Logs found in violation of the 10-minute rule will automatically be reclassified as multi-multi. Maximum power allowed is 1500 watts total output power. Your log MUST show the correct serial number sent and received for each contact.** *(MULTI-ONE)*

(b) Multi-Two: A maximum of two transmitted signals at any time on different bands. Both transmitters may work any and all stations. A station may be worked only once per band regardless of which transmitter is used. **Each transmitter must keep a chronological log containing its own serial numbers and unique transmitter identifier.** Each of the two stations may make a maximum of eight (8) band changes in any clock hour (00 through 59 minutes). For example, a change from 20 meters to 40 meters and then back to 20 meters constitutes two band changes. **Maximum power allowed is 1500 watts total output power.** *(MULTI-TWO)*

(c) Multi-Transmitter: No limit to transmitters, but only one signal (and running station) allowed per band at any time. *Note:* All transmitters and receivers must be located within a 500-meter diameter area or within property limits of the station licensee, whichever is greater. All operation must take place from the same operating site. **Maximum power allowed is 1500 watts total output power**. *(MULTI-MULTI)*

V. Exchange: RS(T) report plus a progressive contact three-digit serial number starting with 001 for the first contact. (Continue to four digits if past 999 and five if past 9999.) **Multi-operator, multi-transmitter stations use separate serial numbers for each band. Your log MUST show the correct serial number sent and received for each contact.**

VI. Contact Points:

(a) Contacts between stations on different continents are worth three (3) points on 28, 21, and 14 MHz and six (6) points on 7, 3.5, and 1.8 MHz.

(b) Contacts between stations on the same continent, but different countries, are worth one (1) point on 28, 21, and 14 MHz and two (2) points on 7, 3.5, and 1.8 MHz. **Exception: For North American stations only—contacts between stations within the North American boundaries (both stations must be located in North America) are worth two (2) points on 28, 21, and 14 MHz and four (4) points on 7, 3.5, and 1.8 MHz.**

(c) Contacts between stations in the same country are worth 1 point regardless of band.

VII. Prefix Multipliers: The prefix multiplier is the number of valid prefixes worked. A PREFIX is counted only once regardless of the number of times the same prefix is worked.

(a) A PREFIX is the letter/numeral combination which forms the first part of the amateur call. Examples: N8, W8, WD8, HG1, HG19, KC2, OE2, OE25, etc. Any difference in the numbering, lettering, or order of same shall constitute a separate prefix. A station operating from a DXCC country different from that indicated by its callsign is required to sign portable. The portable prefix must be an authorized prefix of the country/call area of operation. In cases of portable operation, the portable designator will then become the prefix. Example: N8BJQ operating from Wake Island would sign N8BJQ/KH9 or N8BJQ/NH9. KH6XXX operating from Ohio must use an authorized prefix for the U.S. 8th district (W8, K8, etc.) Portable designators without numbers will be assigned a zero (Ø) after the second letter of the portable designator to form the prefix. Example: PA/N8BJQ would become PAØ. All calls without numbers will be assigned a zero (Ø) after the first two letters to form the prefix. Example: XEFTJW would count as XEØ. Maritime mobile, mobile, /A, /E, /J, /P, or interim license class identifiers do not count as prefixes. **You may not make up your own prefix.**

(b) Special event, commemorative, and other unique prefix stations are encouraged to participate. Prefixes must be assigned by the licensing authority of the country of operation.

VII. Scoring (QSO Points):

1. Single Operator: (a) All Band score = total contact points from all bands multiplied by the number of different prefixes worked (prefix multiplier; prefixes are counted only once). (b) Single band score = total con-

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tact points on the band entered multiplied by the number of different prefixes worked (prefix multiplier).

2. Multi-Operator: Scoring is the same as Single Operator, All Band.

3. A station may be worked once on each band for QSO point credit. Prefix credit may be taken only once.

IX. QRP/p Section: Single Operator only. **Output power must not exceed 5 watts**. You must note QRP/p in the header of your Cabrillo file or, in the case of non-Cabrillo logs, on the summary sheet and state the actual maximum output power used for all claimed contacts. Results will be listed in a separate QRP/p section and certificates will be awarded to each top-scoring QRP/p station in the order indicated in Section XI.

X. Low Power Section: Single Operator only. **Output power must not exceed 100 watts**. You must indicate low power in the header of your Cabrillo file or, in the case of non-Cabrillo logs, on the summary sheet and state the actual maximum output power used for all claimed contacts. Results will be listed in a separate low power section and certificates will be awarded to each top-scoring low power station in the order indicated in Section XI.

XI Awards: Certificates will be awarded to the highest scoring station in each category listed under Section IV—

1. In every participating country

2. In each call area of the United States, Canada, Australia, and Asiatic Russia.

All scores will be published. To be eligible for an award, a single operator station must show a minimum of 12 hours of operation and multi-operator stations must show a minimum of 24 hours of operation.

A single-band log will be eligible for a single-band award only. If a log contains more than one band, it will be judged as an all-band entry unless specified otherwise.

In countries or sections where entries justify, second- and third-place awards will be made.

XII. Trophies, Plaques, and Donors:

SSB

Single Operator, All Band

WORLD – Stanley Cohen, WD8QDQ
USA – Atilano de Oms, PY5EG
EUROPE – Jim Hoffman, N5FA
SOUTH AMERICA – Ron Moorefield, W8ILC
OCEANIA – Phillip Fraizer, K6ZM Memorial
AFRICA – Peter Sprengel, PY5CC
JAPAN – The DX Family Foundation
WORLD Low Power – Steve Bolia, N8BJQ
USA Low Power – Oklahoma DX Association
CANADA Low Power – Amateur Radio League of Alberta
USA QRP/p – Doug Zwiebel, KR2Q
USA ZONE 4 HIGH POWER – Society of Midwest Contesters
USA ZONE 4 LOW POWER – Society of Midwest Contesters

Single Operator, Single Band

WORLD – John N. Reichert, N4RV
WORLD 28 MHz – Alan Dorhoffer, K2EEK Memorial
WORLD 7 MHz – William D. Johnson, KVØQ
USA 21 MHz – Bernie Welch, W8IMZ Memorial
USA 3.7 MHz – Lance Johnson Digital Graphics
USA 14 MHz Low Power – Boomer Contest Club

Multi-Operator, Single Transmitter

USA – Steve Bolia, N8BJQ
USA ZONE 4 – Society of Midwest Contesters
ASIA – W2MIG Memorial (NT4TT Sponsor)

Multi-Operator, Multi-Transmitter

WORLD – Gail Schieber, K2RED

Contest Expedition

WORLD – Kansas City DX Club

CW

Single Operator, All Band

WORLD – Steve Bolia, N8BJQ
USA – Dennis Motschenbacher, K7BV
EUROPE – Ivo Pezer, 5B4ADA/9A3A
OCEANIA – Tom Morton, K6CT
CANADA – Radio Amateurs of Canada (RAC)
JAPAN – The DX Family Foundation
WORLD LOW POWER – Steve Bolia, N8BJQ
CANADA LOW POWER – Amateur Radio League of Alberta
ZONE 3 High Power – Jim Pratt, N6IG
USA ZONE 4 HIGH POWER - Society of Midwest Contesters
USA ZONE 4 LOW POWER - Society of Midwest Contesters

Single Operator, Single Band

WORLD – Pedro Piza, Sr., KP4ES Memorial (NP4A Sponsor)
WORLD 7 MHz – William D. Johnson, KVØQ
WORLD 3.5 MHz – Lance Johnson Digital Graphics
USA – Kansas City DX Club
USA 28 MHz – Bernie Welch, W8IMZ Memorial
USA 21 MHz – Wayne Carroll, W4MPY

Multi-Operator, Single Transmitter

WORLD – Ron Blake, N4KE
Asia – W2MIG Memorial (NT4TT Sponsor)
USA ZONE 4 – Society of Midwest Contesters

Contest Expedition

WORLD – Steve Bolia, N8BJQ

Combined SSB/CW

Single Operator, All Band

WORLD – Al Slater, G3FXB Memorial

Club (SSB & CW)

WORLD – CQ Magazine

A station winning a World trophy will not be considered for a sub-area award. That trophy will be awarded to the runner-up for that area if the returns justify the award.

XIII. Club Competition: A trophy will be awarded each year to the club that has the highest aggregate scores from logs submitted by members. The club must be a local group and not a national organization. Participation is limited to members operating within a local geographical area (exception: DXpeditions specially organized for operation in the contest and manned by members). Indicate your club affiliation on the summary sheet or in the Cabrillo file. To be eligible for an award, a minimum of three logs must be received from a club.

XIV. Log Instructions:

(a) All times must be in GMT. All breaks must be clearly marked (not required for Cabrillo logs). Single operator and multi-single logs must be submitted in chronological order. Multi-multi logs must be submitted chronologically by band.

(b) All sent and received exchanges are to be logged.

(c) Prefix multipliers should be entered only the FIRST TIME they are worked.

(d) Logs must be checked for duplicate contacts, correct QSO points, and prefix multipliers. Duplicate contacts must be clearly marked. Computerized logs must be checked for typing accuracy. Original logs may be requested if further cross-checking is required.

(e) An alpha/numeric check list of claimed PREFIX multipliers must be submitted with your log.

(f) Each entry must be accompanied by a Summary Sheet listing all scoring information, the category of competition, and the entrant's name and mailing address in BLOCK LETTERS. Also submit a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

(g) Official log and summary sheets are available from CQ via snail mail (SASE) or fax, or on the web at <www.cq-amateur-radio.com>. You may make your own forms as long as all the required information is present.

(h) Electronic submission of logs is encouraged for all participants, and is required for all top-scoring entrants and all who use a computer to log or prepare the logs. The Cabrillo format is preferred. Please ensure that you fill out all of the header information, including your club affiliation. If you submit a Cabrillo log, no additional summary sheet is required. For instructions on filling out the Cabrillo header, see the WPX Contest website. Failure to fill out the header correctly could result in your entry being placed in the wrong category. If you cannot submit a Cabrillo log, you may submit the ASCII output from most of the popular logging programs such as TR, CT, NA, Writelog, and SuperDuper. You may also submit the *.BIN,* .DAT, *.QDF files from CT, TR, or NA. If the log is not in Cabrillo format, a separate summary sheet is required. Please name your files with your call and the file type. Example: N8BJQ submits a Cabrillo file. It should be named N8BJQ.LOG. If N8BJQ chose to submit a non-Cabrillo file such as TR's .dat file, he should name the log file N8BJQ.DAT and the summary file should be N8BJQ.SUM. See the WPX Contest website for more information on e-mail log formats. Logs sent on disk should be on 3.5" disks.

(i) E-mail is the preferred method of log submission. **SSB Cabrillo logs should be sent to <wpxssb@kkn.net> and CW Cabrillo logs should be sent to <wpxcw@kkn.net>.** Non-Cabrillo internet or disk submissions require a summary sheet as well as the log file. All logs received via e-mail will be confirmed via e-mail. A listing of logs received can be found on the CQ WPX Contest website at <**http://home.woh.rr.com/wpx/**> and the list will be updated frequently.

XV. Disqualification: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest, unsportsmanlike conduct, taking credit for excessive duplicate contacts, unverifiable QSOs or multipliers will be deemed sufficient cause for disqualification. An entrant whose log is deemed by the WPX Contest Committee to contain a large number of discrepancies may be disqualified as a participant operator or station for a period of one year. If within a five-year period the operator is disqualified a second time, he or she will be ineligible for any CQ contest awards for three years.

The use of non-amateur means such as telephones, fax, telegrams, packet, e-mail, etc., to solicit contacts or multipliers during the contest is unsportsmanlike and is grounds for disqualification.

Declaration: By submitting an entry in the CQ WPX Contest you agree that you have read and understood the rules of the contest and agree to be bound by them, as well as all rules regulations of your country which pertain to amateur radio. Actions and decisions of the WPX Contest Committee are official and final.

XIII. Deadline:

All entries must be postmarked **NO LATER than May 1, 2003** for the SSB section and **NO LATER than July 1, 2003** for the CW section. All logs, including e-mail entries, are subject to these deadlines. If you snail-mail your entry, indicate SSB or CW on the envelope. Logs postmarked after the deadline may be listed in the results, but will be ineligible for any awards.

Check the WPX Contest website <**http://home.woh.rr.com/wpx/**> for instructions on mailing WPX logs. Questions pertaining to the WPX Contest can be mailed to **WPX Contest Director, Steve Merchant, K6AW, 441 Palo Alto Avenue, Mountain View, CA 94041 or via e-mail to <k6aw@cqww.com>.**

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Washington Readout

BY FREDERICK O. MAIA, W5YI

Regulatory News In The World Of Amateur Radio

New Amateur Radio Bands Proposed by FCC Run into Opposition

Last May the FCC Commissioners unanimously proposed to allocate the 135.7–137.8 kHz low-frequency (LF) and 5250–5400 kHz high-frequency (HF) bands to the Amateur Radio Service on a secondary basis. The FCC also tentatively agreed to upgrade the existing secondary Amateur Radio Service allocation in the 2400– 2402 MHz band to primary status and add a primary allocation for the Amateur-Satellite Service in this band. The NPRM was issued by the FCC's Office of Engineering and Technology, which has jurisdiction over spectrum allocation issues.

The FCC said in a May 9 Public Notice that the new allocations "...enhance the ability of amateur radio operators to conduct technical experiments, including propagation and antenna design experiments" in the low-frequency portion of the spectrum and the new 60 meter band would permit amateurs to "...better match their choice of frequencies to existing propagation conditions." Also, upgrading the Amateur Radio Service allocation at 2400–2402 MHz band would "...protect current amateur use of the band," the FCC added.

The proposal was in response to three petitions filed by the American Radio Relay League. The FCC voted unanimously on May 2 to go along with the League's requests.

The comment period was set to close 45 days after publishing in The Federal Register with reply comment closing 15 days later. Since the NPRM was published June 14, comments closed on July 29, replies on August 13.

The comment and reply-comment period on ET-Docket No. 02-98 has passed, with more than 300 comments filed. All of a sudden the prospects for new LF and HF bands don't look so hot—at least not as good as they did. While the amateur community is all in favor, the commercial sector and federal government have their reservations.

LF (2200 meter) Band

On October 22, 1998 the ARRL filed a Petition for Rule Making requesting that the FCC create two domestic secondary low-frequency allocations for the Amateur Service at 135.7–137.8 kHz and 160–190 kHz. Currently there are no Amateur allocations in the LF spectrum range.

Section 15.217 permits use of the 160 –190 kHz band for general unlicensed operations limited to one watt total input power. The League pointed out that numerous amateur radio and non-amateur radio operators in the U.S. are already using the 160–190 kHz band under Part 15.

The League's petition asked for more liberal operating conditions: an output power limit of 200 watts peak envelope power (PEP) and 2 watts effective isotropic radiated power (EIRP). "These power limits would allow amateur radio operators to conduct antenna design and construction experiments, and long-range propagation studies with continuous wave (CW, Morse) telegraphy," the ARRL said.

To facilitate sharing, the FCC proposed lower power levels than requested by the ARRL. The FCC limited the EIRP to 1 watt and the transmission bandwidth to 100 Hz. "Because of possible difficulty in measuring the EIRP of the amateur station in this frequency range, we additionally propose to limit amateur output power in this band to 100 W PEP." The FCC did not suggest restricting antenna size or design for amateur stations because "...such restrictions would inhibit experimentation...."

As requested by the ARRL, access to the band is to be limited to Amateur operators holding a General, Advanced, or Amateur Extra Class license. With an allocation of only 2.1 kilohertz of spectrum in this band, amateur radio operations "...would be limited to propagation experiments, telegraphy, and low speed data [and RTTY] applications," the FCC said. The LF allocation would be the first ever for U.S. hams.

Although the League said its engineering surveys suggest that hams could operate without causing problems to unlicensed power-line carrier (PLC) systems, the Commission declined to provide an allocation in the 160 to 190 kHz band. The FCC noted it had turned down a 1978 ARRL petition for the same reason.

The FCC observed that "...significant PLC use continues in this band in many locations" and "...there does not appear to be interest internationally in adding Amateur Services in the 160–190 kHz band." Amateur radio operations in the 160 to190 kHz band under the Part 15 rules will not be affected. "Under these rules, amateur operations must meet certain power and antenna- length requirements, but they also are allowed to build and operate some equipment of their own design." Unlicensed Part 15 PLC systems are used by electric utilities to send control signals, data, and voice over electric lines.

Comments on the New LF Band

As would be expected, radio amateurs overwhelmingly favored the new allocations. However, major objections were registered by commercial electric-generating companies.

The United Telecom Council (UTC) is the national representative on communications matters for the nation's electric, gas, and water utilities, natural-gas pipelines, and other critical infrastructure industry entities. UTC said it was unable to publicly comment fully on its members' PLC use due to security restrictions placed on critical infrastructure (CI) industries since the attacks of September 11.

It did say, however, that the electric utility members of UTC rely on PLC systems to ensure the safe and reliable delivery of electric service to their customers and "...the effect of any one of these systems receiving interference from amateur operations could have devastating consequences that far outweigh any conceivable public interest benefit that may come from allowing amateurs to use the 135.7–137.8 kHz band on a secondary basis."

Many electric utilities in United States use PLC frequencies ranging from 10 kHz to 490 kHz to protect high-speed transmission lines. Typically, they use a 10 watt signal to trip electric relays to prevent widespread outages when an overload occurs on the power grid. They claim there is a chance of "false transmission-line tripping," which can cause power outages to many utility customers and possible system-wide problems.

Power companies also object to the fact that "..the FCC has refused to adopt antenna size or design limits, because

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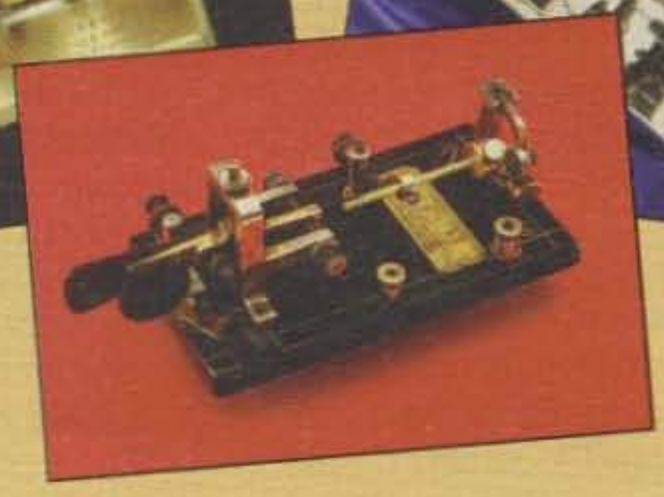

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it believes that power limits alone will adequately address the potential for interference to PLC operations. Power limits are meaningless if they are not coupled with antenna size or design limits that protect PLC systems from harmful interference."

Pinnacle West Capital Corporation, Phoenix, Arizona, is engaged in the generation, transmission, distribution, and sale of electricity to (a) wholesale customers throughout the Western United States, and (b) retail electric customers in the states of Arizona and California. It said it used PLC frequencies on 5000 miles of transmission lines in the western United States for transfer-trip line protection devices. "If falsely triggered, these devices will initiate breaker operation and may cause cascading loss of generation and power outages to our customers as well as portions of the western United States."

IEEE – Power System Relaying Committee (IEEE/PSRC), Oakbrook Terrace, Illinois, commented, "The only way to assure that the power system reliability remains consistent with past experience is to disapprove any allocation in the PLC band. The citizens of the United States enjoy and rely on reliable power."

In its reply comments the ARRL charged that concerns were "...rife with mistaken assumptions and outright misrepresentations about the interference potential to unlicensed, unprotected power-line carrier (PLC) systems in the band.

"The non-Amateur comments attempted to assert protected status for unlicensed RF devices regulated by Part 15 rules, as against a licensed radiocommunication service," the ARRL said, adding "...not one offers any technical support for the concerns raised." The League said the FCC "...should disregard them outright."

The ARRL stated it "...is unwilling to merely accept, without technical support, the bare allegation that there may be interference to the relatively few unlicensed, unprotected PLCs that are operational in the proposed 2.1 kHz segment, or for that matter in the 160– 190 kHz band." It also asked that they explain how they could have been operating in the same environment with a system formerly employed by the Air Force.

"Finally, it is incumbent on the utilities to explain how it is that they are in compliance with the requirement of Section 15.113 of the Commission's rules, which compels them to design PLCs so as to "...achieve the highest practical degree of compatibility with authorized or licensed users of the radio spectrum."

60 meter (5250–5400 kHz) Band

Internationally and nationally, the 5250–5400 kHz band is allocated on a primary basis to the fixed service and on a secondary basis to the mobile service. Currently there is no international Amateur Service allocation in this band. In the United States 5250–5400 kHz is primarily used by the U.S. Government for ship-to-shore and fixed point-to-point communications.

The League said the trend for existing 5 MHz fixed-service operations is to migrate to "alternative technologies" such as microwave, satellite, and fiber for long-haul communications. The organization therefore believes that this band should become increasingly available for amateur radio use.

On January 8, 1999 the FCC granted an experimental (WA2XSY) license to the League so that 15 stations could compare communications reliability among the 3500–4000 kHz, 5100–5450 kHz, and 7000–7300 kHz bands. The ARRL said the results of this experiment show that amateur stations can indeed co-exist with incumbent operations without causing harmful interference. "There have been no reports of interference attributable to amateur operations."

On July 24, 2001 the ARRL filed a formal Petition for Rule Making (assigned RM-10209) requesting that the FCC create a domestic secondary Amateur Service allocation in the 5250–5400 kHz band. The League claimed, "...there is a current need for 150 kilohertz of usable spectrum around 5000 kHz for the Amateur Service, to fill the ionospheric propagation gap between the 3500 to 4000 kHz (80 meter) and 7000 to 7300 kHz (40 meter) bands."

The League maintains that there are times when the existing Amateur Service allocations in the 80 and 40 meter bands do not provide reliable communications due to solar cycles, seasonal and daily variations in the ionosphere, and overcrowding, and that "...an allocation in the 5000 kHz range would provide optimum propagation conditions on occasions when ionospheric conditions do not permit the use of other frequency bands."

The ARRL added that this "propagation gap" occasionally interrupts emergency communications by amateur radio operators between the U.S. and the Caribbean Islands during hurricanes and severe weather disasters.

The FCC agreed that "ARRL's experimentation appears to support its contention that the 5000 kHz frequency band can be effective in supporting communication when the 3500 kHz and 7000 kHz bands are not [usable]."

"The primary allocation to HF broadcasting in Europe and parts of Asia also hinders certain amateur operations in two thirds of the 7 MHz band in the evenings," the FCC noted. Amateurs are required to "operate around" these primary users.

"It appears that amateur radio operators should be able to avoid interference to primary operations in the 5250 to 5400 kHz band due to the limited numbers of primary assignments which are authorized for operation in the band, and their experience in sharing HF frequencies in other bands.

"The operational protocol of 'listen-before-transmit' employed by amateur radio operators should further minimize interference." Noting that this technique is not explicitly required by Part 97, the FCC requested comment on whether it should be clearly stated in the Rules in order to protect the primary operators in the 5250–5400 kHz band.

As requested by the ARRL, the FCC proposed to limit the output power to 1500 watts PEP and invited comments as to whether the 5250–5400 kHz band should be restricted to Amateur Extra Class operators "...to better ensure compatible sharing with the Federal Government operations." As an alternative, the band could also be made available to operators with a General or higher class license as currently authorized in the 10.1–10.15 MHz (30 meter) band.

The FCC also invited comment on whether the band should be broken down into mode-specific sub-bands. The ARRL had proposed opening the entire band to RTTY, data (including CW), phone, and image emission types.

The band, if approved, would be the first new amateur HF allocation since World Administrative Radio Conference 1979 gave amateurs 30, 17, and 12 meters, the so-called "WARC bands."

Comments on 60 meter Band

Again, amateurs were universally in favor of the new HF band. The biggest controversy concerned the need for an FCC-mandated subband to separate telegraphy from wider emissions such as single sideband. Several commenters suggested that the lowest 25 kHz of the band should be set aside for CW/digital data modes and the rest for SSB, as currently is the policy in most of the other HF bands.

One commenter wanted three subbands—one for CW, one for digital, and another for phone, with the widest segment going to CW. Another not only wanted no subbands, but asked that all existing subbands be removed. "Operating modes come and go in popularity and much of the space becomes underutilized," he said. "The CW mode is a good example."

The Power Line Communications Association (Washington, DC)—an association of electric utilities, service providers, and vendors—is involved in the development and deployment of broadband over power lines. PLCA is opposed to the new amateur allocation at 5 MHz "...since it would fall within the range of frequencies used for PLC which is just now getting underway in significant scale trials."

The Home Plug Powerline Alliance, is a Washington, DC industry organization of 65 companies that support networking through a home's electric power wires. Their products operate over the power lines in the 4–21 MHz spectrum range.

"HomePlug took the extra measure of notching out all current amateur radio bands between 4 and 21 MHz in order to minimize radiation to those bands. Working with the ARRL, we were successful in demonstrating that the interference potential from our products is minimal because the unintentional radiation remains at a very low level.

"We are concerned, however, about the implications of a completely new amateur radio band at 5 MHz. ...As a practical matter, the addition of a new band potentially has implications for our existing products in the marketplace and for the design of future products."

The HomePlug Alliance asks that if the FCC allocates 5 MHz to the Amateur Service there be no recourse to any harmful interference caused by HomePlug products for a period of ten years.

The ARRL said the new band was needed to serve as a bridge between the propagation characteristics of the 80 and 40 meter ham bands and would fill a "critical propagation gap" that occasionally interrupts amateur radio emergency communications between the U.S. mainland and the Caribbean islands during hurricanes and other severe weather-related conditions.

"ARRL specifically did not propose sub-bands for this allocation, for several reasons, and suggests that it is unnecessary to impose such regulations at the present time. First of all, and most important, any segregation of wideband and narrowband modes by rule reduces the flexibility that amateurs would otherwise have to conduct in a portion of the band that they determine will not interfere with Federal assignments. ... Limiting a portion of the band so as to preclude SSB voice in a portion of it is detrimental to the principal use of the band [disaster relief and emergency communications]."

Federal government use of the band is for ship-to-shore and fixed point-to-point communications. "Accordingly, amateur operation must be able to protect these assignments against interference." The League agreed with the FCC that "Amateurs should be able to avoid interference to the small number of Federal, and the even fewer non-Federal, assignments in the band."

"The proposed allocation of the 5250–5400 kHz band is, by contrast to the low-frequency allocation issue, essentially uncontested," the ARRL said in its reply comments. "There is no opposition in the record from any non-amateur source whatsoever." That, however, was before the NTIA (National Telecommunications and Information

Administration) sent a dissenting letter to the FCC's Office of Engineering and Technology at the end of August.

Letter from NTIA

On August 29 the FCC's Office of Engineering and Technology received a letter from the National Telecommunications and Information Administration. NTIA is the White House advisor on telecommunications matters and regulates radio spectrum allocated to the federal government. The letter said it opposes the secondary allocation for the Amateur Service at 5250–5400 kHz.

HF bands are currently used extensively by federal agencies for emergency services, including communications support for the Dept. of Defense, Coast Guard operations, Dept. of Justice law enforcement, and back-up or emergency uses by twelve other agencies. NTIA believes the Commission's current proposal does not adequately provide for the protection from harmful interference to these critical government operations primary in this band.

Federal agencies need immediate access to these HF frequencies in times of emergency. The Commission's proposal does not offer any procedure for a federal agency to immediately reclaim a frequency for emergency use once amateur operations have been established nor would the Commission's existing interference complaint process resolve interference to federal emergency operations in real time. Moreover, amateur operators using some of the modes of operation proposed in the NPRM may not be able to hear or recognize a federal station's attempt to communicate because of the difference in modulation types, thus the "listen before transmit" protocol proposed to be used by amateur operators would not avoid causing harmful interference in all instances, and may prevent federal stations from establishing communications.

Some federal agencies utilizing this portion of the HF band have automatic link establishment (ALE) systems that sample channels periodically to determine channel availability. Amateur operations on these channels would preclude ALE systems from sampling a channel successfully for the necessary propagation data for the channel, thereby eliminating an otherwise usable channel, or possibly the best channel, from the agency's frequency list.

Some Coast Guard operations in this frequency band are from small boats that may be engaged in search-and-rescue operations. In general, these boats have low-power systems with less efficient antennas than many amateur operators on 1.5 kW stations with gain antennas. Thus, the boats may be forced to use less optimal frequencies to perform their search-and-rescue missions if an amateur station is otherwise using the HF channels in this band....

Without a fuller understanding of the potential for harmful interference to these federal operations, NTIA believes that adding a secondary allocation for the amateur services in the 5250–5400 kHz portion of the HF band is premature. NTIA will work with the federal agencies, the Commission, and the amateur radio community to determine whether some future accommodation of the amateur service in this portion of the band would be possible, including consideration of limits on radiated power or emission types, reduction of the proposed allocated bandwidth, use of discrete frequencies rather than a band of frequencies, geographic restrictions, or other means to mitigate potential interference.

The ARRL said it has long been aware of the concerns registered by the federal government, but was "...surprised by the tone of the NTIA letter." Chris Imlay, W3KD, ARRL General Counsel, said he did not know how seriously the FCC would take NTIA's late-filed comments. "We're in the process of expediting coordination arrangements and other means to identify and satisfy NTIA's legitimate concerns," he added.

The League said it would be developing a voluntary band plan for the 5 MHz allocation "...which, though voluntary, can be expected to have a reasonable degree of adherence by operators nationwide. This plan will take into account the need to avoid interference to Federal assignments first and foremost, but would otherwise encourage narrowband modes in one segment and wideband modes in another."

"The final reason why sub-band regulation is inadvisable in this band in particular is that the band is to be used for general amateur purposes, and especially for emergency communications," the ARRL added. "Emergency and disaster relief communications at HF are typically conducted using SSB voice emissions."

Primary Status for Amateur Service at 2.4 GHz

Internationally, in all three ITU Regions the 13 cm band (2300–2450 MHz) is allocated on a co-primary basis to the fixed and mobile services and on a secondary basis to the Amateur Service. Further, industrial, scientific, and medical (ISM) devices operate at 2400– 2500 MHz, and users in this band must accept interference caused by these devices.

The Amateur-Satellite Service is also permitted to operate in the 2400–2450 MHz band on a non-interference basis. In the United States, unlicensed Part 15

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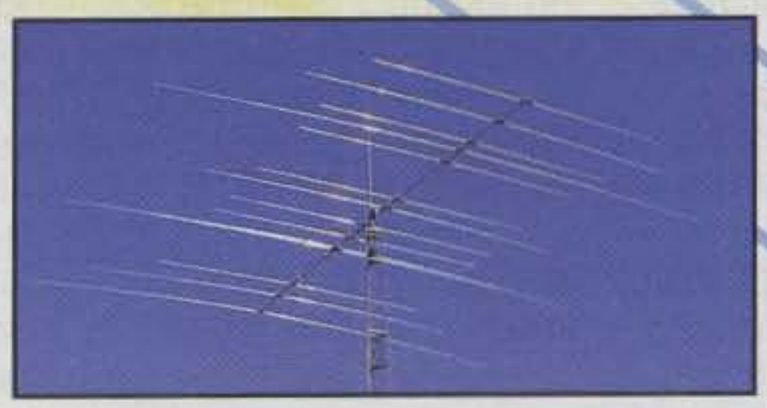

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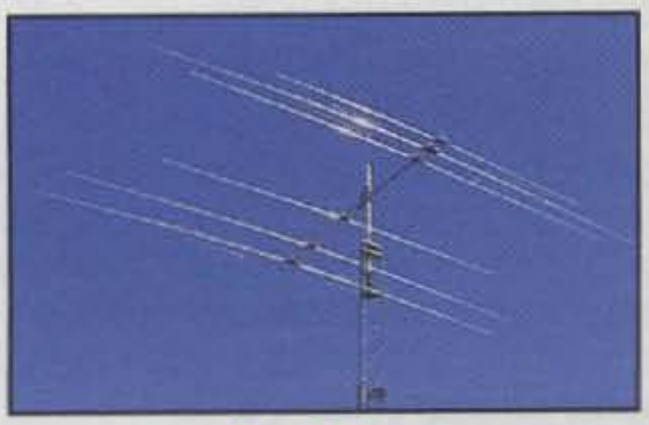
(optional X-base)



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transmitting devices are also permitted in the 2400–2483 MHz band on a non-harmful interference basis to licensed services. These devices are used for a variety of operations, including cordless phones, wireless local area networks, and other broadband wireless applications using industry standards protocols such as IEEE 802.11b and Bluetooth.

On November 18, 1999 the Commission adopted a Policy Statement concluding that the 2400–2402 MHz band should be placed into a spectrum reserve for future "new technology" applications. Responding to this action, the ARRL filed a Petition for Rule Making (assigned RM-9949) on July 17, 2000 requesting that the 2400–2402 MHz band allocation be upgraded to primary status in both the Amateur and Amateur-Satellite services.

Radio amateurs use this spectrum slice for both analog and digital satellite uplink and downlink operations and various other satellite applications. Amateurs already are primary at 2390 to 2400 and from 2402 to 2417 MHz. In support of its request, the ARRL said that a primary allocation in the remaining 2 MHz would protect its operations from reallocation or use by an incompatible sharing partner.

The Radio Amateur Satellite Corporation (AMSAT) commented that the Phase 3D satellite (now AMSAT-OSCAR 40) was built mostly by volunteers from a number of countries at a cost of approximately $4 million. This satellite carries a group of broadband receivers that operate in various bands available to the Amateur-Satellite Service from 21 MHz to 5.7 GHz and broadband linear transmitters that operate in various amateur-satellite service bands from 144 MHz to 24 GHz. Two of Phase 3D's satellite transmitters are in the 2400–2402 MHz band, as is one of its receivers. Furthermore, primary status is needed "...to provide some assurances of future occupancy of the band segments for the next generation of amateur satellites."

The FCC said it believed that the ARRL's request to upgrade the allocation status of the 2400–2402 MHz band had merit. The Amateur Service "...has invested time, effort, and money in the development of the Amateur and Amateur-Satellite Services and primary allocations in this band would protect this investment from future allocation requests in the band."

Accordingly, the FCC proposed upgrading the Amateur Service allocation from secondary to primary status and adding a primary allocation to the Amateur-Satellite Service in the 2400–2402 MHz band. Amateur satellite operators will still be required to protect other services operating in this band outside of the United States from harmful interference. Only a change in the allocation status of the 2400–2402 MHz band is proposed. No change in any other Amateur Service rules affecting the 13 cm band is planned.

Either a primary or secondary allocation in ISM bands must accept interference from, and not hinder the use of, ISM equipment. "Similarly, this band is extensively used by unlicensed operations, which have been able to share with amateur radio station use to this point. Because this band is important to unlicensed applications and there is widespread deployment, the removal of such devices would not be feasible," the FCC said. The Commission asked for public comment on whether the proposed primary Amateur and Amateur-Satellite Service allocations would conflict with unlicensed use of the band.

Comments on 2400 MHz Proposal

Amateurs agreed that a primary allocation in the 2400 to 2402 MHz band will help to protect amateur and amateur satellite communications from frequency allocation pressures in this highly valuable frequency range.

IEEE Project 802 (Lynnfield, Massachusetts) opposes the elevation of the amateur 2400–2402 MHz band from secondary to primary status and **to establish a primary allocation for the Amateur-Satellite Service in the same band. (??)**

"The subject band is of vital importance to unlicensed uses that provide tremendous benefits to the public. ...it does not require a huge imagination to foresee a strong likelihood that the ARRL will, if granted Primary status, attempt to use that elevated status to ultimately raise new challenges to Part 15 unlicensed operations in the subject band.

"...conflicts of a more fundamentally

political nature may, in fact, arise in the future, due to the ARRL's tenacious, and often preemptive, approach to the defense of amateur operations. Sharing of the subject band between amateur satellite operations and unlicensed Part 15 operations could be facilitated by simply limiting amateur satellite use of the band to downlink transmission only.

"This would have the effect of precluding recurrent, frivolous challenges to the Commission's authority from the amateur community vis-a-vis Part 15 unlicensed operations as well as unreasonable assertions of interference to future systems in the Amateur Radio Service or Amateur-Satellite Service that may be designed without adequate technical consideration of the reality of the other uses of the band combined with an attitude that 'the onus of co-existence is totally on the Part 15 community.'

"If the ARRL is sincere in its contention that upgrading the Amateur and Amateur-Satellite Service allocations in this band 'would not impose constraints on co-frequency Part 15 devices' they should not object to a 'Safe Harbor' provision."

The ARRL said the FCC's "...request for 'comment on whether the proposed primary amateur and amateur-satellite service allocations would conflict with unlicensed use of the band' makes no sense. The Amateur service is a licensed radio service which now has allocation status in the 2400–2402 MHz band. Part 15 devices operate there without any allocation status. Part 15 devices cannot continue to operate (on an individual device basis) where interference is caused by that device to any licensed station, by rule. The change in the allocation status of the Amateur Service or Amateur-Satellite Service from secondary to primary can therefore have no effect on the unlicensed use of the band, because the obligations of unlicensed Part 15 devices to both accept and not cause any interference does not change under any circumstances.

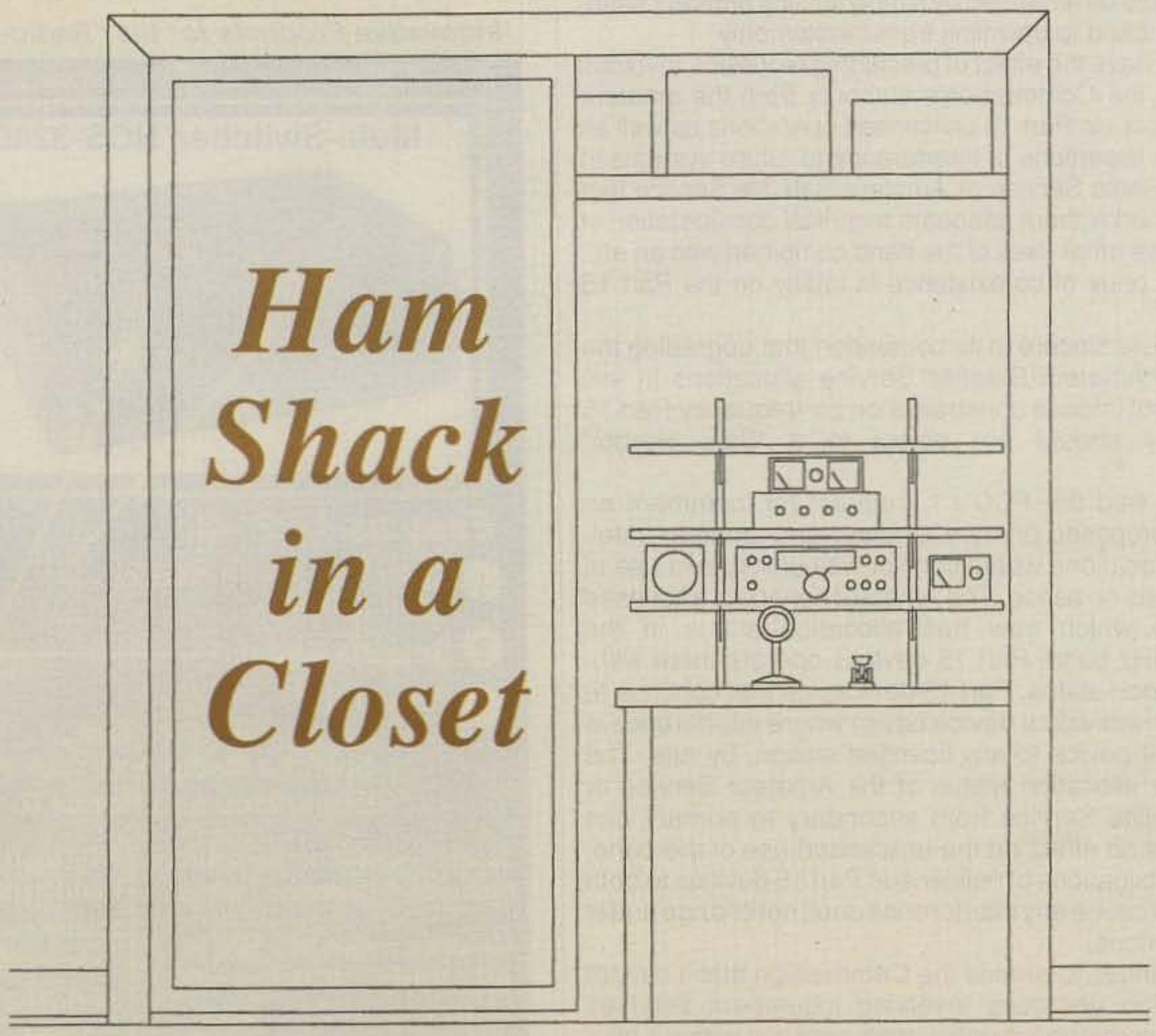
"ARRL continues to remind the Commission that it cannot make allocation decisions involving incumbent services based on concerns about unlicensed services without allocation status." The League added that it was "...very concerned that the Commission appears to be placing the interests of non-licensed users of this band, at a minimum, on par with the interests of licensed users."

"...[We] urge the Commission to reaffirm its commitment to maintaining the proper relationship between licensed and unlicensed services sharing frequencies," noted the League in its reply comments, "and that the interests of unlicensed users of a particular frequency band are secondary to those of all licensed users, along with reaffirming the basic premise that unlicensed operations must tolerate interference from licensed operations, and may not cause interference to licensed operations."

What's Next?

At press time the FCC had not made any decisions on the band proposals; it commonly takes the Commission from six months to a year after the close of all comments to reach a decision and issue a Report and Order. The big question mark at this point is how much weight the FCC will give to the unexpectedly harsh (and late-filed) comments by NTIA about the proposed 5 MHz allocation. It is probably safe to assume that Commission staff will monitor any negotiations between the ARRL and NTIA that might result in a compromise acceptable to both hams and federal users, and will delay issuing a final ruling if it looks like those negotiations are heading toward a resolution. 73, Fred, W5YI

VE3ERP reveals the ins and outs of being a successful "closet[1]" amateur radio operator.



Ham Shack in a Closet

BY GEORGE MURPHY,* VE3ERP

Magazine photographs of ham shacks with operators completely surrounded by walls, racks, and shelves full of radio stuff can be intimidating to a beginning ham. Fortunately, all that space is not necessary for the more casual, space-deprived, and financially challenged amateur just starting out. While we beginners[2] drool over what someday may be, many of us face the more immediate concern of trying to find somewhere to enjoy our hobby with only minimum equipment[3] in a crowded QTH without an attic, basement, or spare room. Unless one lives alone, prime possible locations such as the dining-room table or the top of the grand piano are generally frowned upon. What's left? Closets, that's what!

Over the years most of the apartments, town houses, sub-divisions, housing developments, etc., in which I have parked my bones contained several shallow sliding-door closets. The accompanying artwork on this page illustrates how I turned half of this type of closet into a ham shack. It was simply a matter of installing a counter about half the length of the closet by almost the closet's full depth (allowing just enough room to close the closet door), complemented by some adjustable wall shelving. It all can be built and installed by anyone who, like me, has only basic primitive carpentry skills with a hand saw, a hand drill, and a screwdriver.

The Ins and Outs

As with any other ham shack, you have to get AC power in and antennas out. AC is no problem. On the end wall under the counter I installed a power strip containing a switch, circuit breaker, and surge protection, connected to a three-wire air-conditioner-type heavy-duty extension cord coiled up on the floor. Whenever I wanted to operate, I plugged the extension cord into the nearest wall outlet in the room.

Getting the antenna out took a little more thought. Where the closet was below an attic space, a hole or two in the closet ceiling got the antenna feeders into the attic and merrily on their way to the antenna, wherever it may have been. Where passing feeders through walls was necessary but holes in the wall were inadvisable, I left the antenna lead-in coiled up either inside or outside the closet and plugged it in whenever I opened the door to operate. In one case where I had to get coax from the closet to a window, we had several pictures along the route, so I draped the

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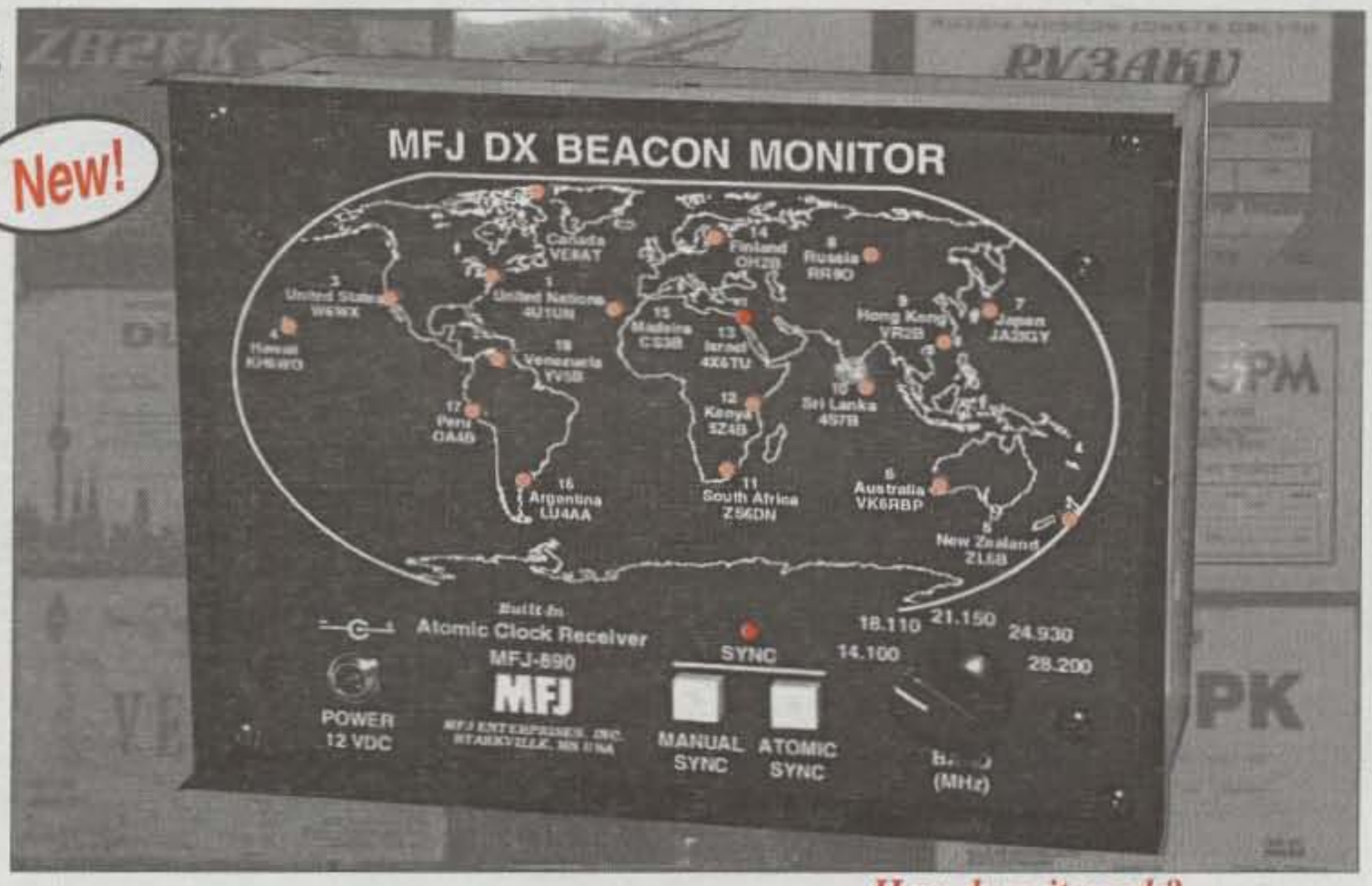

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On each frequency, each beacon transmits for ten-seconds -- its call sign at 22 wpm CW and a one-second dash at 100 Watts and three one-second dashes at 10, 1, 0.1 Watts.

When each beacon completes a transmission it goes silent on that band and switches to the next higher band.

For more information see Oct/Nov, 1994, Sept, 1997 *QST* and Jan 1999, Sept/Dec 2001, Jan 2002 *Practical Wireless* of U.K.

How are band conditions?

Tune to a beacon frequency. If band conditions are good, you'll hear each beacon identifying in Morse and four dashes each at a lower power level.

The more beacons you hear, the more open the band is to different parts of the world.

The more dashes you hear per beacon, the better the quality of propagation and the more robust the band is. If you hear the 100 milliwatt dashes from many beacons you know *the band is wide open!*

In just three minutes you'll know how band conditions are worldwide.

It's interesting to see how propagation vary from day to day -- what beacons you can hear and at what power level.

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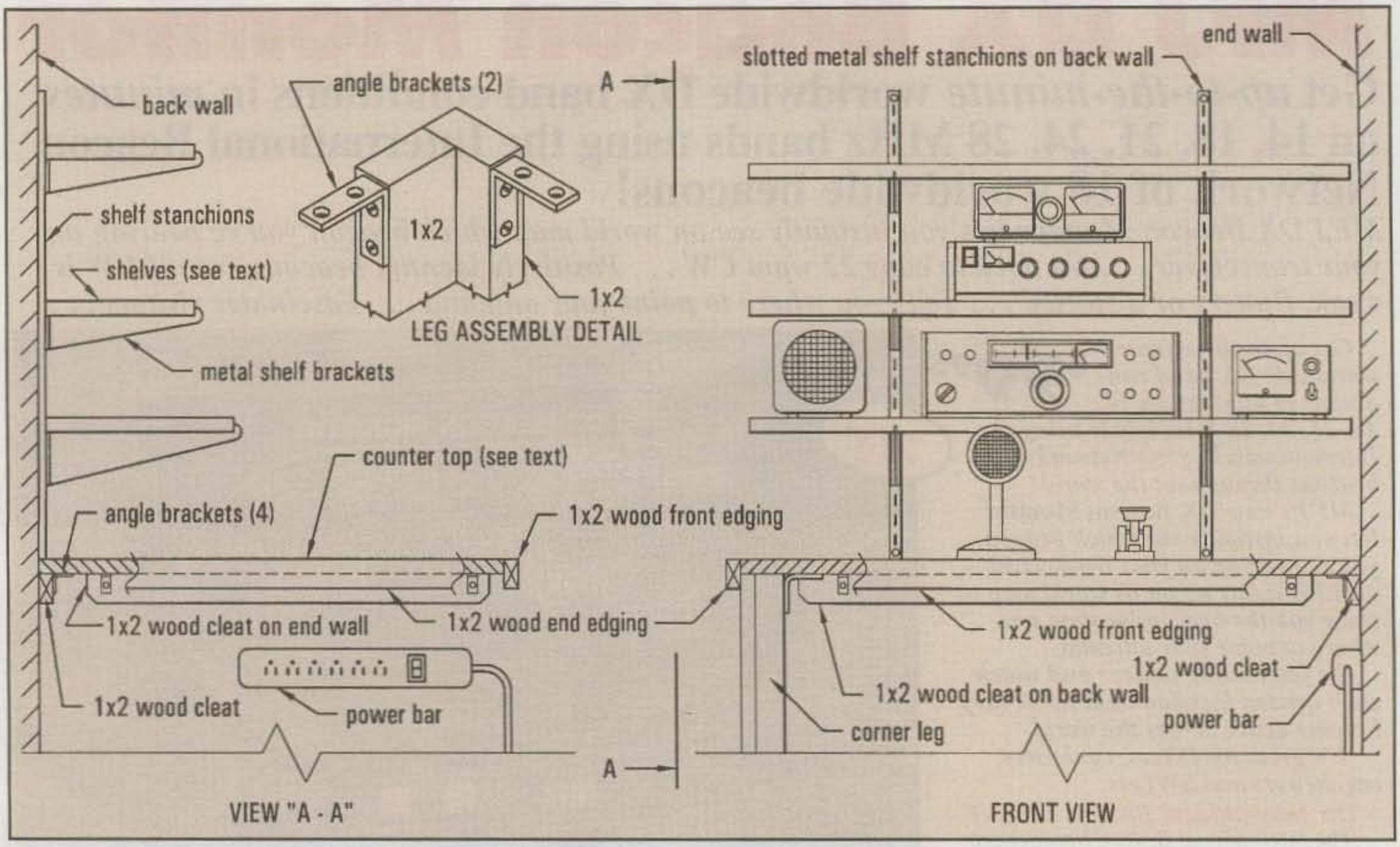

Fig. 1– Construction and installation details for the VE3ERP "ham shack in a closet."

coax behind the picture frames. My XYL painted the coax to match the wall and hung holiday greeting cards on it.

Connecting RF ground wires was a problem at times. Sometimes there was a hot-water radiator or a sink in the room to which a ground wire could be connected. In other cases I was able to sneak a wire out a window and drop it to a ground rod under the window, and in cases where I was feeding the antenna with coaxial cable, I often ran an RF ground wire alongside the coax and dropped it to the ground where the coax finally took off from the house. Sometimes I just ran a counterpoise wire around the baseboard of the room In which the closet was located.

Fig. 1 illustrates the general arrangement of the easily installed and easily removed Closet Ham Shack that followed me around for many years. While this article is specifically about closets, it also applies to almost any small space. In fact, my present ham shack is basically unchanged from its closet beginning, except it currently is installed in an antique armoire.[4]

Materials

The counter top was found in the off-cut leftovers bin at a building supply store. It was a piece of plywood with one face covered with plastic laminate (Arborite® or Formica®), probably left over from a custom kitchen-counter job. Since cutting laminate counter-top material with a hand saw can be messy and usually results in chipping of the laminate, I had the store people cut it to the exact size I wanted. This resulted in smooth, but unattractive edges, so I added 19×38 mm (U.S. 1×2) wood edging to the edges that could be seen. I also had them saw a 50 × 50 mm (U.S. 2" × 2") 45° chamfer at the corner that fit into the corner of the closet, to provide an opening for passing wire and cable runs through the counter. The counter edging, wall cleats, and corner leg all were made from standard 19 × 38 mm (U.S. 1×2) pine.

The shelving consisted of standard slotted wall stanchions, brackets, and shelves from the local hardware store. The shelves were completely encased in plastic laminate and were (and still are) relatively expensive, but painted pine, plywood, or particle-board planks will do just fine. I used 90 cm (U.S. 36") long shelves in varying widths with brackets to suit my equipment. The closet was completely furnished with

fleamarket finds—a padded folding bridge chair and a desk lamp. I avoided the temptation to assemble anything with nails and glue (too difficult to remove and re-use) and assembled everything with screws and angle brackets. When moving from a QTH, screw holes in the walls are easy to patch, and can even be made to match the wall with a few dexterous strokes of a crayon or colored watercolor pencil.

The Other Half

"Other half" here does not refer to the other half of the closet, which is probably already the domain of your "Better Half" anyway. Rather, it refers to the other half of the radio station—namely, the antenna. Antenna design is beyond the scope of this article, but if you would like to start up in a closet and are hanging back because you have no room for an antenna,[5] consider the MFJ Enterprises #1622 Apartment Antenna, #1621 Portable Antenna, or #1624 Mini-Bugcatcher antennas. I have used homebrew 80 through 10 meter versions of all three as indoor and/or balcony/window-sill antennas, and they all worked well—not quite as well as full-size outdoor high-in-the-sky jobs, of course, but quite well enough for a lot of fun and even some respectable DX for over 40 years.

Better still, why not get right into the true spirit of amateur radio and homebrew your own antenna,[6,7] originating in a closet?

Notes

1. My *Webster's New World Dictionary of the American Language, New Revised Expanded Pocket-Size Edition,* reissued July 1983, defines closet as "to shut up in a private room for confidential talk." Sounds like a ham shack to me!

2. I have been a licensed ham for over 40 years, but still consider myself a beginner. I am a slow learner.

3. My original minimum equipment, still in use today, is shown in fig. 1. The middle shelf holds a combination SWR/RF output meter sitting on top of a transmatch (which some misinformed know-it-alls still call an "antenna tuner"). On the bottom shelf I have a speaker, an ancient QRP transceiver (guess what it is!), and a homebrew 12 volt power supply. The counter contains a microphone and a hand key. Who needs anything more? The top shelf is laden with miscellaneous junk, which I am ashamed to show on an otherwise neat and tidy drawing.

4. An antique armoire is an old, beat-up, free-standing wooden kitchen cupboard, refinished, renamed in French, and resold at an outrageous price by an antiques dealer. Computer furniture dealers sell equivalent ugly, modern, plastic-laminate-faced, particle-board monstrosities by the same name, also at outrageous prices. Sometimes I think I would have been better off not coming out of the closet.

5. Designs for several electrically shortened antennas suitable for indoor or outdoor installation can be found in HamCalc, a free software suite on CD containing over 300 computer programs of interest to radio amateurs. HamCalc is available from the author for a modest remittance to cover materials and shipping costs. For details, e-mail <ve3erp@encode.com>.

6. Murphy, George, VE3ERP, "The End-Fed Random-Wire Antenna," *CQ,* January 1999, pp. 42–43. The article describes QRP antennas, but can be adapted for higher power applications (see the preceding note).

7. Murphy, George, VE3ERP, "Aerials—A Lost Art," *QST,* July 1986, pp. 20–22, especially the section headed "Impossible Antennas." ■

Public Service

BY BOB JOSUWEIT, WA3PZO

Public Service and Emergency Communications

Storms, Memories, and MARS

Eyes to the Tropics

Hurricanes Deliver One-Two Punch

For many Labor Day is the traditional end of the summer season. For many along the Atlantic and Gulf Coasts of the United States November 30 marks the end of their season—the hurricane season (along the Pacific coast, the season ends on November 15).

This year was no different, as two residents of the tropics got organized and set their sights on land. Their names were Isidore and Kyle. This month we take a look at the end of summer, a solemn remembrance, and a way to say thanks to those who have defended our freedoms and those who continue to do so.

W4EHW operators provided vital links between the National Hurricane Center and others in harm's way. (Photo courtesy WD4JR)

Isidore Comes Ashore

The Hurricane Bulletins issued by the National Hurricane Center put everyone on alert. "All interests in and along the Yucatan Peninsula and Gulf Coast areas should pay close attention as Isidore moves into the warm Gulf of Mexico." It was time for ham radio operators to serve in the public interest.

By 8 AM on September 19 plans were in place. Julio Ripoll, WD4JR, Assistant Amateur Radio Coordinator at National Hurricane Center, announced the start of amateur radio operations at W4EHW would begin at 3 PM. Reports would be gathered from the Hurricane Watch Net on 20 meters and the Cuban Weather Net and the Civil Defense Net on 40 meters. Reports were also going to be collected via APRS, e-mail, and their on-line reporting system. This operation started about three hours before Hurricane Isidore's eye would hit the Isle of Youth. Hurricane force winds were already extending 115 miles from the center. The operators rotated for three hour shifts between 3 PM and 11 PM on the 19 and from 7 AM to 3 PM the next day.

International Amateur Radio Union Area C Emergency Coordinator Arnie Coro, CO2KK, told the ARRL that ham radio provided communication with remote sections of western Cuba during Isidore's passage. Coro said that an amateur radio station was on the air from the national headquarters of the Cuban weather service.

Members of the Cuban net checked in with W4EHW and compared notes several times. This helped both weather services exchange data. Coro credited the Hurricane Watch Net with helping to coordinate "our mutual efforts to deal with this devastating hurricane."

Over the next two days Hurricane Isidore meandered over the Yucatan Peninsula and was downgraded to a tropical storm. Ripoll reported that information received via ham radio indicated severe building and infrastructure damage along the northern coast of the Yucatan. The town of Merida had several hospitals with broken windows, no electrical power, and flooding from more than 30 inches of rain. By the time Isidore moved into the Gulf of Mexico at least four people had been killed. W4EHW was on the air for 64 hours with support from the Hurricane Watch Net.

Ripoll said they made "extensive use of our bilingual operators, some sacrificing work duties to volunteer. Many Mexican hams stayed up with us late into the night, sending us those valuable surface observations on the Hurricane Watch Net, Mexican Emergency Net, the Central American Emergency Net, and via e-mail."

He also indicated that the surface reports received from the hams were very important. On Sunday, September 22 the National Weather Service in Miami issued an advisory which said, "Ham radio reports indicate some coastal flooding and damage to homes have already occurred near Merida and Chelem on the northwest Yucatan coast."

Isidore Provides Time To Experiment

Ripoll reported that W4EHW conducted several propagation experiments on 20, 40, and 80 meters with the hurricane-hunter aircraft as it flew through Hurricane Isidore over Cuba and the Yucatan. Capt. Dave Tennesen, NL7MT, transmitted live reports of "horrendous" sea surface conditions as they flew through the storm. This was the first time that the hurricane hunter aircraft made contact on 80 meters. He said, "These contacts are very important as they are testing a new HF antenna installed on the aircraft" and they were able to test "our abilities to provide backup communications

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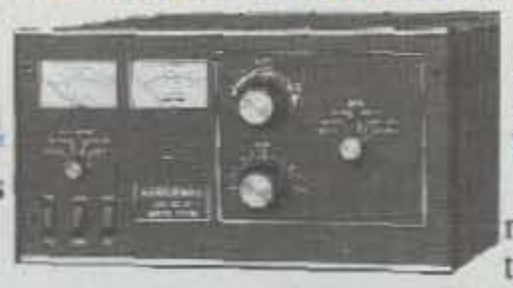

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from NHC." Further propagation and antenna experiments are planned during future hurricanes.

Daybreak

Operators at the Hurricane Center and on various nets got a break before the next wave of operating would begin. This time it was Isidore, Lili, and Kyle. On September 30 Lili became a minimal hurricane with wind speeds of 75 mph. However, it was ready to follow the path of Isidore, which had crossed the Isle of Youth just 10 days earlier.

W4EHW coordinators meet with Hurricane Hunter Aircraft crew members (left to right): John McHugh, KU4GY; Capt. Dave Tennesen, NL7MT; Lt. John Adler, KD6CFW; Flight Dir. Tom Shepherd, WB5ELO; and W4EHW Assistant Coordinator Julio Ripoll, WD4JR. (Photo courtesy W4EHW staff)

Once across the Isle of Youth the storm became a category 2 hurricane with wind gusts of 107 mph. As the week moved on Lili became a monster storm. The Hurricane Center issued a bulletin on Wednesday, October 2:

LILI REMAINS AN EXTREMELY DANGEROUS CATEGORY 4 HURRICANE

On the Gulf Coast, evacuations were taking place. Hams were staffing shelters and getting ready for what looked to be one of the worst hurricanes to hit the Louisiana coast in many years. Many were on standby to help local emergency management agencies should they be needed. Just before the hurricane struck the coast, however, it lost its punch. Winds had died down to near 100 mph and many residents were expressing relief.

New Mode Put To Use

For the first time an IRLP-Skywarn net was held to support the work of the National Hurricane Center. Using the Palmetto Radio Club repeater in Miami, and other repeaters in Louisiana, amateur radio operators were linked together via *Internet Radio Linking Protocol* nodes. The link allowed the Hurricane Center to collect weather reports from stations in the affected area that did not have HF capability.

Many operators with many skills used their talents to provide critical information during the hurricane season. HF, APRS, IRLP, local repeaters, e-mail, and on-line reports all combined to serve in the public interest. Ripoll passed along a thanks to all. Riley Hollingsworth of the Federal Communications Commission summed it up with a comment posted on the Hurricane Watch Net website. He said, "Great work!!" We agree.

Hams Help Remember

9-11 Heroes

September marked the first anniversary of the terrorist attacks on America. Again, ham radio operators contributed to the overall safety and security of those attending memorial services in New York, Virginia, and Pennsylvania. This month we take a look at the planning and events involved with staging the memorial service in western Pennsylvania, where Flight 93 crashed into a remote field.

Advance Planning

The memorial service at the crash site wasn't a last-minute idea. Since March Somerset County officials had been planning a service to honor the fallen heroes and let the families pay tribute to what they did that day to save our country from any additional terrorist activity. Emergency Management Director Richard Lohr, N3VFG, said officials anticipated that approximately 30,000 people might attend the event.

Amateurs provided key communications from remote parking locations at the Flight 93 Memorial Service on September 11 in Pennsylvania. Here Michael Zimmerman, N3XCC, is communicating with the Emergency Management Agency's Emergency Operations Center. (Photo courtesy Elisha Zimmerman, KB9WCX)

Early planning indicated that 17 locations throughout the county would need amateur radio communication. Lohr said it would be difficult for the county to coordinate activities at the parking area, but with the "assistance of the Somerset County Amateur Radio Club the job became a manageable one."

ARES/RACES operators from the county and the surrounding area provided both emergency and non-emergency communications between the designated parking areas and the Somerset County Emergency Operations Center (EOC). By August the number of locations needing amateur radio support had increased to 21, with at least two operators needed at each location. RACES officer Jim Crowley, NJ3T, explained the radio operator's job was "*NOT* to direct traffic, answer any questions pertaining to the operations, or help visitors on the buses." Their job "*WAS* to watch the area and report to the EMA EOC when the parking lot was full, when the buses arrived/departed, any suspicious activity, any emergency messages a visitor or agency might need to pass, and report any injuries needing medical attention." Other officials at each of the sites included a site commander, a greeter from the National Park Service, a group of volunteers to direct traffic at the parking areas, and the Pennsylvania State Police to provide security and check visitors as they boarded the buses.

Lohr said Somerset County EMA had established a forward command post at the memorial site with participation from the Pennsylvania State Police, Pennsylvania Emergency Management Agency, and FBI. R.A.C.E.S. amateur radio operators were also assigned to this location to provide an additional communications link between the forward command post and the EOC some 12 miles away. Operators would have to be on duty between 5 AM and 2 PM, following President Bush's visit to the site.

Family members of crash victims, as well as others, had to be transported from remote parking sites staffed by local amateurs. (Photo courtesy Brian Leventry, N3LZV)

Planning Begins

Somerset County hams began planning for the event. One of the first needs was to recruit hams from outside of the county. Crowley got help from the Somerset County ARC; Somerset County ARRL Emergency Coordinator Barry Shaffer, N3BLS; and Fred Maize, KM3M, and William Armitage, Jr., WK3M, of western Pennsylvania R.A.C.E.S. They began to compile a list of volunteers from Cambria, Westmoreland, Fayette, and Bedford counties. Locally, team members began to check for radio coverage from the crash site, each of the remote parking lots, the EOC, and other key spots. Notes were made on whether or not an operator using an HT could get into the local repeater, how much power was needed, and whether the site could talk to the EOC on a simplex frequency. The reports were simple, but contained important information. Here's an example:

JENNERSTOWN SPEEDWAY TO EOC –147.195 need 5 watt mobile – 146.625 good HT – 147.015 high power HT – simplex could hear EOC CRASH SITE 147.195 1.5W to 5W HT – 146.625 & 147.015 not checked but should be about the same – simplex was good at 5W on top of hill, not checked elsewhere.

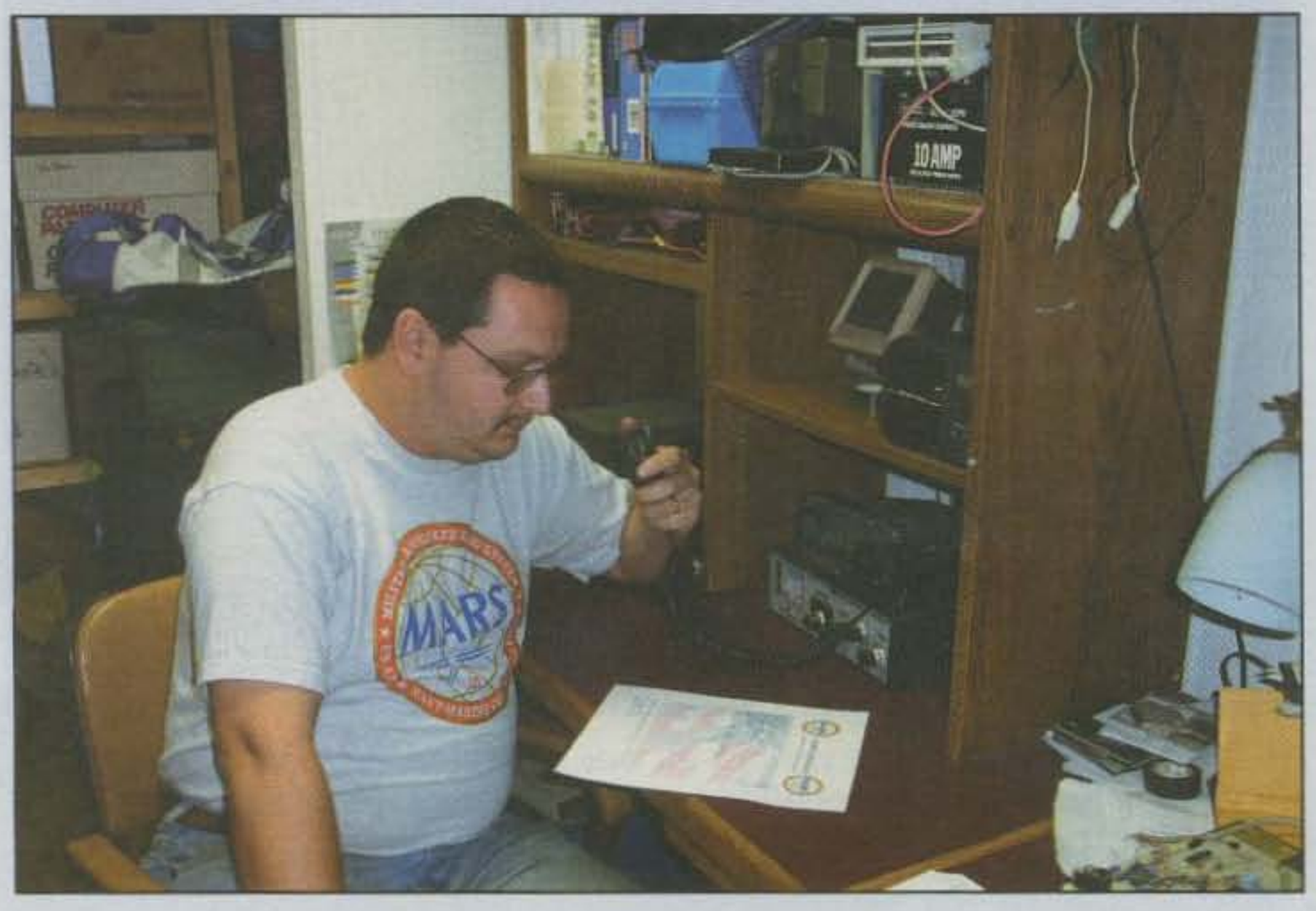
With less than a week to go Crowley was informed that after various federal and state agencies reviewed the plan, the number of parking areas was being drastically reduced to eight. Crowley explained that even though there was a reduction in parking sites, there would still be a need for a good number of hams due to the size of some of the selected sites. There were to be five general visitor lots plus one for visitors with disabilities, one for victims' families and other V.I.P. visitors, and one for the Shanksville residents. Shanksville is the nearest town to the crash site.

In order to get all of the planning just right and all the necessary information passed out, Crowley had a team of hams working on all of the EOC, site, security, and public-relations details. The team included Brad Ott, N3VHR; Lorraine Ott, N3UVC; Artis Kitchens, N3XGL; Ralph Geiyer, KD3NO; Brian Leventry, N3LZV; Bill Smith, KB3GUN, and Barry Shaffer, N3BLS.

The team provided each operator with detailed instructions as to what was expected of all operators at their assigned location. This included key information that was supposed to be passed to different locations. The field-test information was included, as well as an amateur radio operator site leader. The leader was responsible for communications between the volunteers at his/ her site and to the County EOC. Communications between the site leader and the volunteers was handled on a simplex frequency assigned to each site. Directions included specific frequencies for various levels of communications and a backup plan should a repeater fail.

In New York, ARES members supported memorial services and other commemoration events throughout the five boroughs. With security tight, ARES members had to negotiate with various agencies to have radio equipment in the area. Many areas of New York City are RF black holes. To assist with communications from the Red Cross headquarters, ARES members used K1RFD's Echolink system. New York hams assisted for over 15 hours.

Saying Thanks to Those Who Served: A MARSgram



John Schmitz, NS8E (MARS call AAR5LM), of U.S. Army MARS (Michigan), puts the finishing touches on another VA patient MARSgram to go. (Photo courtesy NS8E/AAR5LM)

Each year many club and public-service-minded groups set up displays at local malls or hospitals and ask people to send a holiday greeting to their friends and family via amateur radio. This year consider sending a message to a serviceman or woman on duty or to a veteran who may be spending his or her holiday at a Veterans Administration Hospital.

Today members of the armed forces have a number of ways to keep in contact with family members back home. Probably the simplest method is to pick up the phone, but international calls even direct dialed calls—are costly. Add this to possible reduced income because the serviceman is away from a regular job.

The Air Force sponsors a program called Hearts Apart which helps families keep in contact via videophones, video-e-mail, calling cards, and yes, via the Military Affiliate Radio System (MARS), without the high phone bills. While trying to have a close personal conversation on the MARS system is a little strange when the user has to say "over" at the end of every transmission, it is still great to hear a caring voice from home.

MARS also sponsors a program in which you can send a message to any veteran patient at a VA hospital. VA patients are among the authorized designees who may both send and receive MARSgrams. Others include military organizations and personnel of all services, including active, reserve and National Guard, retired military of all services, U.S. Government civilian employees, federal/state/local disaster support agencies, and all MARS members.

During the last Christmas season several schools in Michigan, New York, and California involved their students in preparing outbound MARSgrams destined for VA medical centers and our troops overseas.

Great Service

Here's an opportunity to perform a great public service for our past and current servicemen and women. It is also an opportunity to let members of the public send a special holiday greeting. Take a moment and contact a local MARS member and see how your club or group can work with the MARS organization in sending holiday messages. Not only will it make the person receiving the message feel good, it will make the sender feel good in that they took a moment to thank members of the armed services for their dedication to our country.

Another year

This month I want to thank WD4JR, NJ3T, WD8NIK, N1IN, and the ARRL for supplying information.

Disaster, hardship, and service in the public interest. Each describes an event about which we have reported over the past year. Each month I have the pleasure of telling a story of ham radio operators serving in the public interest. Simply put, I couldn't provide all of the coverage around the world without help from you, the readers. During this holiday season I wish each of you all the best and hope for a rewarding new year. Keep your e-mails and stories coming in. Until next time . . .

73, Bob, WA3PZO

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Math's Notes

What's New And How To Use It

BY IRWIN MATH, WA2NDM

Optical Power Measurements

Last month we spoke a bit about laser-diode eye safety. (*To reiterate, when working with laser diodes, never look at the direct beam or a reflection of the beam from an operating laser or you may damage your eyes!)* Now that you are familiar with the precautions to take when using these devices, we thought we would present a way to measure their optical power output. The power meter to be described here is intended as a simple construction project, not necessarily a laboratory instrument. However, it can serve as an inexpensive way to categorize laser diodes, and best of all, the price is right.

Light, like all electromagnetic radiation, has two basic parameters that are important—power and wavelength. Wavelength, with regard to visible light, is perceived by humans as color and is beyond the capabilities of simple measuring instrumentation. The chart in Table I, however, will give you a rough idea of color versus wavelength and is derived from various readily available indicator LEDs. As you can see,the equivalent frequencies are quite high and the potential for information transfer is incredible, but that is another discussion. Power, on the other hand, is easy to measure inexpensively.

The heart of an optical power meter is the detector. For our use (in the visible range) we will stick with a wide-area silicon photodiode. For the non-purists, even a silicon solar cell will do, but be sure that it is silicon. The response of such a device varies with wavelength as shown in fig. 1, and for visible laser diodes (in the 600 nm region) it is about 0.3 to 0.4 ampere per watt. What this means is that if 1 watt of total light energy falls on the photodiode, it will produce an output of 300 to 400 milliamperes. Since a laser diode only produces output in the milliwatt range, 1 milliwatt of light power impinging on the photodiode will produce an output of 300 to 400 microamperes (at 600 nm). This curve, by the way, is fairly standard for most silicon photodiodes, so any device you choose will operate in a similar manner, as long as it is silicon. As we also will see shortly, the larger the sensitive area of the photodiode chosen, the better.

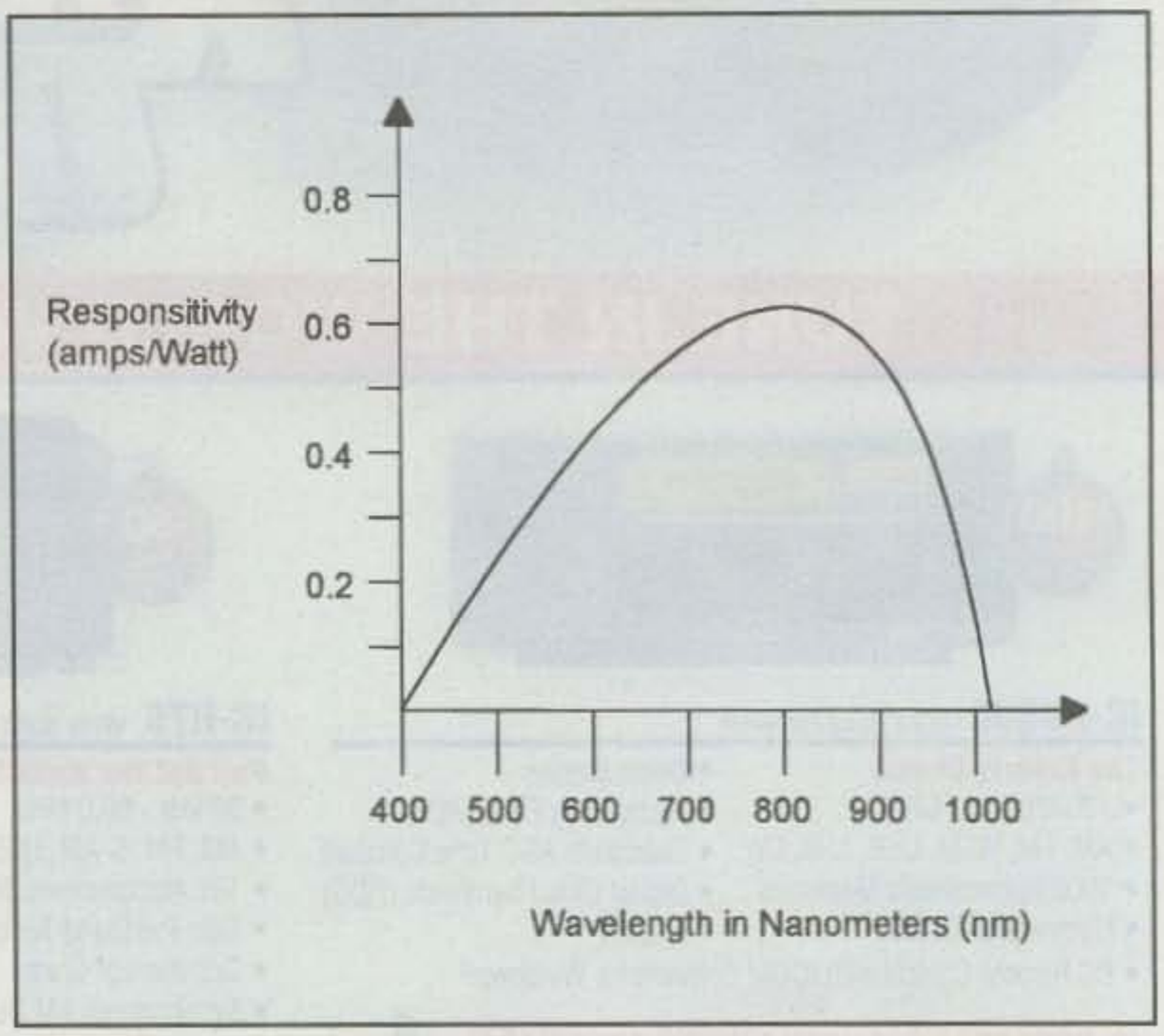

Fig. 1– Responsivity of a typical silicon photodiode.

Wavelength	Color	Frequency
Longer than 700 nm	infrared (invisible)	below 428 THz
660 nm	red	454 THz
600 nm	orange	500 THz
585 nm	yellow	513 THz
565 nm	green	531 THz
430 nm	blue	698 THz
Shorter than 400 nm	ultraviolet (invisible)	above 750 THz

Table I– Approximate indication of wavelength versus color versus frequency.

Fig. 2 is the schematic of the complete power meter. For simplicity, two 9 volt transistor-radio batteries are used to power the circuit, and almost any conventional 8-pin op-amp with an output current capability of a few milliamperes or more will do. You could even use a 741! The basic circuit is known as a current-to-voltage converter. Current from the photodiode flows into the op-amp and is converted to a voltage at the output in accordance with the following formula:

$$E_{out} = -(I_{in} \times R_f)$$

where R_f is the feedback resistor (connected between pins 2 and 6 of the op-amp).

In the Hi-sensitivity switch position 1 milliwatt of light from a visible red laser will result in about 300 microamperes of photodiode current and an output of 3 volts from the op-amp. In the Lo-sensitivity switch setting it takes 10 milliwatts to produce the same output. By using a 0–1 volt panel meter connected to the op-amp, the instrument can be configured to have a 0–1 milliwatt range and a 0–10 milliwatt range. If such a meter is available, the 0–1 scale can be used to indicate power directly. If not, you can connect a low-cost DVM to the meter terminals, which will result in a digital-reading power meter. For other ranges, the value of R_f can be varied along these same lines as desired.

At this point I should mention that the power meter can be made quite sensitive if one raises the value of R_f into the 10K to 100K range. If this is done, the unit can even be used to measure the power output of an optical fiber, providing the wavelength of the light coming from the fiber falls within the optical pass band of the photodiode. If this is your aim, you would also have to provide some sort of housing for the pho-

c/o CQ magazine

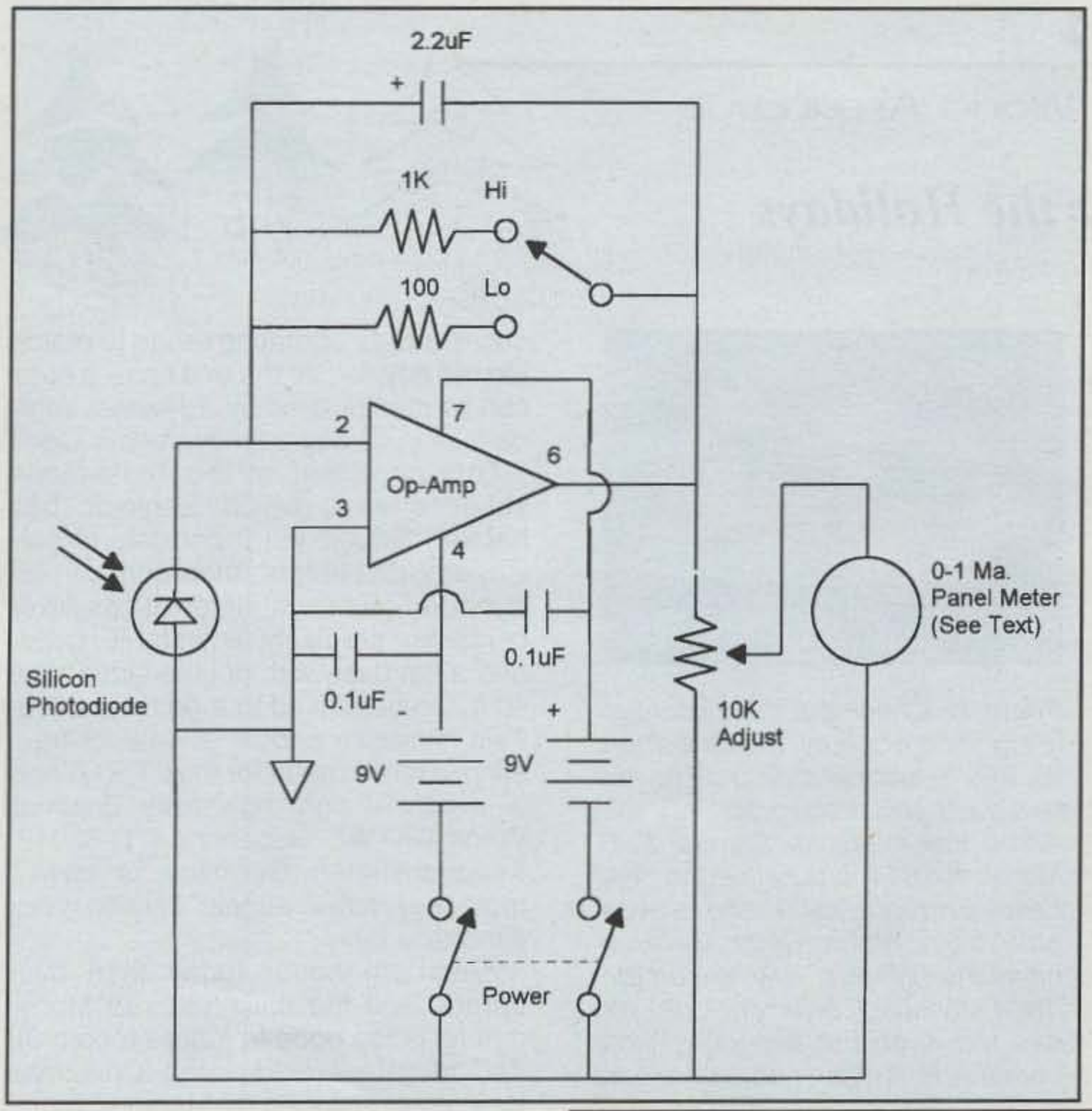

Fig. 2– Simple optical power meter.

active area. If the laser-diode beam is wider than the photodiode, a lens may be used to focus the light. It is important that the entire beam fall on the sensitive area of the photodiode, which is why a photodiode with the largest sensitive area available should be used. Now adjust the pot for the correct reading. Switch to the other range and check that the reading "tracks." Remember, however, that the power output measured in this manner is correct only at the wavelength of the laser used for calibration.

This power meter is really not designed for precise measurements, since exact calibration can be a problem for the average experimenter. However, even if you do not have a precision source of light, the unit certainly can be used for relative measurements. Don't be fooled by its simplicity. Given a precision, known light source, it could be calibrated quite precisely if desired.

As this is December, I would like to wish all of my loyal readers a very Happy and Healthy Holiday season, and may all of your wishes come true in the coming year.

73, Irwin, WA2NDM

todiode so that it would only respond to light from the fiber.

Some of you may ask why, since the output from the photodiode or solar cell is so high when used to measure a laser diode, we don't just simply drive a 0–1 milliampere meter movement directly in order to configure an ultra-simple power meter. Indeed, this can work, but linearity will suffer. The light-versus-current curves for a photodiode assume only current, which means no voltage must be developed. A conventional meter movement has internal resistance ,which will definitely lead to a finite voltage drop and a resulting non-linearity. The op-amp circuit, on the other hand, always presents an extremely low input impedance to the photodiode (effectively 0 ohms), and consequently a very linear output.

As with most instruments, calibration is extremely important. Since each photodiode will have a slightly different amps/watt factor, the 10 K pot has been added to the circuit as a simple calibration control. The best way for the experimenter to calibrate the meter is to obtain a laser diode with a known power output. Shine the light from the laser diode directly onto the photodiode, making sure the entire beam falls within the

World Of Ideas

A Look At The World Around Us

BY DAVE INGRAM, K4TWJ

Ham Treats for the Holidays

Hearty Holiday Greetings, friends! Here's wishing you good health, wealth, and happiness during this most festive season, and may you have a ball hamming to the max during the coming year. Yes, and with those cheerful thoughts foremost in mind, we are once again making our traditional holiday column diversion to spotlight some very special treats and goodies just for hams. This year our main focus will be on affordably priced accessories—those neat little items that make amateur radio life so delightful. We have searched coast to coast and even traveled back in time to find our highlighted items (some debuting right here for the first time), so enjoy the views. Remember, too, featured items are available from their manufacturers or dealers, not from me or CQ. I am only your guide on this holiday shopping tour.

In looking back on the past year and forward to the coming year, incidentally, I realize these are the "good times" of the new millennium in amateur radio and encourage everyone to enjoy them. Sunspot counts are still up, band conditions are good, and QRM is low. Get on the air—and often—from home, the car, and/or while traveling by other means. Have fun! Need an additional nudge? Our upcoming views of stocking stuffers should do the trick, so let's get started!

Keys for the Holidays

Leading our parade of special holiday treats is a brand-new, limited-production item of the best kind—the "Vail Lever Correspondent" replica key made by R. A. Kent in England and sold in the U.S. by Alpha Delta Communications (photo 1). This historically significant, fully functional showpiece is identical to the first "real mechanism" hand key Alfred Vail made for Samuel F. B. Morse to use in his 1844 Washington-to-Baltimore demonstration of telegraphy. Prior to that time, Morse used two straps of spring metal on a board (a "strap key") for sending code and a slow-drawn can-

Photo 1– Check out this historically-significant beauty. It is an authentic, fully functional replica of the first real mechanism telegraph key that Alfred Vail made for Samuel F. B. Morse in 1844. It is called the "Vail Lever Correspondent" and is available from Alpha Delta Communications. What a way to complement any shack or office—and you can use it on the air, too! (Photo courtesy R. A. Kent and Alpha Delta Communications)

vas paint stretcher with an electromagnet-driven pendulum moving a pen from side to side to print dots and dashes.

Alfred Vail was a skilled machinist and an assistant to the artist-turned-entrepreneur Samuel F. B. Morse. He designed and made the "Lever Correspondent," which became a "reference" for key designs over many years. Vail also reportedly made the first telegraph sounder, which quickly replaced Morse's canvas stretcher. The original "Vail Lever Correspondent" key is on permanent display in the Smithsonian Institute, but this reproduction is available for a limited time from Alpha Delta Communications, P.O. Box 620, Manchester, KY 40962, order line 888-302-8777 or <www.alphadeltacom.com>.

Next up is a brand-new style CW paddle made by Englmar Wenk, DK1WE, in Germany and making its grand debut in this column (photo 2). Yes, the little gem looks unusual, but that is its big attraction—and the reason Englmar has applied for a patent on it. Notice the paddle's dual levers are mounted (and move) diagonally rather than horizontally or vertically. This arrangement produces a wide operating range to match almost any fist, as the end fingerpieces can be manipulated by sideways, vertically, or in 45-degree movements. Cool!

Looking closer at this hand-made squeeze key (which Englmar has named "Squeeky"), it consists of polished-brass levers mounted on an anodized-aluminum frame. It has silver contacts, precisely adjustable gaps, and a flat base with double-sided tape so it can be affixed to a rig or desktop. This miniature paddle is ideal for traveling, a terrific mate for the FT-817, and is available right now from Englmar Wenk, DK1WE, Hubenring 4, D-88048, Friedrichshafen, Germany, or <www.morsekey.com>, e-mail: <inseco.wenk@t-online.de>.

Keys are hotter today than ever before, and the third featured Morse marvel is too good to ignore (photo 3)! This miniature, gold-plated "Christmas Key" was designed by Marshall Emm, N1FN, of Morse Express, and produced under special contract by Llaves Telegraphicas Artesanes (LTA) of Spain. The number of keys is limited to 250, with each having the Morse Express and LTA logos, "Christmas 2002," and

Photo 2– Here is the new "Squeeky" miniature paddle from DK1WE. Its dual levers are mounted at 45-degree angles for more comfortable use, and each lever is independently adjustable. The frame is anodized aluminum with a flat base, and the whole paddle is small enough to carry in your pocket. This handmade paddle is available from DK1WE in Germany. (Photo via DK1WE)

4941 Scenic View Drive, Birmingham, AL 35210
e-mail: <k4twj@cq-amateur-radio.com>

Photo 3– Every holiday season needs a special touch of glitz and glamour, and this affordably-priced Christmas Key from N1FN of Morse Express fills the bill in high style. It is gold plated, fitted with an ebony knob, inscribed "Christmas 2002," and it really works. (Photo courtesy Marshall Emm, N1FN)

a serial number on its base. The key measures a tiny $1\frac{3}{4}$" × $\frac{15}{16}$" at the base and weighs a mere 2 oz., and has gap, tension, and fulcrum adjustments available by means of gold-plated screws and matching lock nuts. The ebony indented knob is very comfortable to use.

Last year's model was also made in a limited quantity and sold out well before Christmas. Thus, ordering early is encouraged. The key is available from Morse Express, 2460 S. Moline Way, Aurora, CO 80014, order line 1-800-238-8205, or via <http://www.MorseX.com/xmas>.

Heil Sound "Classic"

Microphones deserve equal attention as very special gifts for hams, and the top choice here is Bob Heil's new "Classic" studio-grade desk mic shown in photo 4. This magnificent beauty is an exact replica of the famous RCA 74B studio mic used by leading radio personalities in eras past—with one big exception. The microphone is fitted with dual switch-selectable elements: a new "Pro Line" ultra-wide-range element that sounds like a million dollars, plus your choice of a Heil HC5/full-range or HC4 "DX Dream" element for general QSOing or DXing in high style. This new masterpiece includes a nameplate with your call letters, dust-cover bag, base stand, and desk pad, and is available from Heil Sound Ltd., 5800 No. Illinois, Fairview Heights, IL 62208, telephone 618-257-3000, or via <www.heilsound.com>. This microphone will really make you proud to be a radio amateur!

Inside and Outside the Shack

Another genuine ham item found in every big-time setup is a world map with call prefixes, and a new version of this popular item is debuting in photo 5. The map measures 24" H × 36 "W, and it is full color and laminated in clear plastic so it can be cleaned with a damp cloth and kept new for many years to come. In addition to showing prefixes by countries, the map also shows CQ World Zones, time zones, frequency allocations according to license for each HF and VHF band, the RST report system, and more. It is a multi-reference item you will use daily. Similar-style maps of the U.S. and repeater-listing maps for most states are also available. Check them out! They are available from Tyler Ott of <www.hammaps.com> or telephone 770-252-1018.

Photo 4– Heil Sound's new "Classic" model desk microphone is a voice-operator's dream and a sheer work of art. It is an exact replica of RCA's famous 74B broadcast microphone, plus it is fitted with a PTT switch and dual switch-selectable elements that produce killer audio on SSB, AM, and FM. (Photo courtesy Heil Sound)

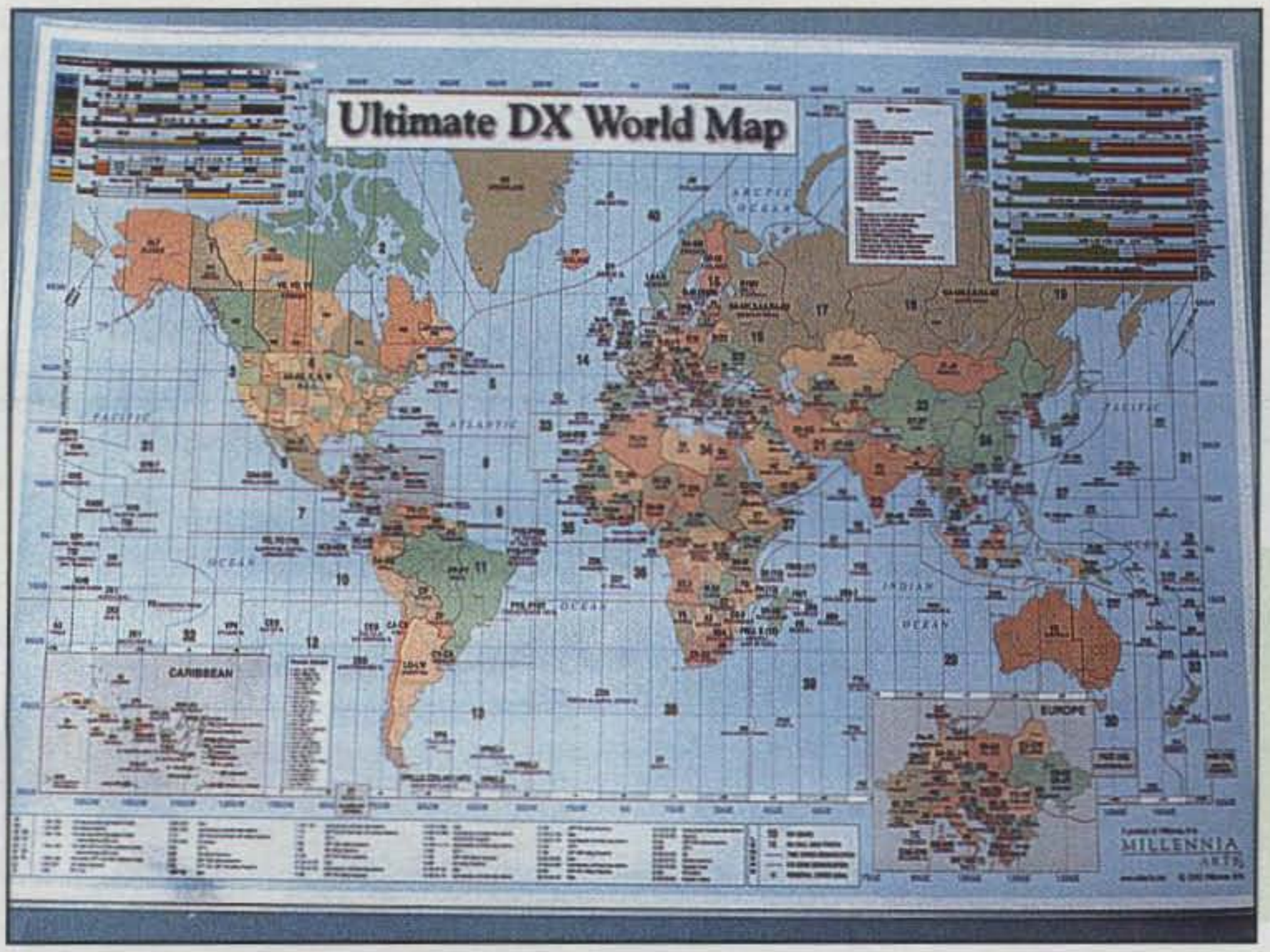

Photo 5– This new "Ultimate DX World Map" measures 24" × 36", is full color and laminated, and contains a variety of communication aids you will find handy every time you are on the air. It is quite impressive, and available from <www.hammaps.com>.

Photo 6– Here is a super-cool accessory you will use every day of the year—a new MFJ-182 wrist watch. It sports dual dials, one displaying 12 hour time and one displaying 24 hour time, and each dial can be set to different time zones of your choice. (Photo courtesy MFJ Enterprises)

Unique wristwatches are another continuously favored item among amateurs, especially when they include special capabilities for handy out-of-shack operations. Consider, for example, the dual-time-display MFJ-182 watch shown in photo 6. Its righthand-side dial functions like a regular 12-hour analog watch, plus the dial on the left shows time in 24 hours and can be independently set to any world zone or to UTC time, as you prefer. Visualize the possibilities here, friends. You can set the 24-hour dial nine hours ahead of UTC to follow times of day (and night) among DX friends in Australia, and more. The watch features quartz accuracy and has a white face with silver trim and band. It is an excellent traveling aid and is available from MFJ Enterprises, 300 Industrial Park Road, Starkville, MS 39759 (1-800-647-1800; <http://www.mfjenterprises.com>) or from dealers nationwide.

Another super-handy item for out-of-shack pursuits and impromptu travels is a dedicated carry-all case for your FM talkie and accessories. The new Radio Wallet from PowerPort/Cutting Edge Enterprises fills the need beautifully (photo 7). It is made of heavy-duty nylon, and has a padded inner pocket to softly coddle your prized talkie, plus additional room to carry a couple of extra battery packs and antennas, a charger, and a repeater directory. The Radio Wallet has double zippers and a belt clip and works great for keeping your VHF gear together. It is available from Cutting Edge Enterprises, 130 Anacapa Circle, San Luis Obispo, CA 93405, telephone 1-800-206-0115 or <www.powerportstore.com>. While checking on the Radio Wallet, also ask about their new DXpedition Pack for carrying a full HF station complete with 8 amp battery, antenna, cables, and snacks galore in a convertible backpack. It's elaborate!

Photo 7– This new "Radio Wallet" from PowerPort/Cutting Edge Enterprises lets you carry everything in one soft padded case ready for use. It is available in two sizes with internal pouches to fit various FM talkies, and it also has areas to carry a charger, extra battery pack, and pull-up antenna. It is first class and survival ready! (Photo courtesy PowerPort/Cutting Edge Enterprises)

Photo 8– Romance recaptured for sure! This remarkable reproduction of a 1946 TrueTone table radio is available from Universal Radio in Ohio; it features AM and FM band reception, has a built-in cassette tape player and as discussed in the text, still plays '50s-style music. A creative-minded amateur could even add a QRP transceiver in its cabinet for an extra treat. (Photo via Universal Radio)

Retro Radio Supreme

"Retro" items from the 1940s and '50s are making a phenomenal comeback today. Small table-size radios are particularly hot items. We discovered an absolute heartthrob in the showroom of Universal Radio, Inc. (photo 8). This beautiful reproduction of a classic TrueTone table radio is brown with cream knobs, louvered sides, and a large, square dial. Inside its ABS plastic cabinet is a modern AM/FM radio plus cassette-tape player, and the first time I turned it on, the little delight still played old-time rock 'n roll music. Really! I may have slipped a Chuck Berry tape in its side slot, but that's besides the point. Furthermore, there's room to squeeze a little QRP transceiver in the cabinet! Link its VXO pot with the tuning dial, and you have AM, FM, cassette, and 20 meter CW rig in one box. Wow! I will describe that idea further in a future "QRP" column.

The TrueTone radio inspired me to look more closely at Universal Radio, and everything I found was most impressive. First, the company is presently celebrating its 60th anniversary, a milestone obviously resulting from making fair-and-square deals on all makes and models of amateur radio gear and accessories. Check it out and see for yourself! Universal also played a major role in R. L. Drake's success during the 1950s. With folks scoffing at the rad-

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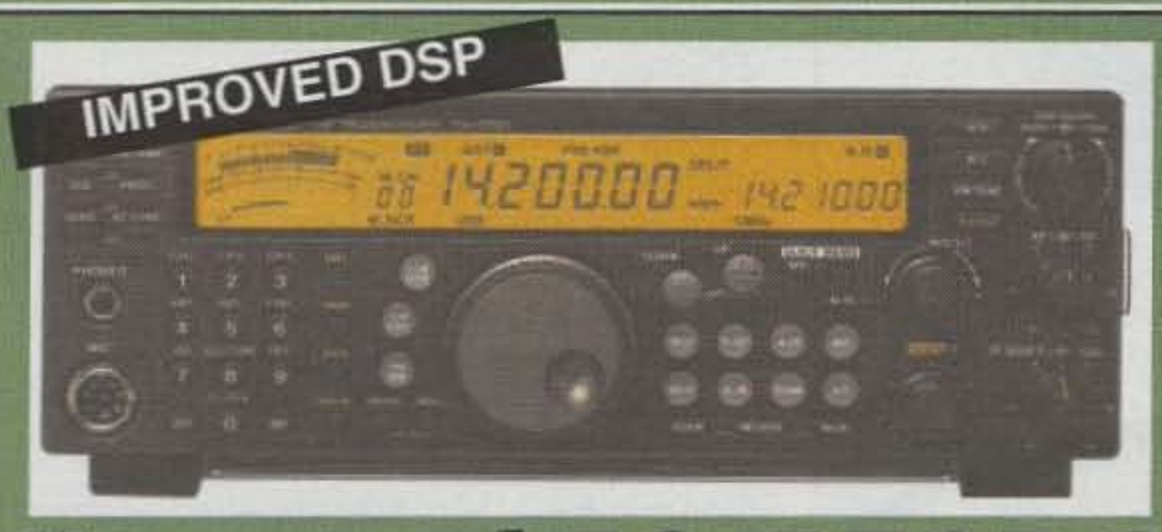

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Photo 9– Here is a classy little stocking stuffer with dozens of uses: a small, plastic-cased 2" × 4" speaker with full-bodied sound. It is quite affordable and available from ComDac radio. (Photo via ComDac)

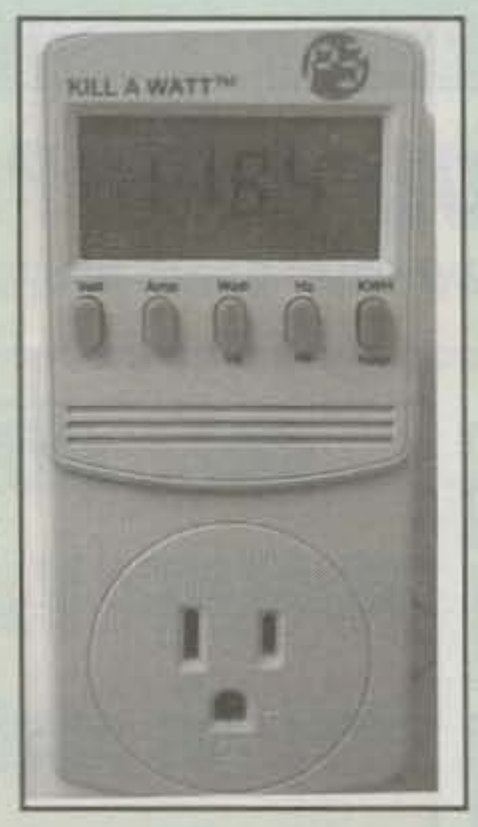


Photo 10– Have you ever wondered how much current your rig draws, how many watts your microwave oven uses, or how many kilowatt hours your energy-saving refrigerator really uses in a week or a month? This "Kill-A-Watt" meter from Radio City can reveal the answers. (Photo via Radio City)

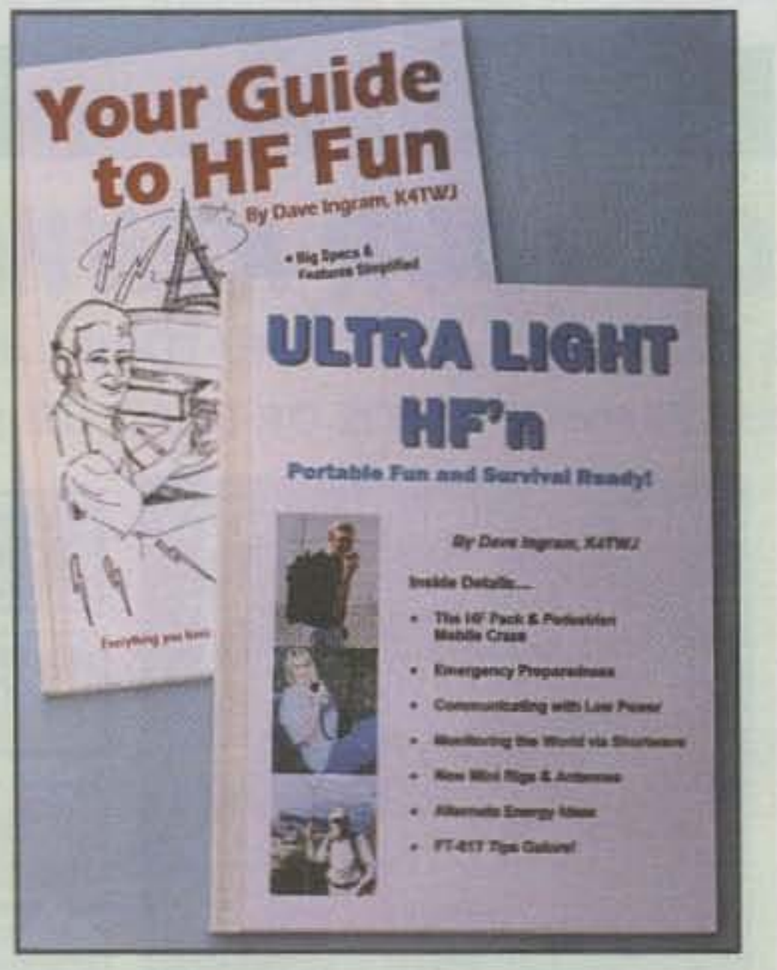


Photo 11– Here are the two hottest books of the day, both from your author, Dave Ingram, K4TWJ. HF Fun *is similar to a wise old pro showing a new amateur all the fine points of hamming for on-the-air success.* Ultra Light HF'n *contains a wealth of information on HF Pack or walk-and-talk HF'n.*

ically different 1A receiver, Universal bought the first 100 of them and established both companies as leaders in the field.

Looking further, I found a neat collection of "stocking stuffers" to fit every need and interest. These items include a smart Universal Radio logo T-shirt, a brilliant cobalt-blue coffee mug with logo, three sizes of Lucite® stands to hold talkies and mobile rigs, plus a super selection of great books. More details on all of these goodies are available direct from Universal Radio, Inc., 6830 Americana Parkway, Reynoldsburg, OH 43068, order line 1-800-431-3939, or <www.universal-radio.com>.

More Stocking Stuffers

Continuing along the stocking-stuffer route, we found a few more items with widespread appeal. First is the handy 2" × 4", 8 ohm speaker shown in photo 9. This speaker is special because it is small, yet powerful enough for home, mobile, or portable operation; is full range and full-bodied rather than "tinny" or hollow; and is priced under $10. The speaker is sold exclusively by ComDac Radio, 1051 Main Street, St. Joseph, MI 49085, order line 1-800-382-2562, or <www.comdac.com>.

Next is a real surprise: the "Kill A Watt" meter shown in photo 10. This amazing little device measures volts, amps, watts, Hertz, and kilowatt hours, and displays the results on its LCD readout. It is ideal for comparing energy needs of equipment and appliances, measuring kilowatt hours used over a period of time, revealing true specs on "energy saving" items, spotting potentially dangerous to gear brownouts, and more. The meter is made for 120 VAC use, is rated up to 1875 watts, and is available from Radio City, Inc., 2663 County Road I, Mounds View, MN 55112, order line 1-800-426-2891, or on the web <www.radioinc.com>.

Books and magazines are items that continue giving long after the holidays, and we have some real horizon-expanding treats for you to enjoy (photos 11 and 12). First is my own new *Guide To HF Fun,* which is loaded with "how to" information beneficial to new and seasoned amateurs alike. It

Photo 12– Every enthusiastic radio amateur will appreciate a subscription or renewal to today's favorite radio magazines: CQ, CQ VHF, *and* Popular Communications. *All three magazines are loaded with great articles on hot topics and are akin to a hamfest via mail.*

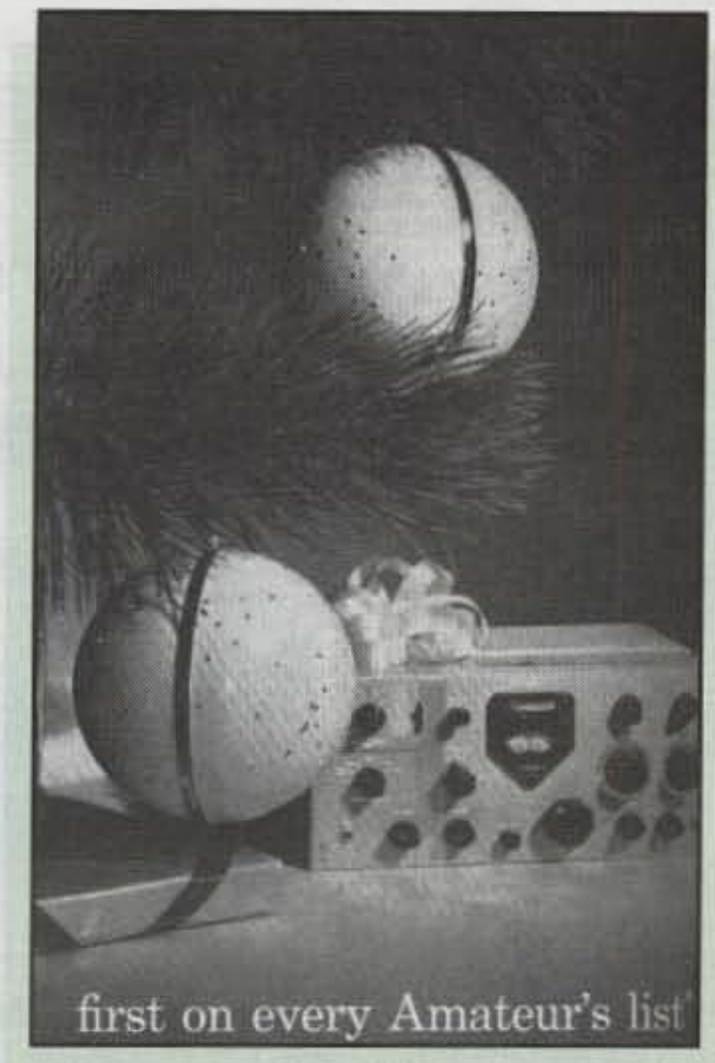


Photo 13– It was first on every amateur's wish list in 1957, and it is still tops many lists today—the classic Collins KWM-1. This first-generation SSB transceiver sports warmth, charm, and personality that is simply unequaled by modern high-tech gear. It is truly a prized collectible of the best kind—if you can find one! (Advertisement from the December 1957 issue of CQ*)*

explains how to understand rig specs, set up a DX-worthy station, operate, contest, work DX like a pro, and more. Second, and brand-new, is my book *Ultra Light HF'n,* which explains everything about the new personal, portable HF pursuit (the HF Pack craze), including the new mini-rigs, the booming market of mini-accessories, how to join the game, and much more. Every FT-817 owner will want a copy of this book, and it (or *Your Guide to HF Fun*) is available for only $16 plus postage ($2.50 book rate, $3.85 Priority Mail) direct—and autographed—to you from me, Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210. My e-mail is still out of control, so please use postal mail.

In the area of ham magazines, *CQ* and CQ VHF reign supreme. Their sister publication, *Popular Communications,* has now been around for 20 years, and it is a great way to complement your ham hobby with shortwave radio news and other areas of interest. Every issue of each one is filled with terrific articles and late breaking radio news. They are akin to a hamfest by mail, and you can get them delivered direct to your door 12 times a year (four for *CQ VHF*) at the holiday special rates. Just fill out the order form in the issue, or contact CQ Communications at 1-800-853-9797 or on the web: <www.cq-amateur-radio.com>.

Finally, and in support of this month's "nostalgia special" theme, we highlight the ultimate ham gift that is just as favored today as it was 45 years ago: the classic Collins KWM-1 shown in photo 13. Although this first-generation SSB transceiver is now a scarce-as-hens' teeth collector's pride, it still screams real radio fun. Just look at those lines . . . those knobs . . . that warm, glowing dial. What beauty! What charm!

On that note of nostalgia, we bow out for another month. Happy Holidays to all, and here's hoping we meet on 20 or 30 meters during the coming weeks.

73, Dave, K4TWJ

What's New

BY KARL T. THURBER, JR., W8FX

A New Column for A New Century

Holiday Goodies Galore

This month we again shine the W8FX spotlight on more fine, new radio gear and accessories, portable and mobile goodies, books, and more—gift-giving (and receiving) goodies we think will be of interest to you and yours as we approach the upcoming holiday season. Let's look at some hot new "radio stuff," both of the big-ticket and the stocking-stuffer varieties.

Radio Gear

ICOM IC-746PRO. Not to be outdone by the competition, especially since the firm's motto is "first in communications," ICOM has introduced an upgrade to its popular IC-746 all-band amateur radio transceiver, the IC-746PRO HF/6m/2m Base Transceiver (see photo A). The new HF/VHF radio, one of several related IC-746 and IC-756 models of recent vintage, is designed for operation that, in the manufacturer's words, "leaves the competition in the dust."

The IC-746PRO, for use on HF as well as 6 and 2 meters, is a state-of-the art, all-mode radio transceiver with enhanced receive capabilities. The radio is 9600-baud-ready, has 32-bit floating-point digital signal processing (DSP), a 24-bit AD/DA (analog-to-digital/digital-to-analog) converter, selectable digital IF filter shapes for SSB and CW, and automatic and manual notch filters. The new radio also sports digital twin passband tuning, a built-in RTTY demodulator and decoder, twin peak audio filters, a digital RF speech compressor, a microphone equalizer, a receive audio equalizer, SSB/CW synchronous tuning, an adjustable noise blanker, and much more than we can possibly list here.

For more technical details and pricing, contact ICOM America, Inc., 2380-116th Avenue N.E., Bellevue, WA 98004 (telephone 425-454-8155; on the web: <http://www.icomamerica.com>).

Photo A– ICOM recently introduced the IC-746PRO HF/6m/2m Base Transceiver, designed for operation that, in the manufacturer's words, "leaves the competition in the dust." (Photo from ICOM America website)

AOR AR-ONE Communications Receiver. Don't you love really rugged, high accuracy, "dream" radio gear, even if you may not be able to afford the equipment? Recently, AOR ("Authority on Radio Communications") introduced the AR-ONE Receiver (photo B). It's a wide-range communications receiver capable of monitoring any frequency from 10 kHz to 3.3 GHz, with excellent sensitivity and maximum user flexibility. The high-end radio is designed for those who need the ultimate in a sensitive, wide-range receiver.

The AR-ONE was conceived by AOR as a "breakthrough" design. Its many features include ten VFOs; 1000 memory channels; an ultra-stable frequency reference oscillator; selectable tuning steps and resolution down to 1 Hz; the ability to monitor AM, NFM, WFM, USB, LSB, CW, and data modes; a triple-conversion superhet front end; an adjustable BFO; and considerably more.

The radio's operating features include the ability to control all functions by computer and most functions through the control head. The unit can communicate many settings and readings to the user, including items such as signal bandwidth.

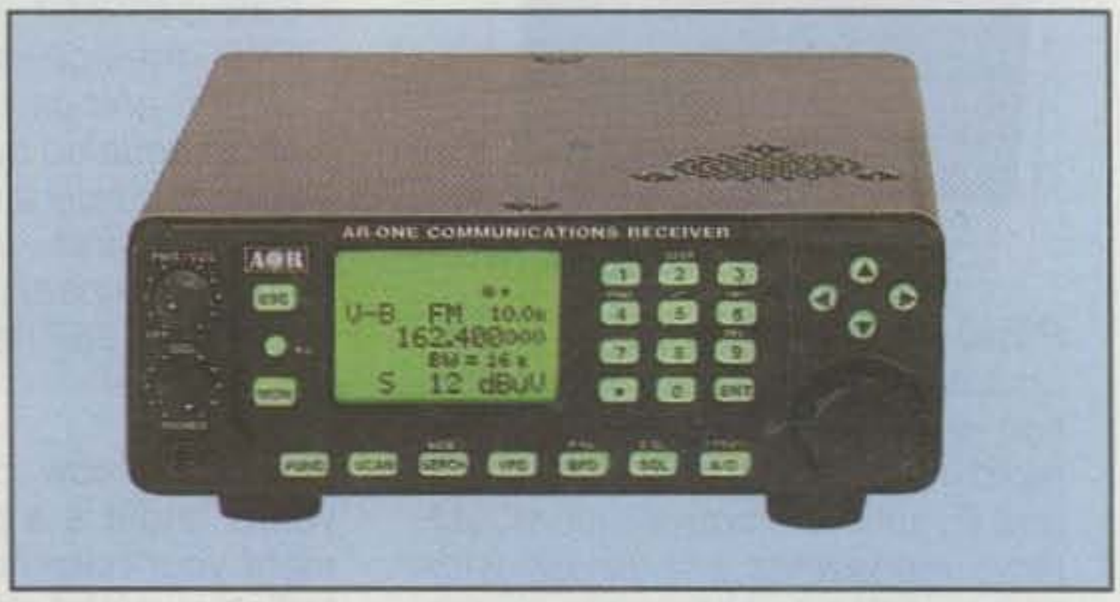


Photo B– AOR's AR-ONE Communications Receiver is a wide-range radio capable of monitoring any frequency from 10 kHz to 3.3 GHz, with excellent sensitivity and maximum user flexibility. The high-end radio is designed for those who need the ultimate in a sensitive, wide-range receiver. (Photo courtesy AOR)

As this is written, however, the radio doesn't have cellular frequencies blocked, so it can't be offered for general sale in the U.S. Thus, we'll have to admire the impressive AR-ONE through the plate-glass display window for the moment.

For more information and current pricing, contact AOR U.S.A., Inc., 20655 S. Western Ave., Suite 112, Torrance, CA 90501 (phone 310-787-8615; e-mail: <info@aorusa.com>; web: <http://www.aorusa.com>).

Accessories for the Shack

SCAN-A-MIX from B & D Enterprises. Boyd Potts, KB5JR, let us know of an interesting audio accessory for the ham-shack, one that he offers through his company, B & D Enterprises. The new accessory is the SCAN-A-MIX Model BX1 (photo C). It's a novel device designed to combine up to six speaker-level audio signals into one speaker-level output.

**289 Poplar Drive, Millbrook, AL 35054-1674*
e-mail: <w8fx@cq-amateur-radio.com>

Photo C– The SCAN-A-MIX Model BX1, offered by B & D Enterprises, combines up to six speaker-level audio signals into one speaker-level output. The unit is best used in a multiple radio monitoring or transceiver station location. By combining all receiver audio into one speaker output, an external speaker will not be needed for each receiver or transceiver. (Photo courtesy B & D Enterprises)

The new unit is best used in a multiple-radio monitoring or transceiver station location. By combining all receiver audio into one speaker output, an external speaker will not be needed for each receiver or transceiver. Since all source radios will be operating at a lower volume level, distortion will be reduced. Also, if the source is a portable radio, its speaker level will be boosted to the BX1's output level of $2^1/2$ watts.

The new unit, priced at $129 plus shipping, has a convenient front-panel switch to mute all audio out of the BX1; a large, front-panel LED indicates normal (green) or muted (red) operation. The BX1 is said to be easy to use and operate; you just plug the speaker output from your radio gear into one of the BX1's inputs and plug your speaker into the BX1 speaker output.

For more information, contact B & D Enterprises, P.O. Box 28362, San Jose, CA 95159; (phone 408-246-6231; e-mail: <bpotts@netmagic.net>; web: <http://www.bdenterprises.com>).

MAHA® PowerEx MH-C777PLUS-II Universal Charger and Analyzer. I have found that analyzing and charging the multitude of rechargeable batteries that I have around the radio ham shack and home can be both troublesome and tiresome. Sound familiar?

Well, based on the inputs of thousands of PowerEx product users and engineers, the MAHA MH-C777PLUS-II Universal Charger and Analyzer is designed with you in mind. From its universal charging capability for almost any shape lithium ion, lithium polymer, NiMH, and NiCD battery packs, to its digital voltage and capacity display, the MH-

Fig. 1– The MH-C777PLUS-II Universal Charger and Analyzer from Maha Energy lets you analyze and charge almost any battery pack for amateur and other two-way radios, cellular phones, digital cameras, camcorders, and more. For details check out the Maha Energy Corp. website at <http://www.mahaenergy.com>, as shown here, or the text of this month's column. (Screen capture from the Maha Energy website)

C777PLUS-II (see fig. 1) is a winner that's available at an affordable cost.

The new unit lets you analyze and charge almost any battery pack for amateur and other two-way radios, cellular phones, digital cameras, camcorders, and more. It supports a wide voltage range of at least 3.6 to 14.4 volts, depending on the type of cell. In addition to battery packs, you can charge one to 12 individual cells of AA, AAA, C, and D rechargeable battery cells (with optional battery holders). The spiffy unit digitally displays voltage, time, and capacity throughout the charge and discharge processes.

The $89.95 universal charger and analyzer has an intelligent microprocessor for several advanced features. These features include discharge-only capacity analysis, where the charger retains the discharging capacity of a battery, allowing you to rate battery performance. Also, there is an enhanced lithium-ion/lithium-polymer charging algorithm for much faster charging. The unit has a one-touch reset button that lets you reset the charger without having to disconnect power from it.

For more information, contact Maha Energy Corp., 545-C West Lambert Road, Brea, CA 92821 (1-800-376-9992; e-mail: <sales@mahaenergy.com>; web: <http://www.mahaenergy.com>). By going to the website, you can download the unit's user manual.

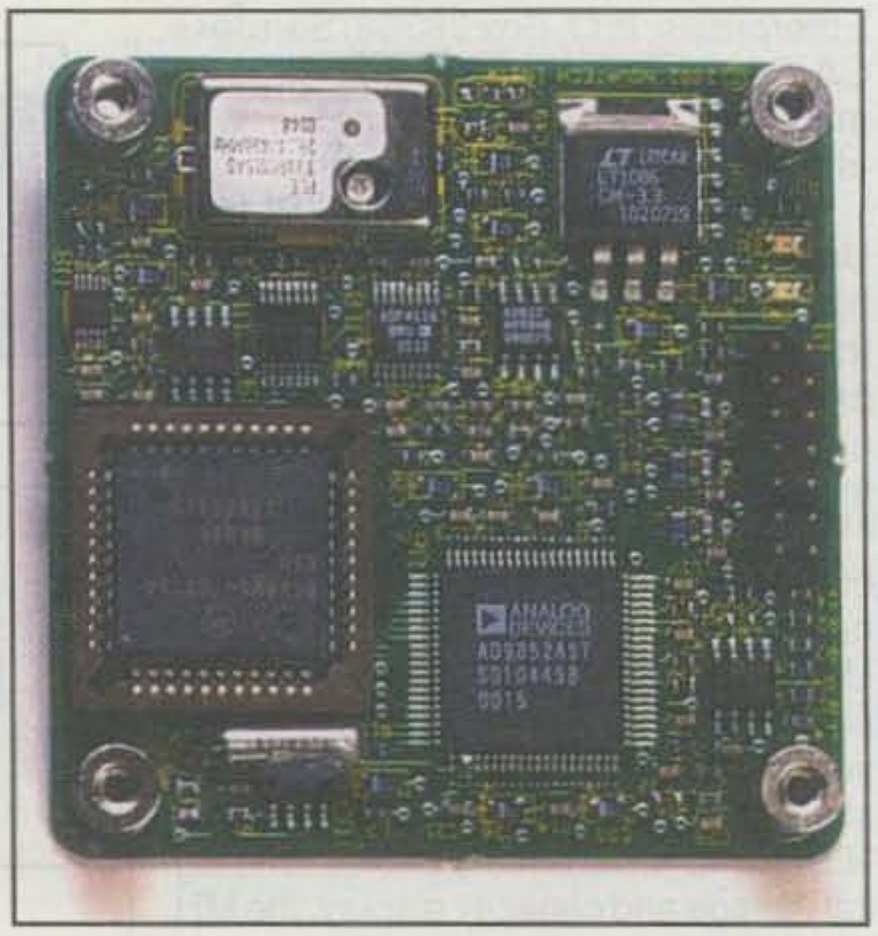
Novatech Model LPO30 30 MHz Locking Programming Oscillator. Another impressive high-end, super-accurate product, this one for the well-equipped test bench, is Novatech's LPO30, a 30 MHz Locking Programmable Oscillator (photo D).

The new LPO30, at $495, is a small module that locks to a user-supplied reference frequency and is customer programmed to generate a low-noise sine-wave output from 1 µHz to 30 MHz with 1 µHz resolution. With digital-phase-locked-loop (DPLL) circuitry, the LPO030 tracks the accuracy and stability of the reference, while the DPLL filters jitter from the reference signal.

If you are a professional tester and developer, you may be interested in the LPO30 EVAL kit (photo E) for simplified testing and programming. The $995 kit consists of the LPO30, a carrier board for mounting the LPO30, BNC connectors, an AC adapter, and an enclosure. The EVAL kit also comes with Windows®-compatible PC software.

For more product information, contact Novatech Instruments, Inc., P.O. Box 55997, Seattle, WA 98155-0997 (phone 206-301-8986; e-mail: <sales@novatech-instr.com>; web: <http://www.novatech-instr.com>). You'll find the website a very good one.

Photo D– Another high-end product, this one for the well-equipped test bench, is Novatech's LPO30, a 30 MHz Locking Programmable Oscillator. The LPO30 is a small module that locks to a user-supplied reference frequency and is customer programmed to generate a low-noise sine-wave output from 1 µHz to 30 MHz with 1 µHz resolution. (Photo courtesy Novatech Instruments)



Roto-Rugged "Tote" Foam-Filled Cases from Jensen® Tools. Are you just a few short months away from planning your next DXpedition or other major radio romp to the field? If so, you might want to take a look at the Roto-Rugged "Tote" Foam-Filled Cases, distributed by Jensen Tools (photo F).

The new cases feature rotationally molded construction to provide extra strength and durability, and uniform wall thickness and extra-thick corners make them resistant to impact damage. All cases have a telescoping handle that extends to 41 inches and stores flush in the case when not in use. Other features include a black-powder-coated tongue and groove valance that resists scratches, recessed military-style quarter-turn latches, ballbearing wheels, full-length piano hinges, spring-loaded handles, and padlock hasps. Each case is filled with layers of 2 inch foam, and a foam-cutting knife is included. A variety of sizes is available, and the cases carry a one-year warranty.

For more details or a catalog, contact Jensen Tools, Inc., 7815 S. 46th St., Phoenix, AZ 85044-5399 (1-800-426-1194; e-mail: <jensen@stanleyworks.com>; <http://www.jensentools.com>).

Portable and Mobile Goodies

Quicksilver MinuteMan 20 Portable Antenna. John Bee, N1GNV, recently told us that he proudly offers an efficient portable HF antenna to the radio community. His company, Quicksilver Radio Products, has introduced the all-new MinuteMan 20™ portable HF antenna (photos G and H). The antenna lets you

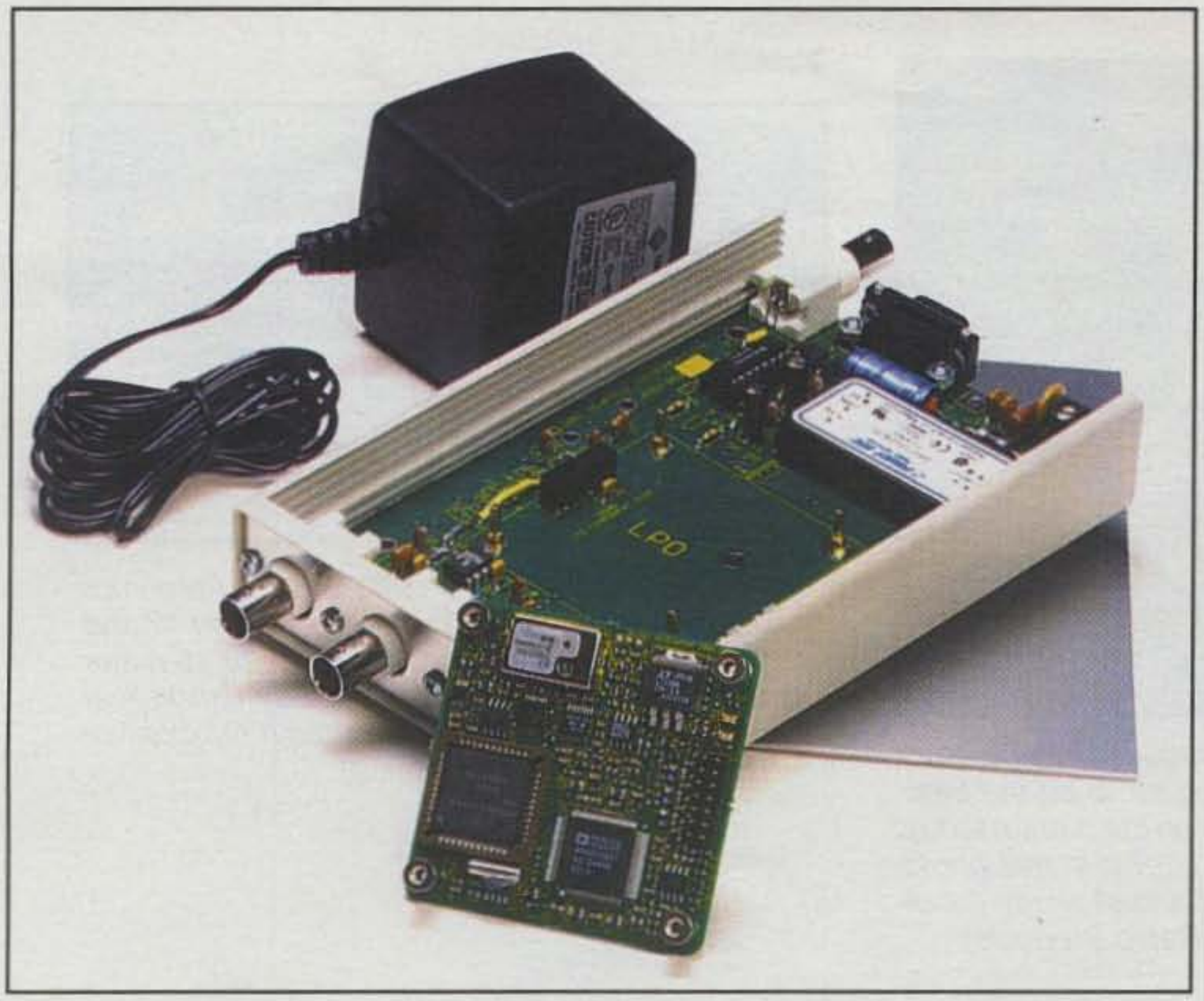


Photo E– If you're a professional tester or developer, you may be interested in Novatech's LPO30 EVAL kit. The kit consists of the LPO30, a carrier board for mounting the LPO30, BNC connectors, an AC adapter, and an enclosure, along with Windows®-compatible PC software. (Photo courtesy Novatech Instruments)

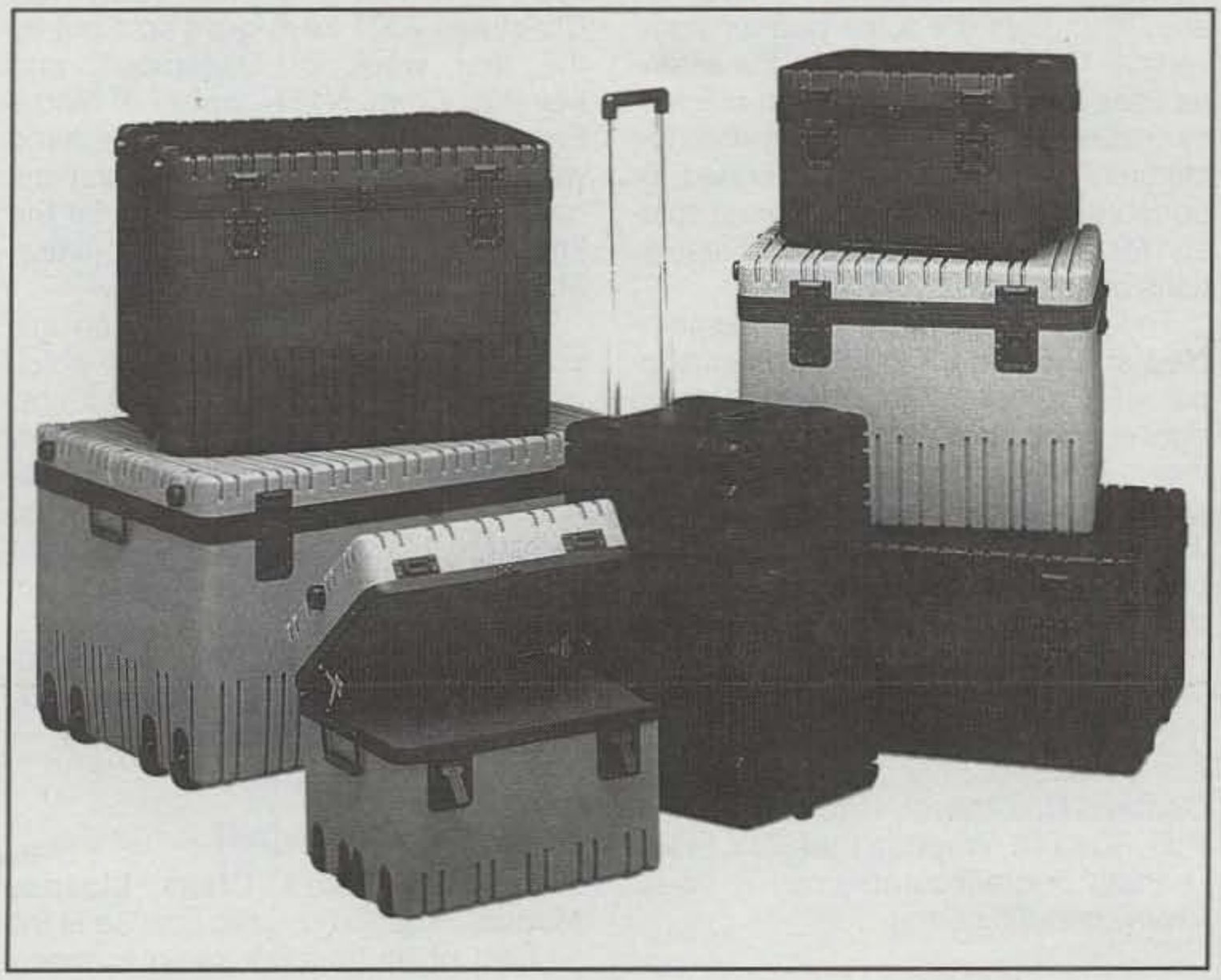


Photo F– Will you be planning a DXpedition or other major radio romp? You might want to take a look at the Roto-Rugged "Tote" Foam-Filled Cases distributed by Jensen Tools. The new cases feature rotationally molded construction to provide extra strength and durability, and uniform wall thickness and extra-thick corners make them resistant to impact damage. (Photo courtesy Jensen Tools)

Photo G– The MinuteMan 20™ Portable Antenna from Quicksilver is claimed by the manufacturer to be the best-performing portable antenna of its type on the market today. The adjustable H-frame 3' × 3' base, shown in this photo, provides stability over uneven ground and in windy conditions. (Photo courtesy Quicksilver Radio Products)

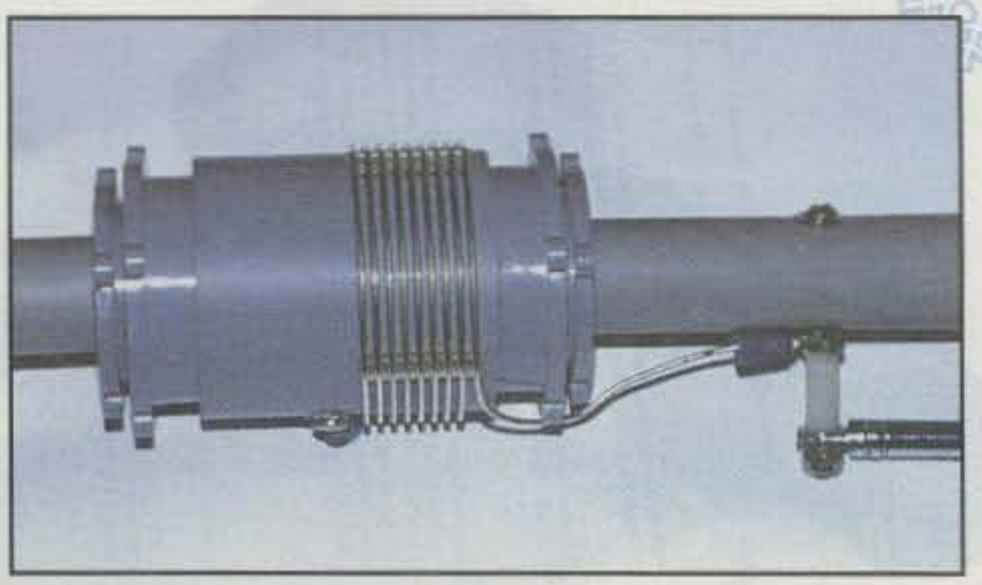


Photo H– The MinuteMan 20 Portable Antenna's efficient, Hi-Q loading coil reduces loss on 17 and 20 meters. No coil is used for 10, 12, or 15 meter operation. The antenna is offered by Quicksilver Radio Products. (Photo courtesy Quicksilver Radio Products)

cover 20, 17, 15, and 10 meters, with no tuner necessary in most cases. According to John, the antenna is designed not only to be efficient, but also portable, lightweight, and affordable. On 15, 12, and 10 meters it's a full quarter-wave vertical. On 17 and 20 meters the antenna uses a small amount of high-efficiency loading. John also notes that while the MinuteMan 20 is primarily intended for portable operation, it's also a great solution for amateurs facing antenna restrictions of any type.

The new antenna comes preassembled and needs no tools or other supports for setup. In fact, it's ready to go right out of the box. With no piece longer than 17 inches, it fits easily into a briefcase, backpack, or airplane carry-on. John says that the antenna goes from briefcase to on-the-air in less than 5 minutes. It weighs just 5 pounds and handles 100 watts of RF.

The MinuteMan 20 is available directly from the company or from select dealers. List price is $130 plus $10 shipping. Contact Quicksilver Radio Products, P.O. Box 146, Williston Park, NY 11596 (e-mail: <info@qsradio.com>; web: <www.qsradio.com>).

Morse Express Christmas Key

In what has become something of a tradition, Morse Express has commissioned a special telegraph key for the 2002 holiday season. The commemorative key is eminently usable for sending code and will double nicely as a very attractive holiday tree ornament!

Morse Express has commissioned 250 Christmas keys this year. The Christmas 2001 keys were sold out by the first week of December, and Marshall Emm, N1FN, owner of Morse Express, says he expects that demand will again exceed supply. Reservations have been taken for some time for the key via his website at <http://www.MorseX.com/xmas/x02res.htm>.

For a picture of and details on this year's Christmas Key—each of which has the Morse Express and LTA logos, "Christmas 2002," and a serial number on its base—see this month's "World of Ideas" column by K4TWJ. To order go to the Morse Express website at <http://www.MorseX.com/xmas>, or contact Morse Express, 2460 S. Moline Way, Aurora, CO 80014-1833; (phone 1-800-238-8205; e-mail: <n1fn@MorseX.com>; <http://www. MorseX.com>).

From the Bookshelf

The ARRL Extra Class License Manual. The Extra class license is the highest of all amateur radio licenses, and it's the goal of most amateur radio operators. Achieve this "level 3" goal, and you'll have access to all amateur radio privileges, including maximum power level, mode, and frequencies. With *The ARRL Extra Class License*

Manual for Radio Amateurs, you are just a few steps away from achieving the top-rung amateur license.

Inside the 605-page book you will find easy-to-understand theory and rules, with everything you need to pass the 50-question Extra class written exam. The book has the latest Extra class question pool (Element 4) with answer key, which went into effect July 1, 2002. There are clear, detailed explanations for all questions, including those involving FCC rules. Step-by-step examples show the detailed math for each type of calculation on the exam.

The paperback book is published by the ARRL at $24.95 plus $6 s/h. Contact the American Radio Relay League, 225 Main Street, Newington, CT 06111-1494 (phone 1-888-277-5289; e-mail: <pubsales@arrl.org>; web: <http://www.arrl.org/catalog>).

New Books from Newnes. Newnes, which bills itself as "publishers for the electronics industry," offers many titles in computing, electronics, electrical engineering, broadcasting, film, TV, video, and audio. Recently, Newnes published several new titles, two of which should be of real interest to readers.

One of these new books is *RF Components and Circuits,* by Joe Carr, K4IPV. Though now a Silent Key, Joe still is well known to readers. During his long career he was one of the world's leading writers on electronics and radio, as well as an authority on the design and use of RF systems. In fact, Joe is said to have written more than 85 books and 650 electronics- and communications-related articles.

Joe's 416-page, $37.99 paperback book, which contains some 599 illustrations, is a complete course in understanding and designing RF circuits. As such, it offers eminently practical design know-how from a world-class author. Joe demystifies the RF design process, presenting real-world design principles, tips, and rules-of-thumb with a minimum of mathematics knowledge.

By explaining how different circuit types work, and how they can be modified, he provides essential reading for electronics experts and newcomers to RF design alike. Whether you are looking for a complete self-study course in RF technology or a concise reference text to dip into, this book may be for you.

A second new book is *Electronics—A First Course,* by Owen Bishop. His book starts with the basics of electricity and component types, and it introduces students to practical work almost immediately. No prior knowledge of electronics is assumed.

The approach used in *Electronics—A First Course* is student-centered, with "Test Your Knowledge" features to check understanding. Key facts, formulas, and definitions are highlighted to aid revision, and theory is backed up by numerous examples throughout the book. The 208-page paperback includes 40 photographs, and 250 illustrations; it's $29.99.

For more info, contact Newnes, 225 Wildwood Avenue, Woburn, MA 01801-2041 (phone 1-800-366-2665; e-mail: <custserv@bhusa.com>; web: <http://www.bh.com>).

Wrap-Up

That's all for this time, gang. Next time, more "What's New." See you then.

Overheard: Don't let stress get to you! When you can't seem to solve a particularly tough problem, at least see if you can find some humor in the problem. It just might help!

73, Karl, W8FX

Beginner's Corner

BY PETER O'DELL, WB2D

For the Newcomer to Ham Radio

Simplex—The Other FM

I was in grad school. Living about 10 miles from school, I drove to a student parking lot, parked my car, and caught a bus to campus. One day I was deep in conversation on 146.52 when I pulled into the parking lot. The bus was there, would be departing in a moment (The next one would be in about 10 minutes.), and I was already late. This was a time when CB theft was still a major problem, so I yanked my TR-22 out of its bracket, disconnected the "quick connects," and threw it in my brief case as I made a mad dash for the bus. Incidentally, the Drake TR-22 looked a lot like a CB mobile rig, but essentially it functioned as a really big, heavy, awkward handheld. However, it was state-of-the-art for its day—1 watt out on 2 meter FM, either 6 or 12 crystal-controlled channels (depending on which model you had).

I don't know if you have seen the movie *Ferris Beueler's Day Off*, but there is a scene in it where Ben Stein plays the role of a booorrrring history teacher. I was taking advanced statistics from a character who made Ben Stein look like a whirling dervish. The only way you could be sure that this guy was not dead was to hold a mirror under his nose and check for fogging. Like in the movie, the students were in deep boredom-induced trances and the professor was asking a question and getting no response. Just as he finished asking the question for the second time, my briefcase boomed out the response: "This is WB8### monitoring 52." I turned eight different shades of red as I dove under my seat to find the offending 2 meter rig and turn it off. The professor was delirious, because someone had finally responded to his questions even though technically it was not the correct answer. He even commented that this was the strangest answer he had ever gotten to one of his questions.

Simplex is a term made popular by the commercial services. It was not until repeater operation became prevalent that most hams ever heard the word. A simplex contact was just a contact—the normal, average, typical contact that most hams had, regardless of mode. Simplex simply meant taking turns transmitting and receiving on the same frequency. Hams have been doing that from the earliest days. In fact, the only contact form I know of that is not simplex in nature is *split* operation, sometimes employed by DX stations. In this case the DX transmits on one frequency and listens on another (or a range of frequencies). Other than that, it was all simplex until repeaters came along.

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e-mail: <wb2d@cq-amateur-radio.com>

The 1970s-vintage Drake TR-22 was an early "handheld" 2 meter FM rig, with either 6 or 12 crystal-controlled channels (the TR-22C pictured here has 12) and one watt of RF out. A telescoping whip pulled out of the front, or you could plug in an external antenna in the rear. A case and shoulder strap made it portable. (Photo courtesy W2VU)

What is the big fear of simplex on VHF and UHF? Before repeaters, all VHF and UHF contacts were simplex. Now, on virtually all other modes of operation the VHF/UHF contacts are simplex. How is it that FM differs from CW and SSB in this respect? Repeaters are so easy to use, and they seem to be everywhere. However, simplex is fun and easy, too. You already have all the equipment you need. There is nothing extra to buy. Unless you happen to live in a box canyon, you will be able to make a lot of contacts on simplex.

Getting Started

Never tried it, or never thought about it seriously? I think the easiest way to get started is simply to listen to the input frequency of your local repeater and get an idea of what stations you can hear and the locations that might be dead spots for you. Most modern rigs have a "reverse" switch on them somewhere. Check your owner's manual, but usually all you have to do is push that button and it reverses the transmit/receive memories. When you hear one of your friends on the repeater, just flip the switch and listen for him on the repeater input. If you hear his signal, you could have a simplex contact with him. It is that simple!

Years ago you could simply get on 146.52 and announce you were monitoring. In most parts of the country you had a pretty good chance of making a contact. That no longer seems to be the case. I cannot recall when I had a contact that began on 146.52 or any other simplex frequency. The easy way to do it is to make contact on your local repeater and then move to a simplex frequency. If you have been listening to the input

for a few days, you should have a good idea of whom you can hear and who is out of range. To start with, pick stations that are solidly in range. After exchanging pleasantries, just say something like this to the other station: "Hey, I want to do a little experimenting. Let's move over to 146.52 simplex (or whatever other frequency you want to use)."

Some stations will go along with you, and some will not; you know, it is sooooo dangerous "over there" and they might come and get you for it! Also, it is expensive. What if it doesn't work? Maybe it is illegal. You aren't some sort of terrorist, are you?

Once you are there, however, it is just a simple matter of one station calling the other, and away you go. If you are really unsure of yourself, arrange who will call whom before you leave the repeater. Honest, I have heard two stations almost miss each other because each was waiting for the other to make the first call. Somewhat rarer are those times when both stations call simultaneously and neither realizes he doubled with the other. Arranging ahead of time who will call whom takes care of these problems. All you need to do is add "I'll call you" to the little speech listed above. That way you know to call as soon as you get there, and the other station knows to listen for you.

Also, once you have moved to simplex with another station a few times, you can shorten the whole setup conversation to something on the order of "Let's go to 52. Call me," or "Let's go to 52. I'll call you." *This ain't rocket science.* However, until you've established the pattern with the other station, you had better use the long form. There are too many hams today who just wouldn't know what you are talking about.

The contact will go like a contact on a repeater. One big difference is that there are no relays to reset and there are no courtesy beeps. You are on your own, which means that the exchanges can be rapid fire if both parties are interested in operating this way. However, you may find that other curious souls begin to float along with you, so you probably want to leave enough time between exchanges to allow another station to break in.

If both stations are at fixed points, then you probably won't experience much change in signal strength. You can stay on frequency as long as you want. If one station is mobile, though, then chances are sooner or later that station will go out of range. Again, you can plan ahead with, "If we lose it here, just pop back over to the repeater," or something like that.

I can't tell you what kind of range you will have, but it probably is more than you think. Years ago I was in Army MARS in Connecticut. We had a net that operated just below the 2 meter band on 143 MHz. I was surprised at how many of the other stations I could hear directly. There were a few the net control could hear and I couldn't, but not many. The one deciding factor is the terrain.

The height of your antenna is the critical factor. As I have mentioned here before, one of the most dramatic examples of the range of a simplex contact was when Roy Neal, K6DUE, listened to Owen Garriott, W5LFL, making the first contacts from space on board the shuttle Columbia. Owen was 150 miles above the Pacific Northwest coast and Roy was on the sixth floor of a hotel in Houston. If you have a *150-mile-high tower,* you can expect that kind of range with a 5 watt rig and a rubber duckie! Chances are your tower/antenna is a little shorter than that, however, so your range will be, too.

Antennas and Amplifiers

Will a beam antenna help? Maybe. If you are talking about two fixed stations on each other's fringe, then a beam will definitely

2 Meters (144–148 MHz)	
144.00–144.05	EME (CW)
144.05–144.10	General CW and weak signals
144.10–144.20	EME and weak-signal SSB
144.200	National (SSB) calling frequency
144.200–144.275	General SSB operation
144.275–144.300	Propagation beacons
144.30–144.50	New OSCAR subband
144.50–144.60	Linear translator inputs
144.60–144.90	FM repeater inputs
144.90–145.10	Weak signal and FM simplex (145.01, 03, 05, 07, 09 are widely used for packet)
145.10–145.20	Linear translator outputs
145.20–145.50	FM repeater outputs
145.50–145.80	Miscellaneous and experimental modes
145.80–146.00	OSCAR subband
146.01–146.37	Repeater inputs
146.40–146.58	Simplex*
146.61–147.39	Repeater outputs
147.42–147.57	Simplex*
147.60–147.99	Repeater inputs

**Note: Due to differences in regional coordination plans, the simplex frequencies listed may be repeater inputs/outputs as well. Please check with local coordinators for further information.*

Table I– The ARRL's national band plan for 2 meters. Note that using FM below 144.300 MHz is strongly discouraged. (Table courtesy the ARRL)

make a big difference. Just remember that a beam antenna takes the signal that would normally radiate in a full circle (360 degrees) from around your antenna and focuses it ideally in one direction. In short, your station becomes deaf and mute in all the directions to which your antenna is *not* pointed.

My opinion is that the best setup is to have both a beam antenna and a good omnidirectional antenna with a coax switch so that you can jump back and forth as circumstances demand. If you choose this setup, be certain that you buy a good coax switch that is rated for 2 meter operation. Years ago I tested some inexpensive ones and found that they were fine for HF operation, but at 2 meters they became very reactive and lossy. If your operation is on 222 or higher, this advice becomes even more important. If you can only afford one antenna or your circumstances limit what you can install, stay with a good omnidirectional antenna.

On this older rig (Kenwood TH25) the reverse switch is one of several switches located on the back of the radio above the belt clip. The reverse switch is at the far right.

If you have a 25 to 50 watt base/ mobile rig, you probably don't need an amplifier. On the other hand, if your only rig is a handheld, then buying a 50–100 watt amp is not such a bad idea. In the past I knew a group located in the northeast. These guys were on the road five days a week and lived for simplex operation. Not too surprisingly, they each had a 250 watt amplifier installed in the trunk. Unless you are approaching this level of fanaticism, you just don't need that kind of power. Also, you would start to annoy other hams in your area if you did run that kind of power and your signal was not squeaky clean. Besides, FCC rules require you to use the minimum level of power necessary to maintain communications. This is a rule that was not enforced much in the past, but the whole enforcement scene has changed dramatically in the past few years and things such as signal quality and excessive power are again coming under the FCC's gaze. Less is more.

Frequencies

Throughout this article, I have used 146.52 as "the simplex" frequency. In fact, pull out your *Repeater Directory* and look at the band plan. You will find that there are several frequencies listed between repeater inputs and outputs on each band segment. Theoretically, 146.52 is the national calling frequency. The idea is that you would make contact on 52, and then move to another simplex frequency. Good luck. If you are going to be the icebreaker in your area, move them from the repeater to 52. You'll get less resistance than trying to convince them to go to another simplex frequency. Once they get used to that, then get them to go to 146.55 or something in the 147 or 145 segments.

By the way, there are lots of other modes on the VHF/UHF bands. Throwing an FM signal into one of the band segments reserved for "weak signal" operation will win you lots of attention—the kind you don't want. You can find all the band plans at <http://www.arrl.org/FandES/field/regulations/bandplan.html> or in the *ARRL Repeater Directory*. The 2 meter band plan in Table I is shown as an example.

As you continue to branch out to other simplex frequencies, one thing you should check for is repeaters on odd-ball splits. In certain parts of the country some of the frequencies listed in the national band plan as being for simplex use are actually coordinated repeater input or output frequencies. For example, 146.490 MHz is listed as a simplex frequency on the national band plan, but in the New York City area it's the output of a repeater with a 1 MHz split (input on 147.490). If you have one of these setups in your area, you will want to avoid those frequencies.

Using relatively unused frequencies can be dangerous, though. Years ago my ex and I used a simplex frequency that seemed to be totally unused in the area. Over a period of time we tended to forget that others might be listening in. Of course, someone was. Hams are always listening. At just the right moment in front of the right people, some ham—let's call him Joe—might just repeat the content of one of those conversations. Are there nine shades of red?

Adios

This is my last column. Next month this column will be coming to you via Wayne Yoshida, KH6WZ, who has been a close friend of mine for over 20 years. He will be bringing you lots of fresh, new ideas. Me? I'm going to be making bird toys for my Blue and Gold Macaw. 73, Pete, WB2D

QRP

BY DAVE INGRAM, K4TWJ

The Art of Low-Power Hamming

QRP Mobile

What? QRP mobile? Surely Doctor Dave jests, you say. Working out with 5 watts or less and a full-size antenna from the home QTH is challenging enough, but pursuing it with a short whip from the vehicle almost seems futile, right? Nay, nay. Look up and think positive, dear friends. With sunspots still fairly high, QRM low, and new-style mini-rigs such as the K2, FT-817, and Argonaut V capturing everyone's attention, mobiling with QRP is more attractive and successful today than ever before.

Skeptic, are you? Recently a good friend started working HF mobile for the first time with a little QRP rig and a miniature hand key. After a couple months of unbelievable success, he decided to really go big time and move up to a 100 watt rig. He couldn't work a thing. Nothing. Zero. In desperation he switched back to QRP. BAM! He worked a string of VKs and JAs right off the bat. Some stations even piled up for 30 minutes to "work the QRP mobile." No doubt about it: Too much power can be a stifling handicap! Don't fret. At least we are not plagued by erratic fuel-pump operation, automatic locking doors, and mysterious computer glitches. Low-power mobiling is a gas!

Photo A– Mobiling need not be elaborate or expensive to be fun, especially with QRP. Here a homebrewed 4 watt 30 meter transceiver (NorCal's famed "38 Special") and new K6VDH paddle (described in our March 2002 "World of Ideas" column) plus headrest-strapped speaker give WB4OEE's Cavalier a touch of real radio clout.

Apprehensive about leaving a rather expensive rig in your car, hitting a tall whip on a low overhang, or working CW while moving around? Relax. If cost or theft is a factor, consider using a little kit rig like you would at home. Just store it in the glove box when you're not using it. If you move around parking decks and garages, homebrew a short antenna that stands only a few inches above the car radio's antenna. You might lose a couple of dBs, but you can offset the difference with sharp operating tactics. Most big-time QRP activity is on CW, so just invite your significant other to drive. He or she can enjoy yelling at all the lane swappers and bumper riders while you ham it up. Yes, indeed, where there's a will, there's a way!

As further encouragement to try QRP mobile, check out our following views and notes.

Photo B– Moving out in style with QRP! My own Chevy Camaro gets a shot of class and flash with a 20 meter MFJ Cub modified for 4 watts output, a neat little 2 by 4 inch speaker (described in my "World of Ideas" column in this issue), and a brand-new round key.

Rolling Out with QRP

Since I presently spend more time working and writing than traveling, my mobiling time is limited to running a few quick errands. I thus find it more convenient to use a little fun rig such as the MFJ Cub or NorCal 38 Special (both built from kits) rather than carry (and watch over) a "big rig." I have used this light-hearted "pocket rig" concept in both my Camaro and my XYL Sandy, WB4OEE's Chevy Cavalier, and

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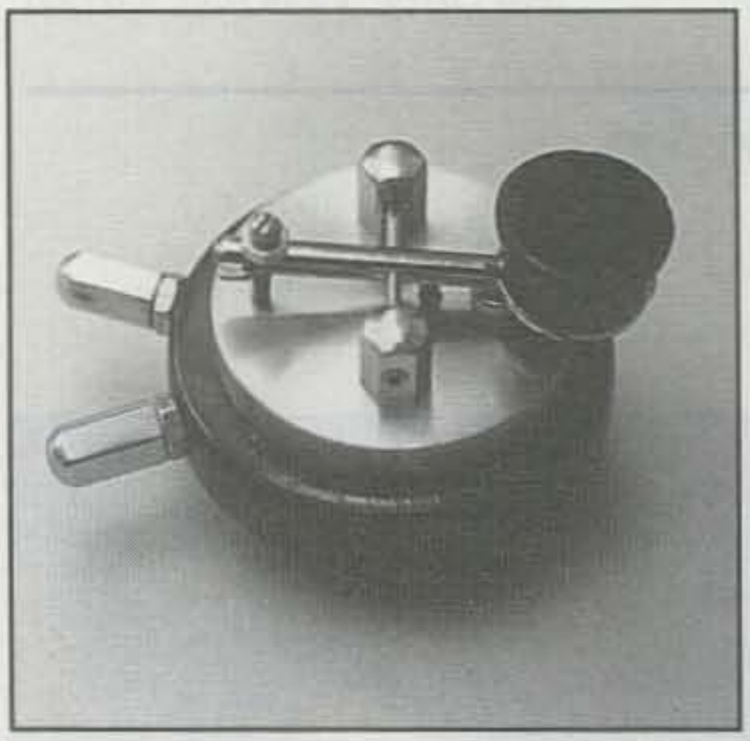

Photo C– A closer look at the round-based key in photo B reveals an elegant, well-polished brass mechanism set into a glazed cocobolo wood base fitted with rear binding posts. Look carefully and you can see the key's main arm is made from a handcuff key and fitted with a unique-shape cocobolo wood fingerpiece. Key is available from Morse Express.

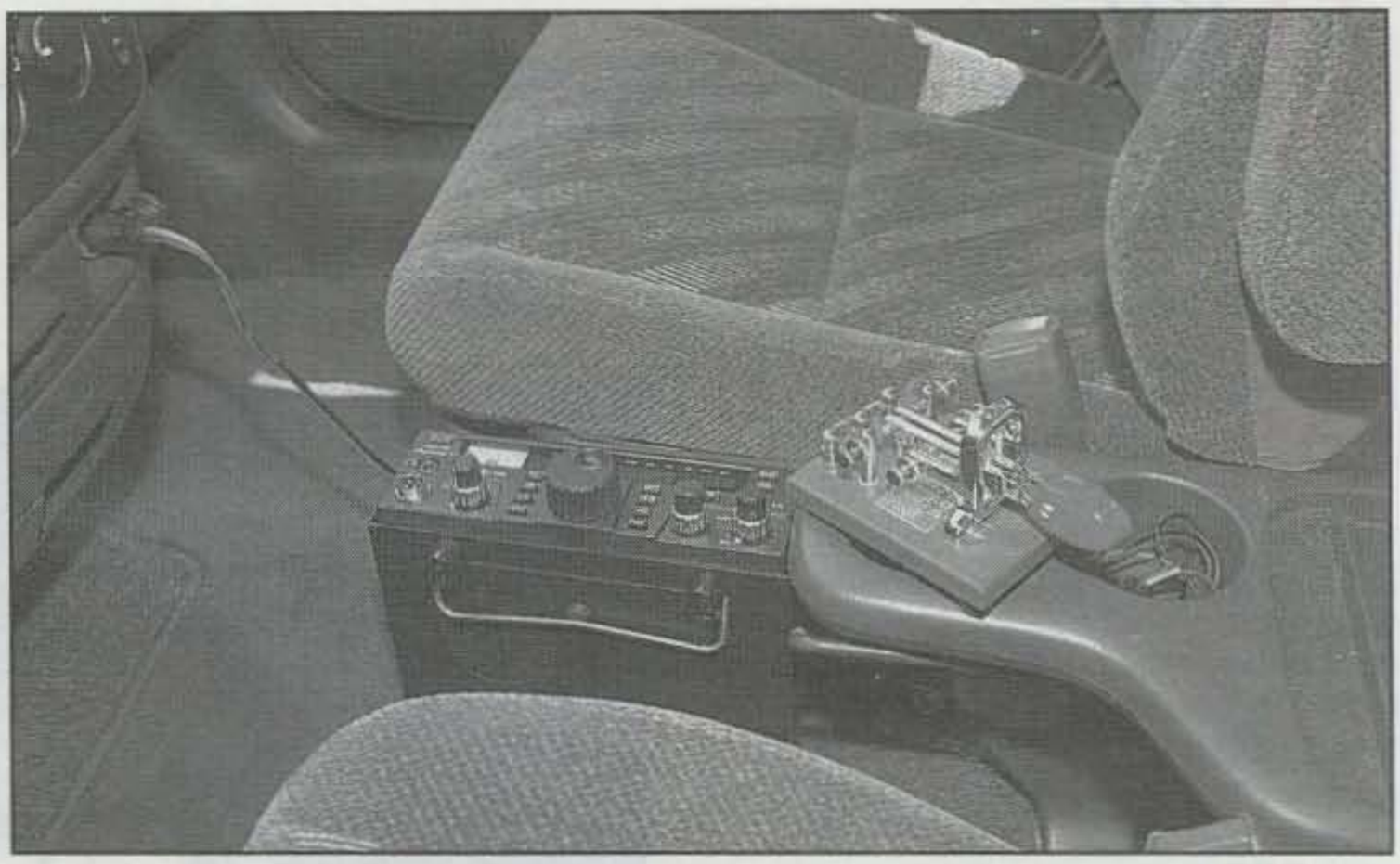

Photo D– First-class QRP mobile for sure! You are looking at the brand-new Ten-Tec Argonaut V mounted between the cockpit seats of Larry, WA4BSM's Honda minivan, and it is a romper! Like its predecessors, this heartwarming (and quite deluxe!) transceiver is destined to become a classic collectible. Notice the paddle, too; it is the prototype of a special Vibroplex/Ten-Tec dual-labeled iambic paddle that is being produced in limited quantity and available right now from Ten-Tec.

despite noticeable differences in antenna size, both setups work out well (photos A and B).

Both the Cub and the 38 Special make good "grab 'n go" mobile rigs, as they are easily powered from a vehicle's 13 volt accessory socket, fit anywhere, and have enough audio to drive a small speaker. The Cub typically runs 2 watts output, but I changed its RF amplifier transistor to a 2N3553 as mentioned in its manual, and it now pumps out 4 watts, which is plenty for mobiling. In fact, I am enjoying an approximate 80-percent return to all calls—on 20 meters with the Cub and on 30 meters with the 38 Special—and that's also with intermixed 4 and 9 foot tall antennas for each band. It is a most exhilarating experience, especially when the mini-rigs are complemented with a unique key or paddle. That really adds spice to the game.

I sense your curiosity about the miniature round-based hand key in photo B, so I moved it from the car and shot a close-up view of it for your study (photo C). This magnificent little delight is handmade by Jim Richards, K6VDH, and sold by Marshall Emm, N1FN, of Morse Express (2460 S. Moline Way, Aurora, CO 80014; telephone 303-752-3382, order line 1-800-238-8205, or <www.MorseX.com>). It is round, 1.75 inches in diameter, and is called a "handcuff key,"mainly because its arm is made from an actual key for unlocking a pair of handcuffs. The key's clean lines, polished brass platform and mechanism, plus chrome arm and unique-shape knob (which, along with the base, is polished cocobolo wood) make it a real attention grabber. Internal wiring plus horizontally positioned rear binding posts make hook up easy, and the "handcuff key" handles well. This item is Jim's second telegraphic treat. As you may recall, his smooth-handling iambic paddle with cocobolo fingerpieces and granite base (shown with 38 Special in photo A) was described in our March 2002 "World of Ideas" column, which featured keys. Both of these gems are available through Morse Express.

Our next featured mobile setup will definitely kindle some major interest and excitement in the world of QRP (photo D). It is the brand-new Ten-Tec Argonaut V mounted in the Honda minivan of Larry Worth, WA4BSM. It is accompanied by another special item—a Vibroplex/Ten-Tec dual-labeled iambic paddle. Like its predecessors, the Argo V promises to be a genuine classic in the world of QRP. It is a software-definable HF transceiver with IF-level DSP, filters galore, up to 20 watts output, Ten-Tec's famous QSK, built-in keyer, and much more. A full review of this rising new star should appear in *CQ* in the very near future, and an additional report on the Argo V storming the bands fixed, mobile, and portable will follow soon afterwards in this "QRP" column. Stay tuned.

The paddle in photo D, incidentally, is a special item with twin Vibroplex/Ten-Tec labels. (The Ten-Tec labels were being made when this photo was shot, so use your imagination to visualize it.) A few Vibroplex bugs were dual-labeled in the past and they rapidly became prized collectibles, so these beauties should also be snapped up quickly. A word to the wise should be sufficient here: Ten-Tec's order number is 1-800-833-7373.

Hopefully, we have inspired your interest in QRP mobile, so let's now discuss the easy way you too can join in the fun.

Easy Setup, Fun Galore!

This is where the simple elegance of QRP is really appreciated. Most low-power transceivers are small and light weight enough to fit in or beside a car's center console, and their mild current needs can be handled by the vehicle's 13 volt accessory socket. Just remember to include a separate ground strap connected between the transceiver's case and the vehicle's frame for good RF grounding. I use a short piece of flexible braid/shield routed from a body or seat bolt to a clamp on the rear shell of my rig's PL-259. That way the rig is well-grounded any time I connect its antenna cable. I sense you saying the vehicle's cigarette-lighter/accessory socket has a ground connection, but it is probably a thin wire routed halfway around the vehicle's interior before connecting to the frame. It is a DC ground—not an RF ground.

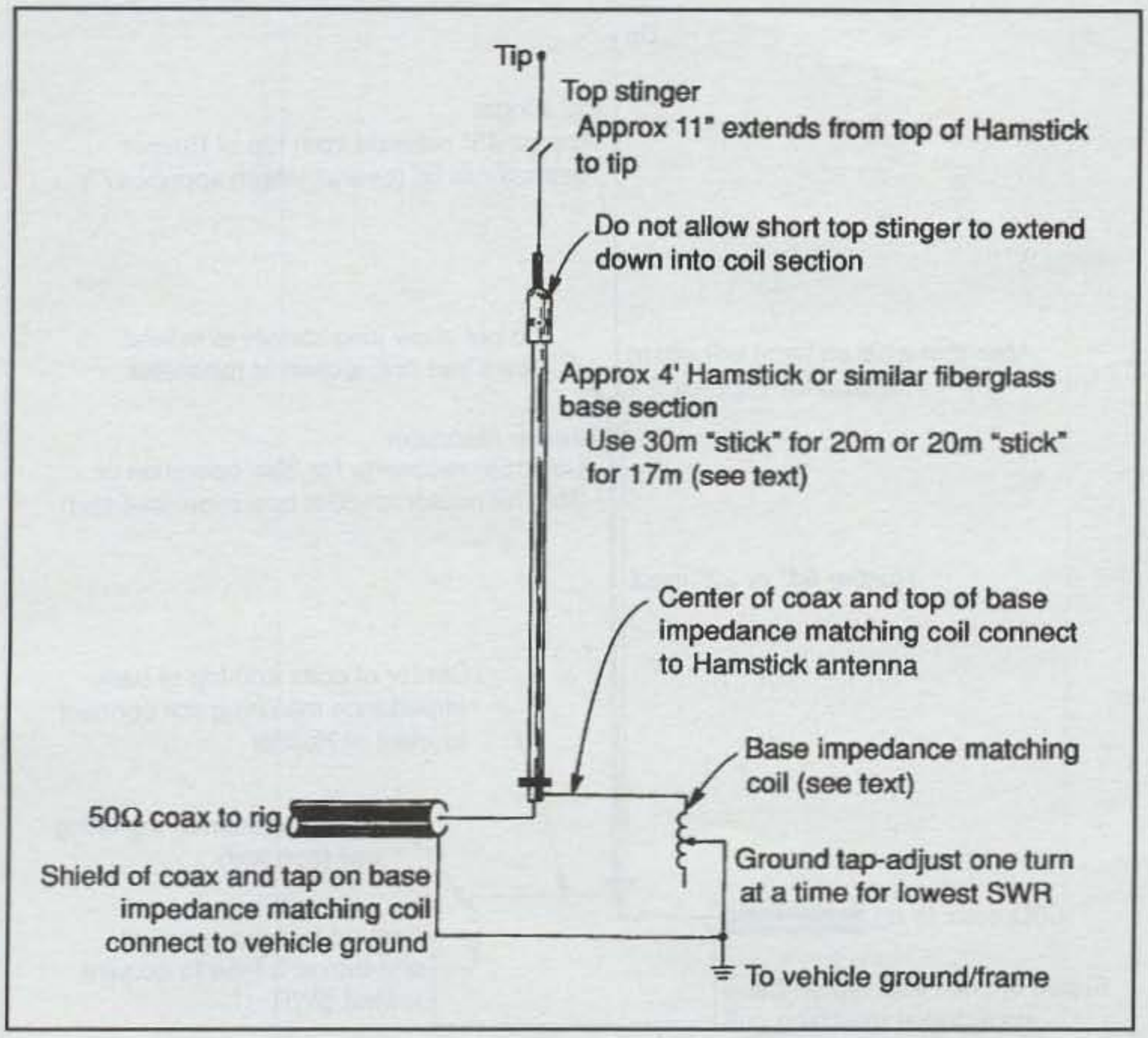

Fig. 1– Outline of a short, yet impressive-performing mobile antenna for 20 or 17 meters. The little gem is ideal for slipping in and out of parking decks.

Also be sure your coax shield and antenna mount are solidly grounded to the vehicle's metal body at the base of the antenna and mount. If you use a trunk-lid mount, use a pocket knife and scrape off paint right where set screws tighten so they connect with metal. If your car is of the non-metallic composite body material, add a couple of 12 or 15 foot long runs of copper strap or braid as a counterpoise. Surprisingly, many mobileers (new and old!) overlook these basic, vital RF ground requirements, and then say they cannot work out good while mobile. Tisk, tisk.

One final tip: Before pronouncing your setup finished and ready for action, quickly check your work as follows. Disconnect the PL-259 antenna plug from your transceiver, and then disconnect the added RF ground strap you connected to its shell. Next, using your ohmmeter, touch one of its test leads to the ground strap and the other test lead to the PL-259 shell. You should now read through the coax shield; through the mount, its set screws, the vehicle trunk and frame; through the body bolt; and back to your added ground strap. If resistance is above one ohm, recheck/reclean your connections. Trust me: This step is well worth pursuing. Now

add a novel key, remember to check your antenna's SWR often, and enjoy. Need some suggestions on antennas? Read on!

Antenna Ideas

QRPers are naturally addicted homebrewers and experimenters, so we have a couple of interesting "concept antennas" to inspire your creative thinking and further your interest in QRP mobiling. What are concept antennas? They are designs I have used with good success, designs you can use as-is or modify as desired and apply to generally similar styles or types of antennas.

One such signal radiator is illustrated in fig. 1. Here the lower 4 foot section of a Hamstick (or similar helical winding on fiberglass shaft antenna) is fitted with an approximately 11 inch upper stinger to produce a neat half-height antenna. When mounted near the bottom of a car's trunk lid, this low-profile whip is barely taller than the vehicle's AM/FM radio antenna, yet it "works out" very well for its size. There is a catch, however. This idea only relates to using a *30* meter "stick" for 20 meters or a *20* meter stick for 17 meter operation. It may also work for using a 15 or 17 meter stick for 12 or 10 meters or a 40 meter stick for 30 meters, but I have not tried it.

Different types of sticks exhibit different inductances, so you also need to dink with stinger lengths for each antenna and band. The quick and easy approach here is to use an MFJ-259B Antenna Analyzer in your vehicle. Just plug the antenna's cable into the MFJ-259. Insert a "looks about right" length stinger in the stick and check (hunt for) its resonant frequency. Then retract or extend the amount of stinger protruding from the stick's top until ham-band resonance is acquired (typically a 4 or 5 minute process). The SWR will probably be around 1.5 or 1.6 to 1 at resonance, so add a base impedance matching coil and you can lower the SWR to 1.15:1 or less. Since you will adjust the base coil's ground tap (one turn at a time) for lowest SWR, its exact diameter is not critical. I use a 2.5 inch diameter by 2 inch tall coil with approximately 10 turns overall, and usually tap it at 4 turns. A 1 inch diameter coil should work equally well if more (approximately twice as many) turns are used. Dink and enjoy!

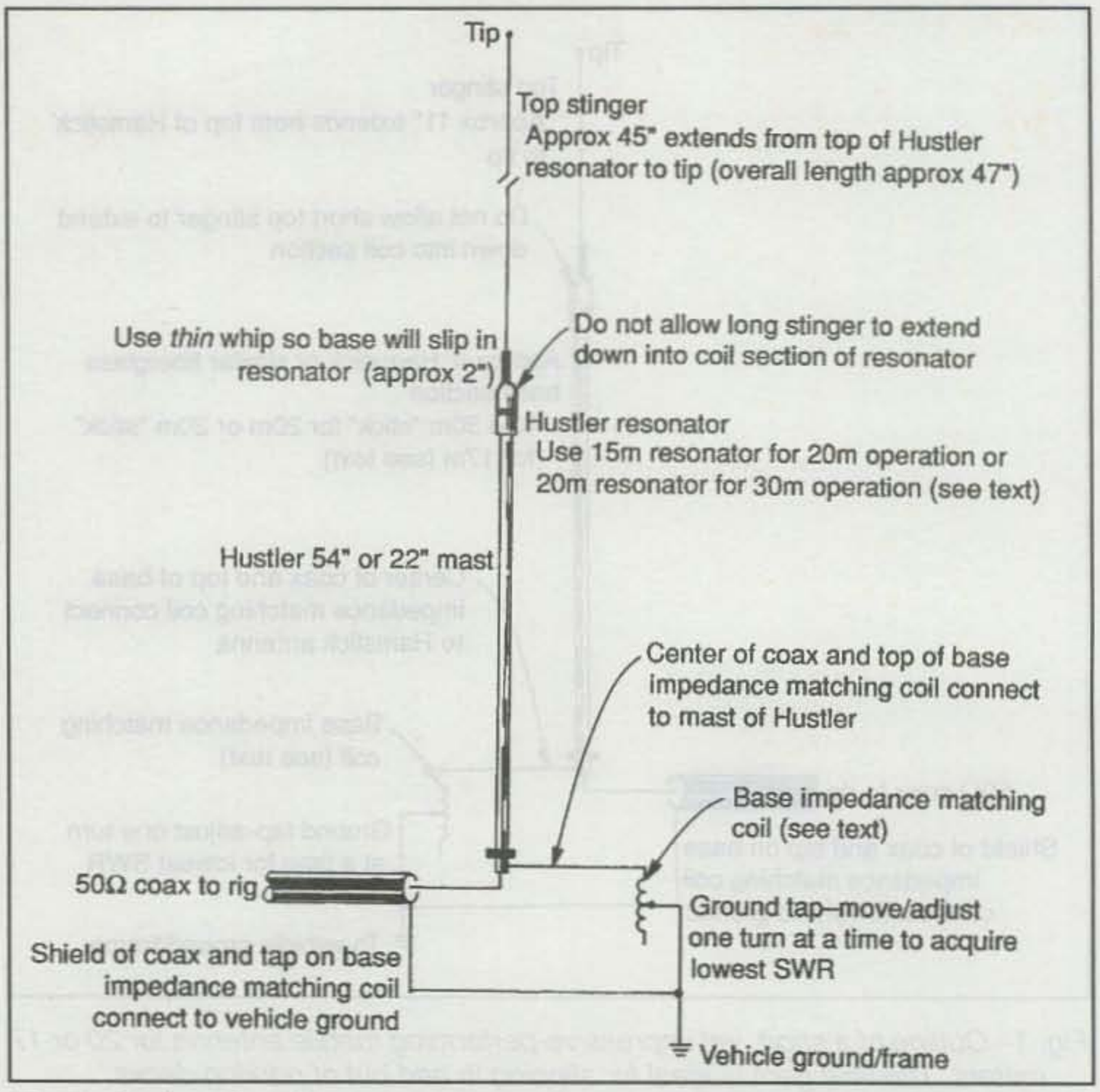

Fig. 2– Outline of a tall, super-performance mobile antenna built around a Hustler antenna. (Discussion in text.)

The second antenna idea is shown in fig. 2. Here the short upper stinger on a Hustler *15* meter resonator is replaced with a 45 inch tall whip or stinger. This change produces a *20* meter antenna that works out great, and it can be mated with a regular (54 inch) or short (22 inch) base mast as desired. Remember, however, trunk-lid mounting results in a very tall antenna, and the standard freeway overpass clearance is 16 feet 6 inches. The same tuning concept applies to this second antenna: Use an MFJ-259 analyzer, insert an approximately 47 inch whip in the resonator, then adjust its "out of resonator" length for lowest SWR. (A longer length lowers resonance, and a shorter out-of-resonator length raises resonance.)

Have fun experimenting, and let us know how things work out so your efforts can be recognized in a future "QRP" column.

Conclusion

That wraps up the views for this month, gang. Now it's your turn to have fun expanding on our ideas. Good luck in all your pursuits, and remember: Whatever the vehicle shape, size, or wheel count, QRP fits. Hopefully, too, we will meet on 20 or 30 meters one afternoon or evening soon.

73, Dave, K4TWJ

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VHF Plus

BY JOE LYNCH, N6CL

All About The World Above HF

Transequatorial Propagation

For those of us weak-signal operators who spend a lot of time on 6 meters, from all observations we appear to be coming off the second and probably last peak of this sunspot cycle. Therefore, it is unlikely that we are going to see a repeat of the excellent worldwide propagation that took place last year. Nevertheless, long-distance north-south propagation is still possible and quite likely in the coming months. Such propagation is known as *transequatorial (TE) propagation* because of its traversing the magnetic equator.

TE propagation (or TEP) is related to *F2* propagation in that the *F*-layer refracts the RF signal. TE propagation seems to occur more often in the spring, during the late afternoon or evening and sometimes into the night. In addition, TEP seems to occur most often during the peak of a sunspot cycle. While a high sunspot count is conducive to TEP, it doesn't seem to be necessary, as TEP QSOs have taken place during sunspot lulls.

The theoretical range is between 3100 and 5000 miles, with the theoretical limit of the path being around 5000 miles. This limit is governed by the *F*-layer, which in the daytime is situated approximately 100+ miles above the Earth's surface. Theoretically, the height of the *F*-layer accounts for the 2500 miles of the path. The linking of two *F*-layer propagation areas at the magnetic equator accounts for the doubling of the path to the potential maximum of 5000 miles.

To take advantage of TE propagation, both you and the station you are trying to work must be approximately the same distance from the magnetic equator. Unfortunately, this rules out all but the southern tips of Florida and Texas and the southern west coast of the continental United States, because the magnetic equator dips southward from the western reaches of the Pacific Ocean to the eastern reaches of the Atlantic Ocean, thereby placing all but the southern tips of the United States too far north to benefit from the effects of transequatorial propagation. Nevertheless, it does include stations on the opposite end of South America, southern Africa, and in the Pacific.

VHF Plus Calendar

Dec. 1	Moon perigee. Good EME conditions.
Dec. 4	New Moon.
Dec. 6	Lowest Moon declination.
Dec. 6-9	Winter 6-meter Contest. See text for details.
Dec. 8	Poor EME conditions.
Dec. 11	First quarter Moon.
Dec. 14	Moon apogee. *Geminids* meteor shower predicted peak.
Dec. 15	Poor EME conditions.
Dec. 19	Full Moon.
Dec. 20	Highest Moon declination.
Dec. 22	Moderate EME conditions. *Ursids* meteor shower predicted peak.
Dec. 27	Last quarter Moon.
Dec. 29	Moon perigee. Good EME conditions.

• *EME conditions courtesy W5LUU.*

TE propagation has been documented from the upper HF frequencies through the VHF frequencies of 222 MHz and higher. The only known TE QSO on 432 MHz reportedly took place between YV5ZZ and LU3AAT on 13 February 1978. With different types of propagation link-ups, occasional contacts outside of the equidistant restriction, such as to more northern QTHs on the continent, can occur. For example, on 6 meters a meteor-scatter or sporadic-*E* induced linking can extend the zone beyond the *F*-layer limits.

Several years ago, one such meteor scatter-caused event is believed to be the source of the contact that Larry Lambert, NØLL, had with Nob, VR6JJ. Larry reported that he could barely hear Nob, until all of a sudden Nob burst through. They quickly completed the contact and then Nob was gone. Larry attributes that sudden burst to ionization caused by a meteor burn.

It is also theoretically possible to work someone via an over-the-horizon satellite and a TEP link. Most amateur satellite aficionados look for a particular satellite's footprint to see what are their limits for communications during that satellite's orbital pass. A challenge would be to know that TEP is taking place and then try to use it as a link into a satellite that may be over one's horizon but in the TE propagation zone. At the very least, one could surprise a few operators on the other end of the satellite's propagation circuit!

How does TE propagation work? Most of the time the southbound signal travels outward to an *F2*-layer north of the equator, is refracted back to Earth at the equator, bounces outward to another *F2*-layer south of the equator, and is finally refracted back to Earth. However, sometimes these two layers break up into ionized clouds and traverse the equator. When this happens, the signal appears to become trapped below these clouds and is continuously refracted until it lands on the surface at the distant location. It is this breakup, which seems to be what occurs during an auroral event, that creates the transequatorial opening on 6 meters.

A couple of other points about TEP: First, if you are located in the northern latitudes and are working well into the southern latitudes on 6 meters, you are working either normal *F2* propagation or multi-hop sporadic-*E* propagation. Second, it is pretty safe to say that you will not work stations via *F2* propagation above 50 MHz. While there is rare evidence of *F2* propagation on the European 70 MHz ham band, that seems to be the limit for amateur radio activity, as there is no known evidence of an *F2* QSO on 2 meters or above.

The above summary of TEP propagation is a brief sketch of its whole story. For more information on TEP propagation, see these URLs: <http://www.qsl.net/ea6vq/tep.html> and <http://www.oz4vv.dk/All%20About%20TEP.htm>. There are other URLs that you can find via a search engine such as Google. For you print jockeys, more information will be found in the winter issue of *CQ VHF* magazine.

More Extra Class Questions

Now that you have read about TE propagation, see how well you do with the following questions from the Extra Class question pool:

What is transequatorial propagation?

A. Propagation between two points at approximately the same distance north and south of the magnetic equator

B. Propagation between two points at

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(phone 918-627-6625; fax 918-835-9785)
e-mail: <n6cl@cq-amateur-radio.com>

approximately the same latitude on the magnetic equator

C. Propagation between two continents by way of ducts along the magnetic equator

D. Propagation between two stations at the same latitude

If you answered A, you are correct, as TE propagation most often takes place between stations that are equidistant from the magnetic equator.

What is the approximate maximum range for signals using transequatorial propagation?

A. 1000 miles
B. 2500 miles
C. 5000 miles
D. 7500 miles

If you answered C, you are correct, as the theoretical and practical limit to TE propagation is 5000 miles.

What is the best time of day for transequatorial propagation?

A. Morning
B. Noon
C. Afternoon or early evening
D. Late at night

Again, if you answered C you are correct, as conditions seem to be just right during late afternoon or early evening.

As these questions demonstrate and as I have said in previous columns, we who regularly work weak-signal VHF have, or should have, knowledge of operating conditions such that we can pass the Extra Class license exam. The challenge for us, therefore, is to go ahead and pass it!

On the Air

Herb Furlong, WA2FGK (FN21), reports that on 6 October he worked the following stations on 6 meters: LU8AHW, LU6DRV, CX5BW, CE3RR, LW3EX, CE1CCC, AY2DEK, LU8DIO, LW6DC, AY6EF, LU7AT, and LW5DX. He also worked WP4O in Puerto Rico. Then sporadic-*E* propagation enabled him to work North and South Carolina. About the time he was completing these QSOs he got inspired to skip to 2 meters. He fired up the 8877 into his four 17B2 antennas and called CQ. That effort netted him AC4TO in EM70 and N4CC in EM80.

Rick Tucker, WØRT (EM27), reports that on 11 October at 0100 UTC he worked VK4APG on 50.100 MHz.

Hail and Farewell at *QST*

There is a changing of the guard taking place at *QST* this month. For the past ten years Emil Pocock, W3EP, has been the editor of *QST*'s "The World

Above 50 MHz." November was his last column. This month Gene Zimmerman, W3ZZ, takes over as editor.

Emil first started appearing as a regular writer for ARRL publications as one of a trio of columnists for the *National Contest Journal*. For several years, covering the VHF+ scene on a rotating basis in their column "VHF-UHF Contesting" were Emil, Michael Owen, W9IP, and Curt Roseman, K9AKS. In 1992 then *QST* editor Mark Wilson, K1RO, asked Emil to replace retiring Bill Tynan, W3XO, which he agreed to do. It was in December 1992 that Emil began his decade-long tenure as *QST*'s VHF+ columnist.

Having been an admirer of Emil's writing during his days at *NCJ*, I was very happy for him when he was hired for *QST*. My having an Avis rental-car-agency-like mindset ("We're Number 2; therefore, we try harder," which over the years of Avis's advertising campaign has been compressed to simply "We try harder."), every month I would check his column to see what he covered in comparison to my VHF+ column.

On occasion I would scoop Emil on a story. Usually that was made possible because of *CQ*'s later deadline. Occasionally, I was able to scoop him because I begged my editors in Hicksville to leave me just enough space to get a timely story into the column, often knowing that I would beat Emil with my coverage on the story by nearly a full month.

Even so, as Emil points out in his farewell comments in the November issue of *QST*, news that appears in his column (and, indeed, our respective columns) is nearly two months old at best. Hence, scooping Emil, as fun as it might have been from time to time, wasn't that significant. More often than not, it was not the scooping of Emil but rather the sharing of material with him that was significant. Indeed, the world above 50 MHz is a small world, and while we were competitors, we were and are also friends. It was that friendship that prevailed more than the competing over Emil's tenure at *QST*.

That friendship began when Mark Wilson introduced us to each other when Emil started at *QST*. It was not many months later, in March 1993, that we got to know each other much better when Roger Webb, W4MW, graciously hosted us in his home during our stay in Charlotte, NC for the annual hamfest, where we held a joint forum. This forum would be the first of many we held over our joint tenure as VHF+ columnists.

Unfortunately for the hamfest organizers, the winter "storm of the century" shut it down early Saturday afternoon, almost immediately after our forum. Fortunately for Emil and me, we spent that Saturday afternoon and evening cementing our friendship for the future of our respective tenures as VHF+ columnists while shooting pool in Roger's ham shack. Subsequently, one of the many ways our friendship expressed itself was when several years ago Emil agreed to be a peer reviewer for my *The VHF "How To" Book*.

While I will miss competing with Emil, I now look forward to friendly competition with Gene, W3ZZ, whom I also consider to be a good friend. Gene is no stranger to VHF coverage, having written for both *CQ Contest* and the earlier version of *CQ VHF* magazines.

Now it is farewell to Emil and hail to Gene as *QST*'s change in columnists takes place this month. I wish both Emil and Gene the best of success in their respective endeavors.

Current Contest

The following is from the Six Club: "The annual Winter (6 meter) Contest begins at 2300 UTC December 6 and goes to 0300 UTC December 9. *Rules:* Each QSO is worth one point in his/her own country and two points for every contact made outside of their country; Hawaii and Alaska each are considered a separate country. *Scoring:* Multiply total QSO points by the total number of grids worked. All entries must be received by January 15, 2003, either by e-mail or snail mail. Webpage address: <http://6mt.com/contest.htm>. The mailing address is: Six Club, P.O. Box 307, Hatfield, Arkansas 71945. *Awards:* Awards will be given out to the first-, second-, and third-place winners in each country."

Current Meteor Showers

Two showers occur this month. The first, the *Geminids*, is predicted to peak around 1000 UTC on 14 December. It has a broad peak and is a good north-south shower, producing an average of 110–130 meteors per hour at its peak. With the Moon at near apogee, you can forget working EME and concentrate on this meteor shower.

The second, the *Ursids*, is predicted to peak on 22 December, but the exact time is unknown as of this writing. It is an east-west shower, producing an average of more than 12 meteors per hour, with the possibility of upwards of 90 at its peak.

And Finally . . .

This has been a whirlwind year. It start-

ed in New York City, at the invitation of Dick Ross, K2MGA, *CQ* magazine's publisher. I came away from that visit as the new editor of the resurrected *CQ VHF* magazine, full of responsibilities and a bit of trepidation.

Fortunately, with a lot of help from Dick; Rich Moseson, W2VU; Features Editors Gordon West, WB6NOA, and Ken Neubeck, WB2AMU; my Managing Editor Gail Schieber, K2RED, the authors who agreed to be in the first issue; and not the least, my wife, Carol, W6CL, we got that first issue out the door in time for the Dayton Hamvention.

In the run-up to the Hamvention we started traveling and promoting the magazine. Our first stop was at the Green Country Hamfest here in the Tulsa area (Claremore, Oklahoma, to be precise). Our next stop was in Ft. Smith, Arkansas, then on to Belton, Texas, all the while seeing and hearing many of you wish us the best for the success of the magazine.

Then it was Dayton and the rollout of *CQ VHF*. The copies literally flew out the door. Except for a precious few copies we saved from the 400 we brought to the show, we sold them all, at the same time watching as the subscription count continued to climb.

As the summer came, we again were traveling, this time to Milwaukee and San Diego to be a part of the Central States VHF Society Conference and the ARRL Southwest Division Convention. In October it was off to Mena, Arkansas and back to Belton, Texas. As I write this, we are contemplating attending at least part of the AMSAT conference in Ft. Worth, Texas. With invitations to Joplin, Missouri and Huntsville, Alabama, we are also lining up our travel plans for next year. Dayton is on the schedule, as is the Central States VHF Society Conference, which next year will be here in Tulsa.

What we have gathered from our travels is that there is a strong interest in VHF weak-signal work. With the technology evolving, however, there is also an evolution on the VHF+ ham bands. At year's end we contemplate that we just finished another ARRL EME contest, albeit the old-fashioned way, using CW and SSB. Mind you, I am one of the first to say CW forever. However, the changes in technology have prompted so many of us to ponder much of what we have been taking for granted.

Among our musings is the question of what constitutes a QSO. It seems only a short time ago in 1986 when during Field Day Larry Tyree, N6TR, made the first computer-only automated QSO. Using a Z80 computer and a Kenwood TS-430, Larry's station sought out Field Day participants and completed CW QSOs with them.

Now, 16 years later, with WSJT 2.3 at our disposal, we ponder what is next—and how easy it could be to let the computer complete the contact on EME or meteor scatter, or even sporadic-*E*.

There are so many questions that we cannot possibly answer in this column this month, or maybe in the next few months, or even for a long time to come, for that matter. What we can do is continue to do our best to report on what is happening and evolving in our hobby, and together with you, we can decide what is best for the future of our hobby.

One topic that I am contemplating for sometime next year is the question "Firewire: friend or foe to amateur radio?" I would be interested in your thoughts on the subject. In the meantime, for a bit of an insight into what is happening in the industry and its potential impact on us amateur radio operators, download this PDF file from the following URL: <http://www.dpo.uab.edu/~jgemmill/Presentations/Wireless_TIMGROUP.pdf>.

I would like to thank you all for the wonderful support of our efforts to report on your activities here and in *CQ VHF* magazine. Together, my wife Carol, W6CL, and I wish you the best for the holiday season and the coming New Year. We hope that we will get to meet many more of you in our travels and via the internet as we continue to try to be the best venue for promoting your special interest in our special hobby.

Until next month...

73, Joe, N6CL

Computers and Internet

BY DON ROTOLO, N2IRZ

Ham Radio's Online Connection

Computers: Why Bother?

Is there really anyone out there reading this who doesn't have a computer? I would imagine that there are a few of you out there, and I hesitate to guess at why you don't have one of the handiest tools we've had available since pliers. It probably isn't the cost, since even an older Pentium machine can be had for free. Maybe you just don't see the value in a general-purpose do-it-all machine.

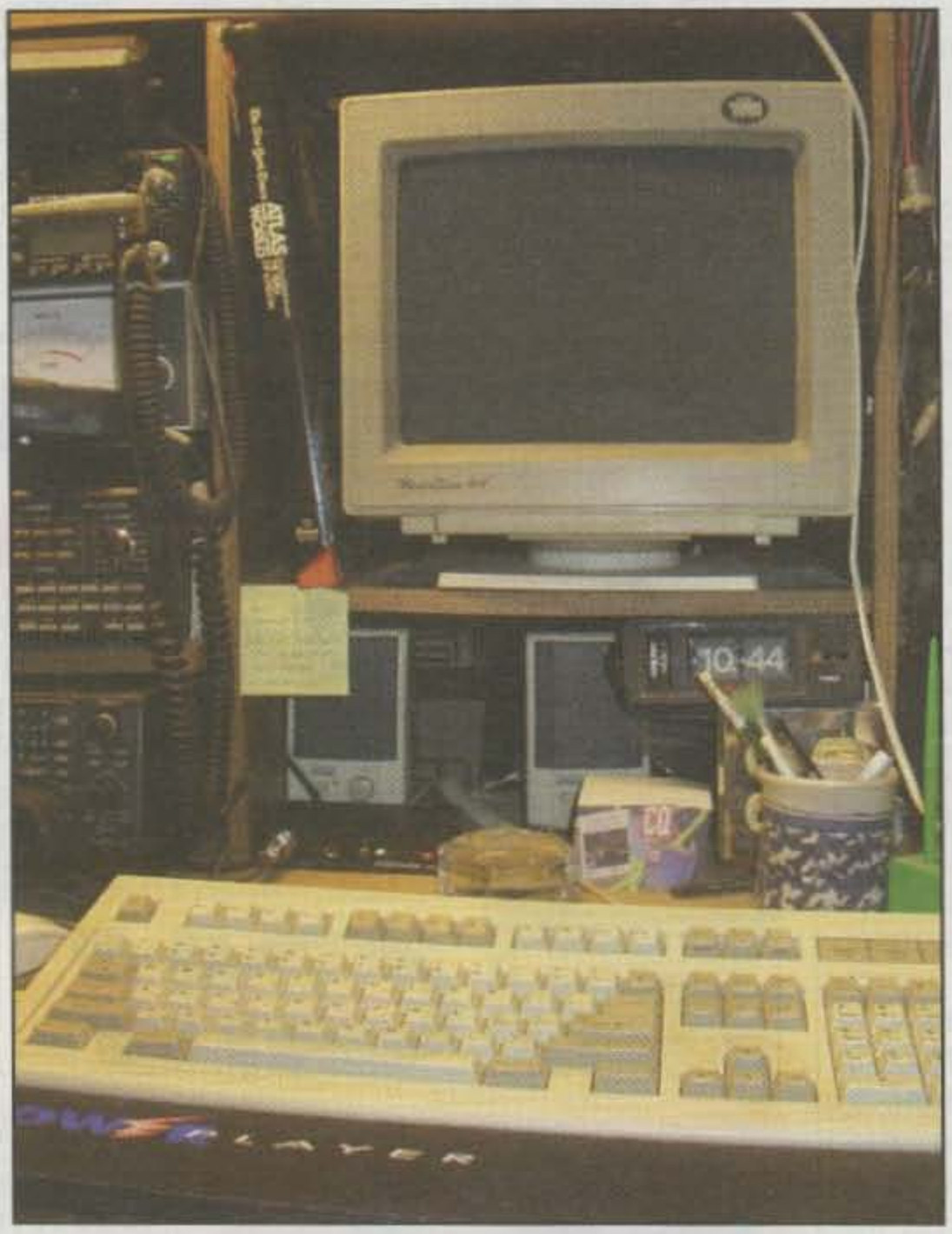
The things you can do today with a computer are literally without limit. This month I'd like to bring up a few ideas for using a computer. Not all of these ideas are new, but by looking at a variety of applications, perhaps it will stimulate you into thinking of other things (and yes, you *can* use one to anchor a boat!).

Years ago, after I had my first computer but before I had spent the money on a PC-board drafting program, I had a need to design a fairly complex printed circuit board that could be reproduced many times. I ended up using PC Paintbrush, a program that shipped with Microsoft Windows 3.1. It took what seemed like forever to put that design onto the screen, a pixel at a time, but in the end I had a precision pattern for my board. If you are interested, you can see the end result in the October 1996 issue of *CQ VHF* in my "Digital Data Link" column.

In the version of Paintbrush I was using you could work on individual pixels. Looking at the Paint program I have on my Windows® 98SE machine, working at that level of detail is difficult, if not impossible. Anyway, what I did was create a bitmap that was scaled to 300 dots per inch, allowing me to work in increments of 1/300th of an inch. The resulting file was huge, but I could make lines as fine as 0.0033 inch, much finer than I could etch.

Each board had something like 130 holes to be drilled. After my tenth board I started looking for a better way. I ended up building a Computer Numerically Controlled (CNC) PC-board drilling machine based on an article by Dan Mauch <http://www.seanet.com/~dmauch/> in *Nuts & Volts*. I resurrected an old IBM 8088 machine (4.77 MHz!) with a failed hard drive to run the machine, booting off a 3.5 inch floppy. I still have it and use it.

545 Baylor Ave., River Vale, NJ 07675
e-mail: <n2irz@cq-amateur-radio.com>



If you think a computer in your ham shack is an accessory you don't need, think again. Even an old, slow one can help with all sorts of things, from designing equipment to operating it.

Getting back to PC-board patterns, I soon realized that my efforts were being limited by the capability of my printer. Remember, this was when a 24-pin dot matrix was high resolution, and a laser printer was a few thousand dollars. I printed out the pattern in best resolution mode at double or triple size, and then reduced it on the copier at the library. The result was quite good. Eventually I found a laser printer, and lived happily ever after.

Once I got the laser printer, I started using it for labels. If you've been a reader of my columns for any length of time, you know that I like to build equipment. Equipment needs controls, and controls need labels and scales. Again using Paintbrush, and also Powerpoint and eventually Adobe Photoshop to make whatever I needed, I just printed out my labels and scales.

Recently, I read about a DOS program that allows you to easily design and print a customized meter scale for just about any meter movement you'll encounter. Written by Jim Tonne, WB6BLD, **meter.exe** can be downloaded from Jim's website at <http://www.qsl.net/wb6bld/>. The program is free for ham use. See the brief article in the "Hints & Kinks" column of last October's *QST* for some useful ideas on printing if you don't have a PCL5-capable printer.

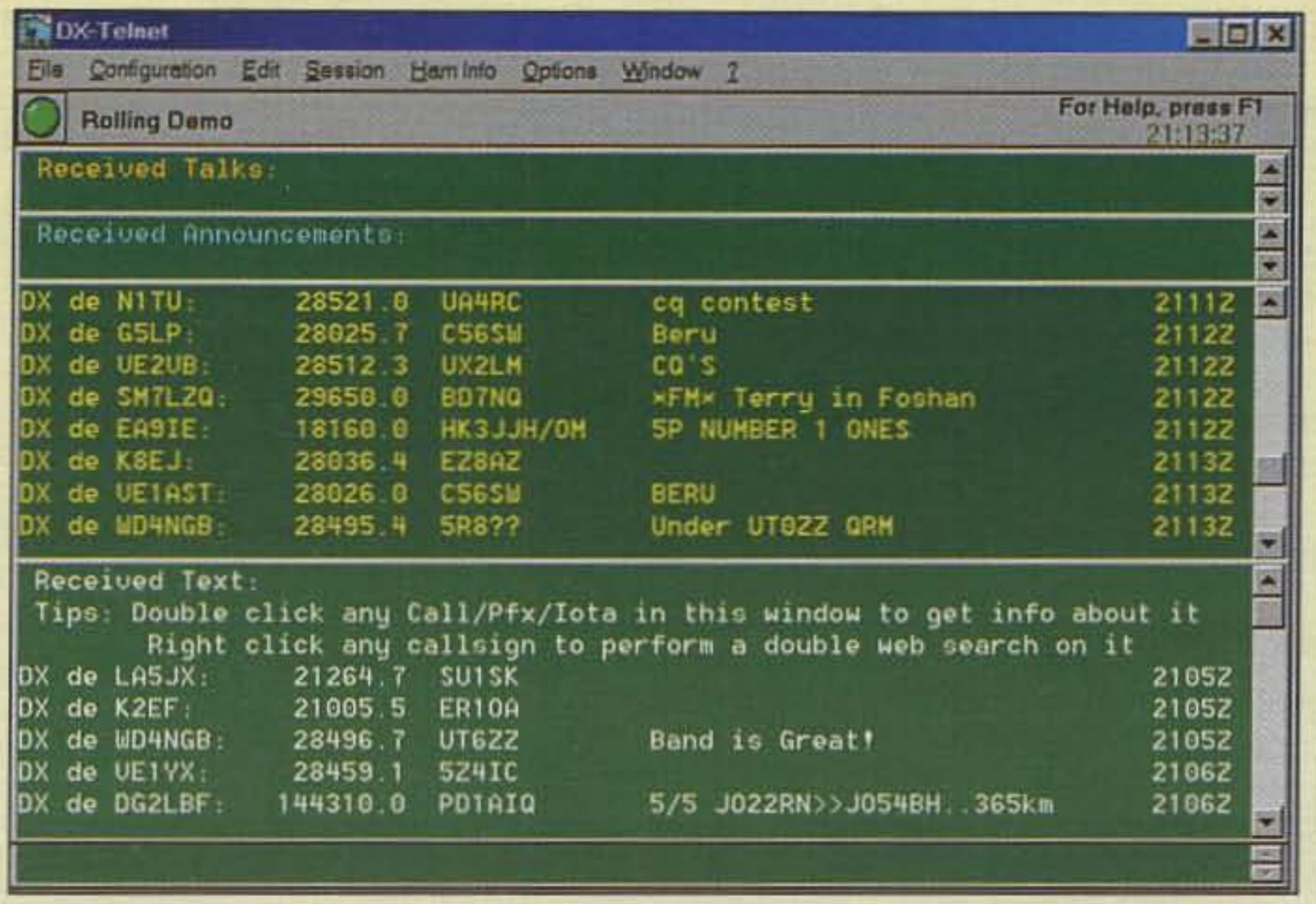
With labels and even entire front panels, I'd usually print onto a clear-plastic overhead transparency. To ensure that the toner didn't rub off, I'd print in reverse, so the printed side went against the equipment, with white paper or paint behind it for contrast. Depending on your printer, you might have to adjust the print size a few percent.

The computer and printer can be a powerful combination. How about identification cards for club members, complete with color photos? I hope your club is already producing a newsletter, as I discussed on these pages earlier this year. How about producing a training manual on something? Maybe a handy reference card for something?

Then there's the sound card. I've written about sound cards before, so you know there's a lot you can do with them besides PSK31. Almost every contester uses his/her computer for logging, sure, but how many also use it as a voice keyer? After all, your sound card can both record and play back any audio you can make. Windows® even comes with a basic

CQ Mini-Review: "DX Workbench" Software Suite

I'm not a DX hunter, preferring long ragchews over signal reports with some rare call prefix. I just take whoever is on the air. Although I might use resources on the internet to make DXing more interesting, I'm often frustrated by the plethora of different programs I'd like to have running "just in case": a browser (with a good "favorites" list), radio control software, a logging program, and a packet connection to a DX Cluster. Then I learned about a suite of programs written by Fabrizio Sartoni, IK4VYX. These shareware programs bring many diverse information sources together, making it easy to get an accurate picture of DX conditions at that moment. It's kind of like having all the tools you need right on the workbench.



Downloading the program is quick at 1.2 MB. Running the downloaded file starts a typical setup routine. Follow the simple instructions and soon you should end up with a program folder on your desktop. There you'll find three programs which are essentially all the same, the difference being what kind of data connection you'll use to send and receive DX spots. DX TNC is for packet connections to a local DX Cluster, DX Plorer uses a connection to DX Summit (<http://oh2aq.kolumbus.com/dxs/>), and DX Telnet allows a connection to any of the many DX Clusters on the internet.

The list of features is large. One of my favorites is the automatic PC Clock setting routine—two clicks and it's done! You can also search updateable databases for IOTA, Locator, or Prefix data. Easily connect to many internet resources, such as callbooks, QSL info, and even a real-time grey-line display. Right-clicking on a callsign brings up a Buckmaster and a QRZ callbook lookup (<http://buck.com/call> and <http://www.qrz.com/>, respectively). It exports to almost every logging program, speaks the callsign and frequency of every new spot as it appears, and can even filter spots according to very flexible criteria. You can even have the program send you DX spots as SMS messages to your cell phone! All that, and the multi-window user interface is intuitive and easy to use, to boot.

Instead of repeating the owner's manual here for you, I just urge you to download it and try it. If the 30 minute timer gets annoying, a lifetime registration code can be had from Fabrizio for around $35 at the time I wrote this. Contact him via e-mail at <rac2610@racine.ra.it>.

sound recording/playback/editing program that should meet most people's needs, and you can open as many instances of it as you have phrases.

DX spotting via the various clusters is also a popular use of computers. Here you have more than one possibility, getting your spots over the air using packet, or by connecting over the internet. See the sidebar "DX Workbench" for a mini-review of a nifty software package that conveniently brings many diverse information sources together. *(Also see "Creating the DXLab Suite" in last month's issue—ed.)*

CW training programs have been available for many years, but one program by Tony Lacy, G4AUD, has really caught my attention. His NuMorse program offers a good selection of standard and advanced CW learning techniques. The upgrade to NuMorse Pro offers multi-user statistics tracking and many other randomization and automation features for only a few dollars more. Especially cool features include the random fading and noise (QSB/QRN) of the audio output, and the "Antique code sound option" which emulates the unique (and rare) sounds of various spark transmitters and telegraph keys.

Tony also offers NuTest, which creates and administers practice tests for any U.S. license class. If that was all it would be enough, but NuTest also has a wonderful study guide, with comments and explanations (some quite extensive) for every correct answer. You also can easily access other learning resources, such as a copy of the Part 97 rules and online links to amateur radio topics and math formulas. VEs can even print out paper tests for an exam session, with support for several types of marking templates. See Karl Thurber, W8FX's "What's New" review in the August issue of *CQ*, and get more information or download free demos at <http://www.nu-ware.com>. You can also take sample tests online at <http://www.hamtest.com>.

With just a little creativity, your computer can help you with many amateur radio tasks. As a builder, I use the printing capabilities of my computer for nearly every step, from design and prototyping through finished front panel and even the documentation. Plus, while I write mostly about personal computers using the Windows® operating system, all of this applies equally to all those Mac and Linux machines out there. Not owning either, I am clueless about the available software for those platforms, but I'd be surprised if it wasn't just as good, maybe better.

Another Year Older...

Once again, another year comes to a close. Recent year changes have been of the once-in-a-lifetime variety—all new digits in the year, a new millennium—and this year it just feels good to get closer to normal again. As I always do this time of year, I want to send you and yours all the very best wishes of the season, for happiness, health, and maybe some wealth. We all should work toward keeping that warm, fuzzy feeling alive throughout the whole year. Until next year . . .

73, Don, N2IRZ

Awards

BY TED MELINOSKY, K1BV

News Of Certificate And Award Collecting

This is the first column written from my new QTH. Those of you who have moved in the past have some idea of the total confusion that lasts for several weeks, trying to find stuff packed in moving company brown boxes. However, things are coming along, and we are getting settled at the new QTH.

This month we start out with several queries we have received from readers.

We Get Questions

Question: Do most county hunters just send a QSL card and hope to receive one back, or do they also send an SASE? If the latter, cost of stamps alone would be about $2400. How do they handle this?

Answer: Postal costs can be significant, but there are some tricks of the trade. Many of your contacts will be made by following the mobile station through various counties. Use of the Mobile Reply Card (MRC) allows five or six contacts to be listed on each card. If you hold on to these cards and send them only when you have five or more contacts, the cost to you is only going to be the 37-cent stamp you use to pay for return postage. If you have 20 or 30 contacts with that station, even better, since the postage cost will still only be 37 cents. There are also volunteer-run mobile QSL bureaus which act similar to the DX QSL bureaus. If you don't need to get a separate card for each contact, your postage costs will be reasonable. As you get toward the end, you will want to get each card individually, although by that point, you really won't care about the costs.

Question: Will you accept an EXCEL spreadsheet or one of the county logging program lists in place of the CQ Record Book?

Answer: Yes. Most hams have a computer in the shack and use an automated logging or tracking program. USA-CA requires the signed wording for the certification and witness form, and this may be copied from the CQ booklet. The list of counties submitted must be in alphabetical order by state and then by county within the state, and include callsign, QTH/"mobile," band, and mode. Date of contact and signal report are not needed. Remember that USA-CA rules require that if you are applying for an endorsement, you must send a complete list up to and including the contacts for that level of endorsement. (If you have the 1000 seal and are applying for the 1500 endorsement, the list must include all 1500 counties.)

*12 Wells Woods Rd., Columbia, CT 06237
e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll

Werner F. Brill, DL9YC
USA-CA All Counties #1049
September 3, 2002

Larry Mitchell, K2MHE
USA-CA All Counties #1050
September 5, 2002

From Ray Petschonek, WG6X

The following is from Ray, WG6X, USA-CA #1045, May 22, 2002:

I have been a ham for over 30 years. I am a retired Navy Chief, and in November 2001 I also retired as an electronic technician from the post office. I sold my home in San Jose and bought a place here in Pensacola, Florida, which is my hometown. I have fulfilled my ham wish of having a tower after all these years.

I was one of the first FCC-issued two-year, CW-only Novices. I have had lots of fun being a ham and have enjoyed many modes of operating, from the green keys to digital and even MARS. I made my first HF mobile trip in 1970 as WB6ZUD. I was on a trip back to Pensacola to visit with my dad, when I came across the County Hunters Net on 14.336 and was welcomed to county hunting by KZ2P, who was net control as I put out my first county, which was in Mississippi. Yes, I was warned almost immediately that county hunting is very addictive, and how true that is.

Since then I have truly enjoyed the fun of hamming and don't believe you can find a more fun group of hams who will go out of their way to help you. I enjoyed county hunting so much that I changed my call from KD6SV to WG6X so that I would be more helpful on other county hunting awards.

There are far too many hams to thank for helping me earn this award. I would, however, at least like to thank a few—KC4UG, W8ILC, KIØJD, WA2AKB, and N4CD, who like so many others went out of their way to get me a last county. A very special thanks to KD4HXM, who made a long trip in Georgia to finish off my last three for this award while I was mobiling in Nevada. I also wish to thank all the net controls and the ones who move mobiles off frequency so they can make a run. To be honest, I enjoy putting out the counties far more than chasing them.

Why not tune in on the fun at 14.336 and check out <countyhunter.com>, or even better, install an HF antenna and put the rig in the old vehicle and go county hunting? The best that can happen is you will become addicted to county hunting and see a lot of the county side roads while having a great day.

73, Ray, WG6X

DX Awards

The Chelmsford Award. The Chelmsford (England) Amateur Radio Society, which sponsors this award, can boast of their little town being the birthplace of radio. This is based on the fact that Marconi's first radio factory for the design and production of equipment was located in Chelmsford. The award commemorates the Centenary of Marconi's first Trans-Atlantic Radio Transmission on December 12, 1901.

Using any of the suffix letters from a station's call, spell the following: CHELMSFORD THE BIRTHPLACE OF RADIO. Only one callsign may be used per letter, and a total of 30 calls is required (i.e., the "R" in G1QRT could be used to represent the "R" in RADIO). One of the callsigns used must be from a station located in the Chelmsford, UK postal district, which is "CM" (Hint: Use the web address below to contact the club and line up the needed contact.).

All bands and modes, but no repeater contacts. Contacts must be on or after December 12, 2001. Send GCR list and fee of 10 IRCs, $US10, or £6. Excess fees collected will be donated to the Essex Air Ambulance fund. Apply to Martyn Medcalf, M3VAM/G1EFL, 47 Paddock Drive, Chelmsford CM16UX, Essex, UK (website: <http://www.g0mwt.free-online.co.uk/>; browse to the "Chelmsford Award" page).


Chelmsford Amateur Radio Society
AMATEUR RADIO AWARD IN AID OF THE ESSEX AIR AMBULANCE
THIS IS TO CERTIFY THAT
A.N. OTHER G1QRT
Has submitted satisfactory evidence of having heard or worked thirty amateur stations and used one suffix letter from each callsign to make up the following words
'CHELMSFORD THE BIRTH PLACE OF RADIO'
AWARD NO. APPROVED BY DATE
President CLUB CALL GX0MWT Chairman

The Chelmsford Award commemorates the Centenary of Marconi's first Trans-Atlantic Radio Transmission on December 12, 1901.

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MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅛ x 6 x 9	3.4
SS-18	15	18	1⅛ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅛	4.2
SS-30	25	30	3¼ x 7 x 9⅛	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9¼	4.2
SS-30M*	25	30	3¼ x 7 x 9⅛	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅛	6.5
SRM-30	25	30	3½ x 19 x 9⅛	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9¼	6.5
SRM-30M	25	30	3½ x 19 x 9⅛	7.0

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9¼	10.5
SRM-30-2	25	30	3½ x 19 x 9⅛	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9¼	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅛	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

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EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

CIRCLE 134 ON READER SERVICE CARD

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

*ICS – Intermittent Communication Service

The A-08 Award—an 8 inch, colorized aluminum plaque engraved with the recipient's callsign—is issued for contacting members of the DARC Lahr DOK (German club).

The A-08 Award. VE3AT sent in a copy of the German A-08 Award. Most German clubs (DOKs) sponsor awards for contacting their members. The cost for this award is a little high, but it comes in the form of an 8 inch, colorized aluminum plaque engraved with the recipient's callsign. Nothing like a couple of plaques mounted on the wall of your shack to get some attention!

Contact stations in DARC Lahr DOK A-08 after January 1, 1971. SWL okay. German District A stations need ten contacts with DOK members; other DL and Europe four contacts, and DX two contacts. Note that the requirements are toughest for Germans in the "A" District, and then Europeans. Since DX stations only need two contacts with members, I would say that this could be a relatively easy award to earn.

Send GCR list and $US20, DM30, or 15 Euros (no IRCs) to: Uwe Rast, DG1GRU, Am Schulgarten1 + 3, D-77948 Friesenheim/Baden, Germany.

CWJF Award Series. Brazilian hams have a passion for promoting CW operating, and their awards often reflect this. The amateurs of the city of Juiz de Fora provide two colorful awards—one for making contact with a small number of their members, and the other, as in the Chelmsford Award, for spelling out a phrase or term using the letters of a stations suffix.

General Requirements: Contacts after January 1, 1993 count for the award, but only on CW. SWL okay. Send GCR list and fee of 5 IRCs to: CWJF, P.O. Box 410, 36001-970 Juiz de Fora, MG Brazil (website: <http://www.powerline.com.br/cwjf>). The award fee is certainly modest, but it might be a good idea to send your application via Registered Mail to ensure it arrives safely.

To earn the Brazilian CWJF Award, contact three different CWJF members on any band, CW only.

For the DCJF Award, use any letters in the suffix of Brazilian stations to form the phrase "JUIZ DE FORA - A MANCHESTER MINEIRA," and work at least three different CWJF members, CW only.

CWJF Award. Contact three different CWJF members on any band.

DCJF Award. Using Brazilian stations, any letters in their suffix, form the phrase "JUIZ DE FORA - A MANCHESTER MINEIRA," and work at least three different CWJF members.

Member list: Many Brazilian stations attach a little summary of the awards of their respective club on their outgoing QSLs. I believe that CWJF uses this method. That member list may be more up to date than the one shown here: CP5GK; F5MZA; LU1FDQ LU5VC; PP1EDU, RR; PP2AR, ESA, FN; PP5AVM, CIA; PP6CW, QM; PP7CAR, CI, CW, JR; PP8GU, JL; PQ2JSV; PQ8ZZ; PR7FB, PO; PR8RLS; PS7BX; PS8AKL; PT2AL, AW, CJ, CW, FK; PT7AA, AQ, ASN, DM, SD; PT8ZZ; PU1AAS, KDR; PU2LCD, OAE; PU4TFP; PU7RJC, TDD; PV8MC, ONU; PW8ACE, EM, LF; PYØFA; PY1AFL, AJK, ANT, BLL, BNE, BVY, BYK, COS, DDI, DGV, DZT, GEC, GRM, IAM, JN, LN, LPS, LVF, QN, RJ, SDN, SL, WAS, WDS, WSP; PY2AF, APQ, BBO, BE, CZL, DBU, EJN, IQ, JB, KP, KTT, MT, NX, NZR, OC, OHJ, ORF, OS, OW, OZF, PZQ, TN, UJJ, WDM, XE, YN, ZI; PY3ATL, CJI, HS, JRG, LI, MQ, XX; PY4ACY, AOR, AUN, BGQ, BH, BIO, BOC, BUY, CEL, CY, ELJ, EM, HGM, HI, HJ, HQ, IU, JCP, KC, KL, PJ, TO, VB, VG, VV, WAS, WQN, YN, ZF; PY5AWB, BLG, CFT, MG, MJ, NN, PX; PY6BU, SS, WF; PY7KE, OJ, SZ; PY8EL, JA; PY9FP; SP2QVS; and YV4ABR.

Sponsored by the Cambridge ARA, the Guernsey County Heritage Award is issued for contacting stations in Guernsey County, Ohio.

Guernsey County Heritage Award. On this award certificate the Cambridge Amateur Radio Association (CARA) of southern Ohio features local heroes who have gone on to earn countrywide or international reputations. Did you know that Guernsey County, Ohio was the birthplace of astronaut and Senator John Glenn, as well as old-time cowboy actor Hopalong Cassidy? If you or your club is searching for a suitable basis for an award, do a little checking to see what notable figures were born in your town, city, or county.

To earn this award, stations located in Guernsey County need 15 different stations in the county, and all others need 10. All bands and modes may be used. No use of repeaters. Send log entries and SASE to: CARA, Guernsey County Heritage Award, P.O. Box 1804, Cambridge, OH 43725 (web: <http://www.w8vp.org/>; sponsor e-mail: <w8vp@hotmail.org>).

Keep sending me those award rules and samples. Publicity is the key to a successful awards program for your club or group. This month's article provided a few tips on how to get started, and *CQ* magazine will do its part to help you promote your awards.

73, Ted, K1BV

DX

BY CARL SMITH, N4AA

News Of Communication Around The World

The Old Days, and The New

Ah, yes . . . In early October, as this is being written, the weather is turning cooler here in the southeastern U.S. That means only one thing to a DXer/contester—*Contest Season,* and hopefully improving band conditions. By the time you read this, we will have already experienced the CQ WW DX SSB Contest and the ARRL Sweepstakes, with the CQ WW DX CW Contest right around the corner. It goes on and on until next spring. What fun we can have almost every weekend.

Remember the old days, 10, 15, or even 20 years ago? What kind of radio were you using back then? I'll bet a lot of you were using what I used—the Drake C-Line. What a radio that was in the 1970s and '80s. Take a look at the photo in this column of a Drake C-Line. This is only one of the radios in the Southern Appalachian Radio Museum in Asheville, North Carolina. I've mentioned this museum before, mostly because I'm part of it and proud of it.

Other photos this month include some even older gear that we used long ago for DXing and contesting. How many of them do you recognize/remember? There's the Hammarlund HQ150 beside the ageless HQ-129. The old Harvey Wells TBS-50 transmitter gets a lot of attention from old timers, especially with that VFO sitting under the transmitter. How about the Heathkits; did you have an HW-16? I'll just bet a lot of you got started with one of those. I fondly remember running a Johnson Viking Ranger along with a Collins 75S1 receiver in the late '50s and early '60s from my room in the barracks at Shaw Air Force Base, South Carolina. That Ranger's 75 watts sure packed a punch. That 75S1 was quite a receiver in those days, too. All that "Donald Duck" stuff was just a nuisance they called *single sideband.* Real hams used "AM"? Then too, there was always CW! There still *is* CW, thank goodness.

DXing has changed over the years. What hasn't? Back in those "old" days, CW was the way to go to work DX. It took less power and you didn't have to fight all that noise on SSB. Hmmm . . . seems to me not a lot has changed in that respect. It still takes less power on CW, and it's a lot easier to break the pile-ups as well. Oh, well . . . times change and DXing has changed, too. Nowadays when hams go on a trip somewhere (whether it's to a Caribbean island or one of the South Pacific islands), they seem to work a lot of SSB, and for the most part CW is worked "some." They also operate the digital modes and even SSTV. Most of the bigger DXpeditions do give CW its fair share of operating time though, and I, for one, appreciate that effort. Smaller operations to some of the more "needed" countries only want to work SSB. I'm not sure of the reasoning behind that, but I really think it is unfair to the DX community for an operation to be SSB only. I'll probably hear about it for making that statement, but that's my opinion. In spite of what some say, CW is *not* dead.

The Hallicrafters SX-100 was a highly regarded receiver in the 1960s. (Photos of items in the Southern Appalachian Radio Museum in Asheville, North Carolina via N4AA)

Most Wanted Surveys

It looks as if there will be four countries vying for the top spot on the Most Wanted Surveys this year. Ed, P5/4L4FN, has done a great job of providing thousands of North Korea QSOs this past year.North Korea certainly will drop down on the list substantially. Thousands of DXers are clamoring for a "good" operation from Yemen (7O). Most of them want to see an operation from Scarborough Reef (BS7), as well as Andaman (VU4) and Lakshadweep (VU7). With all of the problems in these areas of the world it is unlikely that we

The WPX Program

SSB

2849 .....IK8YFU 2851 .....HP1IBF
2850.....SM7GXR

CW

3098 .....OK1DSU

Mixed

1907 .....YBØAI 1908 .....SM7GXR

CW: 600 AI5T. 4750 WA2HZR.

SSB: 350 IK8YFU. 400 K3IRV. 500 SM7GXR.

MIXED: 850 SM7GXR. 1600 WZ4P. 1950 AA1KS. 2350 ON4CAS.

15 meters: AI5T
20 meters: AI5T

Europe: AI5T

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, W0ULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KUØA, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, W4GP, K4LQ.

160 Meter Endorsement: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV, LY3BA, RW9SG, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, W4GP.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA. ***NOTE:*** *WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means.*

P.O. Box DX, Leicester, NC 28748-0249
e-mail: <n4aa@cq-amateur-radio.com>

The WAZ Program

10 Meter SSB

543 ..... KE3A
544 ..... JI1IXW
545 ..... JN4ASA

15 Meter SSB

582 ..... HL4GHT
583 ..... JK2XLJ
584 ..... JH7UUI
585 ..... JA1RAE
586 ..... JA1ACF
587 ..... JN4ASA

20 Meter SSB

1101 ..... HL4GHT
1102 ..... N2YKT
1103 ..... IK4WMA
1104 ..... JN4ASA

10 Meter CW

177 ..... K4ZA
178 ..... K9EU

15 Meter CW

307 ..... KE3A

20 Meter CW

532 ..... N6KZ

30 Meter CW

53 ..... N4CC

40 Meter CW

229 ..... K9EU

6 Meters

55 ..... JM1SZY (36 zones)

160 Meters

180 ..... UU2JZ

All Band WAZ SSB

4804 ..... K5VJ
4805 ..... DF3JO
4806 ..... DL1HSW
4807 ..... 9A4BL
4808 ..... WB2FCR
4809 ..... W1WE
4810 ..... W6WR
4811 ..... JE4MZA
4812 ..... AA3MM
4813 ..... NØYYO
4814 ..... OH2HMA
4815 ..... DS2LGK

Mixed

8183 ..... SM7GXR
8184 ..... W4EA
8185 ..... WD4GOY
8186 ..... WQ5N
8187 ..... W6WR
8188 ..... DF6WE
8189 ..... JJ3TTH
8190 ..... JE4MZA
8191 ..... DS2QJS

All CW

334 ..... PAØMBD

Digital

002 ..... JA1ADN

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Paul Blumhardt. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached via e-mail: <k5rt@cq-amateur-radio.com>.

will see anything happening from these places any time soon. There are a few others in the running, but I believe these are the ones that will make it to the top of the list this year. We'll find out next month.

W9-DXCC Convention DXCC Countdown

At the banquet for the 50th Anniversary of the W9-DXCC Convention in September they had the traditional DXCC

The world-famous Drake C-Line used by contesters and DXers worldwide for many, many years. Even today the R4C receiver is used by many low-band DXers.

Hammarlund receivers date back to the WW II days. Many military installations used the HQ-129s (on the left), which evolved into the HQ-150 shown on the right. Another famous Hammarlund receiver was the SP-600 (not shown), which was used by the military for RTTY operation.

The beginner's transmitter for many of today's contesters/DXers. Here's the HW-16 by Heathkit.

Countdown. You know, everyone who has at least 100 countries stands up and you remaining standing until the number reaches your country total. With a few hundred of the top Midwest DXers in attendance, you would expect a lot of folks to still have been standing when the number reached 300 or so. I was dumbfounded when it looked as if hardly anyone had sat down when the number reached 330, 340, and 350. I had to sit down at 352, but the count continued. Finally it reach 380, and if I recall there were still three standing. The last person standing when the number reached 385 was WØBW, Bob Kelley of Fort Dodge, Iowa. I know there are at least a few others who have even higher overall totals. What an amazing feat!

Obviously, none of us "youngsters" will be able to achieve that lofty total. Just think of the ones they worked before they became deleted, etc. Do you realize that there are 58 countries on the Deleted list? Let's see . . . 335 current plus 58 deleted equals a possible 393. Take a look at that Deleted list sometime. It makes for an interesting history lesson. Remember when East Germany was a separate country? How about Okinawa or the Canal Zone, Malaya or the Gold Coast? I even have a few of those cards on my wall, but certainly not all 58 of them.

A Better Way?

Did you happen to work the group of YLs who operated from Lord Howe as VK9YL or from South Cook as ZK1XYL

5 Band WAZ

As of October 15, 2002, 606 stations have attained the 200 zone level and 1297 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:

None

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
KL7Y, 199 (34)
NN7X, 199 (34)
IK1AOD, 199 (1)
DF3CB, 199 (1)
F6CPO, 199 (1)
KC7V, 199 (34)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W6SR, 199 (37)
W3NO, 199 (26)
K4UTE, 199 (18)
HB9DDZ, 199 (31)
RU3FM, 199 (1)
HB9BGV, 199 (31)
N3UN, 199 (18)
OH2VZ, 199 (31)
K5MC, 199 (22)
W1JZ, 199 (24)
K2UU, 199 (26)
W1WAI, 199 (24)
W1FZ, 199 (26)
UT4UZ, 199 (6)
SM7BIP, 199 (31)
PY5EG, 199 (23)
SP5DVP, 199 (31 on 40)
KY7M, 199 (34)
W8AEF, 199 (40)
W9NGA, 199 (26)
W6BCQ, 199 (37)
K8RR, 199 (26)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
KØSR, 198 (22, 23)
UA4PO, 198 (1, 2)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
LA7FD, 198 (3, 4)
K5PC, 198 (18, 23)
K4CN, 198 (23, 26)
KF2O, 198 (24, 26)
G3KMQ, 198 (1, 27)
N2QT, 198 (23, 24)
OK1DWC, 198 (6, 31)
W4UM, 198 (18, 23)
US7MM,198 (2, 6)
K2TK, 198 (23, 24)
K3JGJ, 198 (24, 26)
W4DC, 198 (24, 26)
N4XR, 198 (22, 27)
OE2BZL, 198 (1, 27)
N4PQX, 198 (24, 26)

The following have qualified for the basic 5 Band WAZ Award:

IW7VJ (192 zones)
W4SMG (177 zones)
KJØM (193 zones)
DL1SP (188 zones)
IK8JVG (176 zones)

****Please note: Cost of the 5 Band WAZ Plaque is $80 ($100 if airmail shipping is requested).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Paul Blumhardt. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached via e-mail: <k5rt@cq-amateur-radio.com>.

THE WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix list. Scores are based on the current prefix total, regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, files will be made inactive.

5062.....9A2AA
4492 .....W2FXA
4154.....F2YT
4146 .....W1CU
3971.....EA2IA
3928.....N4NO
3827 .....9A2NA
3823 .....VE3XN
3784 .....N6JV
3668 .....N4MM
3633.....YU1AB
3602 .....I2PJA
3548.....N9AF
3489...SM3EVR
3465.....N5JR
3235.....I2MQP
3167 .....S53EO
3140.....K9BG
3139..WB2YQH
3121...PAØSNG
3094 .....KF2O
3005.....HAvIT
2952 .....KØDEQ
2944.....IT9QDS
2912 .....W2WC
2898.....IK2ILH
2694 ..YU7GMN
2655...WA1JMP
2545 .....W9IL
2456.....9A4W
2454.....K2XF
2436.....W7OM
2334.....W6OUL
2331 ....W8UMR
2288 .....K5UR
2226 ....JN3SAC
2121 ...PY2DBU
2117 ...OZ1ACB
2063 ..WB3DNA
2018.....HA9PP
1983 .....W9OP
1976 .....DJ1YH
1958....CT1EEB
1914.....I2EAY
1837 .....AA1KS
1751 .....VE6BF
1724 .....W7CB
1697.....Z35M
1674 .....YBØAI
1573 .....VE9FX
1564 .....KØKG
1501 .....W2EZ
1472..OK1DWC
1461.....WT3W
1448 .....NG9L
1429 .....N1KC
1369...KW5USA
1325.....KX1A
1226 ...EA2BNU
1130...PY1NEW
1114.....K6UXO
742.....K5IC
728 .....VE3NQK
604 .....VE9FX

SSB

4386.....IØZV
4018.....VE1YX
3995.....ZL3NS
3581 .....I2PJA
3525.....F6DZU
3260.....CT4NH
3234 .....N4MM
3180.....OZ5EV
3079 .....EA2IA
3068.....N4NO
3066.....I2MQP
3049.....F2VX
3030 .....9A2NA
2885 .....I4CSP
2885.....N5JR
2824 ...CT1AHU
2741...PAØSNG
2667 .....4X6DK
2607 .....KF2O
2594.....I8KCI
2570....LU8ESU
2509 .....EA5AT
2444.....KF7RU
2386 .....EA1JG
2337 .....W2WC
2325.....CX6BZ
2301 .....HAØIT
2259.....K5RPC
2186 .....IN3QI
2180 ...OE2EGL
2061 .....W2WC
2002 .....LU5DV
1969....CT1EEB
1954....CT1EEN
1950 .....K5UR
1937 .....I8LEL
1916.....N6FX
1864.....K2XF
1862 .....EA7TV
1852.....W7OM
1821 .....W9IL
1736 .....K3IXD
1830.....I3ZSX
1721.....DK5WQ
1706.....NQ3A
1704.....IT9SVJ
1658.....W6OUL
1606.....K8MDU
1562.....W2ME
1540...SV3AQR
1520.....DF7HX
1485.....W2FKF
1415 .....KI7AO
1384 ...LU3HBO
1377 .....VE9FX
1368 .....NG9L
1254.....N3SAC
1238.....LU4DA
1193.....WT3W
1190.....K4CN
1162....EA5DCL
1125 .....I2EAY
1089.....N1KC
1078.....EA3KB
1062.....AG4W
1048....EA3EQT
990.....HA9PP
959.....VE7SMP
842.....N9DI
822.....K1BYE
812.....KU6J
786 .....KX1A
776 .....YBØAI
702.....KU4BP

CW

5397...WA2HZR
3785.....N6JV
3469 ...VE7CNE
3485.....N4NO
3217.....K9QVB
3035 .....EA2IA
2822 .....LZ1XL
2681 .....9A2NA
2578.....N5JR
2558 .....N4MM
2399 .....HAØIT
2375 .....W2WC
2312....JA9CWJ
2301....EA7AZA
2259.....KA7T
2219 .....KF2O
2058.....N6FX
2032 .....I7PXV
2009.....OZ5UR
1955.....G4SSH
1938 .....LU2YA
1919.....K2XF
1905....JN3SAC
1854 .....K5UR
1946 .....KS4S
1798.....W7OM
1789.....W6OUL
1780.....IK3GER
1728 .....W9IL
1671 .....DJ1YH
1654 .....VE6BF
1603 .....I2EAY
1585...EA7AAW
1571.....I2MQP
1483.....EA6AA
1464 .....4X6DK
1332.....EA2CIN
1284 .....AC5K
1282.....DF6SW
1218 .....WO3Z
1118...EA2BNU
1118...HB9DOT
1097.....K6UXO
1096.....YU1TR
991 ....WA2VQV
877 .....KX1A
871.....WT3W
809.....KU6J
729.....N1KC

A small section of the "old" QSL cards in the Southern Appalachian Radio Museum. Note that most of them have no prefix, just a number. One in particular in the first column, "Z-2AC" is a card from New Zealand to "4TS" in Canton, North Carolina for a 1925 QSO. In the upper right-hand corner is a card from ET3AD, who we believe may have been one of, if not the first, licensee in Ethiopia. Other notable cards are W1AW and K3UIG (the late Senator Barry Goldwater from Arizona).

a few months ago? I found it interesting to listen as one of the ops at ZK1XYL (June, VK4SJ) chatted with those who called her on 10 meters one evening. She was working the pile-up rather well but didn't hesitate to stop and chat when someone wanted to exchange more

QSL INFORMATION

3A/N9NC via **OM2SA**
3B8FG via UR5VHB
3C2A via VE6JO
3W9HRN via DL1HRN
3XY6A via VE2XO
3ZØAK via SP8BJH
3ZØRG via SP6ZDA
4D70BP via DU1BP
4J9NM via K2PF
4L1BR via DL2RMG
4L1DW via LZ1YE
4L1FX via DJ1CW
4L1MA via ON4RU
4L4L via TA9I
4S7/7J3AOZ via JR3QHQ
4S7/7K1MAG via JR3QHQ
4S7/JA3ARJ via JR3QHQ
4S7/JA3CF via JR3QHQ
4S7/JA3GLU via JR3QHQ
4S7/JA5BM via JR3QHQ
4S7/JA5FDI via JR3QHQ
4S7/JA5GSG via JR3QHQ
4S7/JE3RZT via JR3QHQ
4S7/JF3NIM via JR3QHQ
4S7/JG3FPN via JR3QHQ
4S7/JG3JKG via JR3QHQ
4S7/JH3LSS via JR3QHQ
4S7/JH3VEJ via JR3QHQ
4S7/JN4QIN via JR3QHQ
4S7/JR3OCS via JR3QHQ
4S7CHG via JR3QHQ
4S7DBG via JR3QHQ
4S7FAG via JR3QHQ
4S7GGG via JR3QHQ
4S7GXG via JR3QHQ
4S7IJG via JR3QHQ
4S7JAG via JA6EV
4S7QHG via JR3QHQ
4S7RO via DJ9ZB
4S7UJG via JR3QHQ
4S7YHG via JR3QHQ
4S7YJG via JR3QHQ
4XØX via 4Z5AX
5B4/R3CC via RW3RN
5H1HS via DL7VSN
5NØNHD via JH8BKL
5N6EAM via IK2IQD
5R8ET via K1WY
5R8FT via G3SWH
5R8GZ via G3SWH
5R8HA via G3SWH
5T5SN via IZ1BZV
5V7BR via F5RUQ
5X1CW via F6GQK
5Z4DZ via PA1AW
6J1IDJ via XE1IDJ
6J1L via WA3HUP
6J1UN via N1NK
6J1YYD via EA5KB
6W1RT via VE2XO
6W4RK via F5NPS
7Q7BP via G3MRC
7Q7HB via GØIAS
7S2E via SM2DMU
7X2BK via IØWDX
8N1OGA via JA1MRM
8P5A via W2SC
8Q6QR via HB9BMY
8Q7QR via HB9BMY
8Q7YL via IZ2ELV
8R1USA via 8R1AK
8S5X via SM5HJZ
9G1OO via PA3ERA
9H3AAG via PA3BLS
9H3HEN via PA3BLS
9H3JW via DL9YG
9H7ZK via SM4AIO
9J2BO via G3TEV
9J2GM via PA3HHT
9K2ZZ via W8CNL
9L1BTB via SP7BTB
9L1JT via K4ZIN
9M2KE via JR4PMW
9M2TO via JAØDMV
9M6/GM4DMA via G4DMA
9M6A via N2OO
9M6LSC via JH7IMX
9M6NA via JE1JKL
9N7RB via W4FOA
9N7ZK via SM4AIO
9Q5/ON7UN via ON4ACA
9UØX via DJ6SI
9U5X via IK2ILH
9V1SM via W3HNK
9V1UU via JH1DQC
9V1YC via AA5BT
9Z4DI via KZ5RO
A35MO via OM2SA
A35RK via W7TSQ
A35TO via OM2SA
A35XX via N5XX
A45WD via YO9HP
A52KR via K2PF
A61AJ via N4QB
A61AO via N1DG
A71EM via LZ1YE
A71MA via KZ5RO
AP2MIZ via AP2SP
AY1DZ via EA3RS
AY1XS via LU1XS
AY7HN via EA7FTR
BD4XYL via BD4XA
BI7DX via BA1DU
BXØIARU via BV5Y

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," P.O. Box 3071, Paris, TN 38242; phone 731-641-4354; e-mail: <golist@golist.net>.)

CQ DX Awards Program

SSB

2383	N2LM	2385	N3WL
2384	9A2KL	2386	KBØRNC

CW

1034	W2VJN

SSB Endorsements

320	K4MZU/335	320	W8AXI/334
320	XE1LE/335	320	VE4ROY/332
320	K7LAY/335	300	WA5MLT/309
320	OE3WWB/335	275	AC6WO/290
320	K7JS/335	275	KBØRNC/382
320	VE3GHZ/334	200	9A2KL/210

CW Endorsements

320	K2OWE/334	320	N5HB/329
320	F3AT/334	320	K7JS/328
320	F3TH/334	320	F6HMJ/319
320	K4CEB/333	310	W6YQ/309
320	W2VNJ/331	200	K6UXO/220
320	K7LAY/330		

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 335 active countries. Please make all checks payable to the award manager.

than just a signal report. It was refreshing to hear more than a "59 – 73 – QRZ."

Could the ladies have been trying to show us a better way, intentionally or not? Where is it written that all we can say when working DX is "59"? Relax and enjoy a little conversation for a change. We've gotten so accustomed to only exchanging signals reports (and most of the time it's only 59 or 599, regardless of the "real" signal strength) that's all we say anymore. I think this comes from contesting and that's okay during a contest. If it's not a contest, or a DX-pedition, how about a real signal report? How about exchanging names and a little more? Don't you wonder who the other person is, what he or she does, does he or she have a family, etc.? Are we in such a hurry to fill our logs with contacts that we can't take time to learn something about those with whom we are talking? The world just might be a better place if we knew more about those we talk with in far-away places.

Until next time, enjoy the upcoming holidays and operating activities.

73, Carl, N4AA

One of the most popular transmitters in the museum's collection is this Harvey Wells TBS-50D along with its matching VFO. Many old timers remember this as being their first transmitter from the early 1950s. If they didn't have one, they wanted one.

Contesting

BY JOHN DORR, K1AR

News/Views Of On-The-Air Competition

Contesting for Newcomers—Part I

December's Contest Tip of the Month

Have you checked your antenna's direction and compared it to what your rotator control box is telling you? You'd be amazed how often the effects of wind, loose bolts and other factors can cause a beam/mast to slip inside a rotator assembly. And, 30 or 40 degrees can make a big difference. Make a note to check this easily verified mechanical factor on a regular basis. A little tightening with a box wrench in one hand and a compass in the other can make a huge difference to your contest score!

Calendar of Events

Nov. 23-24	**CQ WW CW DX Contest**
Nov. 23-24	ARRL Int'l EME Contest
Dec. 6-8	ARRL 160M Contest
Dec. 7-8	TARA RTTY Sprint
Dec. 14-15	ARRL 10M Contest
Dec. 21	OK RTTY Contest
Dec. 21-22	Croatian CW Contest
Dec. 28	Canada Winter Contest
Dec. 28-29	Stu Perry Topband Distance Challenge
Jan. 1	ARRL Straight Key Night
Jan. 4-5	ARRL RTTY Round-up
Jan. 11-12	North American QSO CW Party
Jan. 18-19	North American QSO SSB Party
Jan. 18-20	ARRL Jan. VHF Sweepstakes

If you're not into contest operating, joining a "contester's conversation" can make you feel like you just came in from planet Mars. The language often can be completely foreign to the casual listener. While a book could be (and perhaps should be) written on the subject, this month I'm going to take a crack at answering some of the basic questions often asked of me at conventions, via e-mail, and through other venues. If I don't hit your particular hot spot this time, use that as an excuse to send me your question and we'll cover it in a future column. If you're an experienced contester reading this, use this discussion as motivation to teach a new ham about contesting.

What is a contest, anyway?

A contest is nothing more than an on-the-air operating event, usually on a pre-arranged weekend, in which hams communicate among themselves by exchanging a fixed set of information. This information is usually a signal report and serial number and/or location. Contest winners are usually determined by entrants who work the most QSOs and/or locations in the event.

Do I have to be an official entrant to work others in a contest?

This is a great aspect of contesting. It is a "sport" for the casual operator as well as the devoted competitor. You can think of a contest as the equivalent of getting on and off a subway. It's your choice how long you want to ride the train. Serious competitors are anxious to work the casual contester because it increases their score. At the same time, the casual op has a chance to sample the fun at his or her own pace.

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If I do operate, am I required to mail my log to the contest sponsor?

No. Most sponsors appreciate it if you submit a log, but it's certainly not a requirement of the contest. Submitting a log is a useful thing, however, no matter how small your score may be. It not only helps in the log-checking process, but may even result in your receiving an award or other operating acknowledgement for your collection.

Experienced contest operators are much faster than I am. What should I do to keep up? Am I better off avoiding the speed demons altogether?

It's true that experience makes for better operators. That's the case for ham radio in general; contesting doesn't have a corner on this aspect of the hobby. The key for a newcomer is persistence. In reality, accuracy (correctly copying callsigns and other contest information) is much more important than speed. I guarantee, too, that nearly every serious contester will appreciate your call, no matter how slow or fast you may be as an operator.

I only have a small station. Why should I bother operating contests?

The fact is very few hams have big stations. One of contesting's strengths is that it can fulfill personal goals for nearly everyone without forcing you to be a winner. For example, you may want to operate a contest to work new countries or qualify for an award. It also may be as simple as a desire to achieve a personal goal, such as working 500 QSOs or making a score that's 10% higher than that of the previous year. As in nearly all facets of ham radio, your enjoyment is what you make it, not what others are doing.

What are some easy ways to learn more about contesting?

The best way to become involved in contesting is to seek out a local club, particularly one which focuses on contesting as its primary area of interest. There are literally hundreds of contest clubs around the world. A quick search on the internet is a good place to start. If you come up short, drop me a line and I'll be glad to help.

There are also a number of other resources that can be found by searching the internet. Even if you're not geographically close to a contest club, most contest organizations have extensive websites that can offer very useful information for the new contest operator. You'll also find that local clubs usually have hams who are interested in contesting. You won't know for sure until you check it out, so get to work!

What else can I do to get more experience?

You'll notice in this column and other places that there are a lot of contests throughout the year. Most of them are not of the magnitude of the CQ WW. Rather, they are more casual in nature and offer an excellent opportunity to learn contesting in a more laid-back environment. The reality is that operating skill in contests only comes from "doing it." If you've been a ham for a year or two, you probably can pinpoint areas of your operating skill that have improved since that first QSO. The same is true for contesting. Remember that even the best operators were new at one point in their operating careers.

I'm worried about doing something wrong in a contest and getting disqualified. Should I be?

Disqualifying contest entrants is rare in most contests and usually results from the clear identification of someone who is consciously cheating. Contests are meant to be fun, not punitive, activities. Most contest sponsors work ex-

ceptionally hard to ensure the final results are accurate. However, an incorrectly scored entry or similar problem will almost always result in the log being scored correctly after the fact. Your job is to have fun and to do your best to keep an accurate log.

Is contest operating limited to only the HF bands?

A little research will show you that there are many VHF-and-above contests throughout the year, big and small.

Someone asks me to QSY to another band. What's up with that?

Many serious competitors will often work you on one band and discover they need your QTH on another band and ask you to QSY. As you get more experience over time, you may find yourself doing the same thing. Obviously, the decision is up to you. Some operators don't mind doing a favor for another contester if they're not operating that seriously in the contest themselves. The rule of thumb for QSYing should be determined by whether or not it impacts your own personal goals for the contest as a starting point.

A Contester's Glossary of Terms

The experienced contester uses a different vernacular. I discover this time after time when a non-amateur (or even an amateur who is not a contester) looks at my column and undertakes the impossible task of understanding the subject. What follows is hardly a complete list, but is a beginning step to unleashing the confusion that comes from our "specialized" jargon:

Broken QSOs: Contest QSOs that have been proven to be not legitimate during the post-contest log-checking process. These types of contacts occur when a callsign or a portion of the exchange is copied incorrectly. It is rare not to find occurrences of this in most contest logs (new or experienced operators).

Check Sheet: Somewhat antiquated by the advent of computer logging, this is a "paper method" for tracking stations that you have already worked in real-time. The use of a check sheet (in lieu of computers) can help you avoid wasted time in working stations that you have already worked before (dupes).

Club Competition: Contest clubs are not only a way to lead and encourage new operators in the world of contesting, but result in "mini-competitions" among themselves. You often will see the cumulative scores of club members appearing in contest results such as the CQ World Wide, ARRL DX, or ARRL Sweepstakes.

Disqualification: Most contest entries are closely scrutinized and subject to disqualification, as with nearly any other competitive sport. Runners of the 100-yard dash, for example, can be disqualified after their second false start. New contest operators should not operate with fear of contesting. Most disqualification criteria are designed to identify flagrant abuse of the rules and/or sloppy operating. Each contest usually defines its own disqualification criteria, which should be reviewed before the beginning of the contest.

Duplicates: Contest rules and regulations are generally very specific about the accuracy of log submissions. For example, a basic contest QSO is not considered valid unless the minimum information (i.e., contest exchange) is transferred between stations. When a station is worked more than once on a single band (or on any other band in some contests such as the ARRL Sweepstakes), it is considered a duplicate QSO—or a dupe—and must be removed from the contest log prior to final submission. Don't be insulted if someone tells you in a contest that "You're a dupe." It just means you've already worked him.

Exchange: The exchange is a predetermined information set required by the rules to be interchanged between participating contest stations. Contests vary in the content of this requirement. Some common examples include RS(T) + QSO Number (i.e., 599001), RS(T) + CQ Zone, RS(T) + QTH (DXCC country, state, county, ARRL section), etc. This information, in addition to the callsign, is the basic information required to claim a valid contest QSO.

High-Claimed Scores: Many contest sponsors publish a list of high-scoring stations in each major category soon after the contest (either in printed form or on the internet). This does not reflect the contest's final results. High-claimed scores are designed to provide an early indication of the contest's top scores prior to log checking.

Multi-Operator: This is one of the operating classifications in contesting. The most familiar form of multi-operator event is ARRL Field Day. Multi-operator stations can use a single transmitter (i.e., "multi-single" class) or multiple simultaneous transmitters (i.e., "multi-multi" class).

Multiplier: The multiplier in a contest is one of the mechanisms used to compute a competitor's final score. The actu-

al definition of a multiplier varies by contest. In the CQ WW, multipliers are DXCC countries and CQ zones. Other contests use U.S. states or counties, ITU zones, ARRL sections, etc. The final score of a contest operation is usually derived from multiplying the total number of complete QSOs times the total number of multipliers (see QSO points).

Operating Period: All contests specify a certain amount of operating time. The major DX contests are usually scheduled for 48 hours. Many others limit total operating time to a subset of this period. In addition, when you take a break, you often are required by the rules to use a minimum time for this off time. Refer to individual contest rules for more details.

Operating Frequencies: In order to reduce QRM across an entire band, many contest sponsors suggest certain frequencies for contest operation in their event. This is especially true for specialty events such as state QSO Parties. This practice is usually not practical for major events such as the CQ WW due to the high participation level.

QSO Points: Many contest rules attempt to apply a "weighting factor" to QSOs when computing final scores. For example, a valid QSO within your continent may only be worth one point, while contacts with other continents are worth three points. Generally, the final score of a contest log is computed by adding all of the QSO points together and multiplying that number by the total multiplier (see multiplier definition). Refer to various contest rules for further examples.

Rate: The rate measurement is one method to evaluate the speed with which you are entering contest QSOs into your log. It is often used as a measurement of performance and helps guide the decision-making process for band/mode selection at any point in time. Rates are usually measured on an hourly basis (i.e., 60 QSOs/hour).

Run: This is an operating technique characterized by a contest station remaining on a single frequency for a sustained period of time working other stations that respond to the call "CQ Contest." Contest runs can range from a few minutes to several hours in which the operator can log 300+ stations per hour in extreme cases. Although larger contest stations are more likely to employ the "run" technique, smaller operations often can enjoy this style of operating for short periods of time.

"Search and Pounce": This method of operating is the opposite of run. It is characterized by tuning up and down the band looking for new stations to work. This is a common mode of operation when the contest is slowing down or conditions are poor. Smaller stations use this operating method more frequently, as they sometimes lack the "horsepower" to sustain long stretches of contest runs.

Single Operator: This is the operating category in which you operate by yourself (as opposed to multi-operator). In recent years there have been changes to this class, such as QRP and Assisted (i.e., using packet radio/2 m as a way to help find needed multipliers).

Single Operator, Two Radios: While still single operator (see above), this style of operating employs the use of a second radio during slower operating times to find needed QSOs/multipliers on other bands.

Spotting: With the advent of packet radio, more and more contesters are using this technology to identify or spot rare stations for other competitors. Spotting is common among contest club groups and other packet users. Be aware, though, that it takes you out of the Single Operator category (usually you go into Assisted).

Final Comments

Contest operating can sometimes be very intimidating to newcomers. Hopefully, this month you've learned a little more about a great aspect of our hobby. We'll continue next month, focusing more on "on-the-air" operating technique.

We are right in the middle of the holiday season as you read this. I hope you manage to focus on what's important and avoid the craziness of shopping and other events that can often dominate this time of year. 73, John, K1AR

BY TOMAS HOOD, NW7US

The Science Of Predicting Radio Conditions

Above to Low Normal Conditions Predicted for CQ WW DX CW Contest 2002

As we enter 2003, solar Cycle 23 continues its gradual decline. The current cycle started between May and July 1996, with a minimum of activity observed during October 1996. Two peaks were observed: A monthly smoothed sunspot number first peaked at 120.8 during April 2000, with a second, yet lower peak at 115.6 for November 2001. During 2002 the smoothed sunspot counts have been somewhat lower. With an index of 197.2, the monthly smoothed 10.7 cm radio flux for February 2002 seems to be the highest for this cycle. The overall cycle activity has been weaker since the 2000 peak, yet the cycle still holds a lot of punch.

As noted last December, solar Cycle 23 compares most with past cycles 17 and 20. Those developed much the same way, and if the current cycle follows the trends of cycles 17 and 20, expect a slow decrease over several years before reaching the minimum and end. Each cycle averages about 11 years from minimum to minimum. After subtracting the four years from the May 1996 beginning to the peak during May 2000, seven years are left of the cycle. This slow decline promises continuous moderate to excellent conditions for ham radio signal propagation. Check out the graphical comparison at <http://www.dxlc.com/solar/cyclcomp2.html>.

Current Solar Cycle 23 Progress

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for September 2002 is 109. The 12-month running smoothed sunspot number centered on March 2002 is 113, two points down from February. The lowest daily sunspot value during September 2002 was recorded on September 30th with a count of 64, down from August's lowest point of 73. The highest daily sunspot count for September was 147 on the 3rd, down considerably from the high of 186 that occurred on August 17th. A smoothed sunspot count of 76 is forecast for December 2002 by the Space Environment Center.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7 cm observed monthly mean solar flux of 176 for September 2002, down from August's 184. The 12-month smoothed 10.7 cm flux centered on March 2002 is 196, down a point from February. The predicted smoothed 10.7 cm solar flux for December 2002 is about 133, and for January 2003, 128.

The observed monthly mean planetary *A*-index (*Ap*) for September 2002 is 14, down just a bit from an *Ap* of 16 for August. The 12-month smoothed *Ap*-index centered on March 2002 remains 12.

December Propagation

During December a high level of solar activity is expected. The density of ionization in the Northern Hemisphere is expected to increase more rapidly after sunrise than during other seasons. Static and atmospheric noise levels will be at seasonally low values during the month, and exceptionally strong signal levels are expected. Look for one or two very strong 6 meter openings toward the end of December. *F2*-layer openings have occurred over the last four or five years between December and January.

Continue to expect fair to good daytime openings on 10, 12, and 15 meters. Openings will be shorter than the same time last year, but these should still hold a lot of promise for paths into most parts of the world.

Ten and 12 meter DX openings should be possible during much of the daylight hours, especially where the propagation paths cross the sunlit regions. Fairly good DX openings are also expected on 17 and 15 meters, remaining open toward the west during the early evening. Twenty will be the

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for December 2002

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 5, 7, 14-20	A	A	B	C
High Normal: 6, 9-13, 27	A	B	C	C-D
Low Normal: 3-4, 8, 21, 26 30-31	B	C-B	C-D	D-E
Below Normal: 1-2, 24, 28-29	C	C-D	D-E	E
Disturbed: 22-23, 25	C-D	D	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9+, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be fair to poor (C–D) on Dec. 1st and 2nd, good (B) on the 3rd and 4th, excellent (A) on the 5th, etc.

CQ WW DX CW Contest Forecast Looks Good!

Since this issue of *CQ* should reach most subscribers prior to the start of the CQ World-Wide DX CW Contest weekend of November 23–24, here is an updated forecast made at press time for the general propagation conditions expected. Based on the 27- and 74-day recurrence tendencies of solar and geomagnetic conditions, it looks like conditions will be changing quickly between November 23 and 24. Expect Above Normal HF conditions for the first day of the contest, and Low Normal HF conditions for the second day. This might very well be an excellent CW contest weekend.

Daily 10.7 cm solar flux levels are expected to stay at or above the 140 mark during the contest weekend, with the corresponding sunspot counts likely to exceed 70, with a smoothed average of about 80. The geomagnetic planetary *A*-index is expected to remain at or below 12 during both days of the contest.

Propagation conditions during this year's WW CW should be outstanding, with no major storm expected. To maximize scores, be sure to plan your operation based on the details covered in last month's column.

hottest band, starting with early morning openings in all directions until about an hour or two after sunrise, and then remaining open into one place to another through the day until early evening. When conditions are Above Normal, 20 and 17 meters are likely to remain open toward the south and west from early evening until about midnight.

Also expect good conditions on 6 meters, with peak conditions likely toward Europe, Africa, and in a generally easterly direction an hour or two before noon; toward the south from an hour or two before to about an hour after noon; and toward the South Pacific and the Far East during the late afternoon and early evening hours. These openings will be very short, but may be very strong, especially on Above Normal days.

DX openings on 160 and 80 meters during the hours of darkness and into the sunrise period, with considerably decreased static levels, are a sure bet during the longer hours of darkness in the northern latitudes. Continue to look for openings toward Europe and the south from the eastern half of the United States, and toward the south, the Far East, Australasia, and the South Pacific from the western half of the country. With nighttime Maximum Usable Frequencies (MUFs) at or below 5 MHz for most paths, 80 meters becomes a reliable long-distance band throughout the entire period of darkness. Eighty should peak toward Europe and in a generally easterly direction around midnight, then open in a generally western direction with a peak just after sunrise. The band should remain open toward the south throughout most of the night.

From midnight to sunrise, 40 and 30 meters promise some of the hottest nighttime DX during December. The first openings for DX should be toward Europe and the east during the late afternoon, then move across the south but remain open into most parts of the world, and then move to a westerly direction just after sunrise. Low seasonal noise will make DXing a pleasurable endeavor.

Overall, expect good DX conditions on the higher frequencies, with excellent DX openings on both 15 and 20 meters during most of the daylight hours. As night falls, move to 30, 40, and 80 meters for openings all over the DX world.

For short-skip openings during December, try the 80 and 40 meter bands during the day for paths less than 250 miles, and 80 or 160 meters at night for these distances. For openings between 250 and 750 miles, try 40 meters during the day, and both 80 and 160 meters at night. For distances between 750 and 1300 miles, 20 and 30 meters should provide daytime openings, while 40 and 80 will be open for these distances from sunset to midnight. After midnight, 80 meters will remain open out to 1300 miles until sunrise. Try 30 and 40 meters again for about an hour or so after sunrise. Between 1300 and 2300 miles, during the daylight hours openings will occur on 20, 17, and 15 meters, with fewer openings on 12 and 10 meters. From sundown to midnight check 20, 30, and 40 meters for these long-distance openings, and then check 40 and 80 meters after midnight until sunrise. Try 40 meters again for an hour or so after sunrise.

VHF Ionospheric Openings

Six and 2 meters: Aurora may occur during days of Disturbed or Below Normal activity. This should provide some unusual short-skip openings on both 6 and 2 meters. Check the Last-Minute Forecast at the beginning of this column for those days during December that are expected to be in these categories.

Quite a bit of meteor shower activity is expected this month, and this should result in improved conditions for meteor-scatter openings on the VHF bands for distances up to about 1000 miles. The annual *Geminids* meteor shower will peak on the night of December 13–14. This is one of the better showers, since as many as 100 meteors per hour may occur. The *Geminids* is a great shower for those trying the meteor-scatter mode of propagation, since one doesn't have to wait until after midnight to catch this shower. The radiant rises early, but the best viewing and operating time will be after midnight local time. This shower also boasts a broad maximum, lasting nearly one whole day, so no matter where you live, you stand a decent chance of catching sight of some of the *Geminids*. The actual peak will occur at around 04:00 UTC on December 14th. Another shower is the *Ursids*, which will peak on December 22nd and have a peak hourly rate of 10 to 12, or a meteor every 5 to 6 minutes on average.

Worldwide 6 meter openings are expected during days of Above Normal activity, with openings into Europe during the morning, moving west into Asia by afternoon. Openings will be short but strong due to the combination of high solar activity and seasonally high ionization in the *F2*-layer. A secondary seasonal peak in sporadic-*E* ionization should also result in some short-skip

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings. An ** indicates best time to check for 6 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *standard* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

December 15, 2002 - January 15, 2003
Time Zone: EST (24-Hour Time)
EASTERN USA To:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-11 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-13 (2) 13-14 (1)	06-07 (1) 07-09 (4) 09-11 (3) 11-13 (4) 13-14 (3) 14-15 (2) 15-17 (1)	15-16 (1) 16-17 (2) 17-19 (3) 19-00 (4) 00-02 (2) 02-03 (3) 03-05 (1) 17-19 (1)* 19-20 (2)* 20-02 (3)* 02-03 (2)* 03-04 (1)*
Northern Europe & European CIS	08-10 (1)	07-08 (1) 08-10 (2) 10-12 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-14 (1)	16-19 (1) 19-23 (2) 23-03 (1) 19-02 (1)*
Eastern Mediterranean & Middle East	08-10 (1)	08-09 (1) 09-10 (3) 10-11 (2) 11-12 (1)	06-09 (1) 09-10 (2) 10-13 (3) 13-15 (2) 15-17 (1)	18-20 (1) 21-22 (2) 22-00 (1) 20-23 (1)*
Western Africa	09-11 (1) 11-13 (2) 13-15 (1)	07-08 (1) 08-09 (2) 09-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	18-22 (1) 22-00 (2) 00-03 (1) 03-04 (2) 00-02 (1)*
Eastern & Central Africa	10-13 (1)	08-10 (1) 10-12 (2) 12-13 (3) 13-15 (2) 15-16 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	18-00 (1)
Southern Africa	09-10 (1) 10-12 (2) 12-13 (1)	07-09 (1) 09-12 (2) 12-14 (3) 14-15 (1)	07-09 (1) 12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	18-19 (1) 19-21 (2) 21-00 (1) 19-21 (1)*

Reception Area	10 Meters	15 Meters	20 Meters	40/80 Meters
Central & South Asia	*Nil*	08-10 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 18-21 (1)	06-08 (1) 20-22 (1)
Southeast Asia	*Nil*	08-11 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-12 (1) 19-21 (1)	06-08 (1) 20-22 (1)
Far East	*Nil*	16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-21 (1)	05-08 (1) 05-07 (1)*
South Pacific & New Zealand	13-17 (1)	11-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	03-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-07 (3) 07-08 (2) 08-09 (1) 04-05 (1)* 05-07 (2)* 07-08 (1)*
Australasia	16-18 (1)	09-12 (1) 15-16 (1) 16-18 (2) 18-20 (!)	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-18 (1) 18-20 (2) 20-22 (1)	03-05 (1) 05-07 (2) 07-09 (1) 05-08 (1)*
Caribbean, Central America & Northern Countries of South America	09-10 (1) 10-12 (2) 12-14 (1) 14-16 (2) 16-17 (1)	07-08 (1) 08-11 (3) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (2) 07-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-06 (1)	17-18 (1) 18-19 (2) 19-21 (3) 21-04 (4) 04-05 (3) 05-06 (2) 06-07 (1) 19-20 (1)* 20-22 (2)* 22-02 (3)* 02-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-12 (1) 12-15 (2) 15-16 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (1)	13-14 (1) 14-15 (2) 15-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-03 (1) 05-06 (1) 06-08 (2) 08-09 (1)	19-21 (1) 21-02 (2) 02-05 (1) 21-03 (1)*
McMurdo Sound, Antarctica	*Nil*	07-10 (1) 16-18 (1)	07-09 (1) 17-18 (1) 18-22 (2) 22-00 (1) 00-02 (2) 02-03 (1)	00-05 (1)

Time Zones: CST & MST (24-Hour Time) CENTRAL USA To:

Reception Area	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Southern Europe & North Africa	09-11 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-12 (2) 12-13 (1)	06-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-15 (1) 22-00 (1)	16-18 (1) 18-20 (2) 20-00 (1) 00-02 (2) 02-03 (1) 17-20 (1)* 20-01 (2)* 01-02 (1)*
Northern & Central Europe & European CIS	*Nil*	07-08 (1) 08-10 (2) 10-12 (1)	07-08 (1) 08-11 (2) 11-13 (1) 23-01(1)	17-19 (1) 19-22 (2) 22-01 (1) 19-00 (1)*
Eastern Mediterranean & Middle East	*Nil*	08-11 (1)	06-09 (1) 09-12 (2) 12-14 (1) 22-00 (1)	18-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
West & Central Africa	08-10 (1) 10-12 (2) 12-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	09-11 (1) 11-13 (2) 13-16 (3) 16-17 (2) 17-19 (1) 22-02 (1)	18-21 (1) 21-23 (2) 23-01 (1) 19-22 (1)*
Eastern Africa	10-12 (1)	07-11 (1) 11-13 (2) 13-14 (1)	06-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-19 (1)	19-23 (1)
Southern Africa	08-09 (1) 09-12 (2) 12-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (2) 15-16 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-20 (1) 23-01 (1)	18-19 (1) 19-21 (2) 21-23 (1)
Central & South Asia	*Nil*	08-10 (1) 19-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-22 (1)	06-08 (1) 19-21 (1)
Southeast Asia	*Nil*	08-11 (1) 17-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 16-17 (1) 17-19 (2) 19-20 (1)	04-07 (1)
Far East	*Nil*	07-09 (1) 16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 17-19 (2) 19-21 (1)	02-04 (1) 04-06 (2) 06-07 (1) 04-07 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-18 (1)	10-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-15 (1) 15-17 (2) 17-20 (3) 20-21 (2) 21-22 (1) 02-04 (1)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 03-07 (1)*
Australasia	14-15 (1) 15-17 (2) 17-18 (1)	09-11 (1) 13-15 (1) 15-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-18 (1) 18-21 (2) 21-22 (1)	02-04 (1) 04-07 (2) 07-09 (1) 03-06 (1)*
Caribbean, Central America & Northern Countries of South America	08-10 (1) 10-14 (2) 14-16 (1)	07-08 (1) 08-09 (2) 09-13 (3) 13-16 (4) 16-17 (2) 17-19 (1)	06-07 (2) 07-11 (3) 11-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-06 (1)	18-20 (1) 20-22 (2) 22-03 (3) 03-05 (2) 05-07 (1) 19-21 (1)* 21-01 (2) 01-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-15 (2) 15-17 (1)	07-08 (1) 08-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-19 (1)	05-06 (1) 06-08 (2) 08-10 (1) 12-14 (1) 14-15 (2) 15-17 (3) 17-19 (4) 19-20 (2) 20-22 (1) 22-00 (2) 00-03 (1)	19-21 (1) 21-02 (2) 02-05 (1) 21-04 (1)*
McMurdo Sound, Antarctica	*Nil*	07-09 (1) 16-18 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-22 (2) 22-00 (1) 00-02 (2) 02-03 (1)	22-05 (1)

Time Zone: PST (24-Hour Time) WESTERN USA To:

Reception Area	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Southern Europe & North Africa	*Nil*	07-08 (1) 08-10 (2) 10-11 (1)	05-07 (1) 07-10 (2) 10-12 (1) 23-01 (1)	18-20 (1) 20-23 (2) 23-01 (1) 19-23 (1)*
Central & Northern Europe & European CIS	*Nil*	07-09 (1)	06-07 (1) 07-10 (2) 10-13 (1) 23-01 (1)	17-00 (1) 19-23 (1)*
Eastern Mediterranean & Middle East	*Nil*	07-09 (1)	06-07 (1) 07-09 (2) 09-11 (1) 21-23 (1)	18-21 (1)
Western & Central Africa	09-12 (1)	07-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-06 (1)	06-10 (1) 10-13 (2) 13-16 (3) 16-18 (2) 18-19 (1)	18-22 (1)
Eastern Africa	*Nil*	08-11 (1)	08-10 (1) 13-16 (1) 21-23 (1)	18-20 (1)
Southern Africa	08-11 (1)	06-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	07-11 (1) 11-13 (2) 13-16 (3) 16-18 (2) 18-19 (1) 00-02 (1)	18-20 (1)
Central & South Asia	*Nil*	09-11 (1) 17-19 (1)	08-10 (1) 17-19 (1) 19-20 (2) 20-21 (1)	05-07 (1) 18-20 (1)
Southeast Asia	15-18 (1)	09-11 (1) 15-16 (1) 16-18 (2) 18-19 (1)	07-09 (1) 09-11 (2) 11-16 (1) 16-19 (2) 19-20 (1)	03-08 (1)
Far East	15-17 (1)	14-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	08-10 (1) 13-14 (1) 14-15 (2) 15-18 (3) 18-19 (2) 19-21 (1)	00-01 (1) 01-03 (2) 03-06 (3) 06-08 (2) 08-10 (1) 02-08 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-17 (1)	09-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	07-08 (1) 08-10 (2) 10-15 (1) 15-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 03-05 (1)	22-00 (1) 00-03 (2) 03-06 (3) 06-07 (2) 07-08 (1) 00-03 (1)* 03-06 (2)* 06-07 (1)*
Australasia	13-15 (1) 15-17 (2)	08-12 (1) 12-15 (2)	07-08 (1) 08-10 (3)	01-03 (1) 03-06 (2)

	17-18 (1)	15-17 (3) 17-18 (2) 18-19 (1)	10-12 (2) 12-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	06-08 (1) 01-03 (1)* 03-02 (2)* 06-07 (1)*
Caribbean, Central, America & Northern Countries of South America	09-11 (1) 11-14 (2) 14-16 (1)	06-07 (1) 07-08 (2) 08-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (2) 07-09 (3) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-22 (1) 22-00 (2) 00-06 (1)	18-20 (1) 20-22 (2) 22-02 (3) 02-04 (2) 04-05 (1) 19-21 (1)* 21-01 (2)* 01-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	10-12 (1) 12-14 (2) 14-15 (1)	08-14 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	13-15 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-23 (1) 23-01 (2) 01-06 (1) 06-08 (2)	20-22 (1) 22-01 (2) 01-04 (1) 22-02 (1)*
McMurdo Sound, Antarctica	*Nil*	07-09 (1) 12-15 (1) 15-17 (2) 17-18 (1)	16-18 (1) 18-19 (2) 19-22 (3) 22-01 (2) 01-03 (1) 07-09 (1)	23-05 (1)

**Indicates best times to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.*
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

Propagation charts prepared by George Jacobs, W3ASK.

openings on 6 meters between distances of about 800 and 1300 miles.

Six meter transequatorial (TE) openings are considerably less likely during December, but look for a possible opening between the southern states and locations deep in South America. The best time to look for these openings is between about 8 and 11 PM local time.

Next Month

I have been working on a review of a propagation-aid software package, having planned on reviewing it this month. It is a quite complete and complex tool,so I will wait until next month to write about my experience working with it.

This month marks one full year of my editorship of the "Propagation" column. I have a healthy respect for George Jacobs, W3ASK, who faithfully met the deadline each month for 50 years! He never missed an issue. I can tell you, this is quite the feat. I have struggled somewhat coming on board, and George has been ever helpful in my transition, always answering difficult questions. I also must express my gratitude to Gail, K2RED, and Rich, W2VU, for all they do to support me and my effort to provide a column that delivers the propagation information you have come to rely on in *CQ*. I look forward to another year in my journey toward matching George's 50-year record.

73, Tomas, NW7US

antenna for Top band...**GW4BLE**. We in Italy only have permission for 1820 to 1840 which is a big handicap. Many stations operate outside that band illegally...**IC8JAH**. It got dark before I could get up a good antenna so I operated for 1.5 hours working the stations with good ears...**P40A (KK9A op.)**. A nice contest but one bad incidence with a powerful superstation who tried to shut out all others from the band...**SM6WQB**. Finally North America again...**SV8CS**. The correct call was N7DF/TI9 as shown on the license...**N7DF/TI9** *(31 lucky stations worked Larry on Top band—ed.)*. Thunderstorms the first night and quiet the second night. My location is a 90 minute drive from Belize City and I can arrange for others to use the QTH and antennas...**V31AH (WØAH op.)**.Thanks to Luis Brito for his help in the station setup...**YV1CP**.

Station Ops CW Multi-Op

4U1WB: AJ3M, packet. **9A5Y**: 9A3LG, 9A3NM. **9A7A**: ops. **AA1K &** packet. **AA4V &** packet. **DH1TW &** packet. **DJ9MH &** packet. **DJ9RR &** packet. **DKØFFO**: DF4AE, DL1BQG, DL2BWM. **DKØIW**: DJ9WH, DL6KO, DL9CHR, DF9MV. **DKØNS**: DJ9MH, packet. **DK1MM &** packet. **DK3QJ &** packet. **DK7YY &** packet. **DLØMB**: DF2UU, DK9IP. **DLØXAX**: DL5RBK, DL5RBW, DL5RMHM, DL6RDR. **DL1IAO &** packet. **DL2MDZ &** packet. **DL2MY &** DJ9MH, packet. **DL4NAC &** packet. **DL7ZZ &** DL2OBF. **DL9YX &** DF1HF. **EA1WX &** EA1CS. **EA5BY &** EA5FID, EA5GPV, EA5KW, EA5XC. **EW1WB**: EU1-012, EW1-015. **FY5KE &** packet. **G3LZQ &** G4BYG. **G4IIY &** packet. **HB9DDO &** HB9CAT. **HGØHQ**: HA3LN, HA3MY, HA3UU. **HG1S**: HA1TJ, HA1DAE, HA1DAC, HA1AG, HA1DAI. **HG5A**: HA5IW, HA5OM, HA6GK, HA6WX, HA5ML, Kiss Tibor. **I5JVA &** IK4MTF, IZ2AAJ, IK2QEI. **IK2NCJ &** IK2JUB, IK2PFL, IZ2ABI. **JAØZRY**: JH5XDD, JAØDGK, JRØBQD, JL1GJE, JP1QGO, JP1NOM, JE5UMJ, 7K1DBH, JS3JSB, JN1JVA, T. Funato. **JA3YBK**: JF4FUF, JH3PRR. **JA4YHX**: JA4CZM, packet. **KØLIR**: NØIS, WØSLW, WAØIYY, KI9A. **KØSX &** KJØG. **KØTV &** WO1N, KB1PZ. **K1TTT &** KB1W. **K2SB &** packet. **K3ATO &** packet. **K3DI &** K2YWE. **K3NM &** packet. **K3PP &** packet. **K3WW &** packet.

K4EA & K4TW. **K4HA &** K4NYS, W2XL. **K5IUA &** packet. **K5NZ &** packet. **K5TA &** AA5B. **K5ZO &** packet. **K6XT &** packet. **K7OA &** NS7K. **K8ND &** packet. **K8XXX**: K8AQM, K8DD, K8JJC, K8JM, K8KS, N8CC, NU8Z. **K9NR &** K9CS, AK9F. **K9NS &** AA9D, K9HMB, K9PW, K9QVB. **KC4D &** WA4ZPF, W4DF, W2CP. **KTØR &** KCØW. **LY1YK**: LY2CO, LY3CI. **LY2BW &** LY2BIL, Katinas. **LY2MV &** LYR-727. **LZ8T**: LZ2CJ, LZ2HM, LZ1UQ. **MØABC/P**: G3WUX, G4WQX, G4IUZ, G4KEW, G7TWC, G8OO, G1LLW. **N1LN &** N5TU. **N2AWE &** KEØFT. **N2VW &** packet. **N3SD &** packet. **N4BP &** W4FMS. **N4VV &** packet. **N5TW &** packet. **N7GP**: W7MCO, WA6CDR, K7JWD, N5IA. **N7JW &** W7UT, K7CA. **N8KM &** packet. **N8TR &** packet. **N9RV &** W8LVN. **NA2M** & packet. **NC8V** & packet. **NE3F &** KS3F, NT3V. **NF1A &** packet. **NO2R &** packet. **NY4A**: W2CS, N4AF. **NZ1U**: KB1H, K1GX, N1XS, NB1U. **OE1TKW &** packet. **OE2LCM &** packet. **OE5OHO &** packet. **OH6XX**: OH6XX, ex-OH6NU. **OK1KZD**: OK1TO, OK1FUI, OK1XU, OK1FC. **OK5W**: OK1CF, OK1JKT. **OL1C**: OK1AN, OK1HEC, OK1TIC, OK1IPS, OK1FPQ. **OL1F**: OK1DMO, OK1DZR. **OL2U**: OK1FMX, OK1MPM, OK1FMG. **OL5Q**: OK1FFU, OK1HRA, OK1FLC. **OL7W**: OK1AU, OK1DG, OK1DRY.

OM3KZA: OM6FM, OM3TYC. **OM7M &** packet. **OZ/DL2JRM &** OZ2ZB, DH5HT. **PA3BAS &** PA3AUC, PA3BPL, PA3CLH, PA3DSB. **PA5MW &** PA3EA, PA3EZL, PAØSHY, PA1MRK, PA3BXM, PA3FGA, Claudia. **PA5TT &** packet. **PY2FUS &** packet. **RK4UWR**: UA4UDF, RW4UU, RA4UF. **RM6A**: RA6CO, RA6AX, RN6BN, RA6CM. **RU1A &** packet. **RV2FW &** RA2FA, RA2FW, RN2FA. **RW2F**: UA2FC, UA2FCC, UA2FF, UA2FP, UA2FX, SWL Andrew. **RW3WWW**: RA3WJ, UA3WFY. **RW9C**: UA9CGA, RW9CF. **S5ØC**: S53CC, S53MM. **S59ABC**: S51DS, S53W, S57Y. **SL3A**: SM3BDZ, SM3CVM, SM3OJR, SM3EAE, SM3PXO, SM3UKE. **SP9KRT**: SP9EMI, SP9-1753. **SP9KTL**: SP9CCD, SP9JQA, SP9NFB, SP9OYV, SP9LLN, SP9IJE. **UT7L**: UR4LRG, UR4LTX, UUØJL, UXØLL, UY5LW. **UU7J**: UUØJM, UU9JK, UU4JMG, UU5JBO, UUJ079. **VE2KDC &** VE2GDA. **VE2OJ**: VE3EDR, VE3FFK, VE3IAY, VE3NJ, VE3OP. **VE6JY &** packet. **VY2ZMM**: K1ZM, K2WI, WW2Y. **WØAIH &** KØTG. **W1FJ &** packet. **W1OP**: W1GS, W1IUX, N1DM, WA1UWU. **W1QK &** packet. **W2GD &** ops. **W2GG &** packet. **W2MF &** KD2I, KN2T, N2ORM. **W3CF &** packet. **W3DQ &** N3OC. **W3FV &** packet. **W3HVQ &** packet. **W3OV &** packet. **W3UL &** packet. **W4TNX &** packet. **W5TM &** W5AO. **W6XR &** packet. **W6YRA**: WA6AYI, IK3ZAW, KU6T. **W8BAR**: W8WEJ, AA4VV, W1TO, WA8SDA, W8VVE. **W8FT &** AD8P, AA8UP, N8ET. **W8TOP**: W8UVZ, K8GG. **WA9IRV &** PACKET. **WB9CIF &** N9AG. **WY3T &** W3KGL, KA3PVA. **YO2KHK**: YO2CMI, YO2BEH. **YP8A**: YO3APJ, YO3FWC, YO3ND. **YZ7A**: YU7CM, YU7KC, YU7ZZ, YT7DG, 4N7ZZ, BENCE, ROBI, YU7J. **ZF2LM**: KE1F, packet. **ZL6QH**: ZL2BSJ, ZL2TX, ZL2III, ZL1AZE.

Station Ops SSB Multi-Op

4O6A: YT6A, YU1EU. **4U1WB**: AJ3M, packet. **AAØA &** packet. **AA1K &** packet. **AA4V &** packet. **AG4MX &** KS4YT, KV4T. **DH1TW &** packet. **DK1MM &** packet. **DL2DBH &** DJ9DZ. **EA3URE**: EA3DW, EA3FAJ, EA3AYP. **EA4URE**: ops. **EA5BY &** EA5FID, EA5GRV, EA5KW, EA5XC. **EA5EG &** packet. **EI7M**: EI8IR, ops. **F5PYJ &** F6IIT. **G3UEG &** packetT. **HA5KHC/7**: HA5BH, HA5OJ, HA5ZA, HG5OLQ, HA5TBK, HA7PC. **HB9FBO**: HB9CXZ, HB9BLQ, HB9OCR, SWL Nicola. **HG1S**: HA1TJ, HA1DAE, HA1DAC, HA1AG, HA1DAI. **I2OKW** & IK2FIL. **KØLIR**: NØIS, WØSLW, WAØIYY. **KØXD &** packet. **K2FL &** packet. **K2PS &** packet. **K2SB &** packet. **K3DI &** packet. **K3IXD &** packet. **K3OO &** packet. **K3OOO &** packet. **K3SKE &** packet. **K3WW &** packet. **K4BP &** Lauren. **K4YFR &** W4AVN. **K4YT &** packet. **K5BAT**: N5QJ, WB5BHS, WU5X, W5RZ. **K8OQL &** packet. **KK1DX &** packet. **LY7A**: LY3IT, LY3NUT, LYR346. **LZ8T**: LZ2CJ, LZ2JE. **MØABC**: G1GIK, G3WUX, G4KEW, GØDYW, G8OO, G1LLW. **NØKOV &** WBØLBF, WBØSRP. **N2NW &** packet. **N3AM &** packet. **N3DL &** packet. **N3MX &** packet. **N4ION &** N4JDB.

N7GP: W7MCO, N5IA, N7QK, K7LON. **N7KQ**: W7GNP, N1KQ, KJ7RX, Todd. **N7PWZ &** N7IZM, KB7YEB, AC7KV. **N8TR &** WB8K, KF8UN, W8BIN, N8DMM. **NE3F &** KS3F. **NF1A &** packet. **NZ1U**: N1XS, KB1H. **OE1TKW &** packet. **OL5T**: OK1DUO, OK1PAT, OK1QM. **OM3KZA &** OM3TYC. **OZ5ESB**: OZ1CWP, OZ1INN, OZ4AFQ. **PY3MHZ &** packet. **RW3WWW**: UA3WHS, RA3WJ. **RZ9AYA**: UA9AT, UA9AZ, UA9AFZ. **SN8V**: SP8BLK, SP8NCF. **UU7J**: UU4JMG, UUØJM, UU4JDD, UU4JGR, UU5JBO, UU8JK, UUJ079. **UX8IXX**: US8IGF, US8IGE. **UZ4E**: UR7EU, Igor, Serge. **VE2UMS**: VE2FAB, VE2CVB. **VE3DC**: VE3BK, VA3DJ, VE3GCP, VE3VZ, VE3STT, VE3RZ, VE3VMO. **VE6JY &** packet. **VE7OSO &** VE7HPS. **WØNO &** KØWA, ABØS. **W2GG &** packet. **W2MF &** KD2I, KN2T, N2ORM. **W3FV &** packet. **W3FVT &** packet. **W3HVQ &** packet. **W4HJ &** packet. **W6YRA**: WA6AYI, K6LDO, IK3ZAW, KC6LDS, KU6T. **W8FJ &** packet. **W9LYN &** packet. **WB9CIF &** packet. **WO1N &** packet. **WY3T &** WY3T, KA3PVA, N3JRX. **XE1RCS**: XE1JG, XE1KK, XE1ME, XE1VIC, XE1YJY. **YU7AR &** YU7JX, YU7CN. **YZ7W**: YU7ZZ, YT7DQ.

Number groups after calls denote score, total QSOs, W/VE multiplier, countries worked. Total multiplier is the addition of the W/VE and countries. Multi-op scores follow single-op listings. An asterisk (*) denotes low power. State, province, and country certificate winners are listed in bold.

CW RESULTS
SINGLE OPERATOR
NORTH AMERICA
UNITED STATES

CONNECTICUT

K1VW	**216,630**	**809**	**52**	**35**
K1ZZ	163,754	540	50	32
K1PX*	**144,807**	**711**	**56**	**23**
K1IM	99,061	467	49	24

MASSACHUSETTS

K5ZD	**141,266**	**377**	**49**	**34**
K1GU	45,087	317	47	10
N1RL*	**36,816**	**254**	**49**	**10**
K2LP	24,327	159	37	14
WG1Z*	18,018	189	40	2
K1HT*	11,666	121	34	4
W1TW/QRP	**8,217**	**106**	**29**	**4**
N1DC*	8,120	122	29	0

MAINE

K1FK	**37,912**	**261**	**44**	**12**
N1LW*	**7,018**	**103**	**29**	**0**

NEW HAMPSHIRE

KB1EAX*	**162,278**	**695**	**55**	**27**
WC1M	73,372	347	48	20
KN1H/QRP	**10,608**	**138**	**34**	**0**

RHODE ISLAND

K2MN*	**14,520**	**165**	**39**	**1**
KØDI/QRP	**9,009**	**122**	**32**	**1**
AB1BX*	6,864	117	26	0
N1HRA*	3,575	64	25	0

VERMONT

K1KD*	**11,480**	**139**	**32**	**3**

NEW JERSEY

N2ED	**149,038**	**588**	**55**	**31**
K1NK*	**46,256**	**334**	**43**	**13**
K1JT*	37,465	237	47	12
NQ3N	29,574	219	45	8
K2SZ*	11,720	127	37	3
W2ZQ	11,514	126	35	3
W2LE	10,476	125	35	1
K2AF	7,945	96	33	2
K2ZB	4,956	81	28	0
W2JEK/QRP	**3,003**	**64**	**21**	**0**
AD3Y*	189	12	7	0

NEW YORK

N1EU	**280,269**	**889**	**58**	**41**
K2FU	**102,666**	**597**	**53**	**18**
W6XR	77,349	431	50	19
K2UG*	**48,430**	**348**	**45**	**13**
WD5T	40,960	234	50	14
N2GC	25,450	185	38	12
WB2HJV	20,972	185	44	5
K2CS	20,650	163	41	9
N2LL*	14,134	167	35	2
W2FUI	13,818	142	36	5
N2CU/QRP	**8,500**	**110**	**34**	**0**
KC2DGC/QRP	2,373	49	21	0

DELAWARE

N8NA*	**60,574**	**360**	**48**	**16**
NY3C*	6,292	106	26	0

MARYLAND

K2PLF	**102,672**	**569**	**48**	**21**
AI3M*	**98,784**	**552**	**53**	**19**
N3UM	97,704	516	49	23
WK3I/QRP	**76,416**	**513**	**50**	**14**
W3CP*	25,991	226	42	5
N4GG	23,650	182	42	8
N3AM	23,275	188	44	5
AD3F*	21,022	191	40	6
W3GN	20,565	166	35	10
N3ND*	14,040	154	36	3
NS3T	12,129	139	38	1
K3DSP*	9,344	134	31	1
N3HUV	5,992	101	28	0

PENNSYLVANIA

W3BGN	**263,200**	**799**	**56**	**38**
W3GH	**218,946**	**796**	**57**	**34**
W3TS	202,616	840	54	32
WA2FGK	58,032	359	47	15
N3RJ	47,250	364	45	9
W3RJ	46,438	226	39	23
AD8J*	**32,242**	**305**	**42**	**5**
N4XU*	30,195	268	36	9
NA3V*	29,568	257	41	7
AA3LX*	26,979	228	47	4
AA3B	22,750	186	43	7
AA3ML*	18,213	210	37	2
K3GW*	16,454	197	38	0
W3AP	16,072	175	40	1
K3SV*	13,490	148	34	4
K3ZV*	9,792	124	28	4
W3MF*	7,050	101	30	0

ALABAMA

KA9EKJ*	**48,500**	**438**	**43**	**7**
AF4OD*	41,287	360	47	6
W4NTI	34,104	317	44	5
K4WI*	30,672	221	43	11

FLORIDA

N4PN	**131,520**	**646**	**55**	**25**
NO4S	52,794	313	45	18
W4AA*	**51,415**	**317**	**50**	**15**
WS4Y	39,798	324	45	9
K9HUY	38,060	303	44	11
K4PB	33,040	236	44	12
K5KG	31,980	200	46	14
K4GKD*	28,188	200	42	12
WC4H	22,607	201	38	9
KW7R*	16,016	158	38	6
KN4Y*	14,315	194	33	2
ACØM*	5,868	70	31	5
K4RFK*	4,950	69	30	3
W8IM*	4,830	76	28	2
K4FB/QRP	**4,644**	**80**	**26**	**1**
KA6R*	3,657	72	22	1

GEORGIA

W8JI	**505,620**	**1318**	**57**	**49**
W4WA	**225,971**	**844**	**57**	**32**
K9AY	156,926	787	54	23
N4NX	84,168	481	53	19
WA4TT	69,440	404	54	16
AA4Z	69,207	354	47	22
K4BAI	56,940	417	49	11
K4PI	54,374	320	48	14
KR4TG*	**21,318**	**143**	**48**	**9**
K4OGG*	10,944	132	36	2
W4ATL*	7,650	104	32	2
W4TE	7,161	94	30	3
N4XMX	6,727	98	29	2
K4GA*	6,603	102	31	0
WB6BWZ/QRP	**1,184**	**37**	**16**	**0**

KENTUCKY

K4TO*	**80,262**	**553**	**50**	**13**
WB4ZDU	24,552	252	42	2
KM4FO*	19,920	237	39	1
K4BAM*	11,795	161	35	0
K4WW*	4,350	69	29	0

NORTH CAROLINA

WJ9B*	**113,436**	**682**	**49**	**20**
N4YDU	36,698	227	44	15
KO7X	32,550	280	43	7
W4TMR/QRP	**32,150**	**302**	**47**	**3**
N4CW	25,427	225	40	7
NX9T*	8,126	106	31	1
K3KO	4,088	60	27	1
W4ZV	2,166	20	7	12

SOUTH CAROLINA

N2FY*	**27,081**	**238**	**46**	**5**
WA4AOS	23,850	244	43	2
N4UK	16,826	107	36	11

TENNESSEE

N4DD	**140,452**	**792**	**56**	**17**
KØEJ	**138,762**	**720**	**55**	**23**
N4IR	91,326	642	49	13
K4LTA	79,002	646	50	7
N4ZZ	59,940	513	50	4
K4RO	51,975	423	49	6
W4DAN*	**40,185**	**399**	**45**	**2**
NY4N*	38,070	378	44	3
W4NZ*	36,720	325	47	4
NA4K*	35,623	334	46	3
WO4O*	18,048	168	43	4
KE4OAR	18,017	189	40	3
KW4JS/QRP	**12,530**	**167**	**34**	**1**
W4OGG	11,997	136	42	1
N4KN*	7,110	114	0	30
W4AUI*	930	31	15	0

VIRGINIA

W4MYA	**459,690**	**1183**	**57**	**48**
W4RX	**251,136**	**852**	**58**	**38**
K4ZW	241,316	760	55	37
K4OAQ	227,395	913	57	32
K7SV*	**166,415**	**769**	**57**	**26**
N3JB	55,575	330	49	16
KT4U	50,439	257	48	21
K4TX	37,232	276	42	11
W4YE*	30,200	255	43	7
W4HJ*	29,154	306	40	3
K4ORD*	27,589	253	43	4
W2YE*	18,045	170	40	5
N4MM*	15,390	152	42	3
N4GU*	12,669	140	37	4
N4JED*	4,671	79	27	0
K4MX*	2,990	59	23	0

ARKANSAS

WD5R	**112,560**	**748**	**56**	**11**
KJ5WX*	**27,700**	**255**	**46**	**4**
W5MK*	11,362	139	37	1

LOUISIANA

K1DW*	**26,404**	**265**	**42**	**4**
W5OT*	20,382	227	41	2

MISSISSIPPI

N5ID	**13,520**	**172**	**38**	**2**
N5PA*	**5,984**	**89**	**31**	**1**

NEW MEXICO

N7DF	**56,172**	**385**	**52**	**10**
N6ZZ	44,958	328	51	8
N5UL	34,079	276	45	8
K5AM	8,954	105	34	3
K7IA/QRP	**2,814**	**67**	**21**	**0**

OKLAHOMA

K8FU*	**46,530**	**389**	**51**	**4**
NEØP*	6,396	95	33	0
K5PX	4,108	75	25	1

TEXAS

K5RX	**216,032**	**946**	**58**	**28**
N5RG	**123,120**	**685**	**55**	**16**
WØUO*	**94,250**	**652**	**55**	**10**
N1LN	90,027	647	53	10
N8SM	71,556	435	53	14
N5PO	55,519	420	49	10
W9YYG	54,340	356	54	11
W5KFT	47,908	256	52	7
K5RA	42,380	173	45	7
NN5T*	23,296	200	49	3
N5DO*	21,528	218	43	3
K5KJ*	21,113	226	40	3
W5GN	19,646	194	44	3
W5GAI	15,640	147	41	5
AF5Z*	9,176	115	35	2
WØVX*	6,144	90	31	1
N5DUW*	6,039	90	32	1
N1CC*	1,200	40	15	0

CALIFORNIA

K6SE	**169,350**	**719**	**56**	**19**
N6RO	**162,377**	**723**	**56**	**15**
K6NR	86,010	488	49	12
W6JTI*	**47,880**	**331**	**50**	**6**
N6NF*	40,662	288	49	5
K6TA	31,114	205	39	8
W7CB	26,765	217	47	6
K6LRN*	22,736	201	46	3
W6YJ*	22,302	173	47	7
K6MO	16,632	163	39	3
N6WG/QRP	**13,790**	**176**	**34**	**1**
KQ6NN*	10,080	144	31	1
N7FF*	7,922	108	33	1
K6XC	7,843	119	30	1
KØINT*	5,267	102	22	1
K6DGW*	5,145	106	19	2
K6NA	5,085	68	12	3
KU6T/QRP	4,296	84	23	1
AA6EE*	3,634	76	22	1
W6ISO*	3,534	82	18	1
WA6FGV*	3,042	79	17	1
W6ZH/QRP	2,898	75	17	1
W6RKC	2,520	60	17	1
KG6AO	1,615	46	17	0
W6QU/QRP	1,344	48	14	0
K6III/QRP	900	45	10	0
W6ISQ	528	22	12	0
N6LL*	320	20	8	0
K6MI/QRP	231	15	7	0
KA6UMQ*	32	4	4	0

ARIZONA

N7DD	**141,839**	**691**	**57**	**16**
K7RE*	**36,701**	**350**	**46**	**3**
W7YS	26,901	250	45	4
KJ7WY*	26,460	213	49	5
N6SS	17,181	69	53	16
N7MAL/QRP	**5,018**	**91**	**24**	**2**
KN5H*	2,231	47	23	0

MONTANA

KS7T	**60,817**	**411**	**54**	**7**
K7BG	50,160	351	52	8

OREGON

W7GG	**139,728**	**635**	**56**	**15**
N6LF	78,554	426	52	10

UTAH

WA7LNW	**49,761**	**384**	**51**	**6**
W7HS*	**28,254**	**243**	**47**	**4**
K8EI	14,274	158	38	1

WASHINGTON

W7RM	**109,626**	**553**	**55**	**11**
K7OX	**106,795**	**598**	**54**	**11**
WA7LT	81,840	481	53	9
K7QQ	61,944	381	50	8
N6HR	27,900	220	44	6
N7LOX	25,714	243	40	3
W7LD/QRP	**19,120**	**208**	**38**	**2**
NØAX*	**10,506**	**116**	**31**	**3**
N7WA*	4,312	70	27	1
K7MM/QRP	1,164	44	12	0
W7DRA*	1,092	41	12	0

MICHIGAN

K8CC	**174,408**	**733**	**58**	**20**
N8EA	**145,084**	**648**	**57**	**26**
ND5S	115,560	698	58	14
K8VT*	**46,035**	**380**	**51**	**4**
K8IR	41,850	352	51	3
N8LJ	31,360	234	48	8
WA8LCZ*	29,988	266	47	4
K8CV*	15,330	163	40	2
KT8X	3,275	55	24	1

OHIO

K8DX	**242,144**	**934**	**57**	**37**
W8CAR	87,035	553	50	15
W8IQ*	**32,806**	**315**	**44**	**3**
ND8DX	32,256	235	47	8
N8BJQ*	29,400	263	45	5
K8AB*	26,640	245	44	4
K8MR*	19,035	174	44	3
AD8P	10,397	127	37	0
NS8O*	9,576	113	37	1
N8OH	8,364	114	34	0
W8PN*	8,310	128	30	0
N8XP*	7,854	110	33	0
N8XA/QRP	**7,326**	**99**	**31**	**2**
AF8C*	7,130	103	31	0
N8WS*	2,583	57	21	0
W8XY*	1,826	37	22	0

WEST VIRGINIA

K2UOP	**149,688**	**651**	**55**	**26**
K8OQL	87,768	468	53	19
W8IVF*	**80,585**	**464**	**51**	**20**
N8II*	33,746	321	42	5
N4ZR	32,946	251	39	12
WA8WV*	19,000	214	38	2
W8ZA*	2,156	46	22	0

ILLINOIS

K9DX	**243,616**	**984**	**58**	**34**
WB9Z	**223,696**	**1014**	**59**	**29**
K9MMS*	**72,387**	**508**	**56**	**7**
KF9D*	45,747	413	49	2
KG9X	34,821	300	49	4
WO9S	32,864	289	51	1
N2BJ	31,750	291	47	3
W9SE/QRP	**25,335**	**259**	**44**	**1**
K9WA*	21,408	204	46	2
N9TF*	19,044	189	46	0
K9ZO*	15,456	172	40	2
W9YS*	14,924	166	40	1
K9CW*	12,636	150	37	2
KB9CRY*	11,600	129	38	2
KK9A	9,396	119	34	2
AC9S	7,210	97	34	1
K9IJ*	5,983	95	31	0
W9LYA*	4,995	88	27	0

INDIANA

W9IU	**77,488**	**612**	**51**	**7**
W9RE	75,660	506	51	14
WT9U*	**55,432**	**496**	**49**	**3**
K9BG*	52,488	448	47	7
WC9C*	11,856	144	37	1
K9MI	10,112	146	32	0
N4TZ/9*	8,636	115	35	0
KJ9C*	7,170	112	28	2

WISCONSIN

K9OT*	**94,122**	**677**	**55**	**8**
AA9PB	60,648	484	54	3
WA9TZE	56,256	372	54	10
WA1UJU*	51,532	461	50	2
K9DAF*	49,032	411	52	2
W9WAQ*	48,198	370	51	7
WT9Q	33,165	346	43	2
W9LO*	24,080	258	41	2
WI9M*	17,960	205	39	1

COLORADO

K8FC	**103,983**	**658**	**56**	**13**
WV7U	56,463	414	53	6
KØUK*	**39,325**	**306**	**49**	**6**
WØETT*	37,150	335	47	3
NØHF*	18,960	177	46	2
WUØL/QRP	**10,115**	**137**	**35**	**0**
KIØII/QRP	1,462	43	17	0
N4VI*	1,206	32	18	0
KØCO*	910	31	14	0
AEØQ*	780	30	13	0

IOWA

KØIO	**1,197**	**30**	**18**	**1**

KANSAS

WØUY	**35,152**	**309**	**46**	**6**
KI6DY*	**15,840**	**171**	**44**	**0**

MINNESOTA

WJØM*	**64,260**	**475**	**54**	**6**
WØHW	63,270	512	53	4
ACØW*	48,620	398	51	4
WØSEI/QRP	**28,779**	**246**	**51**	**2**
KRØB/QRP	25,488	239	45	3
KJØB*	21,160	211	44	2
K4IU*	16,320	189	39	1
KØCAT*	11,172	135	38	0
NØAT	8,177	100	35	2

MISSOURI

K4VX	**177,870**	**983**	**58**	**19**
NØTT*	**111,328**	**685**	**56**	**15**
KØLW	103,224	666	54	14
KØJPL	75,454	552	55	7
AE9B	72,098	564	53	6
WØTT	59,864	487	52	4
KAØGGI*	27,450	245	47	3
WØTY	12,247	155	35	2

NEBRASKA

WNØL*	**3,825**	**72**	**24**	**1**

SOUTH DAKOTA

WØRSP/QRP	**16,238**	**157**	**46**	**1**

CANADA
NEWFOUNDLAND

VO1HP*	**69,940**	**203**	**27**	**25**
VO1MP	47,840	154	31	21
XJ1NA	41,580	92	35	31
VO1WET*	6,095	49	17	6

NEW BRUNSWICK

VE9WH*	**3,990**	**44**	**18**	**1**

QUEBEC

VX2AWR*	**16,414**	**123**	**28**	**1**
VE2OWL*	456	12	8	0

ONTARIO

VA3UZ	**411,312**	**906**	**56**	**32**
VX3AT	**238,710**	**663**	**58**	**15**
VE3PN	236,544	565	52	25
VA3RU*	**217,764**	**643**	**56**	**13**
VE3XB*	188,240	591	53	12
VE3CSK*	182,910	531	54	16
VE3OSZ*	150,280	448	53	15
VE3FU*	132,120	446	48	12
VE3KP*	110,936	407	51	5
VE3ABG*	66,368	224	49	12
VE3MQW*	53,345	238	44	3
VE3STT*	51,198	253	41	1
VA3NR*	21,035	125	34	1
VA3IX*	14,787	99	31	0
VE3OBU*	13,320	90	30	0

SASKATCHEWAN

VE5SF*	**20,163**	**108**	**37**	**2**

ALBERTA

VE6NTF	**55,680**	**245**	**42**	**6**
VX6BF*	**8,784**	**77**	**24**	**0**
VX6LB	7,000	72	19	1

BRITISH COLUMBIA

VE7CC*	**57,732**	**230**	**46**	**5**
VE7JKZ	23,580	158	26	4
VE7ALN	16,790	177	43	3
VE7IN*	9,639	74	26	1
VE7FO*	912	27	8	0
VA7NT/QRP	832	22	8	0

BELIZE

V31YN	**77,820**	**234**	**40**	**20**

CAYMAN ISLANDS

ZF2NT	**430,560**	**902**	**55**	**35**
ZF2CM*	**55,776**	**227**	**39**	**9**

DOMINICAN REPUBLIC

HI3/OK2ZU*	**39,975**	**189**	**37**	**4**

MEXICO

XE2AC	**44,044**	**200**	**38**	**6**
XE2AUB*	648	15	8	1

ST. KITTS

V47KP	**269,439**	**561**	**52**	**35**

TURKS & CAICOS

VP5/G4RCG	**228,855**	**600**	**51**	**22**

AFRICA
CANARY ISLANDS

EA8AH	**1,023,645**	**978**	**45**	**60**
EA8ZS	14,808	63	6	18

MADEIRA ISLANDS

CT3FN	**490,336**	**560**	**34**	**54**

ASIA
ASIA RUSSIA

UA9AT	**202,176**	**413**	**0**	**52**
RU9TO	73,882	199	0	41
UA9CI	65,518	203	0	34
UA9CGL*	**58,922**	**196**	**0**	**34**
UA9ZZ	57,380	165	0	38
UA9AM	33,002	125	0	29
RA9MA	30,914	120	0	29
RV9SV	23,808	113	0	24
UAØANW	23,301	107	0	27
RK9CZO	19,366	91	0	23
UA9CR*	17,199	88	0	21
RZ9IR	13,685	70	0	23
UA9CL*	12,616	73	0	19
UA9AX*	11,638	58	0	23
RW9QA*	4,017	41	0	13
UAØAGI	1,560	23	0	10
UAØLS	1,314	39	2	4

AZERBAIJAN

4K9W*	**12,000**	**52**	**0**	**25**

CYPRUS

C4A	**491,249**	**747**	**14**	**57**
P3VT*	**121,880**	**307**	**0**	**40**

ISRAEL

4X3A	**334,512**	**505**	**16**	**53**

JAPAN

JH4UYB	**94,146**	**240**	**14**	**37**
JA7IC	4,644	69	7	5
JA5EZI	3,770	30	8	5
JE1SPY*	**3,132**	**45**	**7**	**5**
JE1TSD*	1,510	26	4	6
JA1CP*	651	13	5	2
JE3UHV*	248	15	3	1
JA1IZZ*	216	15	2	2
JHØNVX/1*	215	9	2	3
JK2VOC*	48	24	0	1

KAZAKHSTAN

UN6T	**86,416**	**212**	**0**	**44**

LEBANON

OD5/OK1MU	**209,300**	**415**	**7**	**45**

TAIWAN

BV3/DJ3KR*	**10,355**	**90**	**5**	**14**

TURKEY

TA3D*	**331,506**	**540**	**12**	**51**
TA3DD	57,680	149	1	39

UK BASES ON CYPRUS

ZC4DW*	**3,150**	**26**	**0**	**14**

EUROPE

ALAND ISLANDS

OHØNL	**327,808**	**966**	**5**	**59**

BALEARIC ISLANDS

EA6SX	**47,000**	**168**	**12**	**38**

BELARUS

EU1AZ*	**125,960**	**548**	**2**	**45**
EU1SA/QRP	**12,550**	**100**	**0**	**25**

BELGIUM

OT2T	**729,174**	**1077**	**37**	**69**
ON4BR*	**112,970**	**385**	**12**	**43**
ON4ON*	55,616	250	3	41
ON6TJ*	24,660	135	3	33

BOSNIA-HERZEGOVINA

T95A*	**15,515**	**103**	**0**	**29**

BULGARIA

LZ2UZ*	**8,208**	**65**	**1**	**23**

CROATIA

9A5WA*	**130,302**	**467**	**7**	**47**
9A3PA*	119,586	399	8	49

CZECH REPUBLIC

OK1FCJ	**261,030**	**643**	**18**	**58**
OK1FDY	**203,252**	**589**	**16**	**52**
OK2WM	199,888	644	9	53
OK1EP	149,226	440	16	50
OK1WF	142,104	457	16	46
OK2HI*	**102,258**	**356**	**9**	**48**
OL1A*	86,715	384	1	46
OK2EQ*	71,852	324	5	41
OK8ANM	67,925	236	8	47
OK1AYY*	66,308	309	1	43
OK1FC	65,025	249	9	42
OK1DOS	61,600	296	5	39
OK1XJ	59,386	268	7	39
OK1FKD/QRP	**56,826**	**303**	**1**	**40**
OK1IF/QRP	55,720	298	2	38
OK2DU*	45,220	258	1	37
OK2WTM/QRP	41,514	244	0	37
OK1HGM	34,481	173	1	40
OK1DXR	33,907	176	2	39
OK1JOK*	29,874	151	1	38
OK1DSX	28,119	152	1	38
OK2BPL*	27,798	136	0	41
OK2GG	16,530	121	0	29
OK1MZO*	12,880	70	4	31
OK2PMS*	12,125	106	0	25
OK2ZAW/QRP	10,741	103	0	23
OK2HZ	10,296	52	2	31
OK1DOL*	8,832	80	2	21
OK2SG	8,328	75	1	23
OK1DKM*	7,644	80	0	21
OK1DWJ	3,960	23	9	9
OK1DVK*	1,350	27	0	15

DENMARK

OZ7YY	**387,324**	**813**	**25**	**59**
OZ/DL2JRM	123,210	538	1	44
OZ5WQ	59,220	255	7	38
OZ8AE*	**51,496**	**248**	**1**	**40**
OZ5UR*	6,000	59	1	19

ENGLAND

G4VGO*	**309,987**	**583**	**30**	**59**
GØCKP	**175,015**	**428**	**24**	**47**
GØIVZ	161,420	351	33	37
G3NKC	129,030	336	21	45
G3UFY	115,107	345	17	44
G3MXJ	89,792	248	17	44
M4T*	47,260	285	0	34
G4OBK	22,295	70	12	37
G3ZRJ*	15,660	110	0	29
GØMTN*	14,812	108	1	27
G3JJZ*	6,550	51	2	23
GØ/N9LYE*	3,876	42	0	19

ESTONIA

ES2DJ*	**102,336**	**406**	**3**	**45**
ES6PZ	17,160	131	0	26

FAROE ISLANDS

OY9JD	**186,048**	**538**	**15**	**49**

FINLAND

OH2NN*	**86,802**	**368**	**0**	**46**
OH6NIO*	62,320	309	0	40
OH5NE	54,912	277	0	39
OH8VJ	40,833	208	0	39
OH5PT	15,561	69	0	39
OH1EB	13,736	78	2	32

FRANCE

F6BEE	**336,897**	**634**	**31**	**52**
F8BPN*	**196,560**	**488**	**20**	**52**
F8KCF	69,882	221	13	44
F6CWA	46,850	156	12	38
F6ACD*	38,640	144	16	30
F2AR	26,280	120	6	34
F5JBR*	11,501	73	2	29

GERMANY

DK6WL	**355,470**	**782**	**22**	**63**
DK8ZB	**332,136**	**720**	**26**	**58**
DJØMDR	275,737	686	21	56
DL7CX	165,198	517	14	52
DJ6QT	127,305	354	15	54
DL7UCX*	**113,220**	**387**	**7**	**53**
DK2OY*	94,872	314	12	47
DJ6TK*	91,135	339	5	50
DL1WA*	87,567	367	6	45
DL2KQ*	82,995	310	6	49
DL1JF	61,536	260	4	44
DJ8UV/P*	59,664	254	4	44
DL5JS*	51,980	234	7	39
DL2TG*	47,047	197	3	44
DL3YBM	44,775	200	4	41
DL3ZAI*	38,560	206	1	39
DJ5NN*	38,212	193	1	40
DK3RA*	37,380	185	1	41
DL4JYT*	34,716	233	0	33
DL3YA*	33,670	201	1	36
DK7ZT	31,944	140	6	38
DJ3RA*	31,780	188	1	34
DF9ZP*	25,410	171	3	30
DL6RO*	23,628	149	0	33
DK2BJ*	22,230	167	0	30
DL2RTJ*	21,756	180	0	28
DL1JFM*	19,740	146	0	30
DL6UKL*	19,401	150	0	29
DK7FP*	16,957	115	1	30
DL4KUG*	16,820	127	0	29
DL8AKA*	13,554	106	0	27
DL3DRN*	12,264	90	0	28
DK3GI*	12,093	89	0	29
DH1DX*	12,075	110	0	25
DL3BRA*	11,300	100	0	25
DLØDX*	11,102	98	0	26
DL3BZZ*	9,282	77	0	26
DL1YFF*	6,526	52	1	25
DL1LAW/QRP	**3,600**	**51**	**0**	**16**
DL2LFH/QRP	2,282	38	0	14
DK2GZ	1,976	33	0	13
DF2HL	1,469	28	0	13
DL2RZG	1,157	19	0	13

GREECE

SV2AVP	**101,136**	**337**	**9**	**47**
SV1VN*	2,805	30	0	17

GUERNSEY

GU4YOX*	**27,168**	**168**	**1**	**31**

HUNGARY

HA8IB	**285,228**	**706**	**15**	**61**
HG8C	261,138	680	16	55
HA8BE	187,736	579	6	56
HA3OV	117,392	389	6	52
HA1CW*	**69,230**	**294**	**2**	**44**
HA3LI	62,820	277	0	45
HA0HH*	18,377	171	0	23

ITALY

I4IKW	**287,200**	**622**	**20**	**60**
IK4WMA	**283,920**	**631**	**20**	**60**
IV3TMV	276,108	670	20	56
IK4MGP	169,350	405	17	58
IKØYVV	148,137	400	16	51
I1BAY/QRP	**75,313**	**276**	**6**	**47**
IK4AUY	66,960	228	9	45
I2SVA	31,117	167	1	36
IK2AIT*	819	27	0	7

KALININGRAD

UA2FZ	**253,708**	**687**	**12**	**56**
UA2FB	79,470	337	2	43

LATVIA

YL5W	**207,368**	**717**	**5**	**51**
YL7A	87,552	342	1	47
YL2LY*	**43,120**	**212**	**3**	**37**
YL2PN	180	9	0	4

LIECHTENSTEIN

HBØ/DL3OCH*	**26,320**	**187**	**1**	**27**

LITHUANIA

LY2ZO	**168,777**	**570**	**4**	**53**
LY2TA	**135,474**	**365**	**14**	**53**
LY2OX	122,876	457	4	48
LY2HN	111,540	430	1	51
LY3BA*	**98,440**	**423**	**2**	**44**
LY5G/QRP	**54,568**	**291**	**0**	**38**
LY2FN*	29,850	200	1	29
LY2MM*	15,652	114	0	28

MACEDONIA

Z31GX*	**14,040**	**102**	**0**	**26**
Z36W*	210	6	0	6

MALTA

9H1ZA*	**240,174**	**684**	**9**	**57**

MOLDOVA

ER100*	**71,236**	**310**	**1**	**43**

NETHERLANDS

PA5KT	**150,128**	**392**	**21**	**51**
PAØLOU	37,370	193	5	32
PA3AFF*	**26,750**	**90**	**11**	**39**
PA5WT*	26,598	162	0	33
PAØXAW*	16,895	116	0	31
PAØINA*	8,346	70	0	26
PAØJED/QRP	**7,981**	**70**	**0**	**23**
PA4TU*	5,848	36	0	34
PI4HQ*	4,494	44	0	21

NORWAY

LA2O*	**54,132**	**277**	**1**	**38**
LA3BO*	34,432	217	0	32
LA9DK*	31,155	195	0	31
LA7AK	18,212	127	0	29
LA5FH*	5,975	49	0	25

POLAND

SN8F	**204,057**	**625**	**7**	**56**
SP6AZT	**171,180**	**548**	**8**	**52**
SP3GTS	118,384	410	8	48
SN3E/QRP	**110,160**	**400**	**6**	**48**
SP5JTF*	**106,131**	**409**	**4**	**47**
SP4Z	89,155	315	4	51
SP8NCF*	86,750	344	3	47
SP4TKR/QRP	85,624	392	0	44
SP8LBK	59,361	250	3	44
SP6LV*	57,362	273	0	43
SP5ATO*	52,240	260	2	38
SP2QG	31,779	199	0	33
SN8M/QRP	13,234	108	0	26
SP5GH	10,248	43	4	38
SN8A/QRP	8,648	80	0	23
SP4CQU*	6,486	57	0	23
SP2DNI*	3,705	42	0	19
SP8HKT*	2,669	31	1	16
SQ9MZ*	2,608	35	0	16
SP6AEG*	300	6	0	6

PORTUGAL

CT1FJK	**179,744**	**357**	**27**	**55**

ROMANIA

YO2IS*	**75,856**	**341**	**0**	**44**
YO7BGA*	30,080	137	7	33
YO2BEH	19,020	126	0	30
YO3BWK*	8,027	69	0	23
YO9FYP*	5,389	62	0	17

RUSSIA

RZ3AA	**169,233**	**570**	**2**	**55**
UA6LV	**146,044**	**471**	**2**	**56**
UA3AB	130,645	483	2	51
RA3DOX*	**115,020**	**407**	**1**	**53**
RW1QD	111,150	448	1	49
RW4PL	100,753	357	0	53
RV1CC	99,127	413	2	47
RU1AO	92,757	383	1	48
UA4FER	68,400	300	0	40
UA1OMS	63,210	299	0	43
RW6HJV/QRP	**50,200**	**261**	**0**	**40**
RA4LW	49,856	239	0	41
UA1QV*	48,260	263	0	38
RA6FV	40,318	217	0	38
RU4LM*	39,216	205	0	38
RJ1Z	37,476	213	0	36
RA6LW*	33,744	181	0	38
RV6LA*	29,512	182	0	34
RU3DM*	23,996	184	0	28
RX3AEX	20,020	166	0	26
RU4WE*	14,612	117	0	26
UA3XAC*	12,844	114	0	26
UA3TU/QRP	12,236	91	0	28
UA3RE*	11,900	64	0	34
RN4SS*	11,882	101	0	26
RU3DX	8,568	75	0	24
RU3WR*	8,280	95	0	20

SARDINIA

ISØ/YO3RA	**57,592**	**234**	**3**	**43**

SCOTLAND

GM3POI	**287,475**	**694**	**21**	**54**
MMØCCC*	**14,208**	**87**	**1**	**31**

SLOVAKIA

OMØWR	**256,620**	**693**	**11**	**59**
OM3IAG*	**119,504**	**415**	**7**	**49**
OM7CW	114,075	501	1	44
OM7RU	113,827	463	5	44
OM4DN*	71,767	336	3	40
OM3KXR*	50,181	232	0	43
OM1ADM*	48,090	232	0	42
OM3ROM*	43,486	260	0	34
OM5AW/QRP	**41,610**	**217**	**0**	**38**
OM3BT*	28,996	128	4	40
OM7JG*	18,150	150	0	25
OM8HG*	16,926	135	0	26
OM3KED/QRP	4,743	60	0	17

SLOVENIA

S5ØA	**380,712**	**752**	**27**	**60**
S5ØR	**296,844**	**618**	**27**	**60**
S5ØU	281,637	626	20	61
S57M	259,125	639	19	56
S53O	239,168	618	17	57
S52ZW	226,644	650	10	56
S5ØC	198,445	583	15	50
S57C	197,248	567	13	54
S57DX	190,976	580	12	52
S58Q*	**107,640**	**410**	**4**	**48**
S57IO/QRP	**90,933**	**355**	**7**	**44**
S56A*	84,376	320	4	49
S52U*	56,293	283	3	38
S59D/QRP	55,977	238	4	43
S51W*	45,346	226	3	38
S53FO	45,236	206	5	38
S51VI*	15,762	119	0	28
S58WW*	10,500	85	0	25
S51DX	294	10	0	6

SPAIN

EA2LU/P	**144,003**	**356**	**26**	**43**
EA7ASZ*	**8,675**	**68**	**4**	**21**
EA7CA*	1,905	24	0	15
EA5AAJ*	740	16	0	10

SWEDEN

SM6WQB	**47,463**	**241**	**2**	**37**
SM7CQY	32,802	197	0	33
SM7EH*	**31,745**	**181**	**0**	**35**
SM7BJW*	16,874	131	0	26
SM6IQD*	13,514	95	0	29
SM7BHM	5,082	49	0	21

SWITZERLAND

HB9ARF*	**93,688**	**315**	**11**	**45**

UKRAINE

UR6QA	**207,365**	**575**	**8**	**59**
UXØFF	**197,190**	**603**	**10**	**53**
UX5NQ*	**97,796**	**445**	**2**	**44**
UR5FEO*	89,033	367	4	45
UY3QW*	65,009	358	0	37
UR5EAW*	58,926	281	0	42
UT2UB	51,660	250	0	42
UT7CR*	45,980	242	0	38
UY5ZZ	42,354	217	0	39
UT5DL*	38,934	189	4	38
UT4NW*	38,124	217	1	35
UT5UGR	34,020	197	0	35
UU2JA*	30,456	165	0	36
UYØZG	29,854	114	5	41
UR5EDX	25,752	135	1	36
UT5JAB	24,679	186	0	29
US3IZ*	19,740	135	0	30
UR5FCD*	2,295	29	0	17
UR5NKW*	1,750	28	0	14
UT5UBJ/QRP	**1,650**	**20**	**0**	**15**

WALES

GW3JXN	**97,185**	**318**	**16**	**39**
GW7X	72,350	263	12	38

YUGOSLAVIA

YU7BW	**217,828**	**563**	**0**	**57**
4N1A*	**143,304**	**495**	**8**	**48**
YU1ZZ*	132,124	433	8	50
YU1RA/QRP	**79,380**	**320**	**1**	**48**
YU8/S57AW*	55,755	248	1	44
YU1EA*	54,586	215	5	44
YU7FIJ/QRP	6,688	61	0	22
YU7SF*	540	21	0	6

OCEANIA

AUSTRALIA

VK3IO*	**22,428**	**68**	**26**	**10**

HAWAII

KH6ND	**228,624**	**534**	**52**	**12**
NH7O	53,502	147	33	4

NEW ZEALAND

ZL1CMY*	**5,263**	**30**	**14**	**5**

PHILIPPINES

DU9/NØNM*	**3,570**	**39**	**3**	**7**

SOUTH AMERICA

ARGENTINA

LU1EWL*	**10**	**2**	**0**	**1**

BRAZIL

PV8DX*	**23,840**	**63**	**29**	**11**
ZX5J	15,444	57	21	12
PY2NDX*	2,148	24	9	3
PY1BVY	1,474	21	5	6

FERNANDO DE NORONHA

PYØFF	**90,770**	**161**	**35**	**23**

VENEZUELA

YV7QP*	**2,600**	**20**	**13**	**0**

MULTI-OPERATOR

NORTH AMERICA

UNITED STATES

CONNECTICUT

NZ1U	**113,175**	**457**	**47**	**28**
W1QK	88,708	521	49	18

MASSACHUSETTS

W1FJ	**488,840**	**1001**	**57**	**53**
K1TTT	241,457	818	54	35
NF1A	7,446	80	29	5

NEW HAMPSHIRE

KØTV	**159,768**	**654**	**54**	**32**

RHODE ISLAND

W1OP	**62,592**	**362**	**47**	**17**

NEW JERSEY

W2GD	**544,388**	**1191**	**58**	**58**
NO2R	338,200	848	53	47
W2MF	157,982	678	46	40
N2VW	15,648	113	38	10
K2SB	10,185	125	32	3

NEW YORK

NA2M	**40,300**	**227**	**46**	**16**

DISTRICT OF COLUMBIA

W3DQ	**56,782**	**409**	**46**	**12**
4U1WB	5,808	115	24	0

DELAWARE

AA1K	**300,778**	**863**	**58**	**43**

MARYLAND

K3DI	**101,689**	**512**	**50**	**23**
W3HVQ	35,612	243	44	14
W2GG	19,065	203	38	3
W3UL	9,730	120	33	2

PENNSYLVANIA

K3WW	**328,900**	**948**	**56**	**44**
WY3T	**154,980**	**689**	**54**	**30**
W3FV	100,472	506	53	23
K3NM	73,629	240	50	31
NE3F	64,320	352	48	19
K3ATO	62,055	376	45	18
W3OV	37,434	319	44	7
K3PP	13,524	114	34	8
N3SD	1,748	43	19	0
W3CF	598	20	13	0

FLORIDA

N4BP	**75,008**	**514**	**48**	**16**

GEORGIA

K4EA	**160,380**	**759**	**56**	**25**

NORTH CAROLINA

NY4A	**228,760**	**779**	**56**	**39**
K4HA	144,480	620	52	32

SOUTH CAROLINA

AA4V	**171,948**	**683**	**52**	**31**

TENNESSEE

N4VV	**51,667**	**329**	**48**	**13**

VIRGINIA

KC4D	**105,009**	**617**	**54**	**17**
W4TNX	37,289	328	42	7

NEW MEXICO

K5TA	**55,620**	**415**	**53**	**7**

OKLAHOMA

W5TM	**152,588**	**913**	**57**	**17**

TEXAS

K5ZO	**106,405**	**763**	**55**	**10**
N5TW	51,805	319	49	16
K5IUA	51,545	372	51	10
K5NZ	43,365	320	51	8

CALIFORNIA

W6YRA	**6,000**	**90**	**28**	**2**
K6XT	2,432	24	11	8

ARIZONA

N7GP	**166,278**	**819**	**57**	**17**

UTAH

N7JW	**270,829**	**1041**	**58**	**25**
K7OA	81,459	535	55	8

MICHIGAN

K8XXX	**257,310**	**1079**	**58**	**32**
W8TOP	219,052	880	59	33

OHIO

W8FT	**150,696**	**805**	**56**	**22**
K8ND	106,704	533	54	22

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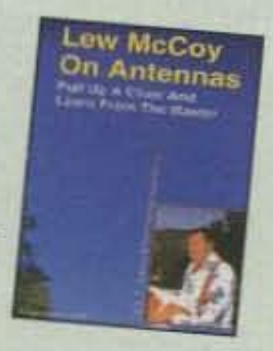

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N8KM	19,036	185	41	4
NC8V	15,548	150	44	2
WEST VIRGINIA				
W8BAR	**155,277**	**741**	**54**	**27**
ILLINOIS				
K9NS	**272,430**	**1147**	**58**	**32**
K9NR	181,789	945	59	22
INDIANA				
N9RV	**207,460**	**1022**	**59**	**23**
WB9CIF	107,537	656	52	17
WISCONSIN				
WØAIH	**124,180**	**784**	**57**	**13**
WA9IRV	119,990	737	57	14
COLORADO				
KØSX	**88,638**	**580**	**55**	**11**
IOWA				
N2AWE	**44,148**	**396**	**51**	**1**
MINNESOTA				
KTØR	**35,241**	**316**	**46**	**5**
MISSOURI				
KØLIR	**94,001**	**706**	**56**	**5**

CANADA

PRINCE EDWARD ISLAND				
VY2ZMM	**1,099,136**	**1234**	**58**	**66**
QUEBEC				
VE2OJ	**202,895**	**598**	**53**	**16**
VE2KDC	37,635	200	37	2
ALBERTA				
VE6JY	**9,750**	**68**	**30**	**0**
CAYMAN ISLANDS				
ZF2LM	**7,592**	**59**	**24**	**2**

ASIA

ASIATIC RUSSIA				
RW9C	**147,430**	**354**	**0**	**46**
JAPAN				
JA3YBK	**17,696**	**76**	**12**	**16**
JAØZRY	8,036	65	9	5
JA4YHX	6,444	49	7	11

EUROPE

AUSTRIA				
OE2LCM	**61,053**	**252**	**0**	**47**
OE1TKW	40,545	137	10	41
OE5OHO	35,003	235	0	29
BELARUS				
EW1WB	**28,770**	**189**	**0**	**30**
BELGIUM				
OT2A	**325,596**	**655**	**24**	**62**
BULGARIA				
LZ8T	**281,634**	**708**	**14**	**59**
CROATIA				
9A5Y	**389,580**	**809**	**21**	**65**
9A7A	334,796	781	16	61
CZECH REPUBLIC				
OK5W	**349,566**	**715**	**21**	**66**
OL5Q	204,476	598	14	54
OL1F	197,442	632	12	51
OL7W	186,921	534	14	55
OK1KZD	144,951	518	8	49
OL1C	114,520	410	9	47
OL2U	92,688	411	2	46
ENGLAND				
MØABC/P	**363,132**	**713**	**31**	**53**
G3LZQ	114,140	311	17	48
G4IIY	1,440	20	1	14
FINLAND				
OH6XX	**156,403**	**564**	**1**	**52**
GERMANY				
DLØXAX	**359,604**	**814**	**21**	**63**
DH1TW	**345,999**	**775**	**23**	**64**
DL2MDZ	204,536	553	14	60
DL7ZZ	200,952	579	10	62
DL1IAO	190,512	526	17	55
DL9YX	158,730	500	11	54
DLØMB	136,344	405	17	52
DKØIW	121,104	443	11	47
DK1MM	102,608	408	2	51
DL4NAC	91,455	265	15	50
DJ9RR	67,320	324	1	44
DKØFFO	63,141	363	1	38
DK7YY	49,350	219	1	46
DKØNS	41,313	176	5	42
DL2MY	40,446	200	2	40
DJ9MH	39,790	176	5	41
DK3QJ	14,310	100	1	29
HUNGARY				
HGØHQ	**417,872**	**821**	**20**	**71**
HG1S	325,401	759	16	63
HG5A	155,868	478	10	52
ITALY				
I5JVA	**612,438**	**937**	**34**	**69**
IK2NCJ	381,076	682	29	65
KALININGRAD				
RW2F	**337,440**	**810**	**16**	**60**
RV2FW	270,400	792	12	53
LITHUANIA				
LY2BW	**200,042**	**653**	**8**	**50**
LY1YK	185,592	621	4	53
LY2MV	140,635	495	3	52
NETHERLANDS				
PA5MW	**400,512**	**817**	**23**	**61**
PA3BAS	203,944	500	19	55
PA5TT	25,461	118	0	41
POLAND				
SP9KTL	**94,860**	**426**	**2**	**43**
SP9KRT	32,634	179	1	36
ROMANIA				
YP8A	**124,320**	**499**	**2**	**46**
YO2KHK	6,880	70	0	20
RUSSIA				
RU1A	**276,316**	**708**	**9**	**65**
RM6A	228,888	621	5	61
RK4UWR	133,540	448	1	54
RW3WWW	39,240	227	0	36
SLOVAKIA				
OM7M	**353,808**	**796**	**19**	**62**
OM3KZA	31,218	192	1	32
SLOVENIA				
S59ABC	**203,728**	**576**	**10**	**58**
SPAIN				
EA1WX	**238,238**	**533**	**23**	**54**
EA5BY	166,796	393	18	56
SWEDEN				
SL3A	**250,668**	**720**	**5**	**61**
SWITZERLAND				
HB9DDO	**68,784**	**272**	**7**	**41**
UKRAINE				
UU7J	**282,796**	**661**	**11**	**65**
UT7L	120,681	439	1	52
YUGOSLAVIA				
YZ7A	**237,448**	**671**	**10**	**57**

OCEANIA

NEW ZEALAND				
ZL6QH	**45,469**	**119**	**35**	**6**

SOUTH AMERICA

BRAZIL				
PY2FUS	**7,958**	**38**	**17**	**6**
FRENCH GUIANA				
FY5KE	**398,880**	**448**	**52**	**38**

CW CHECK LOGS

Thanks to the following stations for their valuable CW Check logs: AAØA, DK5ZX, DL2HRE, DL4CX, DL5KVV, DL7VAF, LA5QC, LY1DF, LZ3AB, OK1FAI, OK1XJ, OL4M, RA3MB, RN3ZZ, SMØXG, UA3ICK, UA6LP, UT8E.

SSB RESULTS

SINGLE OPERATOR

NORTH AMERICA

UNITED STATES

CONNECTICUT				
K1PX*	**114,570**	**769**	**57**	**10**
W1CTN*	52,470	323	51	15
W1CRS*	19,680	176	42	6
MASSACHUSETTS				
W1NA	**337,610**	**887**	**54**	**52**
K1GU	50,350	419	43	10
K5ZD	27,342	94	25	24
W1TW/QRP	**19,505**	**176**	**40**	**7**
K1NU	11,320	113	34	6
W1TO	5,580	64	24	7
MAINE				
AA1UT*	**18,245**	**203**	**39**	**2**
AB1R	8,481	115	30	3
N1LW*	7,092	84	33	3
W1CEK/QRP	**6,848**	**78**	**32**	**0**
NS1Z*	5,430	80	29	1
N1YIS*	3,322	71	22	0
NEW HAMPSHIRE				
KB1EAX*	**124,488**	**669**	**54**	**22**
WA1Z*	29,468	232	42	11
RHODE ISLAND				
K2MN*	**4,600**	**81**	**24**	**1**
VERMONT				
K1LPS*	**12,126**	**125**	**39**	**4**
NEW JERSEY				
N2ED	**16,652**	**156**	**41**	**5**
K1JT*	**16,598**	**171**	**37**	**6**
WA4ATJ	14,233	132	35	8
N2NYR	10,560	140	29	3
K2AF	6,545	76	30	5
N2TTT*	6,270	86	33	0
KE6MT*	2,645	53	23	0
NEW YORK				
NA2M	**58,233**	**422**	**47**	**12**
WA2JQK	**47,502**	**323**	**51**	**12**
N2MTG*	13,356	140	37	5
WB2HJV	5,238	88	27	0
N2LQQ*	1,998	48	18	0
DELAWARE				
NY3C*	**8,711**	**130**	**30**	**1**
MARYLAND				
N3HBX	**169,760**	**876**	**56**	**24**
K2PLF	107,250	699	46	20
W3LL*	**27,270**	**282**	**41**	**4**
N3HXQ	12,996	164	35	1
AD3F*	12,040	160	35	0
N3ND*	8,260	109	34	1
W3CP*	7,192	108	28	1
N3WKE*	5,850	90	30	0
K3DSP*	4,992	95	24	0
KF3BN*	1,620	45	18	0
PENNSYLVANIA				
W3TS	**200,036**	**940**	**59**	**27**
W3BGN	**130,248**	**584**	**54**	**27**
K3NM	120,975	671	56	19
W3GH	66,792	398	52	17
AA3LX*	**46,797**	**376**	**54**	**3**
W3IZ	23,394	248	37	5
NA3V*	16,160	181	35	5
N3NS	12,408	170	31	2
W3MF*	11,088	139	34	2
W3AP	9,828	98	31	8
AD8J*	7,530	111	27	3
K3SV*	3,504	70	24	0
K3IPK	2,880	54	24	0
ALABAMA				
K4WI*	**48,492**	**412**	**46**	**8**
W4NTI	23,568	232	46	2
AF4OD*	9,799	102	37	4
FLORIDA				
AA4MM	**49,446**	**301**	**52**	**15**
K9HUY	12,556	120	35	8
N4EK*	4,676	73	24	4
KD4BRJ*	1,738	35	20	2
KQ4YY/QRP	240	12	10	0
W8IM*	84	7	6	0
GEORGIA				
WA4TII	**84,152**	**556**	**50**	**17**
N4NX	66,912	404	59	18
W4BCV*	**30,660**	**221**	**53**	**7**
K4BAI	18,522	207	37	5
N4XMX	7,328	110	32	0
N4WD*	6,293	94	29	2
WB6BWZ/QRP	**1,292**	**38**	**17**	**0**
NORTH CAROLINA				
NX9T	**105,322**	**690**	**52**	**16**
AA4NC	41,724	299	42	15
KE4SCY	39,195	234	50	17
KO7X	36,774	211	49	5
K3KO	19,404	174	44	5
K4CIA*	3,402	57	26	1
N4CW*	2,834	50	26	0
SOUTH CAROLINA				
N4UK	**229,957**	**1011**	**57**	**34**
TENNESSEE				
K4JNY	**141,450**	**824**	**55**	**20**
W4PV	62,755	538	51	4
KØEJ	40,560	396	44	4
WA4JA*	**37,465**	**280**	**50**	**9**
K4OOO*	10,920	123	37	3
W4OGG	5,307	90	28	1
W4TDB*	3,186	53	26	1
VIRGINIA				
W4MYA	**298,312**	**1168**	**58**	**40**
AC8Y	20,328	210	41	3
N4MM*	**17,576**	**133**	**42**	**10**
W4YE*	7,557	110	33	0
W2YE*	6,732	79	25	8
K3MZ*	1,106	35	14	0
ARKANSAS				
W5MK*	**1,541**	**32**	**22**	**1**
NEW MEXICO				
K5TA	**44,240**	**359**	**49**	**7**
OKLAHOMA				
K5PX*	**19,364**	**188**	**44**	**3**
TEXAS				
W5PR	**110,808**	**650**	**52**	**20**
K5RX	71,325	352	53	22
K5NZ	41,216	327	47	9
K5OE*	**10,138**	**128**	**35**	**2**
KF5YZ*	9,030	93	40	3
N5AFV*	6,160	79	31	4
W5GAI*	3,105	53	26	1
AD5Q	1,932	25	17	6
CALIFORNIA				
K8PO	**31,467**	**275**	**42**	**9**
N6RO	27,417	209	51	6
N6NF*	**15,928**	**160**	**41**	**3**
K6SE*	12,232	124	41	3
WA6CDR*	10,578	111	41	2
WA6FGV*	10,249	128	35	2
K1LU	5,610	76	31	2
K6LRN*	1,290	40	14	1
N6LL	975	33	12	1
KU6T*	952	34	14	0
KE6QR*	648	27	12	0
AA6EE*	308	17	9	0
K6III/QRP	288	16	9	0
ARIZONA				
NF7E	**34,008**	**306**	**50**	**2**
K6TIM	17,689	164	46	3
W7UPF*	**9,576**	**105**	**38**	**4**
W7ZMD*	6,798	94	30	3
W7MC*	5,518	86	30	1
W7YS	3,456	61	26	1
IDAHO				
KG7H	**32,945**	**271**	**51**	**4**
MONTANA				
KS7T	**21,479**	**200**	**45**	**2**
KK7DP	21,168	185	46	3
NEVADA				
N7NTN	**21,900**	**201**	**45**	**5**
OREGON				
W7JXU*	**7,740**	**94**	**33**	**3**
WASHINGTON				
K7OX	**33,550**	**261**	**50**	**5**
N7LOX*	**9,975**	**117**	**32**	**3**
W7SAW*	6,090	78	33	2
WYOMING				
AC7NO*	**13,684**	**142**	**43**	**1**
WC7S*	7,955	97	36	1
MICHIGAN				
N8EA	**67,830**	**396**	**53**	**17**
W8DCQ	31,304	257	51	5
K8GVK*	**11,322**	**153**	**32**	**2**
WB8NXG*	7,293	103	32	1
K8CV/QRP	**4,844**	**79**	**28**	**0**
W8ROS*	2,925	51	24	1
OHIO				
ND8DX	**177,744**	**895**	**58**	**26**
N8KM	49,880	372	46	12
N8OH*	**21,756**	**235**	**39**	**3**
WB8TCT*	19,782	231	41	1
NA8W*	13,650	142	36	6
N8PY*	11,560	128	35	5
KB8JVH*	7,872	114	30	2
K8KTY*	3,741	60	29	0
KW8W*	3,190	68	22	0
N8LGP*	3,080	45	26	2
AF8C*	1,258	34	17	0
WEST VIRGINIA				
W5GFR	**92,217**	**708**	**50**	**9**
K2UOP	81,654	595	52	10
ILLINOIS				
WB9Z	**295,391**	**1406**	**58**	**31**
K9NR	**162,564**	**944**	**57**	**19**
N2BJ	93,102	740	53	6
KX9DX	62,055	448	54	9
KB9CRY*	**40,095**	**326**	**48**	**7**
K9IJ*	22,032	194	47	4
W9YS*	17,688	183	39	5
W9TMW*	11,223	113	38	5
W9SE	10,340	100	39	5
W9YYG	7,525	97	33	2
KB9LFA*	4,843	76	28	1
W9LYA*	4,266	73	27	0
INDIANA				
K8LEE	**90,036**	**680**	**49**	**12**
K9SG	59,943	533	48	5
W9IU	57,708	406	52	11
KC9FC	13,287	144	41	2
K9BG*	**10,374**	**119**	**33**	**5**
WB9NOO*	9,144	115	35	1
WT9U*	6,600	101	30	0
KJ9C	1,660	34	18	2
WISCONSIN				
WA9TZE	**61,774**	**379**	**55**	**12**
WA1UJU*	**28,435**	**286**	**45**	**2**
WI9M*	13,338	164	38	0
COLORADO				
KØDU	**108,674**	**727**	**54**	**13**
KØUK*	**39,270**	**315**	**51**	**4**
KØGAS	18,540	188	41	4
WØETT*	14,994	138	46	3
KKØQ/QRP	**3,750**	**61**	**30**	**0**
IOWA				
WØETC/QRP	**37,128**	**336**	**48**	**3**
KANSAS				
KBØMZG*	**27,897**	**251**	**48**	**5**
KØBJ*	5,511	72	30	3
MINNESOTA				
KTØR	**69,564**	**511**	**53**	**9**
N7AIN*	**68,794**	**538**	**54**	**5**
ACØW*	68,280	515	53	7
KRØB/QRP	**32,913**	**285**	**50**	**3**
K4IU	30,415	245	49	6
WØSEI/QRP	18,326	172	47	2
KIØF*	7,582	98	32	2
WØHW*	2,688	53	23	1
MISSOURI				
KØJPL	**64,172**	**478**	**53**	**8**
NORTH DAKOTA				
NTØV	**16,800**	**146**	**43**	**5**

CANADA

NEW BRUNSWICK				
VE9DXR*	**3,111**	**39**	**17**	**0**
QUEBEC				
VE2DC*	**33,390**	**162**	**39**	**3**
VE2AWR*	2,880	35	18	0
VE2OWL*	1,904	29	14	0
ONTARIO				
VA3KA	**314,853**	**711**	**57**	**30**
VE3PN	**293,948**	**672**	**56**	**30**
VA3RU*	**150,280**	**472**	**53**	**12**
VY2MGY/QRP	**57,319**	**275**	**40**	**3**
VE3KP*	37,488	173	38	6
VA3TTT/QRP	14,123	101	28	1
VA3IX*	7,980	79	21	0
VE3MOW*	7,550	64	25	0
VA3DZ	3,960	47	18	0
VE3RCN*	3,900	42	20	0
MANITOBA				
VE4KR*	**25,427**	**112**	**46**	**1**
SASKATCHEWAN				
VE5SF*	**19,190**	**104**	**35**	**3**
ALBERTA				
VE6JY	**35,712**	**156**	**46**	**2**
VE6BF*	2,156	32	14	0
ALASKA				
KL7Y	**6,528**	**78**	**15**	**2**
BELIZE				
V31AH*	**65,340**	**235**	**39**	**15**
CAYMAN ISLANDS				
ZF2AH*	**100,352**	**352**	**44**	**12**
COCOS ISLAND				
N7DF/TI9	**3,410**	**31**	**18**	**4**
PUERTO RICO				
WP4LNY*	14	2	0	2
ST. KITTS				
V47KP	**252,489**	**487**	**54**	**41**

AFRICA

CANARY ISLANDS				
EA8BH	**200,304**	**260**	**36**	**42**

ASIA

ASIATIC RUSSIA				
UA9ZZ	**42,670**	**142**	**0**	**34**
UA9CL*	**18,420**	**65**	**0**	**30**
RK9CZO	15,475	65	0	25
UA9LAU/QRP	528	13	0	6
ISRAEL				
4X1IM	**9,600**	**42**	**1**	**23**
KAZAKH REPUBLIC				
UN7CR	**22,260**	**88**	**0**	**28**
KYRGYZSTAN				
EX8AA*	**10,355**	**64**	**0**	**19**
TURKEY				
TA3J*	**255,765**	**453**	**8**	**51**

EUROPE

ALAND ISLANDS				
OHØNL	**140,766**	**452**	**6**	**52**

AUSTRIA

OE5JKL*	7,625	60	0	25

AZORES ISLANDS

CU2AF*	144,342	276	33	33

BALEARIC ISLANDS

EA6SX	192,816	412	2	51

BELARUS

EU1AZ*	46,550	229	0	38

BOSNIA-HERZEGOVINA

T95A*	3,705	38	0	19

BULGARIA

LZ7X*	23,629	119	1	38
LZ2UZ*	6,408	53	0	24

CZECH REPUBLIC

OK2WM	116,694	421	6	48
OK1TP	66,664	244	6	46
OK2INW*	35,568	190	1	37
OK2SS*	26,562	139	2	36
OK2BEN*	16,632	103	1	32
OK1JN*	15,469	102	0	31
OK1DOL*	737	14	0	11

DENMARK

OZ1HXQ	78,846	293	8	43

ENGLAND

G4VGO*	76,725	264	10	45
G4WPD*	27,965	105	11	36
G3VAO*	24,219	128	2	37
GØTMN*	368	11	0	8
GØHBC*	14	2	0	2

FAROE ISLANDS

OY9JD	135,240	446	10	46

FINLAND

OH1MA	115,864	381	5	51
OH6NIO*	22,820	131	0	35

FRANCE

F6CWA	13,940	75	4	30

GERMANY

DK2OY	82,656	296	13	43
DL1KZA*	52,290	271	2	40
DL9NDS*	30,094	156	4	37
DLØSHZ*	13,380	101	0	30
DL7NFK*	13,237	91	0	31
DJ9MH*	11,517	75	1	32
DL2NBU	10,292	68	1	30
DL7VPO*	5,925	51	0	25

GREECE

SV8CS	259,275	647	18	57

HUNGARY

HA1CW*	9,153	67	1	26

ITALY

IV3OWC	132,742	418	13	49
IK8HCG*	37,716	186	3	39
IC8JAH*	34,320	164	3	41
IKØLNN*	11,220	80	0	30
I2SVA	10,410	72	0	30
IK4WVW*	9,045	72	0	27
IK3NWX*	7,080	59	0	24

KALININGRAD

UA2FZ	27,504	147	1	35

LATVIA

YL1ZJ*	16,450	90	0	35

LITHUANIA

LY2FY	137,700	430	7	53
LY7Z	28,474	110	6	40
LY2OU*	23,680	149	0	32
LY2FN*	8,664	72	0	24
LY3BA*	7,800	60	0	25

NETHERLANDS

PAØIJM*	23,834	140	1	33

NORWAY

LA6WEA	58,112	264	2	46
LA6EIA	54,653	244	2	41

POLAND

SP6IHE*	44,352	215	1	41
SP4XQN*	43,829	208	0	41
SQ4MP*	31,228	174	0	37
SP9BQJ*	30,709	150	1	40
SP5LCC*	17,675	102	0	35
SQ7BCG*	12,128	79	0	32
SP3OL*	7,245	59	0	25
SP6LUV*	5,586	55	0	21
SP3CUG*	5,382	50	0	23

PORTUGAL

CT1AVR*	1,128	19	0	12

ROMANIA

YO2BEH	15,200	92	2	30
YO3III*	5,720	51	0	22
YO9FYP*	1,320	21	0	12

RUSSIA

RU6LA	106,314	348	2	56
RV4AM	46,704	215	1	41
RU3AT*	16,830	102	0	33
RU3DM*	13,311	98	0	29
RU3ST	10,140	79	0	26
RW4PL	8,160	50	0	32
RA3UAG*	7,616	57	0	28
RK6BZ	7,202	57	0	26
UA3LHL/QRP	5,170	47	0	22
UA4RC	3,720	34	0	20
RX3AEX	3,672	40	0	18
UA4FER	1,232	31	0	8
RA3WNS/QRP	783	21	0	9

SCOTLAND

GMØEGI*	8,154	62	0	27

SICILY

IT9VCE	32,745	170	1	36

SLOVAKIA

OM7CW	37,740	202	1	36
OM8DD*	17,544	104	0	34
OM4JD	15,624	101	0	31

SLOVENIA

S57M	168,840	463	13	54
S57DX	117,425	412	6	49
S57IIO/QRP	32,300	170	1	37

SPAIN

EA1DDO	96,327	262	21	42
EA1GA*	38,592	137	15	33
EA1FCI*	31,590	119	13	32
EA5AT	31,488	157	4	37
EA3CCN	25,625	122	8	33
EA5GCT	18,048	121	2	30
EA3EGB*	11,552	75	1	31
EA3EJI	8,816	62	1	28
EA4ABE*	4,531	41	1	22
EA3QA*	3,780	35	0	21
EA3MR*	2,888	33	0	19
EA3CZM*	1,288	19	0	14
EA1SH*	1,027	20	0	13
EA5BY	392	10	0	8

SWEDEN

SM6WQB	21,312	114	1	36
SK4UW*	3,528	41	0	18
SM4HEJ*	3,234	32	0	21

UKRAINE

UX5NQ*	94,554	350	3	51
UR7M	62,802	234	4	50
UR5ASB	33,669	120	1	42
UR5ETN	17,136	96	0	34
US8IZM	15,768	112	0	27
UR7EM*	3,618	43	0	18
UT5UBJ/QRP	2,888	33	0	19

WALES

GW4BLE	8,250	55	0	30

YUGOSLAVIA

YU1YV*	95,625	357	6	45
YU1JW*	75,450	292	7	43
YU1ZZ*	53,040	213	5	43
YU1RA*	16,461	107	0	31

SOUTH AMERICA

ARUBA

P4ØA	43,280	112	33	7

ARGENTINA

LU2DVI/H	1,485	19	3	12
LU6FFL	873	14	2	7

BRAZIL

PP5JR	19,800	73	18	18
PY3CEJ	2,592	28	3	13
PV8DX*	392	9	1	6
PS8DX	128	4	0	4
PY3FOX	72	5	0	3
PY3MM	6	3	0	1

VENEZUELA

YV1CP	48,363	106	32	15
YV2IF	37,842	94	29	13

MULTI-OPERATOR

NORTH AMERICA

UNITED STATES

CONNECTICUT

NZ1U	68,985	339	48	25

MASSACHUSETTS

KK1DX	12,384	108	32	11
NF1A	6,464	81	28	4
WO1N	4,816	83	28	0

NEW JERSEY

W2MF	164,917	699	57	32
K2PS	37,229	254	43	16
N2VW	16,422	138	36	10
K2SB	8,316	99	32	4
K2FL	5,544	86	27	1

DISTRICT OF COLUMBIA

4U1WB	3,192	76	21	0

DELAWARE

AA1K	112,654	525	51	28

MARYLAND

K3DI	81,000	426	54	21
N3AM	17,808	152	39	9
K3IXD	12,903	182	33	0
K3SKE	11,868	102	37	9
W2GG	9,546	106	29	8
W3HVQ	4,230	53	24	6

PENNSYLVANIA

WY3T	156,072	767	57	27
NE3F	135,090	697	54	25
K3WW	66,236	479	46	12
W3FV	41,477	268	42	17
K3OO	32,175	217	38	17
N3DL	24,986	106	39	23
W8FJ	20,142	119	35	19
K3OOO	14,640	158	34	6
W3FVT	9,108	132	32	1
N3MX	7,808	106	29	3

ALABAMA

AG4MX	52,638	374	51	11
N4ION	23,436	199	48	6

NORTH CAROLINA

K4YFR	27,364	245	40	8

SOUTH CAROLINA

AA4V	116,440	574	52	30

TENNESSEE

K4BP	13,428	173	32	4

VIRGINIA

W4HJ	17,680	248	33	1
K4YT	10,218	112	34	5

ARKANSAS

K5BAT	40,356	310	50	9

CALIFORNIA

W6YRA	16,910	202	36	2

ARIZONA

N7GP	88,308	602	54	12
N7KQ	46,726	343	54	7
N7PWZ	28,958	238	50	4

OHIO

N8TR	230,760	1054	58	32

WEST VIRGINIA

K8OQL	21,482	214	43	3

ILLINOIS

W9LYN	17,572	179	44	2

INDIANA

WB9CIF	17,888	144	45	7

IOWA

KØXD	9,842	118	35	3

KANSAS

WØNO	132,198	904	54	12
NØKOV	82,276	544	55	12

MISSOURI

KØLIR	101,595	708	55	10
AAØA	6,148	103	29	0

CANADA

QUEBEC

VE2UMS	127,740	509	47	5

ONTARIO

VE3DC	208,256	670	54	10

BRITISH COLUMBIA

VE7OSO	8,928	60	30	1

MEXICO

XE1RCS	299,840	742	53	27

ASIA

ASIATIC RUSSIA

RZ9AYA	178,128	581	0	36

EUROPE

AUSTRIA

OE1TKW	15,645	87	2	33

BULGARIA

LZ8T	140,302	434	8	51

CZECH REPUBLIC

OL5T	78,400	310	6	43

DENMARK

OZ5ESB	86,867	308	9	44

ENGLAND

G3UEG	163,584	410	20	51
MØABC	89,811	370	7	44

FRANCE

F5PYJ	50,985	218	9	36

GERMANY

DL2DBH	81,486	308	9	45
DK1MM	18,292	112	1	33
DH1TW	13,830	89	0	30

HUNGARY

HG1S	142,042	428	9	53
HA5KHC/7	32,409	167	1	38

IRELAND

EI7M	235,512	543	28	44

ITALY

I2OKW	33,440	179	1	39

LITHUANIA

LY7A	163,464	646	2	47

POLAND

SN8V	9,660	63	0	30

RUSSIA

RW3WWW	14,670	102	0	30

SLOVAKIA

OM3KZA	16,137	98	0	33

SPAIN

EA4URE	38,592	147	13	35
EA3URE	24,383	136	4	33
EA5EG	17,816	109	4	30

SWITZERLAND

HB9FBO	194,580	507	18	51

UKRAINE

UU7J	306,878	1074	7	67
UZ4E	47,880	229	1	41
UX8IXX	12,376	84	0	28

YUGOSLAVIA

4O6A	192,558	520	15	52
YZ7W	109,620	338	11	49
YU7AR	106,095	366	7	48

SOUTH AMERICA

BRAZIL

PY3MHZ	4	2	0	1

SSB CHECK LOGS

Thanks to the following stations for their valuable SSB Check logs: CT1ALF, DL1DXX, EA7CA, K4JRB, RN3ZZ, RU3DG, RZ9YN, VE3HMK/SWL, W4ROB, YO8AII.

CQ Index 2002

ANTENNAS
Antennas On The Rocks? (O'Dell, WB2D), Nov., p. 66
Basic Antenna Theory Simplified, Ingram (K4TWJ), Sep., p. 56
Cleaning Up The Neighborhood (Another J-Pole Story) (Murphy, KB6LZW), Jul., p. 38
Effective, Cheap, Portable Emergency Antenna for 2m/70cm, An (O'Dell, WB2D), Jul. p. 77
Effective Portable Antennas for 75/80 Meters (Harwood, K4VWK), Nov., p. 48
ES2B (Electricity Shortened Two-Band) Dipole, The (Murphy, VE3ERP), Jul., p. 56
High Sierra HS-1500 MkII Antenna, *CQ* Reviews (West, WB6NOA), Jul., p. 44
It's Alive! (Augsburger, WR0U, & Wagner, WB0MCO), Oct., p. 36
Mobile Antennas for 2 Meter Single Sideband (West, WB6NOA), Jun., p. 22
Portable and Survival-Ready Antennas (Ingram, K4TWJ), Jul., p. 66
PY3CEJ's "Underwater" 160 Meter Vertical (Coro, CO2KK), Jan., p. 78
Straight Talk on Reduced-Size Antennas: A Basic Study (Ingram, K4TWJ), Nov., p. 62
Tower Considerations When Using Side Arms (Weber, K5IU), Jul., p. 11
TVB: A Two-Sloping-Wires-at-an-Angle Homebrew Signal Booster (Coro, CO2KK), Sep., p. 62
Two Wires Will Do It! (Coro, CO2KK), Mar., p. 87
W1ZY 4-3-2 Array, The (Desjardins, W1ZY), Nov., p. 28
What on Earth? (grounding systems) (Harman, VK6APH), Jan., p. 36

BEGINNER'S INFORMATION
Contesting for Newcomers (Dorr, K1AR), Dec., p. 97
Ground Zero Plus Ten Years (O'Dell, WB2D), Aug., p. 54
Ham Radio—A Separate Peace (O'Dell, WB2D), Jan., p. 68
Ham's Sacred Space, A (O'Dell, WB2D), Sep., p. 77
It's Not A Hamfest (Ham Radio University) (Ortiz, K2DO), Jun., p. 32
Lightning Protection (O'Dell, WB2D), Mar., p. 70
Long Cold Winter Nights—The Low Bands (O'Dell, WB2D), Feb., p. 67
Repeaters: What Goes on Inside "the Machine" (O'Dell, WB2D), Apr., p. 70
Rules and the "Radio Police" (O'Dell, WB2D), Oct., p. 70
Simplex—The Other FM (O'Dell, WB2D), Dec., p. 74
Virtual Small Town (using repeaters responsibly), A (O'Dell, WB2D), Jun., p. 62
Your First Mobile Installation (O'Dell, WB2D), May, p. 50

CLASSIC RADIO GEAR & NOSTALGIA
An OT Remembers—Starting Out with a Crystal Detector (Shrader, W6BNB), Jan., p. 22
Batteryless—Ted Rogers and the Invention of the AC Vacuum Tube (McElroy, VE3PKD), Jan., p. 16
Confessions of a Heathkit Collector (Bryce, WB8VGE), Jan., p. 11
Giving Radio Its Voice—Creating Radiotelephony (Thomas, W8QYR), Dec., p. 11
Glass Menagerie (classic tubes), The (Veras, N4QB), Feb., p. 90
Heyday of CW at Sea, Part I (Shrader, W6BNB), Mar., p. 34
Heyday of CW at Sea, Part II (Shrader, W6BNB), Apr., p. 36
Look Back in Time—Radio Row, A (Ross, K2MGA), Sep., p. 26
Military Manpack Radios (Nock, G4BXD), Oct., p. 48
Mobile Operation in the '50s (Veras, N4QB), May, p. 54
"Radio Row," Remembering Gross Radio (Veras, N4QB), Nov., p. 86
Vintage Gear and Its History—Dayton 2002 (Veras, N4QB), Aug., p. 70

COMPUTERS & INTERNET
Computers: Why Bother? (Rotolo, N2IRZ), Dec., p. 88
Electronic Publications—Saving Space (Rotolo, N2IRZ), Jun., p. 38
I-Link: A Marriage Between Radio and the Internet (Millner, WB2REM), Mar., p. 30
Learning the Computer Code (Rotolo, N2IRZ), Sep., pg. 86
PDAs—Fertile Ground for Amateur Experimentation (Rotolo, N2IRZ), Mar., p. 80

CONSTRUCTION
Add Scanning to Converted CB Rigs (Spies, WB9YBM), Mar., p. 47
Build a Beep Box (Metzger, K8JWR), Oct., p. 22
Build Your Own "Vintage" Radios (Homoly, W0RPC), Dec., p. 28
Crystal Showcase 2002, Part I (Ingram, K4TWJ), Aug., p. 78
Crystal Showcase 2002, Part II (Ingram, K4TWJ), Sep., p. 65
N0GSG Portable Radio Direction Finder, The (Wheeler, N0GSG), Jun., p. 44
Single-IC Crystal Tester and QRP Transmitter, The (Spies, WB9YBM), Oct., p. 24
Three Quick-Brew Projects (Ingram, K4TWJ), Aug., p. 58

CONTESTS & AWARDS
160 Meter Contests, Results 2002 CQ WW DX (Thompson, K4JRB), Dec., p. 20
160 Meter DX Contests Rules, 2003 CQ WW, Nov., p. 97
2002 Inductees CQ Amateur Radio, Contest, DX Halls of Fame, Jul., p. 34
Are Companies Hurting Contesting? (Dorr, K1AR), Sep., p. 92
Contesting for Newcomers (Dorr, K1AR), Dec., p. 97
Cost of Wallpaper, The (Melinosky, K1BV), Apr., pg. 89
County Lines—Again (Melinosky, K1BV), Jul., p. 102
CQ Contest Survey Results (Dorr (K1AR), Nov., p. 103
CQ National Foxhunting Weekend 2001 Results (Moell, K0OV), May, p. 30
CQ National Foxhunting Weekend Rules 2002 (Moell, K0OV), May, p. 30
General Guidelines for Applying for Awards (Blumhardt, K5RT), Jul., p. 54
Generating Interest in Your Awards Program (Melinosky, K1BV), Mar., p. 102
RTTY DX Contest, Results 2001 CQ WW (Vinson, W6OTC, & Schneider, G0AZT), May, p. 11
RTTY DX Contest Rules, The 2002 CQ/RJ, Jul., p. 92
VHF Contest, Results 2001 CQ WW (Zimmerman, W3ZZ), Jun., p. 14
VHF Contest Results Additions/Corrections, 2001 CQ WW, Nov., p. 107
VHF Contest Rules, 2002 CQ WW, Jun., p. 85
WPX Contest Rules, The 2002 CQ WW, Jan., p. 44
WPX Contest Rules, The 2003 CQ WW, Dec., p. 36
WPX CW Contest, Results 2001 CQ WW (Bolia, N8BJQ), Apr., p. 11
WPX CW Contest All-Time Records (Bolia, N8BJQ), Apr., p. 102
WPX RTTY Contest, Results 2002 CQ/RJ (Vinson, W6OTC, & Schneider, G0AZT), Jul., p. 22
WPX RTTY Contest Results Additions/Corrections, 2002 CQ/RJ, Nov., p. 107
WPX RTTY Contest Rules, 2002 CQ/RJ WW, Jan., p. 104
WPX SSB Contest, Results 2001 CQ WW (Bolia, N8BJQ), Feb., p. 11
WPX SSB Contest All-Time Records (Bolia, N8BJQ), Feb., p. 19
WRTC 2002—They Did It Again!, Dorr (K1AR), Oct pg. 95
WW DX Contest All-Time Records (Capossela, K6SSS), Oct., p. 34
WW DX Contest Rules, The 2002 CQ, Sep, p. 102
WW DX CW Contest, Results 2001 CQ (Cox, K3EST), Sep., p. 18
WW DX SSB Contest, Results 2001 CQ (Cox, K3EST), Aug., p. 16
WW DX SSB & CW Contest Results Additions/Corrections, 2001 CQ, Nov., p. 107
XT2DX Multi-Multi in the 2001 CQ WW CW (Hinson, G4IFB), Sep., p. 11

DX & OPERATING
Contesting for Non-Contesters (Konior, K4RFK), Aug., p. 24
County Hunting on the Road (Reinhardt, AA6JR), May, p. 24
Creating the DXLab Suite (Bernstein, AA6YQ), Nov., p. 20
Getting the DX (Smith, N4AA), Apr., p. 82
Golden Triangle of Contesting in Poland, The (Kotowski, SM0JHF), Apr., p. 29
Ham Radio Voyage of Discovery, A (Leo, W7LR), May, p. 18
HF Pack'n in the USA, Part I (Ingram, K4TWJ), Oct., p. 76
HF Pack'n in the USA, Part II (Ingram, K4TWJ), Nov., p. 80
How To Win "The Contest" (Kotowski, SM0JHF/D44CF), Aug., p. 11
Journey to Mongolia (Claerbout, K4ZW), Mar., p. 11
Most Wanted on the Air, The (Smith, N4AA), Mar., p. 90
North Korea, P5 and a Report from Kabul (Smith, N4AA), Jan., p. 97
Old Days and The New, The (Smith, N4AA), Dec., p. 93
Operating Procedures (Smith, N4AA), May, p. 87
Pride in Operating (Smith, N4AA), Aug., p. 86
QRP DXing...Revisited, by "Uncle DX" (Smith, N4AA), Oct., p. 91
QSLing and Donations (Smith, N4AA), Jun., p. 91
Team Dominica—J75J (Kerous, W9AAZ), Jul., p. 49
WARC'n USA: Eyeing These Bands on a Budget (Ingram, K4TWJ), Jan., p. 72
Where's My QSL Card? (Smith, N4AA), Sep., p. 88

HUMOR
Impact of Solar Storms on World Economies and the Birth of A New Commodities Trading Technique (Prof. Heisseluft), Apr., p. 32

KEYS, HAND CW
Keys 2002, Part I (Ingram, K4TWJ), Mar., p. 60
Keys 2002, Part II (Ingram, K4TWJ), Apr., p. 56
Telegraphy and the Double-Speed Key (Shrader, W6BNB), Dec., p. 16

LEGAL
Amateur Radio—What You Need to Know, Part I (Maia, W5YI), Sep., p. 32
Amateur Radio—What You Need to Know, Part II (Maia, W5YI), Oct., p. 54
Amateur Radio—What You Need to Know, Part III (Maia, W5YI), Nov., p. 74
ARRL Panel Recommends Phone Band Expansion; FCC Shuts Door on Extending PRB-1 to Condos (Maia, W5YI), Mar., p. 54
ARRL Petitions FCC to Eliminate Novice CW Bands and Expand Phone Segments (Maia, W5YI), Jun., p. 80
Europe Weighs in on Amateur Radio Issues before WRC-2003 (Maia, W5YI), May, p.58
FCC Proposes to Allocate New Bands to Amateur Service (Maia, W5YI), Aug., p. 44

IARU Calls for End to Morse Testing (Maia, W5YI), Jan., p. 52
Interview with ARRL Technical Relations Manager Paul Rinaldo, W4RI (Maia, W5YI), Apr., p. 24
New Amateur Radio Bands Proposed by FCC Run Into Opposition (Maia, W5YI), Dec., p. 40
Question Pool Committee Proposes New Technician Class Outline (Maia, W5YI), Jul., p. 83
What are We Regulating and Why? (Maia, W5YI), Feb., p. 62

MISCELLANEOUS
Accessories for the Yaesu FT-817 (West, WB6NOA), Feb., p. 34
CO2KK's Visit to the U.S.—Miracles Ham Radio Can Accomplish (Coro, CO2KK), May, p. 36
CQ Amateur Radio Hall of Fame, 2002 Nominations Open for, Jan., p. 55
Giving Radio Its Voice (Thomas, W8QYR), Dec., p. 11
Ham Pride: True Tales, Legacies, and Traditions (Ingram, K4TWJ), Jul., p. 80
Hot Stuff at Hamvention® (Moseson, W2VU), Aug., p. 30
Joe Walsh WB6ACU, *CQ* Interviews (Ellison, WB7AWK), Nov., p. 11
Putting Your Own Magic in the Sky (Reinhardt, AA6JR), Apr., p. 76
Survival Radio Challenge Winners and Awards (Ingram, K4TWJ), Jun., p. 50

MOBILE
HF Mobile Mount Warning (West, WB6NOA), Jul., p. 20
Make Your Mobile Mic "Hands Free" (Shrader, W6BNB), Apr., p. 44
Mobile Hamming—A Driving Distraction? (Lynch, N6CL), May, p. 96
Mobile Operation in the '50s, Veras (N4QB), May pg. 54
Mobiling 2002: Ideas and New Goodies (Ingram, K4TWJ), May, p. 44
QRP Mobile (Ingram, K4TWJ), Dec., p. 79

PACKET
Blue Sky Amateur Radio Networking Starting from Scratch (Stroh, N8GNJ), Jun., p. 69
Broadband Wireless Internet Access and Amateur Radio (Stroh, N8GNJ), Apr., p. 62

POWER SUPPLIES & BATTERIES
Automatic Power-Supply/Battery Charger for Your Ham Station (Ferrell, K7PF), Oct., p. 44
Build a Regulated Solid-State Power Supply For Vintage Transmitters (Karasz, WB2GMY), Dec., p. 32
Cells and Battery Packs Simplified (Ingram, K4TWJ), Mar., p. 83
Solar Power The Easy Way (Ingram, K4TWJ), May, p. 80
West Mountain Radio RIGrunner, *CQ* Reviews (West, WB6NOA), Oct., p. 26

PRODUCT REVIEWS
Alinco DJ-596T Handheld With Digital Voice Option (Moseson, W2VU), Jun., p. 26
AOR TDF-370 Multi-Media Terminal (West, WB6NOA), Feb., p. 30
Elecraft K2/100 (Prather, N7NB), Nov., p. 44
Ham Treats for the Holidays (Ingram, K4TWJ), Dec., p. 62
Heil Sound Series of Special Microphones for ICOM Transceivers (Ozimek, N2OZ), Aug., p. 37
High-Frequency Transceivers (West, WB6NOA), Mar., p. 17
High Sierra HS-1500 MkII Antenna (West, WB6NOA), Jul., p. 44
Holiday Goodies Galore (Thurber, W8FX), Dec., p. 68
ICOM IC-756PROII Transceiver (Littlefield, K1BQT), Jul., p. 30
Kenwood TH-F6A FM Tribander (Neubeck, WB2AMU), Nov., p. 34
KMA-1330 HF Log-Periodic Antenna (Bertini, K1ZJH), Jul., p. 36
Manufacturer Previews at Charlotte Hamfest (Moseson, W2VU), May, p. 79
RadioShack HTX-420 2Meter/440 MHz Handheld (West, WB6NOA), Sep. p. 36
Tuned, Tested, and Great (accessories) (West, WB6NOA), Mar., p. 44
West Mountain Radio RIGblaster and RIGblaster Plus (Moseson, W2VU), Jan., p. 30
West Mountain Radio RIGrunner (West, WB6NOA), Oct., p. 26
Win-EQF Logging Program for Windows® (McCarthy, AAØA), Jul., p. 60

PROPAGATION
Aurora Season Begins (Hood, NW7US), Sep., p. 97
CME Shock Wave Starts Off CQ WW CW 2001 (Hood, NW7US), Feb., p. 103
CMEs—What are They? (Hood, NW7US), May, p. 101
Cycle 23 is (Not) Dying (Hood, NW7US), Apr., p. 97
Cycle 23 Surprise Turnaround (Hood, NW7US), Mar., p. 105
Equinoctial and Diurnal Path Switching, Part I (Ireland, VK6VZ, Bazley, VK6HD, & Brown, NM7M) Feb., p. 22
Equinoctial and Diurnal Path Switching, Part II (Ireland, VK6VZ, Bazley, VK6HD, & Brown, NM7M), Mar., p. 24
Geophysical Alerts (Hood, NW7US), Aug., p. 97
High to Above Normal Conditions Predicted for 2002 CQ WW DX CW Contest (Hood, NW7US), Nov., p. 108
More Normal Conditions Predicted for 2002 CQ WW DX SSB Contest (Hood, NW7US), Oct., p. 104
Solar Flares—What are They? (Hood, NW7US), Jul., p. 109
Sunspots—What are Those Spots on the Sun? (Hood, NW7US), Jun., p. 107
Tale of Three Continents (Wagenan, K5MAT), Feb., p. 39
Transequatorial Propagation (Lynch, N6CL), Dec., p. 84

PUBLIC SERVICE
Being Ready When the Call Comes (Josuweit, WA3PZO), Sep., p. 51
Do You Have "Hazard Amnesia"? (Josuweit, WA3PZO), Jun., p. 77
Franklin Institute Station Silent After 50 Years (Josuweit, WA3PZO), Oct. p. 64
Homeland Security: Will You Be Ready if Needed? (Josuweit, WA3PZO), Feb., p. 44
Internet Linking Provides Public-Service Opportunity (Josuweit, WA3PZO), Aug., p. 48
Looking Back at that Day in September (Josuweit, WA3PZO), Jul., p. 70
Passing and Receiving Messages (Josuweit, WA3PZO), May, p. 64
President Bush Praises Hams, Calls for More Volunteering (Josuweit, WA3PZO), Apr., p. 18
Public Service, A Youthful Event (Josuweit, WA3PZO), Nov., p. 58
Saving Lives (and having fun) with WIRES® (Margelli, K7JA), Jun., p. 11
Sept. 11th: Hams Respond in D.C. and PA (Josuweit, WA3PZO), Jan., p. 62
Sept. 11th: Would Listening Have Made A Difference? (Reinhardt, AA6JR), Jan., p. 66
Storms, Memories, and MARS (Josuweit, WA3PZO), Dec., p 54.
Survival Radio Challenge Update (Ingram, K4TWJ), Feb., p. 50
Touch of Home for the Holidays, A (Josuweit, WA3PZO), Mar., p. 66

QRP
Build a Beep Box (Metzger, K8JWR), Oct., p. 22
Build 'em Notes and FT-817 Tips (Ingram, K4TWJ), Apr., p. 78
Foxes, Micro Rigs, and More (Ingram, K4TWJ), Jun., p. 96
FT-817 and QRP-Related Treats (Ingram, K4TWJ), Oct., p. 60
Going On a Family Vacation? Don't Forget the Rig! (DeLuca, AA2VG), Jan., p. 48
Musings on an Experiment in QRP (Locher, W9KNI), Oct., p. 11
Neat Treats for Light Travelers (Ingram, K4TWJ), Feb., p. 77
Poor Man's Battery Supply and Portable Antenna for the FT-817 (Blalock, WN4BML), Oct., p. 14
QRP Mobile (Ingram, K4TWJ), Dec., p. 79
QRP Toolbox, A (Hart, AD1B), Oct., p. 18
Single-IC Crystal Tester and QRP Transmitter (Spies, WB9YBM), Oct., p. 24
Three Quick-Brew Projects (Ingram, K4TWJ), Aug., p. 58

SATELLITES/SPACE
AO-7 Comes Back to Life; AMSAT-DL Plans to Go to Mars (Chien, KC4YER) Oct., p. 84
FM vs. SSB (Chien, KC4YER), Aug., p. 73
New Ham Antennas for the Space Station, Plus a New All-Ham Crew (Chien, KC4YER), Feb., p. 58
Pirates from Space on the Ham Band (Chien, KC4YER), Apr., p. 48
Security Concerns Threaten ARISS? (Chien, KC4YER), Jun., p. 66

SOFTWARE & COMPUTERS
Creating the DXLab Suite (Bernstein, AA6YQ), Nov., p. 20
Softbrewing a Logbook: A Primer For Database Design (Jacob, KB2ZPE), Apr., p. 50

TECHNICAL DATA
1950s Homebrew 2 meter Handheld, Shortwave Receiver, Transistorized Circuits (Math, WA2NDM), Jul. p. 62
Battery Accessories (Math, WA2NM), May, p. 38
Electricity is Everywhere Part I (Shrader, W6BNB), Oct., p. 28
Electricity is Everywhere Part II (Shrader, W6BNB), Nov., p. 54
Laser Safety (Math, WA2NDM), Nov., p. 38
LEDs for Illumination (Math, WA2NDM), Mar., p. 52
Listening to the Past (Math, WA2NDM), Apr., p. 54
Operational Amplifiers Revisited (Math, WA2NDM), Sep., p. 44
Optical Modulation (Math, WA2NDM), Feb., p. 56
Optical Power Measurements (Math, WA2NDM), Dec., p. 60
Reflections and Ramblings (Math, WA2NDM), Jan., p. 87
Speech Compression and ALC Simplified (Ingram, K4TWJ), Jan., p. 82
Unique Applications of Voltage Regulators (Math, WA2NDM), Aug., p. 35
Unique Components (Math, WA2NDM), Jun. p. 60
White LEDs (Math, WA2NDM), Oct., p. 52

VHF
2001 *Leonids* Delights Amateurs Worldwide (Lynch, N6CL), Jan., p. 88
Fall Predictions Are Out (Lynch, N6CL), Jul., p. 105
Leonids Meteor Shower Reports (Lynch, N6CL), Feb., p. 99
Leonids to Light the Night Skies (Lynch, N6CL), Nov., p. 98
Meteor Storm Nobody Saw, The (Lynch, N6CL), Sep., p. 81
New 241 and 322 GHz DX Records Set (Lynch, N6CL), Mar., p. 96
New Level for Weak-Signal Communications (Lynch, N6CL), Jun., p. 82
Perseids—Lackluster Shower but Surprising Results (Lynch, N6CL), Oct., p. 80
Preparing for August Activities (Lynch, N6CL), Aug., p. 82
Sunspots: Downhill? (Lynch, N6CL), Apr., p. 92

Oops...

If you've tried to e-mail author Phil Ferrell, K7PF ("An Automatic Power Suppl /Battery Charger..." Oct. *CQ*), and your message bounced or you did not receive a reply, Phil informs us that he now has a new e-mail address: <philf@cablespeed.com>. In the same article we forgot to credit Dick Miles, K7RNZ, with taking the excellent photos of Phil's project. Sorry, Dick, and thanks, Phil, for the update.

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Advertiser's Index

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Morse Express.....67	www.MorseX.com
Nemal Electronics.....87	www.nemal.com
New Communications Solutions.....49	www.ncsradio.com
Orlando Hamcation.....104	www.oarc.org/hamcat.html
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PowerPort.....98,103,113	www.powerportstore.com
Productivity Resources.....67	www.force12inc.com
QSLs by W4MPY.....103	www.w4mpy.com
Radcomm Radio.....31	www.rad-comm.com
Radio City, Inc 25	www.radioinc.com
Radio Club of JHS 22 103	www.wb2jkj.org
Radio Daze.....114	www.radiodaze.com
Radio Depot.....71	www.hammall.com
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Rotor EZ-Idiom Press 109	www.idiompress.com
SGC, Inc. 45	www.sgcworld.com
Solder-It 114	www.solder-it.com
Spectrum International.....77	
Surplus Sales of Nebraska 95	www.surplussales.com
Tarheel Antennas 24	www.tarheelantennas.com
Ten-Tec 39,98	www.tentec.com
T.G.M. Communications.....113	www3.sympatico.ca/tgmc/index.html
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Tropical Hamboree 48	www.hamboree.org
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Vibroplex.....85	www.vibroplex.com
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W & W Manufacturing Co. 35	www.ww-manufacturing.com
W3FF Antennas.....73	www.buddipole.com
W4RT Electronics.....24	www.W4RT.com
W5YI Marketing 46,72	www.w5yi.org
W9INN Antennas.....114	
West Mountain Radio 13	www.westmountainradio.com
Wireman, The 114	www.thewireman.com
Writelog.....82	www.writelog.com
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Sports
Reindeer League
See page B1 for late scores

NORTHPOLE NEWS

Todays weather
Snow continues...
See page A8 for full forecast

ICOM HOLIDAY SALE STARTS ON NOV.13th

Never seen before savings. Crowds expected

Bellevue, WA. Icom America announced today its biggest holiday sale ever. Savings from $10 all the way up to $200 on certain radios. The public is cautioned not to panic, as the sale runs through December 31. Never the less, officials are concerned that large crowds traveling to Icom authorized dealers might cause traffic delays.

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This was confirmed by eye-witnesses near Icom America headquarters in Bellevue, WA, where reported sightings of elves have risen sharply.

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North Pole. In a surprise move today, local celebrity, Santa Claus has broken with tradition and announced he will not be using reindeer to pull his sleigh this year. He has opted, instead, to use "MAX!", Icom's high flying Ham mascot, to pull the sleigh on this years journey. "Those reindeer were eating me out of house and home." Claus was reported as saying. MAX! on the other hand eats very little and is a quite capable of pulling the sleigh himself. (see A4)

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