65th Anniversary Issue

Amateur Radio

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COMMUNICATIONS & TECHNOLOGY

JANUARY 2010

CQ

- Marconi's First Great Miracle, p. 13
- SSB Results: 2009 CQ WPX Contest, p. 20
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On the Cover: Greg Hanson, KI8AF, of Marquette, Michigan, takes advantage of ideal antenna weather to make some adjustments. Details on p. 90.

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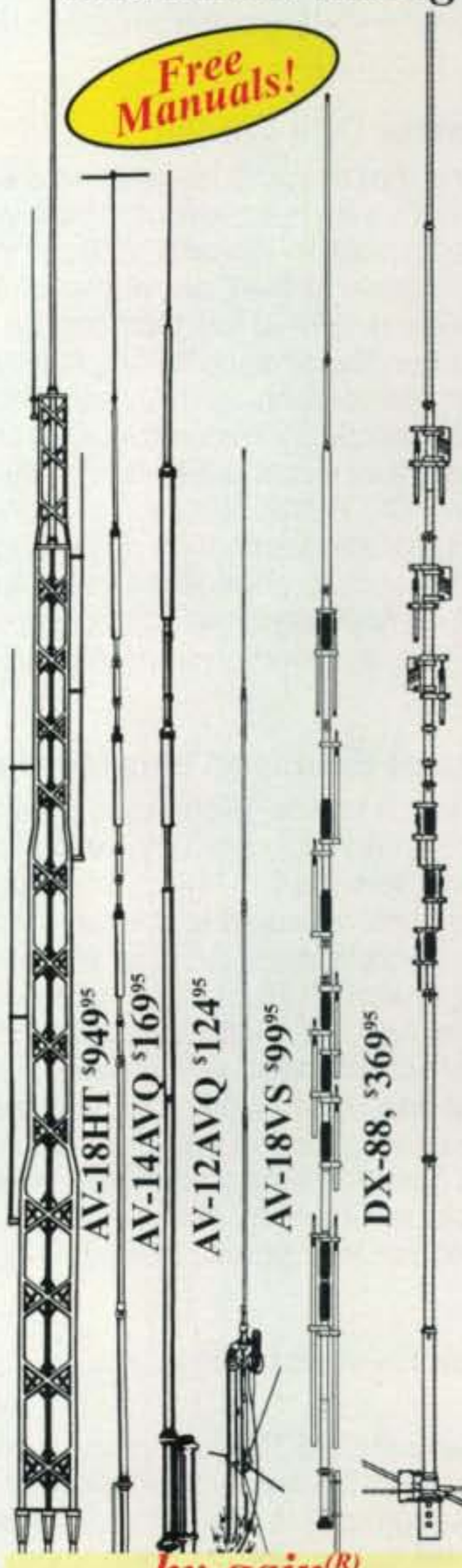

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AV-14AVQ, $169.95. (10,15,20,40 Meters). 18 ft., 9 lbs. **The** Hy-Gain AV-14AVQ uses the same trap design as the famous Hy-Gain Thunderbird beams. Three separate air dielectric Hy-Q traps with oversize coils give superb stability and 1/4 wave resonance on all bands. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

AV-12AVQ, $124.95. (10, 15, 20 Meters). 13 ft., 9 lbs. **AV-12AVQ** also uses Thunderbird beam design air dielectric traps for extremely Hy-Q performance. This is the way to go for inexpensive tri-band performance in limited space. Roof mount with AV-14RMQ kit, $89.95.

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DX-88, $369.95. (10, 12, 15,17,20,30,40,80 Meters, 160 Meters optional). 25 ft., 18 lbs.

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DX-77A, $449.95. (10, 12, 15, 17, 20, 30, 40 Meters). 29 ft., 25 lbs.

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Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
AV-18HT	$949.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$124.95	10,15,20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$99.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

Hy-Gain 160-6 Meters Self-Supporting Vertical

Full 1500 Watts, 43 feet, includes base mount

New! AV-6160 **$399.95** UPS SHIPPABLE

Operate all bands 160-6 Meters at full 1500 Watt with this self-supporting, 43 feet high performance vertical! It assembles in less than an hour and its low profile blends in with the sky and trees -- you can barely see it . . .

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An optimized balun design allows *direct coax feed* with negligible coax loss (typically less than ½ dB 60-6 Meters and less than 1 dB 160-80 Meters with good quality, low-loss coax).

Extremely low wind loading

With just 2 square feet wind load, the AV-6160 has the lowest wind-loading and lowest visibility of any vertical antenna! The key is a six foot section of tapering diameter *stainless steel* whip that flexes in strong wind instead of stressing the bottom sections. Its 2-inch O.D.and .120 inch thick walled tubing bottom section makes it incredibly strong.

Just 20 lbs., uses super-strong *6063 aircraft aluminum tubing.* Stainless steel hardware.

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Ground mounting lets you hide antenna base in shrubbery. Requires ground system -- at least one radial. More extensive ground work better.

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ham radio news

AA2EJ Wins Nobel Prize

The next time you pick up your digital camera, or snap a photo on your cell phone, take a moment to thank George Smith, AA2EJ. Back in 1969, he and fellow Bell Labs researcher Willard Boyle invented the charge-coupled device, or CCD, which was the first successful digital imaging device. Their invention led to development of digital photography and a host of other digital imaging technologies, and has now netted them a one-half share of the 2009 Nobel Prize in Physics. The rest of the prize went to Charles Kao of Hong Kong for figuring out how to transmit light over great distances through ultrapure digital fibers. Today's fiber-optic networks are at the heart of the internet and let you send those digital photos to friends across the globe in seconds.

ARISS Celebrates Milestone in Space Station-School Contacts

When International Space Station Commander Frank DeWinne, ON1DWN, talked with students at the Copernic Science Center in Warsaw, Poland on October 27, it marked the 500th school contact made by astronauts in the Amateur Radio on the International Space Station (ARISS) program. According to the AMSAT News Service, contacts have been made with schools around the world since ARISS began in 2000.

Making contacts with the space station should be getting easier with the planned installation in November of several new ham antennas on the ISS Columbus module. The antennas—for 2 meters, 70 centimeters, 1296 MHz, and 2.4 GHz—were part of a shipment of supplies and equipment carried to the ISS by the shuttle Atlantis in mid-November. They were scheduled to be installed during a spacewalk.

Gray Hair in Space

AMSAT celebrated the 35th anniversary of the launch of the amazing OSCAR-7 satellite on November 15. According to the AMSAT News Service, AO-7 was launched from Vandenberg Air Force Base in California in 1974. In 1981, power problems caused the satellite to go silent. However, in 2002 the satellite suddenly returned to the air and has been in use ever since. AMSAT officials speculated that a short-circuit in the batteries had somehow "unshorted," allowing the satellite to operate whenever its solar panels were illuminated.

Another nearly-ancient ham satellite, LUSAT-OSCAR 19, went silent in October. The AMSAT News Service reports that the shutdown in telemetry transmissions was preceded by an unexpected change in the bird's transmit frequency. Controllers hope to get it up and running again in time for its 20th anniversary on January 23.

Federal Grant Money to Help Build D-STAR Network in Georgia

The Georgia Emergency Management Agency has landed a $165,000 federal grant to fund the construction of a statewide amateur D-STAR network. "Newsline" reports that the system will use repeaters set up at nine public-television transmitter sites around the state, providing coverage across Georgia. The state's Amateur Radio Emergency Service organization will coordinate construction and use of the network, which will be available for everyday amateur use except during emergencies. According to "Newsline," this is the second-largest government grant ever secured for building an amateur radio emergency network.

Teams Chosen for WRTC 2010

Teams have been selected for this year's sixth running of the World Radio Teamsport Championship (WRTC), considered the ultimate challenge for the world's top contesters. This year's event will be held in Russia in July, in conjunction with the IARU HF World Championships. There will be 50 two-person teams, representing all continents, including 11 from North America. Two CQ contest directors—WPX Director Randy Thompson, K5ZD, and 160 Director Andy Blank, N2NT—will be among the North American competitors (they each will be on different teams). The competition will be held "Field-Day style" in a large, flat area about 35 kilometers south of Moscow.

FCC Issues First Disaster Drill Waiver

A week after announcing that it would issue case-by-case waivers to government agencies allowing employees who are hams to participate in disaster drills, the FCC granted the first such waiver to the Commonwealth of Kentucky for a statewide drill held on October 28. According to the *ARRL Letter*, the League's Regulatory Information Manager, Dan Henderson, N1ND, said the request was a "textbook example" of how the waiver process should work, noting that it met every one of the guidelines set down in the FCC Public Notice.

At press time, the FCC had taken no action regarding a petition filed by three amateurs to change the rules to permit employees of emergency-response agencies to participate in emergency drills without requiring a case-by-case waiver.

New Tech Questions to be Released This Month

A new set of exam questions for the Technician Class license will be used starting this coming July, and the new question pool is being released to the public this month. The questions were first released to the nation's 14 Volunteer Examiner Coordinators (VECs) in December. According to the Question Pool Committee of the National Conference of VECs, which develops the questions, the new Technician pool will consist of approximately 400 questions, from which 35 will be selected for each license exam. For the first time since the NCVEC took over test question preparation, the new Technician exam will include graphics and diagrams. The new pool will be used for four years, from July 1, 2010 to June 30, 2014.

Harrison Will Not Seek Re-election as ARRL President

ARRL President Joel Harrison, W5ZN, has announced he will not seek election to a third two-year term, according to the *ARRL Letter*. No reason for the decision was given. Harrison was elected to the League's top volunteer position in 2006, after serving six years as First Vice President. He previously had been an unnumbered Vice President, Delta Division Director, and Arkansas Section Manager. A successor will be chosen at the ARRL's January Board of Directors meeting.

Old Logs Sought for Sociological Study

Researchers in Wisconsin and Ohio are seeking to mine information from old ham radio logs to help trace the development of social networks and document changes in attitudes about work and leisure time. According to "Newsline," researchers at the University of Wisconsin and at Miami University of Ohio are looking for ham station logs from 1913 to 1927. The researchers will be comparing early licensing records with detailed information contained in station logs. If you have a log from this era and are willing to share it, contact Steve Johnston, WD8DAS at <Johnston@wpr.org>.

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.

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HL-2.5KFX *Auto Band Set and QSK*

Solid-state HF 1.5kW Linear Amplifier

Photo : From 1eft HC-1.5KAT (HF 1.5kW Tuner with Auto Band Set Feature), HL-2.5KFX (HF 1.5kW MOSFET Linear) and IC-7700 Transceiver

For DXpeditioners

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HF 600W Linear

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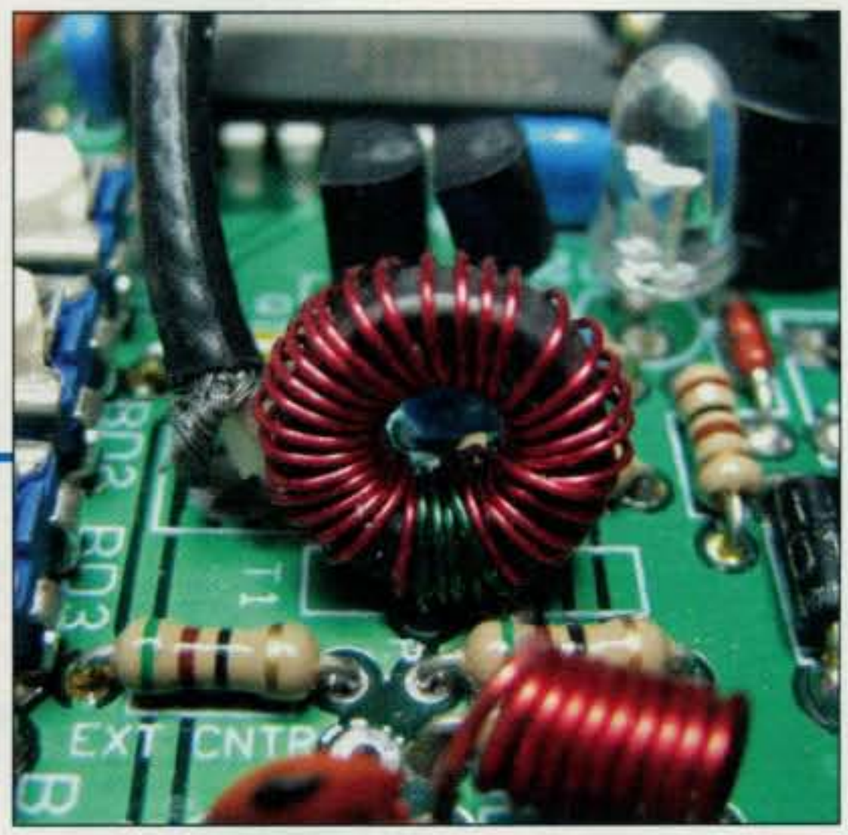

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departments

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- Large Multi-color VFD (Vacuum Fluorescent Display)
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- Optional RF μ -Tune Units for 160 m, 80/40 m and 30/20 m Bands

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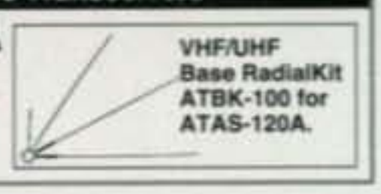
required)



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- Compatible with various APRS® information and functions - Receive WX info from other APRS® weather stations, exchange messages (max 67 characters) using the APRS® function, etc.

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Dual speakers (Control Head - backside)

- Optional FPR-1 Monitor Unit receives your transmission out to about 1,000 ft (300 m) depending on transmit power and other conditions. Give to others to hear your transmissions during emergencies, special events, and so many other operations so that they can follow the situation.

FPR-1 Monitor Unit

- Available to display your friend APRS® stations (FTM-350R and VX-8R) with their directions, distances and other info.
- Huge memory channel management capability! 500 Independent memory channels with memory name tag function (up to 8 characters) for each L and R band (1000 channels total), + 9 PMS (Programmable Band Limit Memory Scan) channels for each L and R band (18 channels in total), + a rewritable preferred channel for each L and R band, + 31 channels specifically allocated for the Smart Search function.
- DTMF Autodial (Memory) Feature: 16 digits/9 memories.
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- Easier Menu setup - Menu items are associated with the various operations for easier and faster setup modifications.

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The FTM-350R has not been approved by the FCC. This device may not be sold or leased, or offered for sale or lease, until FCC approval has been obtained.

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a CQ editorial — zero bias

Thoughts on Turning 65

BY RICH MOSESON,* W2VU

For several years now, I have had a regular correspondence going with one of our long-time readers in the UK, Ray Howes, G4OWY. Ray has a different perspective on many things than I do, and I enjoy reading his views. Ray's most recent letter was of particular interest, especially timed as it was in conjunction with *CQ*'s 65th anniversary, which we celebrate this month.

Ray was responding to my November editorial, "A Decade in the Rear-View Mirror." He said he'd been looking in his own rear-view mirror recently, back about two decades, though, and said, "I didn't like much of what I saw." He commented that underneath the "bonnet" of today's rigs, "a radical transformation has covertly taken place! The computer chip is now in the ascendant. Under the thin metal skins of our beloved rigs lies an impostor, an impostor so deceiving it will and has changed our hobby forever. 'Flex radios' are but the beginning of that inexorable change."

The More Things Change...

I replied to Ray that I agreed with his observations, but not his conclusions. I don't see the ascendancy of the computer chip in our rigs as bad. I see it as essential for the long-term health of our hobby. As I dug back through old issues of *CQ* in putting together our 65th anniversary timeline (see first installment on page 70), it occurred to me that with a few exceptions, ham radio technology of 2010 is totally different from 1945. Sixty-five years ago, tubes were all we knew about—the transistor wouldn't be invented until 1948—"phone" meant AM (SSB also wasn't introduced until '48), and a large number of hams could remember back to when CW was not a synonym for Morse code, but a designator to set apart code sent using that new-fangled continuous-amplitude wave from the "traditional" spark gap. Of course, many hams in the '20s and '30s fought the advent of CW, fearing that it would ruin "real" ham radio.

But returning to 1945, there were no ham satellites (no other satellites, either), no moonbounce, no computers, no internet, no repeaters, no palm-sized handhelds, no transceivers, no Echolink or IRLP, no D-STAR, no Packet Cluster, no packet, no CW Skimmer, no eQSL or LoTW, and no 15-meter band (let alone 60, 30, 17, or 12). About the only things a ham from 1945 might recognize in a ham shack of 2010 would be some antennas (but not all) and either a hand-key or a "bug" (iambic keyers were still off in the future). So yes, the technology has changed radically in the past 65 years, and the ascendancy of the computer chip is heralding another round of radical changes that will likely make ham radio in 2075 as unrecognizable to a ham of 2010 as today's shack would be to a ham from 1945.

(Fun project: We'd like to hear your ideas—based on what's happening on the leading edge of communications technology today—on what we could expect our stations and our means of ham radio communications to look like 65 years from now. E-mail them to me, and we'll share the most interesting and innovative ideas we receive.)

... The More They Stay the Same

What has *not* changed in the past 65 years, though, is at least as important as what has —the people part of ham radio and what we do with all of our technology. We still use our radios to try to talk to other hams and make new friends all over the world; we still enjoy chasing QSLs and certificates attesting to on-air accomplishments, and competing with each other and ourselves in on-air contests; we still love to tinker and come up with innovative uses for the technology that surrounds us (even if more of today's tinkering is in the realm of software than hardware); and we still are able to provide backup communications for our communities "when all else fails."

What also has not changed in the past 65 years is the basic mission of this magazine. As we approached this anniversary, I contacted "Mr. Magazine," Dr. Samir Husni at the University of Mississippi, who is widely regarded as the country's leading expert on the magazine industry, to ask just how common or uncommon it is for a magazine to reach its 65th anniversary. Dr. Husni responded:

> The average life span for a new magazine being published today is one and half years, so needless to say, you have exceeded the average life span by many, many milestones. Also, in my last research I found that only 12% of the magazines that were born 20 years ago are still being published ... so how many magazines from the 7,000+ magazines out there can claim the ripe age of 65? A good guesstimate will be around 1 to 2%.
>
> Congratulations on your new milestone and on staying true to your DNA. Age does not kill magazines, messing with their DNA does.

Our DNA, which dates back to *Pacific Radio News* in 1917, is wrapped up in the mission statement that *CQ*'s founding editor, John Potts, set forth in our first issue, in January 1945:

> This, then, is the *raison d'etre* for *CQ*—a magazine for the radio amateur, with a particular invitation to the newcomer. It should not, however, be inferred that we shall confine ourselves to the ABC's of ham radio. We visualize *CQ* as a magazine that will stick with the ham long after the parts of his first rig are dust-laden in the junk-box, and as a monthly refresher course for the old timer. While placing some emphasis on the elementary, we are still under obligation to carry through with articles on modern techniques and apparatus. Similarly, we shall follow up tradition (with which every ham must be familiar) with all the vital news of amateur radio today and tomorrow.

There is no need to update or otherwise tinker with this basic mission statement. It is a formula that has worked well for the past 65 years, and hopefully will continue to work well for at least the next 65. It is our DNA, and we won't be messing with it.

Additional Milestones

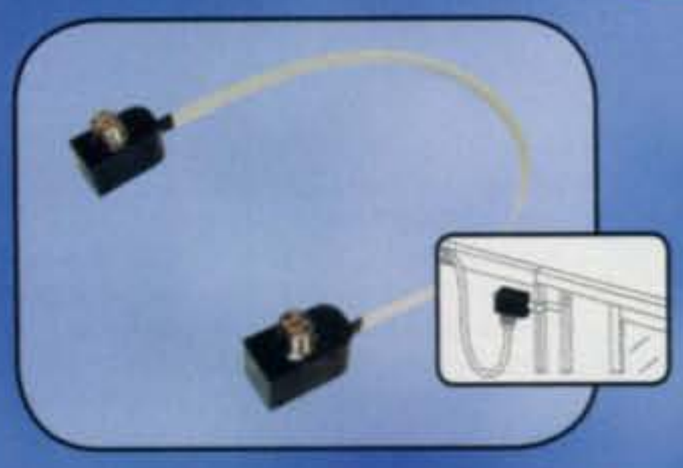
This year marks a couple of personal milestones as well. For me, 2010 is my 40th year in ham radio (I was first licensed in October 1970). For our publisher, Dick Ross, K2MGA, this year marks his 50th year in amateur radio publishing, a career spent entirely with the magazine you are holding in your hands right now.

Happy New Year to all, and may 2010 be a much better year than 2009 has been for so many of us. May the economy and the sunspot cycle recover together and reach new heights as we finish the first decade of the 21st century.

73, W2VU

*e-mail: <w2vu@cq-amateur-radio.com>

Life is a JOURNEY. Enjoy the ride!



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UHF: 40W FM
900MHz - 1.3GHz: 10W
VSWR: <500MHz 1.3:1
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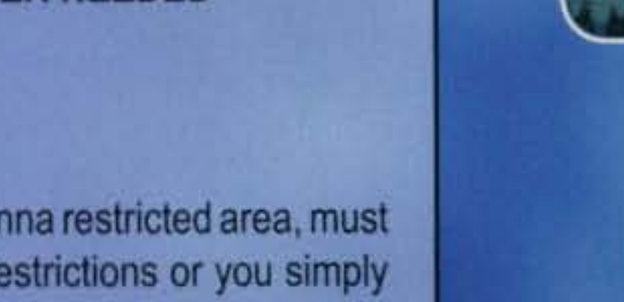

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announcements

Ham Radio University 2010 – The 11th annual Ham Radio University, held in conjunction with the ARRL New York City/ Long Island Section Convention will be held January 10 at Briarcliffe College, Bethpage, LI, NY. The theme this year is Digital Communications and more than 15 seminars are scheduled for the day on various aspects of ham radio, plus tables will be set up with information on different organizations and clubs. special event station W2V will be operational on HF. There will also be a VE session. Talk-in on W2VL 146.850 –600, 136.5 PL. For more details, go to <www.HamRadioUniversity.org>.

Horkheimer Prize 2010 – Rudolf Horkheimer was one of the first radio amateurs in Germany. A prize bearing his name is awarded by the DARC for merits of amateur radio and its further development contributing to amateur radio in a selfless manner. The prize can be awarded to one or more persons or institutions and is not restricted to members of the DARC. Any member of an amateur radio society in the IARU is entitled to apply or be proposed for the award. Self-proposals are permitted. The prize consists of ann etched-glass sheet and a monetary prize for non-personal use. Proposals must be submitted by March 31, 2010 to DARC, Lindenallee 4, 34225 Baunatal, Germany, or by e-mail to <darc@darc.de>. Include the name and address of the proposed applicant, a short written piece of why the person or organization should receive the award, and possible further information. The prize(s) will be awarded at the Ham Radio 2010 fair in Friedrichshafen.

• These special event stations are scheduled for Jan.:

K2USA, from "Farewell to Fort Monmouth," Fort Monmouth MARS station AA2USA, Fort Monmouth, New Jersey; Garden State ARA; January 29–31 from 0001–2359Z on 3.860, 7.260, 14.260, plus NJ linked repeater system (W2NJR/R), CW +50, PSK31 +70. QSL information: <www.gardenstateara.org>.

K3Y, from the Straight Key Century Club's celebration of four years of steady growth to nearly 6000 members on CW; operation in all call areas starting at 0000Z January 1 to 2359 January 31 on 1.820, 3.550, 7.055, 10.120, 14.050, 18.080, 21.050, 24.910, 28.050, and 50.090 (±10 kHz). For QSL send QSL and name and address to Dan Rhodes, KA3CTQ, 618 Seminole Dr., Erie, PA 16505 (www.skccgroup.com).

• The following hamfests, etc., are slated for Jan.:

Jan. 9, **Midwinter Ham Radio, Computer & Electronics Swapfest**, Waukesha Co. Expo Center Forum, Waukesha, Wisconsin; West Allis RAC. Advance table reservation ($19) deadline December 30, 2009. Send advance registration form and #10 SASE to WARAC Swapfest, Box 1072, Milwaukee, WI 53201. Information call Phil Gural, W9NAW, 414-425-3649, <www.warac.org>. (Exams 9–11:15 AM, AMF Waukesha Lanes)

Jan. 17, **Hazel Park ARC 44th Annual Hamfest**, Hazel Park High School, Hazel Park, Michigan. To reserve previous year's location, table reservations ($15) must be made by January 4 (HPARC Inc. Swap, P.O. Box 368, Hazel Park, MI 48030). Contact: WD8S e-mail <WD8S@comcast.net>, phone 248-399-7970, <www.hparc.org>. (Talk-in 146.640 [100 Hz PL])

Jan. 23, **Capital City Hamfest**, Memorial United Church of Christ, Madison, Wisconsin. Contact Steve Johnston, WD8DAS, e-mail <wd8das@arrl.net>; <http://www.wd8das.net/hamfest>.

Jan. 31, **Tusco ARC Hamfest**, 965 North Wooster Ave., Strasburg, Ohio. To reserve tables ($10 plus admission) send SASE and payment to arrive by January 15 to KD8HDJ. Contact Kyle Quillen, KD8HDJ, 518 Fair Ave. NNW, New Philadelphia, OH 44663; phone 888-447-2403, e-mail <hamfest@tuscoarc.org>.

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HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
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Shipping Weight	26 lbs.
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Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
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Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power	350 in.-lbs.
Brake Power	**450 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
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Effective Moment (in tower)	**300 ft.-lbs.**

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HDR-300A Rotator Specifications	
Wind load capacity (inside tower)	25 square feet
Wind Load (w/ mast adapter)	**not applicable**
Turning Power	5000 in.-lbs.
Brake Power	**7500 in.-lbs.**
Brake Construction	solenoid operated locking
Bearing Assembly	**bronze sleeve w/rollers**
Mounting Hardware	stainless steel bolts
Control Cable Conductors	**7**
Shipping Weight	61 lbs.
Effective Moment (in tower)	**5000 ft.-lbs.**

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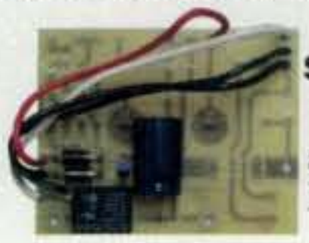

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Marconi's First Great Miracle

A Visit to The Lizard During the Centenary of Marconi's Nobel Prize

BY C. STEWART GILLMOR,* W1FK

One-hundred years ago last month, Guglielmo Marconi shared the Nobel Prize in Physics with Karl Ferdinand Braun for their discoveries and inventions in the field of radio (see the sidebar on Braun). Most people would find familiar the events sometimes called "Marconi's Second Great Miracle," the transatlantic (wireless) radio experiments conducted during 1901–1902 between Poldhu Cove, Cornwall, England and St. John's, Newfoundland, and with the ship *Philadelphia*. However, few know that "Marconi's First Great Miracle" took place a year earlier, in January 1901, between St. Catherine's Point, Isle of Wight, and a wireless station at The Lizard, Housel Bay, Cornwall. The Poldhu–Newfoundland, and especially the Poldhu–*Philadelphia* tests confirmed the commercial future not only of long-distance ship-to-shore, but continent-to-continent radio messaging. However, the *empirical* reality of long-distance, over-the-horizon radio communication was first shown at The Lizard on January 23, 1901, and this story is worth retelling here.

My wife and I recently had a pleasant vacation in Cornwall and drove a rental car to several charming coastal Cornish towns and viewpoints (Newquay, St. Ives, Land's End, the Mousehole, Mount St. Michael, Mullion Cove, and The Lizard). Such driving is *not* for the faint of heart, since the roads are particularly narrow and are often six to ten feet below the surrounding landscape. We hoped to visit the Poldhu Cove Marconi site and other spots in that immediate area, including The Lizard (locals have always called it *The* Lizard). At The Lizard village, as we parked on the green, I saw a familiar tribander antenna above the Regent Cafe and immediately told my XYL, "There's a ham around here and he'll know where to find the Marconi wireless station." Indeed, we went in for a nice lunch and met chef-owner Jim Farley, G4WSH (photo A), who told us how to find Poldhu Cove and the much nearer station at The Lizard.

Photo A– The author, W1FK, and Jim Farley, G4WSH, outside Jim's Regent Cafe at The Lizard, Cornwall. (Photos by Rogene Gillmor)

When we finally found The Lizard station, it was locked. A sign indicated that the British National Trust administered the site, but visitor hours were over for the day. Well, we were disappointed but told our bed-and-breakfast hostess, Mrs. Colin Hendy, that the station looked interesting. She told us that the land around the station formerly had been her father-in-law's farm! In turn, his grandfather, Mr. T. S. Hendy, had worked for The Lizard station as driver and constructor and had kept a diary for the years 1902–1916 detailing all events in the village.

At the Regent Café, I had purchased a very interesting book, *Marconi at The Lizard*,[1] written by Mr. Courtney Rowe. Mrs. Hendy telephoned Mr. Rowe and he came over and gave us a special tour

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Photo B– Steep cliffs and rocks near The Lizard station.

of The Lizard station. What follows is why The Lizard station was constructed and how it accomplished what came to be called "Marconi's First Great Miracle."[2]

Marconi, His Collaborators and His Competitors

Guglielmo Marconi (1874–1937) was born in Bologna, Italy. His Irish mother, Anne Guinness, was heiress to the Jameson Irish Whiskey fortune, and this connection would prove very valuable to Marconi's advancement in the new technique of radio. As a young man, Marconi found success in England with field tests before British signal and naval authorities. Marconi was astute and hired as consultants several celebrated telegraph and wireless experts—engineers and university professors—including William Henry Preece, John Ambrose Fleming, A. A. Campbell Swinton, and J. Erskine Murray. While Marconi was the father of radio *as an industry*, a number of men invented parts of the basic technology, and Marconi employed the services of some of those other pioneers. He also sought the approval of the world's most powerful physical scientist and industry consultant, William Thompson, Lord Kelvin.

Marconi also knew that national monopolies in the post office systems in European countries prevented him from gaining inland radio message contracts, since inland telegraph networks were the sole property of, e.g., the British Post Office department. Thus, he sought to develop ship-to-shore and ship-to-ship agreements. Both were extremely necessary to the improved safety and economies of maritime trade. Merchant companies wished to inform ship captains of port access, and attain knowledge of ship cargoes, and ship captains needed to know coast conditions in fog or bad weather to avoid shipwreck.

In the earliest days of radio, numerous European companies were established to sell radio equipment to navies and to merchant shipping, including companies of Alexander Stepanovich Popov (Russia); Eugene Ducretet and Edouard Branly (France); Professor Adolf K. H. Slaby and his assistant Count Georg von Arco, and Professor Ferdinand Braun (Germany). In 1897 Marconi began to build a planned series of 27 coastal radio stations in Britain and Ireland for ship-to-shore communication, eight of which were completed by 1901. The first of these stations was on the Isle of Wight;

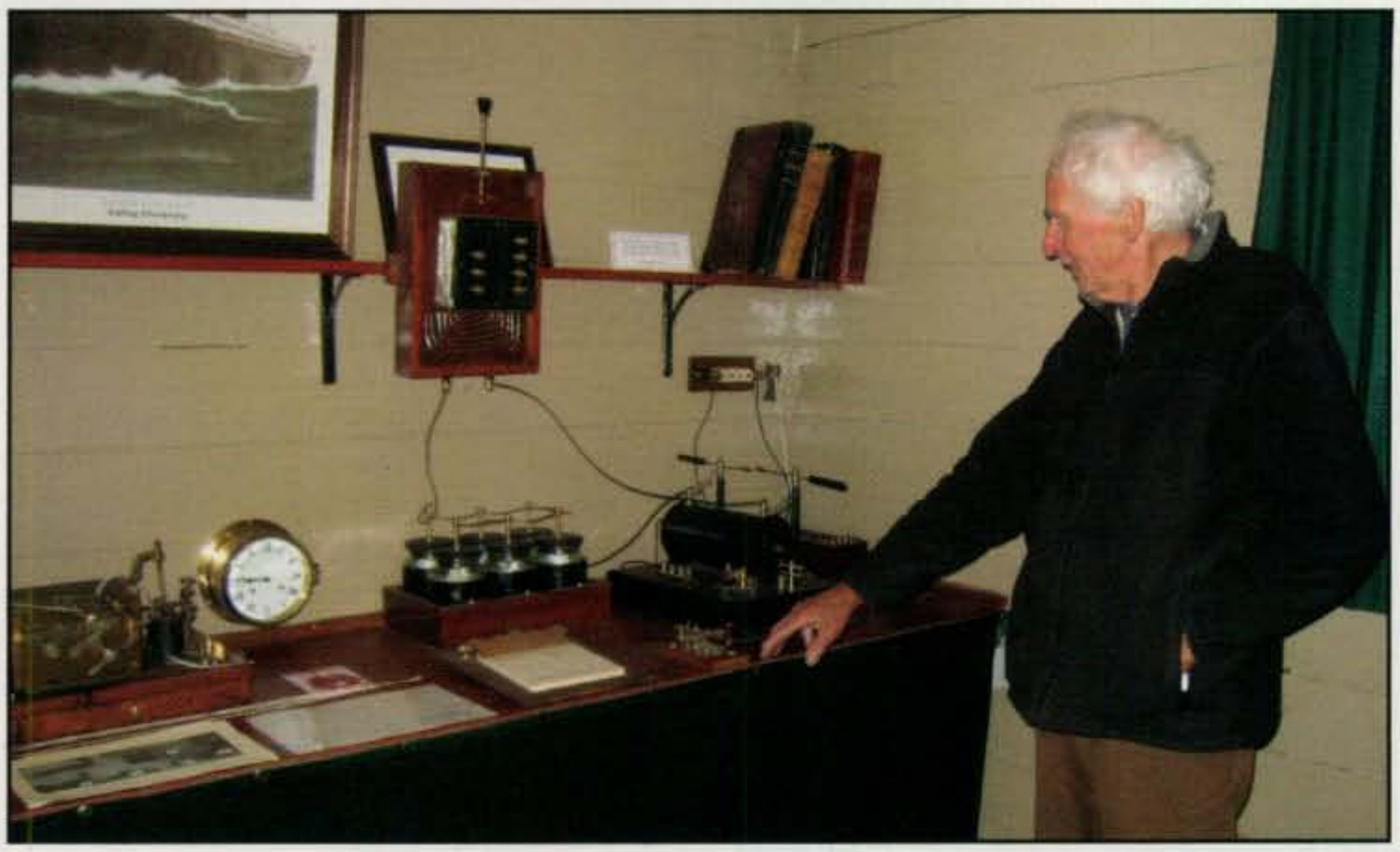

Photo C– Mr. Courtney Rowe indicating The Lizard wireless equipment in its restored condition.

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Photo D– Exterior view of the restored wireless buildings at The Lizard.

another was at The Lizard, at Housel Bay in southeast Cornwall, the southernmost point of England.

The Lizard

The Lizard is at a dangerous and busy spot on the southern English coast. Numerous shipping lanes pass by, there are a considerable number of rocky islets and reefs off the shore, and often there is fog. First attempts to alert ships of the dangers off Housel Bay were signal fires at a makeshift lighthouse for several years beginning in 1619. Permanent lighthouse signals began in 1752. To these were added a foghorn system in 1878 and a bell in 1910. Lloyd's company took over a flag and light signaling station at The Lizard in 1882 and connected this to London through Falmouth by an inland post office telegraph line. At this site also was an oceanic telegraph cable linking Cornwall to Bilbao, Spain. Marconi liked to do his coastal radio experiments near comfortable hotels, and such a hotel was only a mile or so from The Lizard and the Lloyd's Signal Station. Thus, in 1900 Marconi commissioned the construction of a small two-building wireless station right at the end of The Lizard on the edge of a 200-foot cliff overlooking the ocean (photo B).

He built the station there for three purposes:

1. to use for ship-to-shore traffic, in connection with the inland telegraph station next door at Lloyd's;

2. to serve as a test station for the much larger station he would build six miles away at Poldhu Cove. This was to investigate the improvements in tuning (syntony) which would allow multiple radio stations to transmit simultaneously with reduced interference; and

3. to establish the possibility of true over-the-horizon radio propagation.[3]

Classical physics predicted that radio transmissions could be received only over line-of-sight distances and the maximum distances achieved by 1900 were about 30 to 50 miles. This allowed, for example, cross-Channel links between England and France but not much more. Marconi's station on the Isle of Wight received some publicity for messages sent from there to British royalty at sea. However, the distance from Isle of Wight to The Lizard was 186 miles, six times the maximum distance that was predicted by classical optical physics for antennas at ground level. That prediction for maximum range of line-of-sight propagation over a spherical Earth uses the following formula:

$$d^2 = 67.2*h$$

where "d" is the distance of separation

Karl Braun: The Man Who Shared Marconi's Nobel Prize

Karl Ferdinand Braun (1850–1918) was born in Fulda, Germany and died in the United States. He achieved fame as a Professor of Physics at several German universities, including Marburg, Strasbourg, Karlsruhe, and Tubingen. Braun's research covered a wide range of physics, including elasticity, thermodynamics, magnetic materials, and electromagnetism. He invented the crystal diode, an electrometer, and the cathode-ray oscillograph, or Braun tube. His radio experiments included transmission of signals through water, improved coupling designs to improve damped-wave circuits, and directed beam antennas. Braun's improvement to Marconi's system was the magnetic coupling of transmitter to antenna, and his 1899 patent for this became used industry-wide. Slaby and von Arco's German General Electric Company joined Braun, and Siemens and Halske in 1903 to form the Gesellschaft für Drahtlose Telegraphie (Telefunken) as a formidable rival to the Marconi companies.[9]

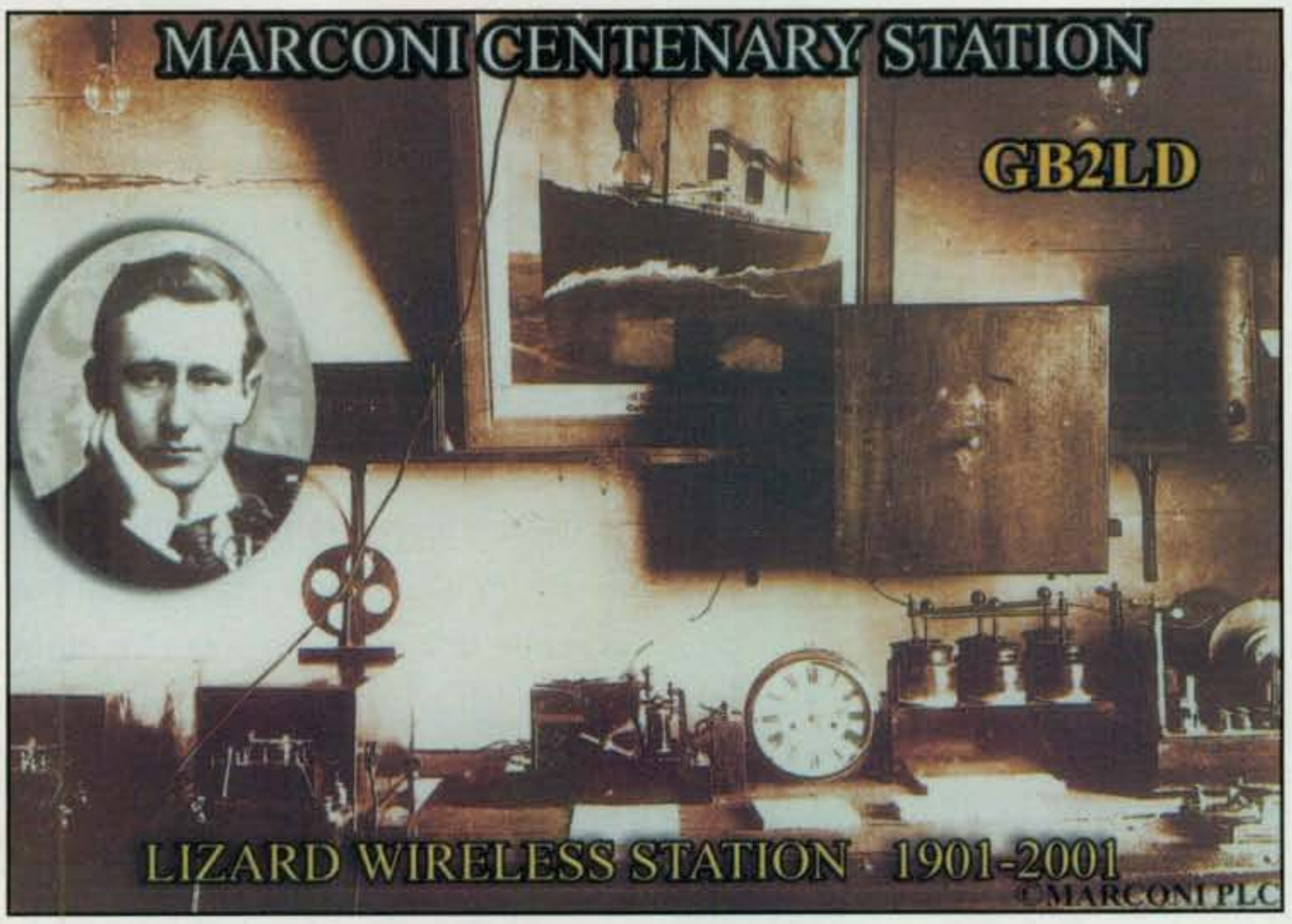

Photo E– The QSL card of permanent special event station GB2LD, located at Marconi's restored wireless station at The Lizard.

in kilometers, and "h" in antenna heights in meters.

Given the distance between the Isle of Wight and The Lizard, antenna masts would have to be 4300 feet high for successful transmission-reception if the visual line-of-sight formula were to apply to radio. With the actual antennas used of 125–150 feet height, the maximum range predicted was about 47 miles.

Both Isle of Wight and The Lizard employed Marconi's newest equipment, with battery-powered spark transmitters and coherer receivers. "Jiggers," Marconi's patented tuning coils, were used both in the coherer and in the spark transmitter, which consisted of a 10-inch induction coil with an interrupter. The tuning utilized capacitors made from six Leyden jars and a transformer. The receiver used a coherer, which was a small glass vacuum tube containing two silver plugs separated by granules of nickel and silver. The coherer operated a relay which, in turn, actuated a Morse inker. In the Morse inker, paper tape is pulled through using a clockwork mechanism. When a signal is received, a battery-operated relay causes a pen to drop onto the tape, thus marking it with the Morse code.

The antennas were single wires, one each for transmitting and receiving, hung from masts 125–150 feet high. The antennas were matched using a "jigger" coil, with primary fixed windings and secondary windings on a slider. The station was grounded via about ten 6-foot by 3-foot plates buried around the hut.[4] (A re-creation of the original 1901 station at The Lizard is shown in photo C and a view of the restored exterior of the buildings in photo D).

A Demonstration Project

Marconi had had difficulty convincing his board of directors to spend much of the company's working capital on the Poldhu project, to build a super-power station far larger than any other built. The board also objected that such a huge transmitter would certainly swamp out all shipboard receiving sets from receiving any other signals.[5] The Lizard would be the needed test station for the Poldhu design, featuring improved tuning. (The giant Poldhu station was already under construction at this time, despite the board's misgivings.) Thus, the Isle of Wight-Lizard tests were done in secret until the board could consider the full significance of the results.

On January 23, 1901, The Lizard received messages from Isle of Wight. The exact content of those messages is unknown today, but a landline telegram was sent at 6:24 PM on that date from The Lizard post office to Marconi personnel, stating: "COMPLETELY SUCCESSFUL KEEP INFORMATION PRIVATE." Following consultation, the Marconi Company released the news publicly on February 11, 1901.[6] The 186-mile radio link con-

Photo F– QSL card of GB2GM, the club station of the Poldhu Amateur Radio Club, based at the Marconi Centre there. Poldhu was the launching point for Guglielmo Marconi's first transatlantic transmissions.

Photo G– Poldhu Amateur Radio Club (GB2GM) meeting at the Marconi Centre, Poldhu Cove.

vinced the Marconi board of directors, and indeed potential investors, of the true possibilities of long-distance radio.

The Nobel Prize Centennial

Guglielmo Marconi and Karl Ferdinand Braun shared the 1909 Nobel Prize in Physics "in recognition of their contributions to the development of wireless telegraphy."[7] This was a somewhat controversial prize, since several other radio pioneers and theorists were considered worthy. Thus, the award specifically mentioned "*development* of wireless telegraphy." In his Nobel Lecture of December 11, 1909, Marconi highlighted the experiments between The Lizard and the Isle of Wight as proving that electric waves would be able to go great distances "such as those dividing America from Europe…"[8]

The Lizard Today

The Lizard station huts remain the oldest surviving purpose-built wireless buildings in the world. In 2000 the British National Trust restored the site and maintains it open to the public on many days of the year. The Lizard is a popular spot for ham activity, especially at VHF and UHF, since it is in a grid square almost unique in itself (Locator IN79) and is the southernmost point in England. The hut also contains a small but modern ham station, GB2LD, for visiting hams (QSL card, photo E). The initials "LD" were the original radio call of "The Lizard" station.

Mr. Rowe informed my wife and me that the following night that the Poldhu Amateur Radio Club, GB2GM (QSL card, photo F), was holding its monthly meeting at the Marconi Centre museum (also a National Trust property) six miles along the coast at Poldhu Cove. We hiked along the cliffs at sunset the next day and saw the remaining foundations of the famous Poldhu station, where Marconi performed his "Second" Great Miracle, the transatlantic wireless connections in 1901–1902. We then met Keith Matthew, GØWYS, David Barlow, G3PLE, and numerous other enthusiastic hams at the Poldhu Club meeting (photo G). The date December 12, 1901, is usually given for the first successful transatlantic radio communications, but I give the dates in the range of 1901–1902. Radio physicists J. A. Ratcliffe and John S. Belrose (VE2CV) have reasonably questioned the December 1901 Poldhu–St. John's Newfoundland results, but the tests from Poldhu to the ship *Philadelphia* in February 1902 were definitive.

Today, at The Lizard, remains one of the most significant spots in radio history. Why not plan a vacation to charming Cornwall, England and visit The Lizard and Poldhu Cove and have a chance to operate the stations GB2LD and GB2GM, the sites of Marconi's Great Miracles? Interested hams may obtain details by writing to LD Wireless, c/o P.O. Box 50, Helston, Cornwall, TR12 7YQ, England.

Notes

1. Rowe, Courtney, *Marconi at The Lizard*, the Trevithick Society, 2000.
2. "Picture of Marconi" Speech, given in 1931, on 30th anniversary of The Lizard tests, as cited in Rowe, p. 35.
3. Baker, W. J., *A History of The Marconi Company*, Methuen and Co., Ltd, 1970.
4. Barlow, David H., *The history of the Lizard Wireless Telegraph Station*, The Radio Officers' Association, 2007. <www.lizardwireless.org>
5. Baker, *op cit*, p. 62.
6. Rowe, *op cit*, p. 35.
7. *Nobel Lectures, Physics, 1901–1921*, Elsevier Publishing Company, Amsterdam, 1967. Speech by H. Hildebrand, President of the Royal Swedish Academy of Sciences. (See also: <http://nobelprizes.org/nobel_prizes/physics>)
8. *ibid.*, Marconi Nobel Lecture, "Wireless Telegraph Communication," December 11, 1909, p. 207.
9 . Baker, *op cit.*; *Nobel Lectures* , *op cit.*; and Sharlin, Harold I., "Ferdinand Braun", in *Dictionary of Scientific Biography*, Charles C. Gillispie, ed., Charles Scribner's Sons, 1970, pp. 427–8.

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Results of the 2009 CQ WW WPX SSB Contest

BY RANDY THOMPSON,* K5ZD

How many sports can attract more than 30,000 players to a single event? One is the New York City Marathon, which draws more than 35,000 runners each October. On March 28–29, 2009 the 51st edition of the CQ WPX SSB Contest achieved worldwide participation of over 33,000 operators as measured by callsigns appearing in the received logs. Just as every runner has his or her own motivation to enter the marathon, so it is for amateur radio operators and the WPX contest. Each brings individual goals and interests to this global test of skills, station, propagation, and stamina.

Rain or shine, marathon runners all must deal with the conditions of the day. Some years the weather is perfect and the running seems effortless. In the case of a contest, propagation varies but the contest still goes on. With the solar conditions this year, it felt like the WPX was being run up hill and into the wind the whole way! Many areas of the world also had to deal with strong storms and rain static. Even with the difficulties, there were 27 new continental records established! The opportunity for success in the midst of these uncontrolled variables is what makes radio contesting such a challenge and keeps us coming back year after year.

The 2009 WPX SSB Contest set a new record for entries, with 4087 logs received. There were 1,819,311 total logged QSOs with calls from 209 DXCC entities. The USA was the easiest country to work, with 464,627 QSOs logged. Other top countries were Germany (117,061), European Russia (86,606), Italy (63,177), and Japan (59,748).

The WPX contest is a celebration of ham radio callsign diversity. Every year there are new prefixes created either through the licensing of new hams or through contesters' efforts to obtain special calls. Examples of extraordinary prefixes that could be found include 9A8ØØVZ, 3Z5ØKPN, 4B2S, 4H9RG, 4V4JR, 5D5A, 5Q1A, HF8ØBEM, L2ØE, L73DX, LZ131GO, SN9ØSW, V55X, VP59V, YR8ØHCS, ZT2V, and many others. The prefix champion this time was the EF8R multi-single team with 1429, followed closely by CT9M with 1413. Top single-op prefix chaser was CN2R with 1219. There were 75 entries that broke the 1000-prefix barrier!

Single-Operator All-Band High Power

Taking a break from his pursuit of single-band records, Jim, W7EJ, piloted CN2R to the head of the pack in the Single-Operator All-Band (SOAB) High Power category. Tom, W2SC, came up short in his attempt to capture a fourth consecutive title from 8P5A. Just 150k points behind was Bill, KH7XS, who took advantage of some great conditions to Europe on 40 meters in setting a new Oceania record. Jack, RW3QC, operating from 5B4AII in Cyprus, finished fourth on his way to a new Asia record for the category. The top four scores came from four different continents! All had extremely accurate logs, showing that high rates can be achieved without errors.

*e-mail: <k5zd@cqwpx.com>

The enthusiastic operating team at YEØX gives out a rare multiplier every year. Left to right YBØAZ, YBØECT, YBØGOF, YCØMXV, YBØYAD, YCØKVM, YCØRAN, YBØDPO, YBØKVN, YBØBSR, and YBØJS.

Once again there was an incredibly close race for top score in Canada with Ron, VE3AT, at VC3A outscoring John, VE3EJ, by less than one half of one percent (0.5%)! Accuracy made the difference, as Ron had a few less errors in his log and moved ahead during the log checking process.

The top USA score came from Kamal, N3KS, operating with the call WY3P. After a couple of Assisted category wins, this was Kamal's first SOAB victory. Second went to Ken, K4ZW, operating from the station of NR4M in Virginia. George, NR5M, took the wheel of his fantastic station in central Texas to finish a strong third. Ever present, Fred, K3ZO, talked his way into fourth. Kamal was the only one of the top USA single-ops to go over 1000 prefix multipliers.

The winner for Europe was Chris, MIØLLL, operating as GI5K. It was Chris' first attempt at the WPX Contest in the SOAB category and he did quite well! Second went to the special call EO5M operated by Roman, URØMC. Both of them had very large QSO totals on 20 meters. Lothar, DL3TD, placed third ahead of OH8L (Jari, OH8LQ, at the mic).

Single-Operator All-Band Low Power

John, KK9A, operating as P4ØA, once again removed any suspense from the top of the SOAB Low Power category. It was his sixth WPX SSB contest from Aruba and his sixth win! John sold his Aruba contest QTH days after this year's contest, but has made arrangements to continue operating there for a few more years. Second place went to CN2BC, operated by Hartwig, DL7BC. Not far behind in third place was Tomas, ZP5AZL, operating as ZPØR. Vitor, PY2NY, operated from his home station this time to take fourth.

The USA trophy returned to its customary place on the wall of Ed, N1UR, operating with the call NV1N. This was Ed's third win in four years! Another Ed, NX7TT, visited the station of KØUK in Colorado to take second place for the second year in a row. An impressive third-place score from the West Coast was turned in by John, K6AM, operating as NX6T. Another perennial Top Ten finisher was Terry, N4TZ, who once again travelled to KS9K, and this time took fourth.

Ashraf, 3V8SS, made over 1-million points using this efficient low-power setup.

In 2008, the European Low Power category was dominated by stations from the south. In 2009 it was the complete opposite with Gedas, LY9A, taking the win by a wide margin. Vlad, RW1CW, cruised into second. The next seven places were separated by less than 10%, with Christiaan, ON7CD, leading the pack in third place.

Single-Operator Single-Band

The top overall single-band score was achieved on 20 meters by Carlo, IK1HJS, operating as 5D5A from Morocco. It was a virtual tie for the next three spots on 20 meters with Jovica, 6W1SJ, just beating Bob, KQ2M/1, and Willy, UA9BA operating as UP2L. Bob still got the satisfaction of replacing the USA 20-meter record held by KK9A from back in 2000. Willy earned his reward by breaking the 20-meter single-band record for Asia set by H2A way back in 1991! Jiri, OK1RF, operated CT1JLZ to take fifth in the world and tops in Europe.

Ten meters may have sounded quiet where you were, but there was activity. John, LU1HF, made 756 contacts on the way to his fifth consecutive victory! Walter, PP5WG, and Christian, CX2CC, made strong efforts to complete a South American sweep of the top spots. Chuck, KZ5MM (a.k.a. W5PR), used his new call which was issued the day before the contest to take top honors in the USA. Vitomir, S56M, was the European winner.

Fifteen meters was no surprise with Sergio, PP5JR, back in the chair at ZX5J to take another commanding win. The next three finishers were all from Argentina, with Jesus, AY5F, getting by Ezequiel, LU1FDU, and Jorge, LU5VV (operating as LV5V). The top score in the USA was by Neal, K4EA, operating as NJ4U. George, SV9GPV, was the European winner over Milan, YU1ZZ operating YTØZ. It was tough going for everyone, as the east-west paths were fleeting.

There were more 40-meter single-band entries than ever before due in large part to the expanded frequency allocations and the reduction in foreign broadcasters on the band. Despite being far from everyone, Dule, ZL3WW, operated as ZL3A to a repeat victory as world high. Also repeating his second place finish of the prior year was Dusan, YU1EA, operating as YT8A. Dusan increased his own European record by 8%. Places three through six were a four-way race among 9A5E,

Log Checking Honor Roll

As the software tools become more sophisticated, we are able to go to a new level of cross checking. How deep? Of the 1.8-million submitted QSOs, we were able to cross check 95.1% against another log! Even though contesters tend to focus on points lost during log checking, we prefer to look at the fact that call and serial number information was exchanged at better than 96% accuracy. No wonder contests make such great training for emergency communication.

One area of extra emphasis this year was to investigate the source of calls that only appear in one log. We discovered that more than 68% of these unique calls were the result of copying errors. Many of these not only cost the point value of the QSO, but a multiplier as well. Accuracy is a fundamental element of contesting.

The average score reduction of the top 20 *Single-Operator All-Band* entries (including penalties) was 5.7%. The average for *all* single operator entrants was 11.7% (for all Multi-Operator entries it was 12.3%). Detailed log checking reports are available for every entry and can be requested by sending an e-mail to <k5zd@cqwpx.com>.

There were 254 golden logs this year with no score reductions. The top five golden logs by score (with number of contacts made) were: KG6OJB (296), KD7MSC (257), AI4ME (236), VE7FCO (213), and W2UJ (223).

It takes two stations to make a QSO, and there were 232 entries that caused no errors in other logs. The top five among these golden transmitters based on QSOs completed were N6RZR (167), W7CAR (167), DO5AWE (144), NE5D (141), and KD4MZM (136).

How much could you increase your score just by taking extra time to get calls and serial numbers correct?

WORLD TOP SCORES

SINGLE OPERATOR HIGH POWER ALL BAND

CN2R (W7EJ) 20,336,577
8P5A (W2SC) 17,863,617
KH7XS 17,615,360
5B4AII (RW3QC) 17,320,771
3V8BB (YT1AD) 14,745,708
6W1RW (F6BEE) 13,847,382
VC3A (VE3AT) 13,203,475
VE3EJ 13,139,096
4LØA (4L4WW) 11,299,200
GI5K (MIØLLL) 10,467,204

28 MHz

LU1HF 736,524
PP5WG 471,835
CX2CC 305,184
KZ5MM (W5PR) 99,693
S56M 24,300
VR2XMT 12,236
IG9/I2ADN 12,060
S57S 9,211
JA6WJL 9,100
JA7OWD 6,419

21 MHz

ZX5J (PP5JR) 9,930,600
AY5F 5,689,620
LU1FDU 4,737,575
LV5V (LU5VV) 1,482,190
CX1AV 1,292,576
HC2GF 620,620
YC9MDX 597,025
NJ4U 448,944
NH6P 448,256
SV9GPV 408,720

14 MHz

5D5A (IK1HJS) 11,356,980
6W1SJ (E78A) 7,066,140
KQ2M/1 7,034,082
UP2L (UA9BA) 6,996,448
CT1JLZ (OK1RF) 6,153,800
ZF1A (ZF2AH) 4,929,930
S5ØK 4,585,434
W7WA 4,440,531
YT1BB 4,293,024
YT2T 4,178,164

7 MHz

ZL3A (ZL3WW) 6,940,320
YT8A (YU1EA) 5,501,639
9A5E 4,400,935
H22H (5B4MF) 4,347,408
HG3A (HA3MY) 4,268,768
PYØFF 4,121,630
OHØJFP (SMØTQX) 3,489,882
AM7M (EC7ANC) 2,975,700
NN5J (KIØMB) 2,936,156
SO6X (SP6IXF) 2,779,036

3.7 MHz

RW2F (UA2FB) 3,087,400
9A5Y (9A3LG) 3,013,851
SN3A 2,521,636
SO8A 2,486,025
S53MM 2,294,124
9A6A 1,992,888
SP7MTF 1,862,883
H2T (5B4XF) 1,592,770
YT8WW 1,213,650
IK3HMB 1,148,450

1.8 MHz

SN3R (SP6HEQ) 656,367
YL2SM 414,726
C4M (5B4AGM) 343,728
SO8R 318,396
OG5B 291,648
HA1YI 289,800
F5LJA (F1UVN) 238,965
OK1NI 162,604
RV9SV 134,514
CU2AF 24,820

SINGLE OPERATOR LOW POWER ALL BAND

P4ØA (KK9A) 14,106,670
CN2BC (DL7BC) 4,208,064
ZPØR (ZP5AZL) 3,677,901
PY2NY 2,426,318
NV1N (N1UR) 2,351,175
CN4P (CN8NK) 2,349,050
RA9FTM 2,277,196
LT7H 2,196,156
LY9A 2,113,824
NX7TT/Ø 1,826,260

28 MHz

LQ5H (LU3HS) 240,170
LU2UE 218,550
PU2MTS 134,871
ZV2C 127,264
LU6FOV 70,213
PU2LEP 61,200
LTØD (LU6DU) 56,160
NA4W (K4WI) 44,748
HP1RIS 34,196
CE2WZ 26,578

21 MHz

ZV5E (PP5KE) 1,284,215
6V7E (RW3TN) 848,166
CE4CT 700,422
EA8/DL3KVR 567,930
YV1FM 446,368
PY2GH 397,328
LU4WG 336,217
E21YDP 267,509
PY4DEL 221,859
K9OM/4 217,620

14 MHz

E21EIC 1,418,175
IU9A 1,353,660
TG9AXF 1,313,637
HI3CCP 1,243,212
NV8N 820,500
RUØAKB 754,548
FM1HN 703,764
JR7WAB 670,410
IW1QN 622,170
RN3DY 604,572

7 MHz

HI3TEJ 2,869,380
UZ7M (UT9MZ) 1,301,869
SN3X 1,242,938
SO6V (SP6DVP) 1,057,472
S52OT 956,284
HA6NL 688,040
HQ9R 639,480
UA9UBL 635,116
E79D 615,134
YO5OED 534,543

3.7 MHz

YT1AD (YT3W) 885,256
4L2M 609,677
4L4CC 370,728
OM7AB 342,104
KU4BP 262,350
G4BXT 238,260
SP9H 221,236
LY4Q 220,215
SP4SHD 208,104
LY2CO 167,466

1.8 MHz

HA8BE 325,876
OK6Y (OK2PTZ) 162,855
ER3HW 112,266
YM3D (TA3D) 103,168
SN9P (SQ9GAI) 89,397
SP6EUA 67,545
F5VLV 53,491
YO6BZL 51,561
TA1CM 37,332
RW3MB 25,956

SINGLE OPERATOR QRP ALL BAND

TI5N (NØKE) 776,205
OK2BYW 595,265
F5BEG 552,690
OK7CM 524,372
RX1CQ 396,207
OM7DX 345,450
S59D 343,638
N2WN/4 331,441
NAØCW (W8QZA) 325,995
SP2DNI 219,760

28 MHz

EA8TX 23,120
LU7VCH 17,739
I5KAP 3,286
W6GMT/5 2,484
JA2MWV 319

21 MHz

JH7RTQ 37,296
SQ4HRN 12,544
7N4WPY 11,844
YCØCOX 10,920
WA6FGV 9,100

14 MHz

RA3FO 264,067
IØUZF 107,778
LA9BM 90,055
CT/LZ3ND 63,867
TG9ANF 51,291

7 MHz

RA4FWA 93,790
N1TM 67,482
YU1LM 20,962
YR8V (YO8CT) 19,140
ES6KW 11,748

3.7 MHz

OL4W (OK1IF) 154,580
SP9DTE 110,432
Z35X 100,746
SP2QOT 87,236
UT3L (UR5LO) 71,214

1.8 MHz

DJ3GE 280

SINGLE OPERATOR ASSISTED HIGH POWER ALL BAND

CS9L (DF7ZS) 14,356,552
RZ3AXX (RA4HTX) 8,262,288
RG9A (UA9AM) 8,038,800
ZX2B (PY2MNL) 7,805,700
E73M 7,750,990

28 MHz

9A2U (9A3ZA) 7,128
CX4DX 1,200

21 MHz

EA8/OH6CS 5,084,580
PT9PA 314,685
EA7ZY 201,124
4XØA (4X1VF) 184,245
YM2W (OK1MU) 130,140

14 MHz

RL3A (UA3ASZ) 5,616,526
IR2C (IW2HAJ) 4,309,476
OE2S (OE9MON) 3,537,990
EA1FDI 3,487,926
IR2M (IZ2FDU) 2,563,721

7 MHz

YT5C (YT7AW) 3,680,052
9A3AG 3,165,372
MW9W (MWØJRX) 1,985,340
S56X 1,829,805
RT3T (UA3TU) 1,419,100

3.7 MHz

S57UN 2,195,202
IW2HAJ (HB9DUR) 1,868,370
MCØSHL (G1VDP) 635,817
SQ9HZM 476,905
KN6DV/2 (E78WW) 336,740

1.8 MHz

SP1GZF 340,458
DMØY (DL3BQA) 298,144
W2MF 76,212
EA1GFW 55,125
YW5T (YV5JBI) 18,939

SINGLE OPERATOR ASSISTED LOW POWER ALL BAND

NP2KW 1,643,000
PX2T (PY2DN) 1,294,852
EF1W (EA1WS) 1,276,632
RW3DU 1,158,906
KP2BH 1,091,664

28 MHz

PU9OSB 74,358
PY7AHA 7,380
PY2XC 7,259
LU3JVO 5,170
PY5TJ 2,176

21 MHz

PY2ZY 776,385
PS6T (PY6KY) 504,754
LU7YW 499,155
VR2PX 131,440
IZØEYP/8 129,482

14 MHz

RU3SD 485,780
BD4QH 273,511
YQ5Q (YO5OHO) 257,114
W4LC 221,872
RA9JR 187,739

7 MHz

EA5KA 2,235,168
OK1UG 290,624
YY5LI 226,872
DL9ECA 133,133
YO3JW 122,008

3.7 MHz

YT4A 305,602
SN9Q (SQ9NFI) 280,120
DO4DXA 194,775
DF1HF 32,760
LY3JM 16,356

1.8 MHz

VE3MGY 34,020
YT7AW 11,736
RA4FUT 6,288

TRIBANDER/SINGLE ELEMENT HIGH POWER ALL BAND

HG8R (HA8JV) 6,321,780
PY2ADR 2,597,705
KH6FI 2,569,894
EV1R 2,240,430
VE3NE 2,181,250

28 MHz

K4MF 6,118

21 MHz

PT9PA 314,685
IWØBCF 73,350
PAØM 17,739

14 MHz

CT4NH 2,186,880
JH7XMO 1,562,946
EA5GS 1,531,134
VK7ZE 1,061,528
MØWLF 553,320

7 MHz

S51CK 1,186,515
SP9JZT 315,700
AM1C 223,130
KX9DX 184,992
NA3M 84,800

3.7 MHz

EA3ATM 749,023
IO3X 336,156
WK4Y 113,750
W2UJ 94,355
KK9V 11,016

1.8 MHz

DMØY (DL3BQA) 298,144
SV1GRD 24,378
WZ8P 14,615

TRIBANDER/SINGLE ELEMENT LOW POWER ALL BAND

CN2BC (DL7BC) 4,208,064
LT7H (LU1HLH) 2,196,156
EC8ADW 1,579,008
NX6T (K6AM) 1,290,096
ON7CD 1,211,370

28 MHz

PU2KLM 6,102
7N2UQC 779

21 MHz

CE4CT 700,422
EA8/DL3KVR 567,930
C4Z (5B4AIZ) 149,682
W7UPF 36,270
K7MY 31,570

14 MHz

NV8N 820,500
RN3DY 604,572
AO1B (EA1YB) 330,064
UA4WCM 243,984
W4LC 221,872

7 MHz

LY2MM 274,920
DL9ECA 133,133
IK1YED 92,000
N9TF 73,260
CT1EEK 47,616

3.7 MHz

YT4A 305,602
G4BXT 238,260
OH6JYH 3,486

1.8 MHz

KTØP/4 9

ROOKIE HIGH POWER ALL BAND

NØQO 3,708,432
IR1G (IZ1LBG) 3,552,120
RK3SWS 354,172
AD1DX 297,470
KP3VA 268,649

21 MHz

BD7MVZ 102,305
UA3QOS 9,856

14 MHz

IZØPSC 237,140
BG3DLX 133,042
UY8LM 106,020

7 MHz

PJ7MF 103,752
BG3DDB 53,192

3.7 MHz

PU3KNG 4

ROOKIE LOW POWER ALL BAND

F4FDA 465,792
RN3DBA 461,131
PF4T 369,408
YT2AAA 324,995
IZ2JPN 308,840

28 MHz

IT9AUG 5,895
PU1SAT 2,400
IW9/KJ4DJL 765

21 MHz

DV1EE 77,165
EC6UD 2,460
VR2WHA 2,204

14 MHz

BD4QH 273,511
LR1H (LU2HOD) 216,630
EW1IP 99,750

7 MHz

4Z5UN (UU2JM) 443,681
YY5LI 226,872
BV4VR 15,120

3.7 MHz

DG5SBK 12,720
DO1TGM 8,505

1.8 MHz

KC2RKU 2,556

MULTI-OPERATOR SINGLE TRANSMITTER

EF8R 32,273,965
D4C 32,202,182
P33W 24,589,434
CQ3T 19,639,404
E7DX 17,197,261
K1LZ 16,007,975
ES9C 15,296,688
ED8R 14,450,560
OL4A 13,951,245
OM7M 13,609,700

MULTI-OPERATOR TWO-TRANSMITTER

CT9M 33,085,395
PJ2T 26,165,040
ZY7C 20,751,356
9A8ØØVZ 19,512,924
OG8X 17,523,730
OLØW 13,870,605
KD4D/3 13,300,413
VE7SV 12,433,314
DQ8N 11,949,176
KI1G 11,934,690

MULTI-OPERATOR MULTI-TRANSMITTER

ZW5B 21,733,005
WE3C 19,779,364
OT5A 17,668,508
NQ4I 17,372,190
LZ9W 16,898,658
UU7J 16,465,872
HG1S 13,312,500
LY7A 7,763,692
WX3B 7,727,832
NE1C 5,564,936

H22H, HG3A, and PYØFF, who all broke 4-million points. Low-power winner Ted, HI3TEJ, set a new world record from the mountains of the Dominican Republic.

The 75-meter category turned into a form of European championship with 9 of the top 10 scores coming from Europe. RW2F, operated by Dmitri, UA2FB, made 1748 contacts with 718 prefixes to take the win. 9A5Y (operated by 9A3LG) was 100 contacts behind in second. Two Polish stations, SN3A and SO8A, were separated by only a few points in third and fourth place. Paris, 5B4XF, operating as H2T was the first-place score outside Europe. Steve, W3BGN, was the next highest score outside Europe and first in the USA. The top low-power score on the band was YT1AD operated by Dragan, YT3W. Dragan set a new European record. The second place score by Mamuka, 4L2M, set a new record for Asia.

Who operates 160 meters on SSB at the end of March? World high scorer was SN3R operated by Wieslaw, SP6HEQ. His 754 QSOs and 411 prefixes were very impressive. Viesturs, YL2SM, in Latvia finished second ahead of Ben, 5B4AGM operating as C4M in Cyprus. Top USA score was by Jim, K5RX, operating as NE5D near Dallas, Texas.

TROPHY WINNERS AND DONORS

SINGLE OPERATOR ALL BAND

WORLD: Stanley Cohen, W8QDQ Trophy. Won by: **CN2R operated by James P Sullivan, W7EJ**
WORLD Low Power: Caribbean Contesting Consortium Trophy. Won by: **P40A operated by John Bayne, KK9A**
WORLD QRP: Phil Krichbaum, NØKE Trophy. Won by: **TI5N operated by Philip Krichbaum, NØKE**
USA: Atilano de Oms, PY5EG Trophy. Won by: **WY3P operated by Kamal Siragelidin, N3KS**
USA Low Power: Terry Zivney, N4TZ Trophy. Won by: **NV1N operated by Edward Sawyer, N1UR**
USA QRP: Doug Zwiebel, KR2Q Trophy. Won by: **Julius Fazekas, N2WN/4**
USA Zone 4 High Power: Society of Midwest Contesters Trophy. Won by: **George A. Demontrond, III, NR5M**
USA Zone 4 Low Power: Society of Midwest Contesters Trophy. Won by: **Ed Campbell, NX7TT/Ø**
USA Zone 3: Lauri "Mac" McCreary, KG7C Trophy. Won by: **NY6N operated by Jim Stevenson, W6YI**
EUROPE High Power: Jim Hoffman, N5FA Trophy. Won by: **GI5K operated by Chris Smith, MIØLLL**
EUROPE Low Power: Ed Sawyer, N1UR Trophy. Won by: **Gediminas Lucinskas, LY9A**
AFRICA: Peter Sprengel, PY5CC Trophy. Won by: **3V8BB operated by Hranislav Milosevic, YT1AD**
ASIA: Chris Terkla, N1XS Trophy. Won by: **5B4AII operated by Evgeny (Jack) Danielyan, RW3QC**
NORTH AMERICA: Albert Crespo, F5VHJ Trophy. Won by: **8P5A operated by Tom Georgens, W2SC**
NORTH AMERICA QRP: Phil Krichbaum, NØKE Trophy. Won by: **Doug Ferris, VA3DF**
OCEANIA: Phillip Frazier, K6ZM Memorial Trophy. Won by: **Bill Kollenbaum, KH7XS**
SOUTH AMERICA: Andrew Faber, AE6Y Trophy. Won by: **Hamilton Oliveira Martins, PY2YU**
CANADA High Power: Todd Bendtsen, VE5MX Trophy. Won by: **VC3A operated by Ron Vander Kraats, VE3AT**
CANADA Low Power: Contest Club Ontario Trophy. Won by: **Yuri Onipko, VE3DZ**
JAPAN: Hamad Alnusif, 9K2HN Trophy. Won by: **Akira Minagawa, JAØJHA**

SINGLE OPERATOR, SINGLE BAND

WORLD: Steve Merchant, K6AW Trophy. Won by: **5D5A operated by Carlo De Mari, IK1HJS**
WORLD 21 MHz: Stuart Santelmann KC1F Memorial (W3UA/RA3AA sponsor) Trophy. Won by: **ZX5J operated by Sergio Lima De Almeida, PP5JR**
WORLD 14 MHz: Jorge Taboada, EA9LZ Trophy. Won by: **6W1SJ operated by Jovica Todorovic, E78A**
WORLD 7 MHz: Jorge Taboada, EA9LZ Trophy. Won by: **ZL3A operated by Dusko Dumanovic, ZL3WW**
WORLD 7 MHz Low Power: Neal Campbell, K3NC Trophy. Won by: **Ted Jimenez, HI3TEJ**
WORLD 3.7 MHz: D4C Contest Team Trophy. Won by: **RW2F operated by Dmitri Gorshkov, UA2FB**
USA 28 MHz: Maurice Schietecatte, N4LZ Trophy. Won by: **KZ5MM operated by Chuck Dietz, W5PR**
USA 21 MHz: Maurice Schietecatte, N4LZ Trophy. Won by: **NJ4U operated by Neal Sulmeyer, K4EA**
USA 14 MHz: Charles Wooten, NF4A Trophy. Won by: **Robert L. Shohet, KQ2M/1**
USA 7 MHz: Yankee Clipper Contest Club Trophy. Won by: **NN5J operated by Brian Smith, KIØMB**
USA 3.7 MHz: Bernie Welch, W8IMZ Memorial (WB8MRU sponsor) Trophy. Won by: **Steven Sussman, W3BGN**
EUROPE 28 MHz High Power: SKY Contest Club Trophy. Won by: **Vitomir Kregar, S56M**
EUROPE 21 MHz High Power: SKY Contest Club Trophy. Won by: **George Charokopakis, SV9GPV**
EUROPE 14 MHz High Power: SKY Contest Club Trophy. Won by: **CT1JLZ operated by Jiri Pesta, OK1RF**
EUROPE 7 MHz High Power: SKY Contest Club Trophy. Won by: **YT8A operated by Dusan Ceha, YU1EA**
EUROPE 3.7 MHz High Power: SKY Contest Club Trophy. Won by: **9A5Y operated by Zvonimir Karnik, 9A3LG**
EUROPE 1.8 MHz High Power: SKY Contest Club Trophy. Won by: **SN3R operated by Wieslaw Gebal, SP6HEQ**

SINGLE OPERATOR ASSISTED

WORLD: Emir-Braco Memic, OE1EMS Trophy. Won by: **CS9L operated by Helmut Mueller, DF7ZS**
USA: Alabama Contest Group Trophy. Won by: **WU3A/1 operated by Gene Shablygin, W3UA**
EUROPE: Martin Huml, OL5Y Trophy. Won by: **RZ3AXX operated by Alex Tokarev, RA4HTX**

OVERLAY CATEGORIES

WORLD Tribander/Single Element: Helmut Mueller, DF7ZS Trophy. Won by: **HG8R operated by Pál Vrbovszki, HA8JV**
USA Tribander/ Single Element: Paul Newberry, N4PN Trophy. Won by: **Wayne Rogers, N1WR/3**
WORLD Rookie: Val Edwards W8KIC Memorial (K3LR sponsor) Trophy. Won by: **Ken Long, NØQO**

MULTI-OPERATOR, SINGLE TRANSMITTER

WORLD: Latvian Contest Club Trophy. Won by: **EF8R operated by EA8AH, EA8CAC, EA8EW, EA8ZS, ES2RR**
USA: Steve Bolia, N8BJQ Trophy. Won by: **K1LZ operated by K1LZ, N8BO, K3JO**
ASIA: W2MIG Memorial (NX7TT Sponsor) Trophy. Won by: **P33W operated by RN3QO, RW4WR, RX3DCX, RA3AUU**
EUROPE: Tonno Vahk, ES5TV Trophy. Won by: **E7DX operated by 9A1TT, E7ØR, E7ØT, E74AW, E76C, E77DX**

MULTI-OPERATOR, TWO TRANSMITTER

WORLD: Ken Adams, K5KA Trophy. Won by: **CT9M operated by CT3BD, CT3DL, CT3DZ, CT3EE, CT3IA, CT3KU, CT3KY**
USA: Florida Contest Group Trophy. Won by: **KD4D/3 operated by K3RA, K3MM, NA3D, KD4D, K3MIM, AC6WI**
EUROPE: Bernd Och, DL6FBL Trophy. Won by: **9A8ØØVZ operated by 9A2X, 9A3TR, 9A3OS, 9A5X, 9A7V**

MULTI-OPERATOR, MULTI-TRANSMITTER

WORLD: Gail Sheehan, K2RED Trophy. Won by: **ZW5B operated by PP5EG, PP5XX, PU2MZI, PU5AAD, PU5OGE, PU5RAS, PY2KC, PY2KJ, PY2WC, PY3VK, PY5CA, PY5KD**
USA: Dale Hoppe, K6UA Memorial Trophy. Won by: **WE3C operated by WE3C, W3FV, NN3Q, KQ3V, K3TUF, N3RD**
EUROPE: Rick Dougherty, NQ4I Trophy. Won by: **OT5A operated by DF3TJ, JK3GAD, ON1GL, ON3AEI, ON3BD, ON3DGA, ON3MP, ON3NG, ON3PTZ, ON3VS, ON4AID, ON4AMI, ON4ASB, ON4AWT, ON4AWU, ON4CDE, ON4CFQ, ON4FG, ON4LN, ON4PVH, ON4ROS, ON4XB, ON5AEI, ON5CD, ON5CIM, ON5DH, ON5OT, ON5PVH, ON5WL, ON6HP, ON6LK, ON6LUQ, ON6MR, ON6PU, ON6RJ, ON6SX, ON6YYY, ON7GF, ON7NB, ON8UM, PA1BX, PB2T, Annelien, Carolina, Ellen, Jessie, Jimmie, Linda, Marc, Marleen, Olivier, Tim**

CONTEST EXPEDITION

WORLD: C6APR Memorial (PT7ZZ sponsor) Trophy. Won by: **C91TX operated by KG5U, W5MJ, N4AL, W5PF, K5WAF, WF5W, ZS6JR**

The operators at AHØBT included (left to right) Kuny, W1FPU; 8-year old Yoshiki, KHØUA; and Tomo, N2QP. Yoshiki made over 800 QSOs in his first HF contest experience!

Single-Operator QRP

Running an SSB contest with less than 5 watts is for those who really enjoy a challenge. Phil, NØKE, flew down to Costa Rica and maneuvered TI5N through the QRM to a world high score in the QRP category. Milan, OK2BYW, just beat fellow Europeans F5BEG and OK7GM for second place. Julius, N2WN/4, took the USA trophy. Close behind him was Bill, W8QZA, operating as NAØCW from the home station of NØKE!

The top QRP single band score was made by Nick, RA3FO, who made 576 contacts among the QRM on 20 meters! Another impressive QRP score was from Milan, OK1IF, who operated OL4W to 342 contacts on 75 meters.

Single-Operator Assisted

The Assisted categories drew a record 663 total entries this year, reflecting the continued integration of computers and networking into contesting. Even with help from the spotting networks, only four Assisted stations managed to break the 1000 prefix mark.

Winner of the all-band high-power category was CS9L operated by Helmut, DF7ZS. The chase for second was between two Russians, with RZ3AXX (operated by Alex, RA4HTX) getting past RG9A (Yuri, UA9AM). Wanderly, PY2MNL, operating again as ZX2B, was unable to repeat as champion.

Best of the single-band scores went to RL3A (Ruslan, UA3ASZ) who had over 5.6M points on 20 meters and set a new world record. Jyrki, OH6CS/EA8, also set a new world record with 5M points on 15 meters. Goran, YT5C, set a new world record for 40 meters.

Please note that we check carefully to detect stations that use the DX spotting networks during the contest and do not submit their entry in the Assisted category. For a first-time mistake, we simply correct the category. If this happens a second time, the action may be disqualification.

Overlay Categories

The Tribander/Single-Element classification provides a separate score listing for modestly

USA TOP SCORES

SINGLE OPERATOR HIGH POWER ALL BAND

WY3P (N3KS)	8,898,968
K4ZW	7,143,392
NR5M	6,378,560
K3ZO	5,797,440
K5TR	4,414,326
NY6N (W6YI)	3,994,056
WM5R	3,852,993
NØQO	3,708,432
N7TT	2,619,162
K7ZZ	2,583,168

28 MHz

KZ5MM (W5PR)	99,693
K4MF	6,118
W9SE	102

21 MHz

NJ4U (K4EA)	448,944
KV4T	155,040
N5DO	57,456
WØLSD	12,416

14 MHz

KQ2M/1	7,034,082
W7WA	4,440,531
K9CT	2,241,589
WØEWD	1,499,887
W9EXY	1,481,116
N2RJ	1,425,000
K6HNZ	1,105,125

7 MHz

NN5J (KIØMB)	2,936,156
K9NW	1,012,455
W4NP	635,481
AB9H	565,862
N8II	498,292
K4KZZ	461,714
K7WP	412,050

3.7 MHz

W3BGN	778,508
K9SH	190,995
W2UJ	94,355
AA1O	46,320
AI2N	24,564

1.8 MHz

NE5D (K5RX)	22,022
K1VW	12,530

SINGLE OPERATOR LOW POWER ALL BAND

NV1N (N1UR)	2,351,175
NX7TT/Ø	1,826,260
NX6T (K6AM)	1,290,096
KS9K (N4TZ)	1,232,160
WD5K	1,127,744
K7ZSD	966,656
N4XL	912,636
W3LL	744,224
WB8TLI	723,600
WZ8T	596,992

28 MHz

NA4W (K4WI)	44,748
K4QVK	2,106
KB2NEJ/4	1,100

21 MHz

K9OM/4	217,620
W7UPF	36,270
K7MY	31,570
NØUU	22,015
NØRB/5	21,336
W3CP/7	11,730

14 MHz

NV8N	820,500
W6AFA	427,482
NN5Z (K5PX)	351,220
AD7J (W7FP)	333,585
KN7T	110,880
K7ACZ	96,048

7 MHz

KI6LZ	378,708
K9SQL	196,458
KA9O	91,866
N9TF	73,260
N8BV	20,768
NYØT	17,936

3.7 MHz

KU4BP	262,350
NJ1H	62,568
K4EU	23,324
WA6WPG	22,936
NR8U	12,792
W2LP	9,891

1.8 MHz

KC2RKU	2,556
K4WI	64
KTØP/4	9

SINGLE OPERATOR QRP ALL BAND

N2WN/4	331,441
NAØCW (W8QZA)	325,995
WB4MSG	125,191
NN7SS (K6UFO)	88,074
KT8K	66,980
WA8WV	64,548
W2JEK	4,860
WI1G (W1IG)	3,880
WA5RML	2,408
AF9J	1,645

28 MHz

W6GMT/5	2,484

21 MHz

WA6FGV	9,100

14 MHz

K3TW	21,660
WB7OCV/2	8,976
KB1QEU	1,175
KZ2V/6	66

7 MHz

N1TM	67,482

3.7 MHz

AJ3T	18,648

SINGLE OPERATOR ASSISTED HIGH POWER ALL BAND

WU3A/1 (W3UA)	6,701,832
WB9Z	5,104,008
K7RI	4,193,814
W5WMU	3,674,874
W8MJ	3,498,908
WE4M (N2QT)	2,531,778
WG5J	2,191,133
NG3R (N3DXX)	1,937,562
WN9O (W9IU)	1,790,526
AB3CX/2	1,755,333

21 MHz

NQ5K (W5ASP)	86,190

14 MHz

KI7M	994,449
WR2G	391,124
W9NGA/7	384,748
KC1ME (K1JB)	376,302
KG9N	328,960
W2OSR	188,238

7 MHz

AC6DX	408,240
K2RET	139,698
KI9A	99,288
NA3M	84,800

3.7 MHz

KN6DV/2 (E78WW)	336,740
WK4Y	113,750
N4QV	27,740
N8KOJ	18,540

1.8 MHz

W2MF	76,212
WZ8P	14,615

SINGLE OPERATOR ASSISTED LOW POWER ALL BAND

NR1I (W1NT)	689,165
W4KTR	525,470
N4IG	483,035
KE1V	318,008
W4EE	284,100
K2DSL	208,260
K4NAU	203,404
WN6K	190,212
KØAD	187,854
W1TO	153,652

14 MHz

W4LC	221,872
KC9LNH	1,798
W7SST	1,323

7 MHz

N7MAL	21,930
W8EH	3,280

3.7 MHz

W6HH/5	377

TRIBANDER/SINGLE ELEMENT HIGH POWER ALL BAND

N1WR/3	1,826,250
K4FX	1,824,984
AB3CX/2	1,755,333
WN2O (N2GC)	1,673,685
W7ZR	1,616,598
W6TK	1,605,176
K4PV	1,496,082
AA4NU	1,306,942
AD4EB	1,256,564
WX6V	1,003,458

28 MHz

K4MF	6,118

14 MHz

KJ3X/6 (K1DQV)	520,188
AD1L	78,323
WB8O	66,744
WØPPF	40,044

7 MHz

KX9DX	184,992
NA3M	84,800
AA4D	20,007
WJ1R	8,064

3.7 MHz

WK4Y	113,750
W2UJ	94,355
KK9V	11,016
KA1CQR	9,381

1.8 MHz

WZ8P	14,615

TRIBANDER/SINGLE ELEMENT LOW POWER ALL BAND

NX6T (K6AM)	1,290,096
WD5K	1,127,744
WB8TLI	723,600
WZ8T	596,992
KT4ZB	553,380
WB4JFS	435,600
KB3LIX	297,348
KS4X	291,828
NA4K	276,885
WBØTSR	259,880

21 MHz

W7UPF	36,270
K7MY	31,570
W9ELN/Ø	468

14 MHz

NV8N	820,500
W4LC	221,872
K7ACZ	96,048
AE6YB	67,032

7 MHz

N9TF	73,260

1.8 MHz

KTØP/4	9

ROOKIE HIGH POWER ALL BAND

NØQO	3,708,432
AD1DX	297,470
K7DSL	138,516
N4BCD	112,308
N2PKP	81,954
AF6ME	65,155
W8DQ/4	22,746
KDØACO	1,155

14 MHz

N6BY	456

ROOKIE LOW POWER ALL BAND

K2DSL	208,260
N6IEF	138,859
KD8GOX	106,805
AF6EV	75,036
AJ4JD	57,232

14 MHz

KDØDRQ	15,326
KF1D	3,570
KC2TYZ	3,225

1.8 MHz

KC2RKU	2,556

MULTI-OPERATOR SINGLE-TRANSMITTER

K1LZ	16,007,975
NF4A	11,313,432
WR3Z	7,894,528
K3EST/4	7,533,517
NX5M	6,920,938
N7AT	3,082,840
KD9ST	2,968,144
NJ6N	1,939,164
KT4PD	1,936,471
K7ZS	1,369,914

MULTI-OPERATOR TWO-TRANSMITTER

KD4D/3	13,300,413
KI1G	11,934,690
KZ9O	7,773,885
WC6H	6,883,344
W1CU/6	6,114,584
NG6S	1,675,298
AC2AC/1	228,726

MULTI-OPERATOR MULTI-TRANSMITTER

WE3C	19,779,364
NQ4I	17,372,190
WX3B	7,727,832
NE1C	5,564,936
NR6O	569,114
KBØHH/5	420,792
WC8VOA	277,005

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Featuring... Antenna Analyzers

AIM 4170C Antenna / Lab RF Analyzer

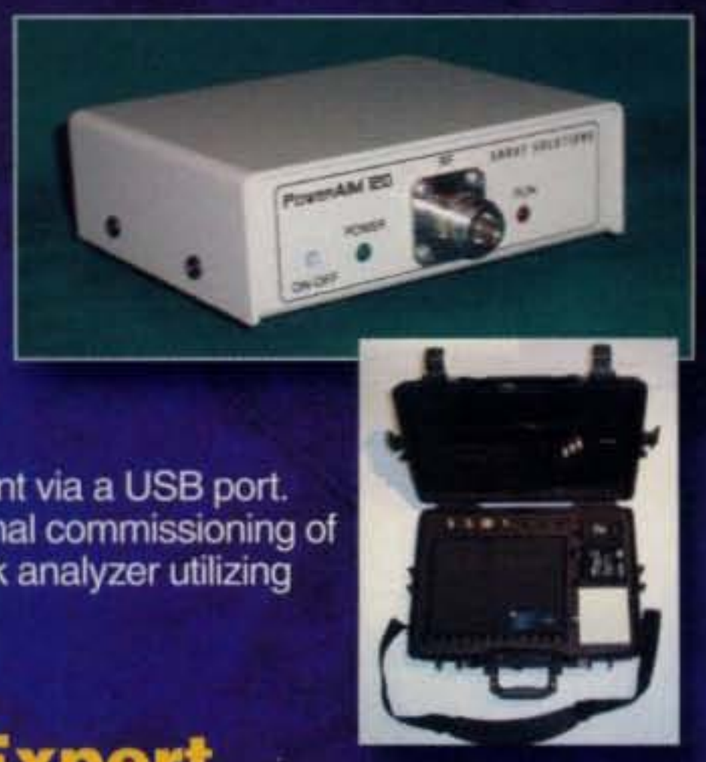
The AIM 4170C antenna analyzer measures the complex impedance (magnitude and phase) at each frequency of interest in the range of 5KHz to 170 MHz. A PC is used to calculate all RF parameters, including R +/-X, Magnitude and Phase, SWR, Return Loss, TL loss, and more and plot the results in an easy to read graph and interactive Smith Chart.

The test frequency is generated digitally and bandpass filters are used to reject stray signals (like broadcast stations) that are more than a few KHz from the operating frequency. A 12 bit analog to digital converter digitizes the raw data. This avoids non-linearities associated with diode detectors, and results in very good dynamic range and linearity for accurate magnitude and phase measurements.

PowerAIM 120

Vector Impedance Analyzer for Broadcast Engineers

The PowerAIM 120 Vector Impedance Analyzer with patent pending unique technology which offers the broadcast engineer the full capabilities of a single port network analyzer in a small lightweight software driven instrument that is easy to carry onto airlines and in the field. It is also very simple to set up and use but very accurate even at tens of thousands of ohms of impedance. All impedance parameters are measured and calculated.



The software for the PowerAIM is loaded on a laptop computer, which is coupled to the instrument via a USB port. The PowerAIM is particularly beneficial to broadcast engineers involved in the adjustment and final commissioning of AM HD radio transmission systems. The instrument is calibrated in a similar manner to a network analyzer utilizing an open, short and 50-ohm or other resistance load.

Vector Network Analyzer

Model VNA 2180

New!

The VNA 2180 measures impedance (magnitude and phase) and filter transmission in the range of 5KHz to 180 MHz. A PC is used to plot parameters, such as, impedance, SWR, S11 and S21.

The test frequency is generated digitally. A 12 bit analog to digital converter digitizes the raw data. This avoids non-linearity associated with diode detectors, and results in very good dynamic range and linearity for accurate magnitude and phase measurements.

RigExpert AA-230 PRO and AA-520 PRO

Antenna Analyzers

RigExpert AA-230PRO and AA-520 PRO are powerful, laboratory grade antenna analyzers designed for testing, checking, tuning or repairing antennas and antenna feedlines in 0.1 to 230 MHz range.

Graphical SWR (Standing Wave Ratio) and impedance display are key features of this analyzer which significantly reduce time required to adjust an antenna.

Easy-to use measurement modes, as well as additional features such as memory storage and connection to a personal computer.

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equipped stations to compete among each other. Moving up from second place in 2008, Pali, HA8JV, operated as HG8R to win the high-power category by a wide margin. Pali's station consists of a single vertical and a 4-element quad. Second place went to Adriano, PY2ADR who was less than 30k points ahead of Fred, KH6FI. For low power, it was CN2BC with a big lead over LT7H operated by Daniel, LU1HLH.

"Rookie" is an American term for someone who is a first-year participant in a sport. For the Rookie category, the WPX widens the definition to allow any participant who has been licensed for less than three years at the time of the contest to enter. This year there was an extremely close race for first place in the high-power class. The winner was Ken, NØQO, operating in his first-ever WPX contest. Just a few points behind was Filippo, IZ1LBG, operating as IR1G. Filippo entered the contest with one goal—break the Rookie category record for Italy. He did that easily. On low power there was an even closer race between David, F4FDA, and 13-year old Sergej, RN3DBA. Tom, PF4T, has been licensed less

EUROPE TOP SCORES

SINGLE OPERATOR HIGH POWER ALL BAND

GI5K (MIØLLL)	10,467,204
EO5M (URØMC)	8,632,428
DL3TD	6,757,824
OH8L (OH8LQ)	6,444,900
LX7I (DF1LON)	6,437,667
OHØR (OH2PM)	6,412,140
HG8R (HA8JV)	6,321,780
LY8O	5,970,363
S57DX	5,956,720
SP9LJD	4,340,514

28 MHz

S56M	24,300
S57S	9,211
LY1G	121

21 MHz

SV9GPV	408,720
YTØZ (YU1ZZ)	242,814
9A5K	185,234
AO7A (EC7DX)	177,158
EA4EER	148,941

14 MHz

CT1JLZ (OK1RF)	6,153,800
S5ØK	4,585,434
YT1BB	4,293,024
YT2T	4,178,164
S57AL	3,714,522
S5ØA	3,622,515
9A5W	3,031,077
OL3Z (OK1HMP)	2,754,189
OL9Z (OK2PVF)	2,241,528
SX1L (SV1GE)	1,588,344

7 MHz

YT8A (YU1EA)	5,501,639
9A5E	4,400,935
HG3A (HA3MY)	4,268,768
OHØJFP (SMØTQX)	3,489,882
AM7M (EC7ANC)	2,975,700
SO6X (SP6IXF)	2,779,036
OY9JD	2,674,004
F5BZB	2,616,817
SP4TKR	2,356,302
LN9Z (LA5KO)	2,110,779

3.7 MHz

RW2F (UA2FB)	3,087,400
9A5Y (9A3LG)	3,013,851
SN3A	2,521,636
SO8A	2,486,025
S53MM	2,294,124
9A6A	1,992,888
SP7MTF	1,862,883
YT8WW	1,213,650
IK3HMB	1,148,450
US2YW	1,089,680

1.8 MHz

SN3R (SP6HEQ)	656,367
YL2SM	414,726
SO8R	318,396
OG5B	291,648
HA1YI	289,800
F5LJA (F1UVN)	238,965
OK1NI	162,604

SINGLE OPERATOR LOW POWER ALL BAND

LY9A	2,113,824
RW1CW	1,620,408
ON7CD	1,211,370
YO3CZW	1,193,753
EI/ON4EI	1,111,428
UR4U (UR4UDI)	1,110,294
YO7LFV	1,098,625
LY4T	1,066,500
UA3BL	1,058,109
RK3MWI (UA3MSA)	966,966

28 MHz

CT1IUA	9,741
IWØHBY	8,750
IT9AUG	5,895
CT1AOZ	1,260

21 MHz

LZ1ND	75,429
SV1UT	46,746
EI4CF	34,768
IK2YGZ	10,672
RW4LQ	10,152
EB1CFH	9,145

14 MHz

IU9A	1,353,660
IW1QN	622,170
RN3DY	604,572
OH5TS	527,172
E74AA	524,955
UA1AQA	428,676
LY2OU	428,000

7 MHz

UZ7M (UT9MZ)	1,301,869
SN3X	1,242,938
SO6V (SP6DVP)	1,057,472
S52OT	956,284
HA6NL	688,040
E79D	615,134
YO5OED	534,543

3.7 MHz

YT1AD (YT3W)	885,256
OM7AB	342,104
G4BXT	238,260
SP9H	221,236
LY4Q	220,215
SP4SHD	208,104
LY2CO	167,466

1.8 MHz

HA8BE	325,876
OK6Y (OK2PTZ)	162,855
ER3HW	112,266
SN9P (SQ9GAI)	89,397
SP6EUA	67,545
F5VLV	53,491
YO6BZL	51,561

SINGLE OPERATOR QRP ALL BAND

OK2BYW	595,265
F5BEG	552,690
OK7CM	524,372
RX1CQ	396,207
OM7DX	345,450
S59D	343,638
SP2DNI	219,760
DJ3HW	214,200
DL4VCG	189,224
HA7YS	165,120

28 MHz

I5KAP	3,286

21 MHz

SQ4HRN	12,544
SM5MEK	1,260

14 MHz

RA3FO	264,067
IØUZF	107,778
LA9BM	90,055
CT/LZ3ND	63,867
YT1CS	50,020
SP4GFG	48,100

7 MHz

RA4FWA	93,790
YU1LM	20,962
YR8V (YO8CT)	19,140
ES6KW	11,748
ON8NT	6,032
OK2NMA	3,440

3.7 MHz

OL4W (OK1IF)	154,580
SP9DTE	110,432
Z35X	100,746
SP2QOT	87,236
UT3L (UR5LO)	71,214
OK1AIJ	10,934

1.8 MHz

DJ3GE	280

SINGLE OPERATOR ASSISTED HIGH POWER ALL BAND

RZ3AXX (RA4HTX)	8,262,288
E73M	7,750,990
OH4A (OH6KZP)	5,903,040
YR9P (YO9HP)	4,443,585
TM7F (F6GLH)	4,416,352
LY6A	4,383,042
YL4U (YL1ZF)	4,252,797
UR6F (UXØFF)	4,164,084
YT3M	4,089,055
UA6GP	4,074,543

28 MHz

9A2U (9A3ZA)	7,128

21 MHz

EA7ZY	201,124
EA1DR	117,008
LY1R	59,032
IZ5ASZ	49,750
DP9Z (DF9ZP)	48,160

14 MHz

RL3A (UA3ASZ)	5,616,526
IR2C (IW2HAJ)	4,309,476
OE2S (OE9MON)	3,537,990
EA1FDI	3,487,926
IR2M (IZ2FDU)	2,563,721
ES5RW	2,377,620
CT4NH	2,186,880
EI9HX	2,120,930
YT5A	2,049,385
F5UTN	2,045,585

7 MHz

YT5C (YT7AW)	3,680,052
9A3AG	3,165,372
MW9W (MWØJRX)	1,985,340
S56X	1,829,805
RT3T (UA3TU)	1,419,100
S51CK	1,186,515

3.7 MHz

S57UN	2,195,202
IW2HAJ (HB9DUR)	1,868,370
MCØSHL (G1VDP)	635,817
SQ9HZM	476,905
IC8C (IC8JAH)	253,134
OM6NM	247,032

1.8 MHz

SP1GZF	340,458
DMØY (DL3BQA)	298,144
EA1GFW	55,125

SINGLE OPERATOR ASSISTED LOW POWER ALL BAND

EF1W (EA1WS)	1,276,632
RW3DU	1,158,906
UR5AS	898,700
DK5MB	669,864
UR5IFB	589,720
DK3W (DL6MHW)	527,505
UX2MF	443,156
DD5M (DJØZY)	402,048
OK1TC	276,544
UR5ZVJ	254,888

21 MHz

IZØEYP/8	129,482
Z35T	59,130
RX6AH	49,403

14 MHz

RU3SD	485,780
YQ5Q (YO5OHO)	257,114
ON6NL	169,545
ES5TF	89,452
SP4PBI	67,298
ES2BH	50,213

7 MHz

EA5KA	2,235,168
OK1UG	290,624
DL9ECA	133,133
YO3JW	122,008
IZ3KKE	110,856

3.7 MHz

YT4A	305,602
SN9Q (SQ9NFI)	280,120
DO4DXA	194,775

1.8 MHz

YT7AW	11,736
RA4FUT	6,288

TRIBANDER/SINGLE ELEMENT HIGH POWER ALL BAND

HG8R (HA8JV)	6,321,780
EV1R	2,240,430
EU1AZ	1,703,208
MDØCCE	1,618,391
YL7X (YL2LY)	1,450,504
DB2B (DL8OBF)	1,210,758
RL6YXX (RU6CQ)	1,124,010
DK1KC	968,156
EA3RR	927,276
OE6MDF	822,940

21 MHz

IWØBCF	73,350
PAØM	17,739

14 MHz

CT4NH	2,186,880
EA5GS	1,531,134
MØWLF	553,320
EA5KV	363,735
OQ5M (ON5ZO)	159,372
SM5U (SM5UGC)	130,009

7 MHz

S51CK	1,186,515
SP9JZT	315,700
AM1C	223,130

3.7 MHz

EA3ATM	749,023
IO3X	336,156

1.8 MHz

DMØY (DL3BQA)	298,144
SV1GRD	24,378

TRIBANDER/SINGLE ELEMENT LOW POWER ALL BAND

ON7CD	1,211,370
YO7LFV	1,098,625
RK3MWI (UA3MSA)	966,966
LY2TS	782,768
EE7R	667,371
DB8NI	567,008
DR4G (DJØGM)	547,365
G3ZQH	520,740
UA3ABJ	513,600
EF7A (EC7ABV)	512,300

21 MHz

IKØEIE	17,155

14 MHz

RN3DY	604,572
AO1B (EA1YB)	330,064
UA4WCM	243,984
ON6NL	169,545
RU3SE	135,708
G1FON	80,892
IT9LED	79,497

7 MHz

LY2MM	274,920
DL9ECA	133,133
IK1YED	92,000
CT1EEK	47,616
UR8IDX	42,780

3.7 MHz

YT4A	305,602
G4BXT	238,260

ROOKIE HIGH POWER ALL BAND

IR1G (IZ1LBG)	3,552,120
RK3SWS	354,172
DJ5TD	189,222
DL7DS	126,218
IZ2ODM	105,646
DJ6TB	48,764
UR4PWC	47,880
RZ3DZI	11,319
DN5KID	6,426

21 MHz

UA3QOS	9,856

14 MHz

IZØPSC	237,140
UY8LM	106,020
DL1LQL	2,223

ROOKIE LOW POWER ALL BAND

F4FDA	465,792
RN3DBA	461,131
PF4T	369,408
YT2AAA	324,995
IZ2JPN	308,840
RA3VLD	229,824
PD1KSA	228,137
IZ1JLF	220,150
YU3MMM	217,854
F4FFH	207,432

28 MHz

IT9AUG	5,895

21 MHz

EC6UD	2,460

14 MHz

EW1IP	99,750
ES5TF	89,452
YT2ACA	20,292
IZ2JQP	16,456
EA1GWM	14,400

7 MHz

EA7ILI	4,928
UU2CW	4,242
UU5JFP	1,350

3.7 MHz

DG5SBK	12,720
DO1TGM	8,505

MULTI-OPERATOR SINGLE-TRANSMITTER

E7DX	17,197,261
ES9C	15,296,688
OL4A	13,951,245
OM7M	13,609,700
OM8A	11,860,731
IO5O	11,728,454
4O3A	10,263,644
LY9Y	9,300,648
IR9Y	9,132,656
EE2W	9,114,376

MULTI-OPERATOR TWO-TRANSMITTER

9A8ØØVZ	19,512,924
OG8X	17,523,730
OLØW	13,870,605
DQ8N	11,949,176
DR5N	10,211,225
UZ2I	8,562,889
OZ5E	8,408,928
DJ6KS	8,213,472
OL1X	6,608,415
YU/HB9EDB	6,190,594

MULTI-OPERATOR MULTI-TRANSMITTER

OT5A	17,668,508
LZ9W	16,898,658
UU7J	16,465,872
HG1S	13,312,500
LY7A	7,763,692
SX5P	5,027,256
EA3CCN	2,693,905
SF6D	2,240,453
DR2P	607,166
IZ1OMY	383,825

than one year and finished third. Let's keep an eye on these up-and-coming stars!

Multi-Operator

The Multi-Single category is the equivalent of Formula 1 for car racing. Teams of skilled operators seek every advantage to maximize their score under the rules. The team at EF8R overpowered the competition, but only by 70k points (that's less than 0.2%)! Second-place finisher D4C had more contacts, but fewer prefixes. In the end, it was logging accuracy that decided the winner. In third place was the Russian team at P33W operating a temporary Field Day style station assembled just for the contest. CQ3T finished fourth, continuing the island theme. E7DX finished fifth overall and was first place in Europe. In sixth, K1LZ broke the 10-year-old USA record in convincing fashion.

The Multi-Two team at CT9M achieved the highest score of any station in the contest, with over 33M points. Only six contacts behind them, the group at PJ2T battled rain static and poor conditions to finish second. Multipliers definitely made the difference. ZY7C decided to move up from their normal Multi-Single entry and finished a strong third. The gang at 9A7A once again introduced everyone to a new and confusing callsign, this time 9A8ØØVZ. They set a new European record and gave everyone who could copy their call correctly a new multiplier. Radio Arcala, OG8X, tested out their big antennas and declared success with finishing in fifth place.

CQ WW WPX SSB CONTEST ALL-TIME RECORDS

The contest is held each year on the last full weekend of March. The All-Time Records will be updated and published annually. Data following the calls: year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS

Single Operator

1.8	CN2R('07)	1,613,955	399
3.5	CN2R('06)	11,849,076	894
7.0	CN2R('05)	14,724,696	931
14	CN2R('08)	15,778,840	1199
21	ZD8Z('05)	17,129,112	1196
28	D44AC('02)	15,707,401	1123
AB	D4B('05)	26,871,482	1271
QRP/p	HC8A('94)	7,520,562	714
Assisted	P40W ('07)	15,837,235	1069

Multi-Operator Single Transmitter

D44TD('02)		33,443,856	1332

Multi-Operator Two Transmitter

AN8A('07)		47,019,528	1444

Multi-Operator Multi-Transmitter

HC8N ('03)		60,703,452	1476

U.S.A. RECORD HOLDERS

Single Operator

1.8	K1ZM('95)	327,712	308
3.5	WE3C('95)	1,519,300	475
7.0	NN5J('09)	2,936,156	692
14	KQ2M('09)	7,034,082	1082
21	KX8R('00)	7,556,250	930
28	NY4A('00)	6,006,573	877
AB	KQ2M('00)	11,875,240	1066
QRPp	KR2Q('00)	2,688,158	649
Assisted	NB1B('01)	7,463,666	1022

Multi-Operator Single Transmitter

K1LZ('09)		16,007,975	1273

Multi-Operator Two Transmitter

KD4D('06)		14,535,521	1183

Multi-Operator Multi-Transmitter

KM3T('00)		29,338,460	1355

CLUB RECORD

Contest Club Finland ('00)	250,320,141

QRPp RECORD

HC8A('94)	7,520,562

WPX (Prefix) RECORD

OTØA('00)	1528

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	CN2R('07)	1,613,955	399
3.5	CN2R('06)	11,849,076	894
7.0	CN2R('05)	14,724,696	931
14	CN2R('08)	15,778,840	1199
21	ZD8Z('05)	17,129,112	1196
28	D44AC('02)	15,707,401	1123
AB	D4B('05)	26,871,482	1271

ASIA

1.8	*YMØT('05)	486,846	222
3.5	H22H('08)	2,432,692	502
7.0	H24LP('87)	5,348,975	503
14	UP2L('09)	6,996,448	1048
21	7L1GVE('92)	6,848,136	838
28	H22H('00)	9,092,146	931
AB	5B4AII('09)	17,320,771	1093

EUROPE

1.8	SN3R('07)	835,884	434
3.5	RW2F('09)	3,087,400	718
7.0	YT8A('09)	5,501,639	869
14	DJ7AA('00)	7,955,224	1052
21	CQ1BOP('00)	6,989,997	1029
28	GM7V('00)	8,305,756	982
AB	OK1RI('01)	10,844,592	1034

NORTH AMERICA

1.8	VA1A('99)	535,225	271
3.5	ZF1A('08)	2,269,344	462
7.0	TI4CF('05)	8,057,479	751
14	KP2A('95)	7,088,976	912
21	WP3R('98)	10,167,632	986
28	KP2A('00)	11,385,710	1046
AB	8P5A('06)	20,560,452	1199

OCEANIA

1.8	KH6ND('07)	26,432	59
3.5	WH7Z('03)	1,208,900	308
7.0	ZL3A('08)	8,200,800	816
14	KH6ND('03)	6,493,727	887
21	AH7DX('00)	7,645,990	890
28	TXØDX('00)	12,049,422	847
AB	KH7SX('09)	17,615,360	983

SOUTH AMERICA

1.8	YV5JEA('84)	40,320	63
3.5	P4ØA('96)	1,715,076	426
7.0	ZX9A('97)	10,787,128	814
14	PYØFM('95)	9,660,432	939
21	ZX5J('08)	14,740,056	1242
28	ZX5J('99)	14,405,820	1095
AB	HC8A('01)	25,180,199	1199

MULTI-OPERATOR SINGLE TRANSMITTER

AF	D44TD('02)	33,443,856	1332
AS	5B/AJ2O('05)	28,966,272	1252
EU	9A7A('02)	19,034,950	1306
NA	VP2EC('92)	24,409,580	1115
OC	T33RD('99)	17,778,372	998
SA	HC8A('93)	32,502,677	1107

MULTI-OPERATOR TWO TRANSMITTER

AF	AN8A('07)	47,019,528	1444
AS	A61AJ('04)	30,157,650	1255
EU	9A8ØØVZ('09)	19,512,924	1403
NA	6Y1V('08)	29,018,014	1306
OC	KH7X('05)	20,910,656	1066
SA	HC8N('06)	46,791,472	1456

MULTI-OPERATOR MULTI-TRANSMITTER

AF	CN8WW('99)	55,151,562	1334
AS	P3A('00)	53,554,592	1456
EU	9AY2K('00)	42,477,343	1493
NA	WL7E('00)	42,013,215	1395
OC	KH7R('02)	32,806,032	1304
SA	HC8N('03)	60,703,452	1476

The PJ2T crew on Monday after the contest. Front: KBØB (Bob), WØCG/PJ2DX (Geoff), NØVD (Kelly). Back: PJ2BVU (Jean-Claude), K8LEE (Wayne), N4RV (Jack), W9JUV (Joe), and K2PLF (Marty).

Oms, PY5EG, summed up the essence of the Multi-Operator Multi-Transmitter category this way: "Despite the bad propagation we had a great time giving opportunity to a new generation of contest operators." Oms is a good teacher, as his ZW5B team finished with the top score. The second place WE3C team worked hard to keep at least two stations on the air at all times, but had to take an hour off on Sunday due to a tornado warning! I don't think any group dedicates as much energy to

the WPX contest as the ON7LR club, this year operating as OT5A. Check out the photos on the club's website at <www.on7lr.com>.

Final Thoughts

In August 2009, the WPX Committee invited all participants from the 2008 and 2009 contests to take an online survey about the contest. We were thrilled by the high level of response and the very thoughtful comments we received. Results can be found in the blog on the website at <www.cqwpx.com>. While you are there, check out the searchable score database, photo gallery, rules, and other topics of interest about the contest. You can also follow the CQ WPX Contest on Twitter (www.twitter.com/cqwpx). For expanded results of the 2009 contest (ops and more QRM) go to the CQ website:<www.cq-amateur-radio.com>.

It would be almost impossible to handle the record number of logs without the software development efforts of Ken, K1EA. All paper logs were converted to Cabrillo format by K1ZE, N1NK, N8RA, NJ1F, W1KM, W1TO, W1UE, W1ZT, W2JU, WA1Z, and WO1N. Barry, W5GN, does a great job of printing and mailing the more than 1200 certificates that were earned this time. Doug, K1DG, coordinates the plaque sponsors and distribution. Experience and advice were contributed by past directors N8BJQ and K6AW.

The 2010 WPX SSB Contest will be held on March 27 and 28. There are rule changes under consideration for 2010, so please read the rules carefully. We should finally be into the new solar cycle with a sunspot or two to help conditions improve. Rules can be found in the February issue of *CQ*, on the *CQ* website (www.cq-amateur-radio.com), and on the CQ WPX Contest website (www.cqwpx.com). See you in the 2010 WPX contests! 73, Randy, K5ZD

QRM

I really enjoyed the contest! Amazing 40m! ... **3V8SS**. We very enjoyed the WPX contest. Our young star Yoshiki, KHØUA, who is 8-year-old son of Kuny, W1FPU, made more than 800 QSOs. ... **AHØBT**. Last-minute work project required me to work and travel over the weekend. Managed to sneak in a few hours during breaks from a work project. Nice to see so much activity! ... **AK1W**. Having a 5-ele tribander can be a lot of fun, but only if you can turn the antenna. As rotator didn't work, missed all Asia and a lot of South America, by luck the antenna was pointing to Europe. ... **CN2BC**. Thanks for sponsoring a great contest. Due to my humble dipole antenna used on all bands, I like the bonus of making contacts on the low bands. That makes me more competitive. ... **DJ3WE**. First contest I have done in some time. Propagation was good and lots of stations. WX in Rarotonga was great for this frozen Alaskan. ... **E51COF**. Our first contest as Multi-Op Single Transmitter. Next time we can do it better. Very bad propagation, no QSOs on 28 MHz, our tribander antenna did not hear anything else on this band. ... **EE5J**. Band seemed less exotic than last year, but the activity was intense. I had to give up at 8 PM Sunday because I was feeling dizzy! Great fun as usual. ... **EI4GNB**. Hard weekend: Propagation very bad, bands noisy, computer grrr, two microphones failed, ARGH! I need a good repair of my station :(Anyway, it was a very good contest! CU next year! ... **F4ASK**. This is my first DX contest. Great enjoying the game! ... **F4FBP**.Very very busy with stations on top of stations. Excellent fun though and great to work new countries Thanks to those who go to distant places to activate unusual prefixes. It makes this contest very exciting. Hope to be back again next year! ... **GØMLY**. Great fun by all. Gave GD to a few guys and it made their day. Started late due to flight delays and had to finished early to set up other DXpedition stations (GT4BRS) but this short interlude enabled us to warm up the rigs, hi. Thanks for working us. ... **GD8K**. I heard a lot of callsigns which were originally VHF only, but after CW is no longer a requirement in many countries, have received full privileges. I am very happy that so many of these guys have taken up HF contesting. It was more fun with them on air! ... **HG5XA**. Propagation was not helping, but the most important thing we can have fun at WPX contest. cu next year. ... **HQ2W**. Another CQ WPX is done! A vertical antenna, a 100w rig, and a claimed score higher than last year (and lower than next one I hope!). Many thanks to you for contribute to my logbook. ... **IT9JDH**. Great opportunity given by ARI Sezione Cinisello Balsamo (Milano) to enjoy this contest on 80m. Everything worked well. Relative low number of NA stations logged. Thanks to IK2JUB, IK2PFL, IW2HAJ for the support in setting up the station. HB9DUR, Andrea. ... **IW2HAJ**. I entered single-op 80m low power. The conditions between the U.S.A. and JA were not so good. But the conditions of all except the U.S.A. were very good. I QSOed with 5 continents. I was able to update the personal-best record. This year, Chinese OTH radar was QRV on out of JA ham band. (OTH radar is now on 3810–3850 kHz.) It's signal strength was over S9++. ... **JE1SPY**. A real QSO-fest. Run, run, run. Averaged 95 QSOs/hour. ... **K2PS**. Anybody got a spare sunspot? ... **K5LAD**. My first big contest. Loved it! ... **KB3SCZ**. We nneed sunspots! And we want them now! ... **KD7DCR**. I only worked a few hours, was mainly trying to add new countries for LoTW DXCC. I had a great time. I really enjoy the professionalism and courtesy of the operators. I was successful in adding Ecuador, Northern Ireland, Lithuania, and Cape Verde. ... **KG4ZDM**. Nice to see the activity up from China. ... **KG6DX**. Believe me, anybody I worked on 40 and 75 meters was truly S-9 here. QRN level was also S-9 due to snow storm clouds. That coupled with rapid QSB sure made this one a challenge. If only everybody was as loud as 6W1SJ, who was +35 on 20! ... **KS7T**. The theme this weekend was "noise." "Noise" as in "energy that does not carry desired information." ... **KS9K**. My first WPX contest. Hard work with QRP but a lot of fun. Manage to work a lot of DX and pleased with the result. The 3-el Yagi help me a lot. ... **LA9BM**. I heard but was not able to work 9M8Z and work 9K2K. I was pleased to work 6W1SJ for new DXCC. Very difficult with numerous stations just not hearing my call. Two watts QRP. ... **M5AEF**. We decided this year to create the unusual MJ4 prefix, by taking our MD4K call for a fun entry in CQ WPX to Jersey. One of our ops had to pull out due to a bad flu, so then we were three for a multi-single effort. We had a lot of fun, in bad conditions on HF again, but seemed to create some interest! Let's hope the sunspots return sometime soon. ... **MJ4K**. 15 meters in pretty poor shape but still plenty of contacts available with a little effort. I still had a blast as usual. ... **N5DTT**. Fun! Tnx to WB6BFG for letting me sit in the hot seat all weekend (what would I do without my technical guru, chef, bartender, partner in crime). ... **N6UWW**. WPX SSB 2009 was tremendous fun for us! Station operations went very well, which further added to our enjoyment of every QSO. See you next year, sunspots or not! ... **N8AJN**. Although we were operating from one of the best 160 meter stations in the US (W8JI), we couldn't take advantage of it due to the severe storms in the SE USA during the contest. We left a lot of 6 point Q's on the table because we couldn't hear much on 160 (or 80) due to the storms. Thanks to W8JI for letting us use his great station. ... **NF4A**. Propagation was better on 15 meters and 20 meters. Only one contact in 80 meters and few on 40 meters. Only few South America stations heard in 10 meters. Heard only few stations from Europe this time mostly on 20 and 15 meters. ... **NP3CW**. Part-time operation. A lot of fun despite the fact that the DX conditions were marginal at best. ... **OG6N**. Had a great time. Looking forward to better band conditions. It was Norm's last hurrah from PNG; we're really gonna miss P29NB next time. ... **P29NB**. Surprising conditions on 15. Mni thanks for the great fun this contest offers. ... **PAØM**. Nice contest! Worked some nice DX on my simple openline dipole (like JAØJHA, and TF3ZA,TC3EC). ... **PA3GEO**. Lots of fun in the contest. Not much activity on higher bands. My simple wire dipole simply needs better condx. Thanks to all stations who had to dig my signal up from the noise.

At PJ2T Jean-Claude, PJ2BVU, is searching for multipliers on 160 while Marty, K2PLF, and Jack, N4RV, handle the run stations on 40 and 75.

Your patience is appreciated. ... **PE2KM**. Nice to hear 10 meters alive again! ... **PY2XC**. Really enjoyed big RKØAXX antennas. See you next year. ... **RUØAKB**. Amazing how well the band works on QRP. ... **SM5MEK**. Murphy had a lot of fun with us! We had problems with one PC, RF, and CT network, and 80 and 160 meter antenna, but it was great because we introduced Ernesto, CM8GJ, to our contest crew. It was CO8KA's first WPX also. Hope to get more new operators soon! ... **T48K**. I only operated Saturday, but it went well. Most stations were from Europe and only 9% from NA, similar to my previous contests this winter. Few years back, NA stations started to appear in the afternoon and were strong going into late night, but not this time. Highlights included A73A, VQ9JC, JP1DJV, and SX5P. Thanks for organizing this great contest. ... **TF3AM**. 20/9 QRN all weekend = the perfect mess! Or the perfect 160m training exercise. ... **VE3MGY**. We had a lot of fun in this contest using our vintage FT-101ZD and teamed with FL-2100B amp. A lot of new hams got their feet wet in this contest. ... **VE7NA**. Many thanks to the US licensees above 7.200 who make contesting a pleasure with their patience, mutual respect, and courtesy. Wx was kind. Best 73 from down under ... **VK3NI**. My first WPX contest and just using 100W and ground mounted vertical. Already have the 5-element tribander on order, hi. Nice 40m openings to NA both evenings and Europe on last morning. Lots of new countries. Hooked on contests now! ... **VK5HRT**. Great fun giving out the first VP59 Prefix. Be back next year with another new one. ... **VP59V**. Was not able to operate the full contest due to family commitments. Decided to try QRP to see how the antenna system works and with a target of 50 QSOs and 5000 points. Operating time about 6 hours, mostly on RX. ... **VU2PTT**. Great contest, many more DX contacts this year, great path to Europe, even worked Senegal and South Korea, and heard the Philippines. ... **WØCBH**. My first SSB contest! Many thanks to those who copied my QRP signal. Very good operators! ... **WA5RML**. Two power outages but had a lot of fun! Working Greece, Cyprus, and Thailand helped too! ... **WA6KHK**. Great openings to Europe Saturday evening and Sunday. Great fun. I can't believe that there are so many different prefixes to contact. ... **WB6JJJ**. Great time by enjoying operating at times in a busy weekend. Made some interesting QSOs and new ones for me on 40, 20, and 15 meters. ... **XE2RV**. Always a great contest despite a poor propagation. Anyway I enjoyed every contact. See you next year. .. **YV6BXN**. Wow! So many signals. I am left wondering if the DX QRP stations ever get heard amongst all the splatter and QRM. I was struggling with 100w and tribander with wires. Fun comes in various forms! Next contest I will try new antennas on 40m. Thanks to all who worked me. ... **ZL1AAO**.

(Continued on page 104)

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*Frequency coverage may vary. Refer to owner's manual for exact frequency specs.

ICOM

Announcing:

The 2010 CQ World-Wide WPX RTTY Contest

February 13–14, 2010

Starts: 0000 GMT Saturday Ends: 2359 GMT Sunday

I. Objective: For amateurs worldwide to contact as many amateurs and licensed prefixes as possible during the contest period.

II. Period of Operation: 48 hours. Single-Operator stations may operate 30 of the 48 hours—**off times must be a minimum of 60 minutes**. Multi-Operator stations may operate the full 48 hours.

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

IV. Terms of Competition for All Categories:

(a) All entrants must operate within the limits of their chosen category when performing any activity that could impact their submitted score. Only the entrant's callsign may be used to aid the entrant's score.

(b) A different callsign must be used for each entry.

(c) All entrants must not exceed 1500 watts total output power, or the maximum output power of their country, or the power limit of their entry category, whichever is less, on any band.

(d) QSO alerting assistance is permitted in **all** categories. However, self-spotting or asking other stations to spot you is not allowed.

(e) All operation must take place from one operating site. 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.

(f) The entry location of a remote station is determined by the physical location of the transmitters, receivers, and antennas. A remote station must obey all station and category limitations.

V. Entry Categories

A. Single-Operator Categories: Only one person (the operator) may contribute to the final score during the official contest period.

(a) Single-Operator High (All-Band or Single-Band): One person performs all of the operating and logging functions. Only one transmitted signal is permitted at any time. **Total output power must not exceed 1500 watts**.

(b) Single-Operator Low (All-Band or Single-Band): One person performs all of the operating and logging functions. Only one transmitted signal is permitted at any time. **Total output power must not exceed 100 watts.**

B. Multi-Operator Categories (All-Band operation only, high power only): Only one transmitted signal per band and only one run transmitter per band.

(a) Single-Transmitter (Multi-One): Only one transmitted signal is permitted at any time. A maximum of 8 band changes may be made in any clock hour (00 through 59 minutes). For example, a change from 20 meters to 40 meters and then back to 20 meters counts as two band changes. Excessive violations of the band change rule will result in reclassification to the Multi-Multi category. Use a single serial number sequence for the entire log. **Total output power must not exceed 1500 watts**.

(b) Two-Transmitter (Multi-Two): A maximum of two transmitted signals at any time on different bands. Both transmitted signals may work any and all stations. A station may only be worked once per band regardless of which transmitted signal is used. The log must indicate which transmitted signal made each QSO (column 81 of Cabrillo QSO template for CQ contests). Each transmitted signal may make a maximum of 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 counts as two band changes. Excessive violations of the band change rule will result in reclassification to the Multi-Multi category. Use a separate serial number sequence for each band. **Total output power of each transmitted signal must not exceed 1500 watts**.

(c) Multi-Transmitter (Multi-Multi): Use a separate serial number sequence for each band. **Total output power of each transmitted signal must not exceed 1500 watts**.

VI. Exchange: RST report plus a progressive contact serial number starting with 001 for the first contact. Single-Operator and Multi-One entries must use a single serial number sequence for the complete log. Multi-Two and Multi-Multi entrants use separate serial number sequences starting with serial number 001 on each band.

VII. 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 and 3.5 MHz.

(b) Contacts between stations on the same continent, but different countries, are worth two (2) points on 28, 21, and 14 MHz and four (4) points on 7 and 3.5 MHz.

(c) Contacts between stations in the same country are worth one (1) point on 28, 21, and 14 MHz and two (2) points on 7 and 3.5 MHz.

VIII. Prefix Multipliers: The prefix multiplier is the number of valid prefixes worked. Each PREFIX is counted only once regardless of the band or number of times the same prefix is worked.

(a) A PREFIX is the letter/numeral combination that 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 count as 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, /AD8, 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.

(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.

IX. Scoring (QSO Points): A station may be worked once on each band for QSO point credit. Prefix credit may be taken only once.

(a) Single-Operator:

(i) All-Band score = total contact points from all bands multiplied by the number of different prefixes worked.

(ii) Single-Band score = total contact points on the band entered multiplied by the number of different prefixes worked on that band only.

(b) Multi-Operator: Scoring is the same as Single-Operator, All-Band.

X. Awards: Certificates will be awarded to the highest scoring station in each category listed under Section V

(a) In every participating country.

(b) In each call area of the United States, Canada, Australia, European Russia, Asiatic Russia, Spain, and Japan.

(c) In countries or call areas where entries justify, second- and third-place awards may be made.

All scores will be published. To be eligible for an award, a Single-

Operator station must show a minimum of 6 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, only contacts made on the band specified in the Cabrillo header or summary sheet will be considered for scoring purposes.

XI. Plaques and Donors:

Plaques are awarded to recognize top performance in a number of categories. For a current list of plaques and sponsors, or to learn how to become a sponsor, see <www.cqwpxrtty.com/plaques.htm>.

A station winning a World plaque will not be considered for a sub-area award. That award will be given to the runner-up for that area if the number of entries justifies the award. Contestants who win a category for which no plaque is sponsored may contact <plaques@cqwpxrtty.com> to arrange sponsorship.

XII. Club Competition: A plaque will be awarded each year to the club that has the highest aggregate score from logs submitted by members.

(a) The club must be a local group and not a national organization (e.g., ARRL or DARC).

(b) Participation is limited to members residing in or operating from a local geographic area defined as within a 275-km radius circle from center of club area (except for DXpeditions specially organized for operation in the contest).

(c) Single Operators can only contribute to one club. Multi-Operator scores are allocated as indicated with the entry.

(d) Please spell out the full club name in the CABRILLO file, exactly as it is listed on the Club Names web page, <www.cqwpxrtty.com/clubnames.htm>. To be listed in the results, a minimum of three logs must be received from a club.

XIII. Instructions for Submission of Logs:

(a) All times must be in GMT.

(b) All logs must be submitted with the QSOs in chronological order.

(c) The log MUST show the correct serial number sent and received for each contact. Logs without sent and received serial numbers may be reclassified as checklogs.

(d) We would appreciate receiving all logs in electronic format. Electronic submission of logs is **required** for anyone competing for an award and for all who use a computer to log the contest or prepare contest logs.

(e) Single band entrants are required to include *all* contacts made during the contest period, even if on other bands. Indicate the single-band information in the CABRILLO header and only those contacts made on the single band will be included in the scoring.

(f) The CABRILLO file format is the standard. Please make sure all of the CABRILLO header information is included. For detailed instructions on filling out the CABRILLO file header, see <www.cqwpxrtty.com/logs.htm>. **U.S. stations must indicate the ARRL Section of operation in the CABRILLO header (e.g., LOCATION: OH)**.

(g) E-mail is the expected method of log submission. Logs in CABRILLO format should be sent to <rtty@cqwpx.com>. In the "Subject:" line of your e-mail message, please include only the callsign used in the contest. The CABRILLO formatted log file should be named call.log, with "call" being the callsign used in the contest. Portable callsigns should use a hyphen in place of the slash, e.g., w0yk-kh6.log for W0YK/KH6. All logs received via e-mail will be confirmed via e-mail. A listing of logs received can be found at <www.cqwpxrtty.com/logs received. shtml>.

(h) Instructions for NON-CABRILLO electronic logs: If you are not able to submit a CABRILLO log, please contact the Contest Director for permission to submit another format.

(i) Instructions for paper logs: Paper logs may be mailed to CQ Communications, Inc., 25 Newbridge Road, Hicksville, NY 11801 USA or by fax (+1) 516-681-2926). Each paper log 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. Indicate WPX RTTY Contest on your envelope.

XIV. Disqualification: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest; unsportsmanlike conduct; taking credit for excessive unverifiable QSOs or unverifiable multipliers will be deemed sufficient cause for disqualification. Incorrectly logged calls will be counted as unverifiable contacts.

Any use by an entrant of any non-amateur means including, but not limited to, telephones, e-mail, internet, Instant Messenger, chat rooms, VoIP, or the use of DX cluster to *solicit, arrange, or confirm* any contacts during the contest is unsportsmanlike and the entry is subject to disqualification.

An entrant whose log is deemed by the Contest Committee to contain a large number of discrepancies may be disqualified from eligibility for an award, both as a participant operator or station, for one year. Disqualification of an entrant in any CQ contest will lead to check-log status in all CQ contests for a period of one year. If an operator is disqualified a second time within five years, he/she will be ineligible for any CQ contest awards for three years.

XV. Declaration: By submitting an entry in the CQ WPX RTTY Contest you agree that: (1) you have read and understood the rules of the contest and agree to be bound by them, as well as all rules and regulations of your country which pertain to amateur radio, (2) your log entry may be made open to the public, and (3) all actions and decisions of the CQ WPX RTTY Contest Committee are official and final.

XVI. Deadline: All entries must be postmarked NO LATER than March 1, 2010. All logs, including e-mail entries, are subject to the deadline. Logs postmarked after the deadline may be listed in the results, but will be ineligible for any awards.

E-mail logs to <rtty@cqwpx.com> and review the response e-mail from the robot. If noted in the response, make any corrections and resubmit the log.

Questions pertaining to the CQ WPX RTTY Contest may be e-mailed to the Contest Director, Ed Muns, WØYK, at <w0yk@cqwpxrtty.com>.

Announcing:

2010 Nominations Open for the *CQ* Amateur Radio Hall of Fame

Amateur radio operators have been responsible for many advances in communications technology, and entire industries have been built on the foundation of amateur radio experimentation and activity. In an effort to recognize outstanding amateurs and their achievements, and help the public appreciate the far-reaching and long-standing value of amateur radio in our society, we have established the *CQ* Amateur Radio Hall of Fame. Nominations for the 2010 "class" are now open. Members of the 2009 "class" were announced last May and appeared in the July issue of *CQ*.

The *CQ* Amateur Radio Hall of Fame honors those whose technical or other accomplishments have helped propel amateur radio forward, or whose achievements in other areas of life have helped improve ham radio's reputation simply through association. Nominees for the *CQ* Amateur Radio Hall of Fame will be judged on the basis of qualifying in one of two broad areas: those individuals—whether licensed amateurs or not—who have made significant contributions to the amateur radio hobby; and those radio amateurs who have made significant contributions to society in general. Nominees must have made *significant* contributions of nationwide or worldwide impact.

Nomination Period Closes March 31

Between now and March 31, 2010, we will be accepting nominations for the 2010 "class" of the Amateur Radio Hall of Fame. Nominations received after that date will be considered for future selection. You may either use the form on the following page or on our website, or simply write us a letter stating your candidate's name, where to contact him/her if still living, for which category you are nominating him/her, and a brief one- to two-paragraph description of this person's accomplishments. Please include your name and contact information as well. E-mail to <hall-of-fame@cq-amateur-radio.com> or mail to *CQ* Amateur Radio Hall of Fame, 25 Newbridge Rd., Hicksville, NY 11801. If you feel someone has earned this recognition, please submit a nomination. Please *don't* assume that someone else will nominate the person you may have in mind.

We'll be making up our own candidate list at the same time, and will announce this year's selections at the Dayton Hamvention® in May 2010. Please help us recognize these "ham radio heroes" whose contributions have helped shape our hobby, our nation, or our world.

(The official nomination form is on the CQ website.)

CQ DX and Contest Halls of Fame Deadline March 1st

Nominations are also open for the **CQ DX Hall of Fame** and the **CQ Contest Hall of Fame**, which recognize those amateurs who have made major contributions to DXing and contesting, respectively. The activities and accomplishments that qualify one for membership in these elite groups involve considerable personal sacrifice and can usually be described by the phrase "above and beyond the call of duty."

Nominations for the Contest and DX Halls of Fame are made by **contesting or DX clubs or national organizations,** and must be submitted by **March 1** of each year to be considered. A maximum of two (2) people may be inducted into each hall of fame each year. Nominations for the CQ Contest and DX Halls of Fame should be directed to Bob Cox, K3EST, c/o CQ Communications Inc., 25 Newbridge Rd., Hicksville, NY 11801; or via e-mail to <k3est@cqww.com>.

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Oops...

AD5X's October review of the updated Ameritron ALS-600 HF amplifier was supposed to include a sidebar on a control/ indicator unit Phil designed for the ARI-500 automatic band-switch accessory. Somehow, it never made it to the final version. So, without further ado, here is Phil's add-on circuit.—the editors

Control/Indicator Unit for the Ameritron ARI-500

As discussed in the review (see the October 2009 issue), there are no ALS-600 status indicators on the ARI-500, requiring an ALS-500RC Remote Control Head for monitoring a remotely mounted ALS-600 amplifier. Also, you must switch off your ALS-600 to run barefoot or check exciter drive power.

To remedy these "deficiencies," I built a compact interface that plugs into the ARI-500 Remote A input that includes PWR, TX and O/L LEDs, and a Standby/ Operate switch. The circuit is shown in fig. 1. While I made my own RJ45 cable interface, I've called out an RJ45 cable so you can just cut off the necessary cable length. The cable length is non-critical, but it should extend just 3 inches from the box to the end of the RJ45 connector if you want to mount the interface unit right on the ARI-500. All parts (Table II) are from All Electronics (www.allelectronics.com). Photo G shows the inside wiring of the unit, and photo H shows the unit mounted on the ARI-500 with double-sided tape. *(Note: Photo H also shows a highly modified ARI-500 that is the subject of another article.)* Labeling was done using Casio "White-on-Clear" labeling tape.

In order to use this unit, strap the ARI-500 as though the ALS-500RC is being used. Unlike the ALS-500RC, however, this interface unit does not disable the ARI-500 auto-reset, nor does it load the ALS-600 RF power meter. Now I can mount the ALS-600 out of the way and still monitor TX and O/L status. Also, I can easily switch between Operate and Standby so I can check transceiver drive or switch between barefoot and full-power operation.

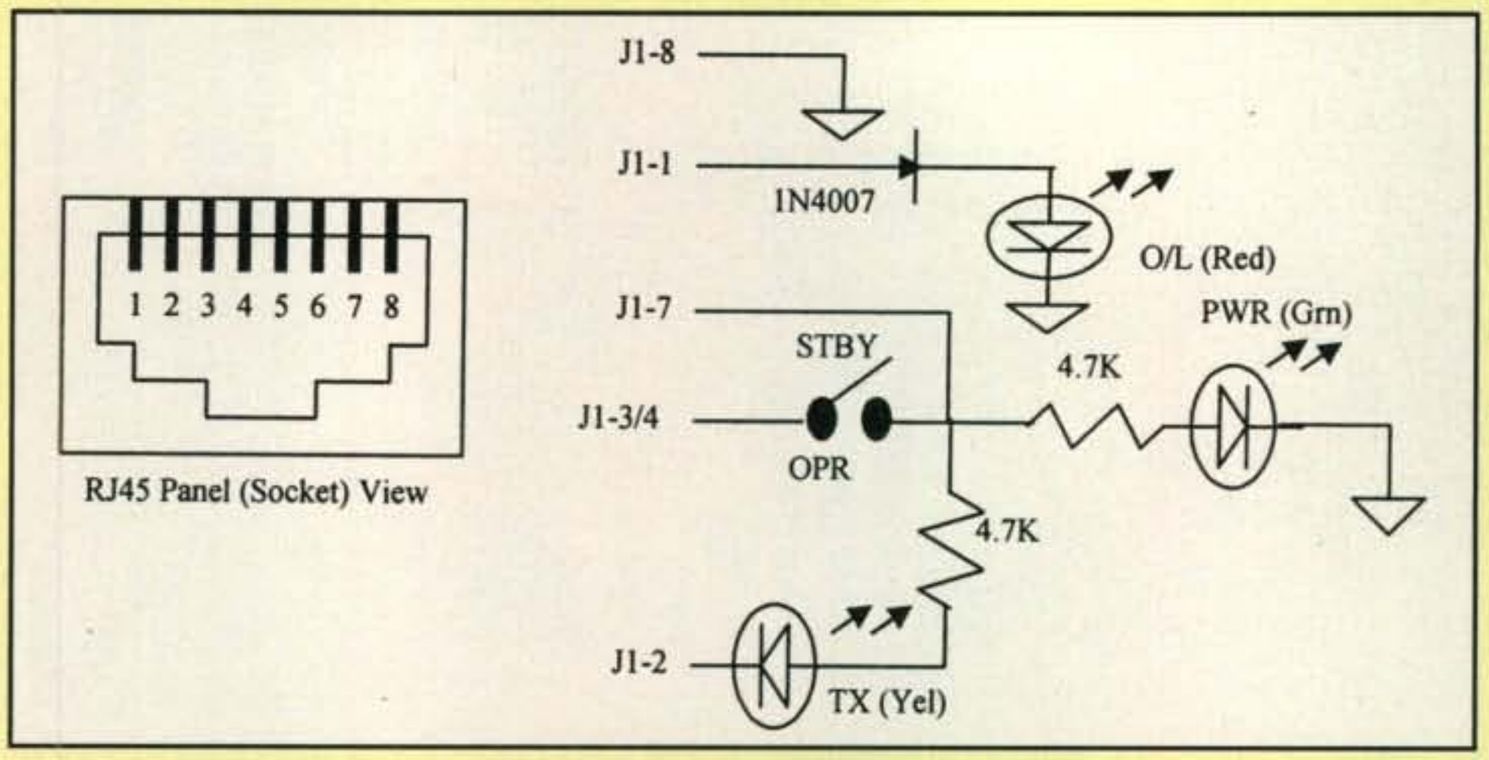

Fig. 1– ARI-500 interface unit schematic.

Qty	Description	Part No.	Price ea.
1	Subminiature toggle switch	SMTS-4	$1.35
1	Ultra-bright green LED	LED-57	$2.00
1	Ultra-bright red LED	LED-94	$0.55
1	Ultra-bright yellow LED	LED-72	$0.95
2	4.7K 1/4-watt resistor	4.7K-1/4	5/$0.50
1	1N4007	1N4007	6/$1.00
1	2.36" × 1.36" × 0.8" plastic box	1551-HBK	$1.95
1	3-ft. CAT5 cable	CB-53	$2.35

Table II– ARI-500 interface unit parts list. All Electronics part numbers shown.

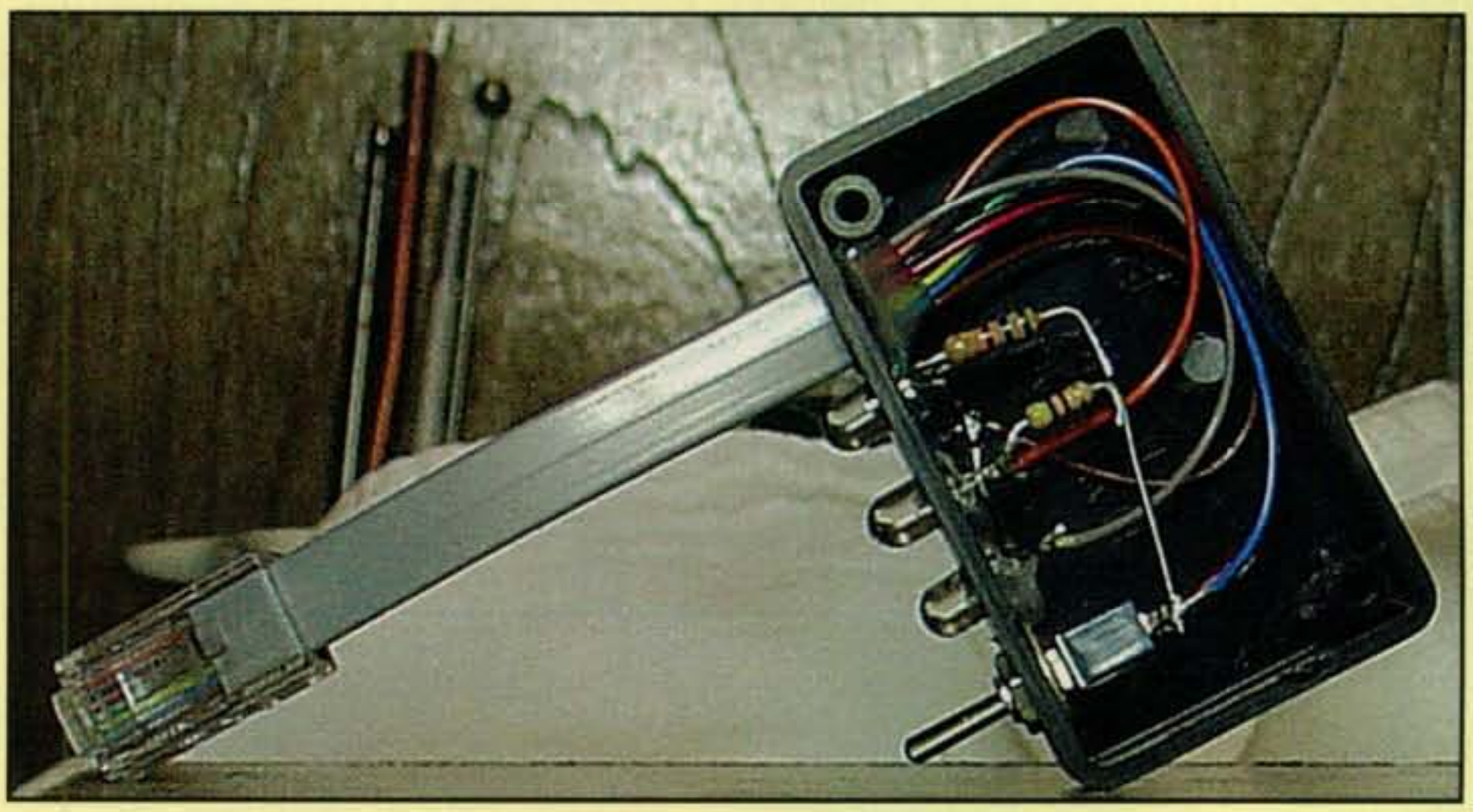

Photo G– Inside wiring of the author's homebrew ARI-500 interface unit.

Photo H– Interface unit mounted on the ARI-500 with double-sided tape.

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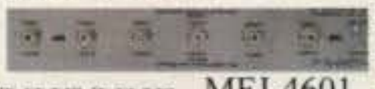

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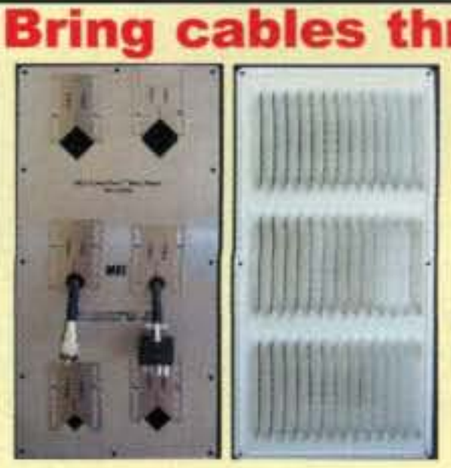

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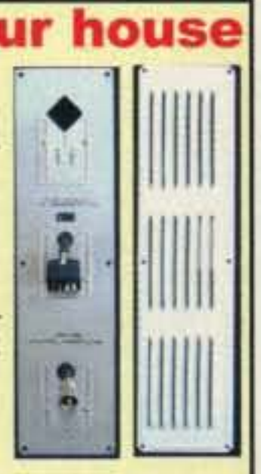

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math's notes

BY IRWIN MATH,* WA2NDM

New Year Nostalgia

At this time of year I always like to look at where we are, where we have been, and where we may go. During my lifetime so far progress has been very rapid and amazing, and I cannot believe just how "advanced" we are now.

When I was 13 we got our first television set. Although I had seen TV shows for several years on a neighbor's 7-inch RCA 630 black-and-white TV set, ours was the "latest" and first color TV on the block. The 16-inch screen looked tremendous, and the few shows that were actually broadcast in color ("The Wonderful World of Disney" and "Bonanza") were amazing, to say the least. The CRT was huge and heavy and had lots of controls (internal as well as external) to adjust color hue, saturation, convergence, etc. When I look at my cell phone's HD display today I cannot help but marvel. Where is the 30-kv high-voltage supply? How is all of that packed into a tiny pocket-size housing that is less than 1/4-inch thick and weighs a few ounces?

In the "old days" we did not have computers. We did have heavy mechanical adding machines with rows and rows of buttons, rolls of paper, and carbon ink saturated ribbons, but we could only add and subtract with these behemoths. The technological breakthrough came with the first 10-key "calculator" (yes, the terms had changed) made, I believe, by Olivetti. Now you could not only add and subtract, but multiply and divide as well. You did not even have to pull the crank, since an internal electric motor did the job for you. These rapidly evolved from basic calculators into the tape-driven TRS-80s, the 8-inch, 5 1/4-inch, and 3 1/2-inch disk-drive computers, and finally into today's multi-gigabit units (in tiny thumb drives as well), also quite amazing (and in a relatively short time)!

Speaking of computers, when I was in middle school we had to take a mandatory typing class. We had to learn proper posture, proper finger positions, and if you were good you might be able to actually type at 10 to 20 words per minute. Well, not only are typewriters obsolete today (an IBM Selectric was $15 at a garage sale recently, complete will five type balls), but my 16-year-old can type at least 10 times faster (and more accurately) than I can with no formal training at all. Her posture is not that bad either, and she can easily manipulate a 10-key non-QUERTY multi-symbol-type keyboard when texting. Any mistakes she might make are also quickly and automatically corrected.

With regard to our hobby I am not that old that I remember spark, but I did build many transmitters and receivers with vacuum tubes such as the 6SN7, 6AG7, 6146, 2E26, 6L6, and so on. All of these required high-voltage supplies (I still remember the shocks!), dipping and loading finals, and an obsession with SWR. Today all tuning and matching is automatic, and the only high currents required from the power supplies (at low voltages) are for the transmitters. Even fully software-controlled radios are becoming readily available, making me wonder where all of this will lead. Will amateur radio remain roughly where it is, or will it be unrecognizable in a few decades?

With these thoughts in mind, I would like to share a dozen of my views as to where we may be in the future. You may or may not agree with me, but this is where I believe we will be—eventually. Note that these predictions are not necessarily in the order in which they will or may occur.

1. The GHz and THz regions will be as easy to work with (and as common) as HF and VHF are today. Also, new propagation modes will be found in the SHF and optical electromagnetic regions.

2. The keyboard and mouse will become obsolete. Voice recognition will become 99%+ accurate, and we will converse with our electronic devices much as the actors do in the "Star Trek" TV shows. For that matter, amateur radio will become full duplex all of the time. No more "over."

3. There will be no more manual dials or controls. Touch screens such as used on the Apple iPhone™ will be just one of the ways that we will control our future devices prior to full voice recognition.

4. A new component family will be found that will replace transistors in much the same way that semiconductors replaced vacuum tubes.

5. Full-motion video will be commonplace in cell phones, amateur radio, and anywhere communication from one person to another is carried out.

6. Worldwide amateur communications will become commonplace via small, low-power HTs addressing amateur satellites (or something similar) 24 hours a day.

7. Battery technology will be vastly improved, allowing very rapid recharging and extremely long operating times between charges.

8. Super-capacitance energy storage systems will be developed providing thousands of Farads of capacitors. This will eliminate problems caused by surges, peak momentary demands, etc.

9. Flexible transparent screens less than 1/10 inch thick will become commonplace, allowing all sorts of unique displays.

10. Virtually everything will be cordless. This means no more test probe leads, no more jumper cables, no more patch cords, etc.

11. The same will be true for power supplies. Wall warts will become obsolete. All remote power (where needed) will be delivered by inductive (or similar) means, and portable devices will recharge themselves when needed as long as they are located in a preconfigured area.

12. LEDs and lasers will be developed allowing true FM optical transmissions by accurately varying the frequency (wavelength or color) of a light source, not only the amplitude, just as we tune an RF assembly today.

I think the world of 2050 will be a very different one, and I hope all of this has given you a few ideas. I wish you a very Happy New Year and hope all your wishes come true. 73, Irwin, WA2NDM

*c/o CQ magazine

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magic in the sky

BY JEFF REINHARDT,* AA6JR

The Unquantifiables

Radio exists largely because a dedicated collection of scientists, experimenters, and hobbyists refused to be confined by what was known and what could be seen or documented by "known" forms of quantification. As described in this column and extensively elsewhere, pioneers including Maxwell, Faraday, Morse, Hertz, Marconi, Fleming, Edison, Tesla, Bell, De Forest, Armstrong, and countless others were drawn by their curiosity into the strange but invisible forces that allow the transmission of communications across space. From the first simple static noises of dots and dashes across "the ether" to today's many forms of transmission including AM, FM, SSB, spread-spectrum, and digital, for over a century our planet has been a virtual "lighthouse" in the universe, signaling the presence of intelligent life on this rock orbiting a rather ordinary star.

Exploring the unknown seems to be encoded in our species. Then there are the many different types of "unknowns"—those bigger than us, such as the universe, those smaller than us, such as subatomic particles, and the metaphysical, which transcends multiple disciplines. The "drive" in mankind has been to constantly ask the question "why" and upon discovering immediate answers, apply that knowledge in new, sometimes unforeseen directions.

Imagine for a moment being present at some of the "eureka" moments, such as the dawn of mathematics and geometry, seeing the expression on the face of Galileo the first time a telescope allowed man to view the heavenly bodies of space, or hearing the first dots and dashes of telegraphy.

The Undiscovered Countries

What is yet to be discovered in the field of wireless communications? Are there "gaps" in our understanding waiting to be filled?

For many of us, our communications "hobby" offers a limitless *je ne sais quoi* of unquantifiable joys and curiosities. Certainly these are the things that first drew many of us into radio, perhaps as a satisfying amateur pursuit, for others forming the basis of their professions.

As a lay person dabbling in the radio arts I can't help but wonder what lies ahead. What is the "stuff" that makes up subatomic particles? Do those components have components? What is the source of energy that binds everything together? We have shown we can tap carbon, gravity, and even nuclear energy. As we seek to exploit wind, solar, and other forms of power, are we overlooking a simple solution that lies immediately before us? Is "cold" fusion really possible? Will there be a combined "eureka" and "duh!" moment?

What are the qualities that make sound transmitted and received using vacuum-tube apparatus more "satisfying" than the same material transmitted and received using solid-state gear? The same is posed with digital versus analog methods? We know some of those answers, but clearly not all of them.

Will the recently conducted experiments that indicate the possibility of exceeding the speed of light bear fruit? And if we develop the ability to transmit intelligence at superlight speeds, how does one go about receiving it? Is it possible it could arrive before it was sent?

Is the Large Hadron Collider in France a key to man's future or our demise? Would the discovery of anti-matter make nuclear weapons look like swords, bows, and clubs by comparison? What might develop of the experiments to move mass across space by electronic means? What might that mean for freight shippers or airlines?

Where the Answers Are

The answers to many of these questions aren't so much "out there" as they are "in here." Somewhere on the planet today are bright young people who will choose to make these curiosities the subject of their life's work. Some will succeed; others will contribute to the knowledge base by not meeting their objectives but their work may be just as important.

Sadly, I and many others do not have the gifts of the research scientist or electronic engineer. However, we do have the ability to inspire, mentor, share, and envision. The science-fiction writers of the last two centuries laid the blueprints for many of the items taken for granted today. Space travel has become routine, and for some it has become a "tourism" activity. Communications satellites and the delivery of "newspapers" over the internet and other such visionary wonders sprang from the minds of Jules Verne, Isaac Asimov, Ray Bradbury, Robert Heinlein, and more. For those of us less gifted than the true discoverers, we can play a role in helping to imagine what will be—what can be—by delimiting our imagination. A requirement of every high school commencement seems to be "if you can dream it, you can do it." It's true enough to keep repeating.

Your amateur radio license is more than a permit to operate. It's documentation that you have a desire to reach beyond yourself. Ham radio is a rare pursuit that cannot be done alone; you need at least one other person. Your commitment to communications acknowledges those pioneers who came before us as well those among us. Ham radio's rich tradition of mentorship is perhaps one of its most endearing qualities and the key to its future. Remember, Marconi started out as an "amateur."

As we begin another year, at the threshold of yet another decade, I offer the resolution on an individual level of rededicating our passion for radio in all its forms by sharing it with at least one person who just may be the next great discoverer who adds his or her legacy contributions to what we enjoy as the "Magic In The Sky." 73, Jeff, AA6JR

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What You've Told Us...

Our August survey asked about young people in amateur radio, and we first asked how old *you* were when you were first licensed. More than half of you first got your ham tickets when you were 25 or younger (38% between 15 and 25, 21% under 15), followed by 22% first licensed between ages 26 and 40, 11% between 41 and 55 and 8% over 55. Next, we asked, if you were that age again today, how likely would you be to consider becoming a ham? "Very likely" was the answer of 78% of you; 15% said somewhat likely, 4% somewhat unlikely and 2% very unlikely.

On the question of whether there are enough young people entering ham radio today, 72% of you said no, followed by "I don't know" at 16%, and yes at 9%. Next, we asked you, based on personal experience, to rate the abilities of today's young hams compared to those of the past. There was no consensus here: 26% said today's young hams are less capable, 25% said the skills needed today are too different for a valid comparison, 23% said ability levels are about the same, 13% feel today's young hams have greater skills than in the past, 7% don't know and 5% don't know any young hams.

We next asked what you, personally, had done to help encourage young people to become hams; 43% of you have talked with young people about the fun and excitement of ham radio, 33% have helped give license exams, 30% have invited young guests and/or family members to operate your stations, 29% have helped with ham radio demonstrations, 26% have helped teach licensing courses, 23% have helped with club activities aimed at young people, 21% have worked directly with young people as, for example, a merit badge counselor, 16% have helped in other ways, and 14% have done nothing so far.

Finally, when asked to rate your club's attitude toward young people, 41% of you rated it as good, with another 11% rating their club as excellent (52% total); followed by mediocre at 21%, poor at 6% and very poor at 2%.

This month's free subscription winner is Fred Race, W8FR, of Blue Mt., MS.

Reader Survey January 2010

We'd like to know more about you—about who you are, where you live, what kind(s) of work you do, and of course, what kinds of amateur radio activities you enjoy. Why? To help us serve you better.

Each time we run one of these surveys, we'll ask a few different questions and ask you to indicate your answers by circling numbers on the Survey Card and returning it to us. As a bit of incentive, we'll pick one respondent each month and give that person a complimentary one-year subscription (or subscription extension) to *CQ*.

This month, in honor of *CQ*'s 65th anniversary, we'd like you to get out your crystal ball and peer 65 years into the future. ... When our first issue came out in January 1945, hams were still off the air because of World War II, all radios used tubes, "phone" meant AM, and CW was not yet a synonym for Morse code in general. What do you thing ham radio will be like in 2075?

Please answer by circling the appropriate numbers on the reply card.

1. Do you think ham radio will still exist in 2075?
- Yes, definitely 1
- Probably 2
- Not sure 3
- Probably not 4
- No, definitely not 5

2. If ham radio does still exist in 2075, what types of signals are we likely to be transmitting?
- Digital only 6
- Mostly digital, some analog 7
- About half digital, half analog 8
- Mostly analog, some digital 9
- Something we haven't thought of yet 10

3. Will hams still be using Morse code in 2075?
- Yes, definitely 11
- Probably 12
- Not sure 13
- Probably not 14
- No, definitely not 15

4. How will the size of ham radio gear in 2075 compare with today's gear?
- Much smaller than today 16
- Somewhat smaller than today 17
- About the same size as today 18
- Bigger than today 19
- There will no longer be discrete ham radio equipment 20

5. What will the circuits inside ham gear likely look like in 2075?
- Still transistor/IC-based 21
- Mix of transistor-based and some new current-amplifying device 22
- A new device will be the basis of most circuits 23
- Everything will be in software, as an "app" on a multifunctional device 24

6. What will be the basis of most long-distance amateur radio communications in 2075?
- The ionosphere 25
- Satellites 26
- A mix of RF/Internet links 27
- Two or more of the above 28
- A propagation method we haven't yet discovered 29

Thank you for your responses. We'll be back with more questions next month.

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BY RICHARD FISHER,* KI6SN

North Carolina Hams Applauded for Developing Back-up EmComm System

A report in a recent edition of the North Carolina Division of Emergency Management's online periodical "Memo" highlighted ongoing efforts of the region's radio amateurs in developing reliable EmComm back-up communications systems—in this case, MARS Winlink.

Pointing out how dramatically "technological advances are changing amateur radio operations," the report details how "much of the day-to-day work of public safety agencies is conducted via e-mail and Internet-based applications such as WebEOC. When these systems fail or become overloaded, public safety could be diminished because critical agencies are no longer able to receive and send vital information in a timely manner."

"Memo" reported that in late 2008, "amateur radio volunteer operators began installing a back-up e-mail system in several NCEM facilities to provide basic e-mail service using a unique system developed by the amateur radio community. Winlink allows computers to communicate via shortwave radio instead of using the Internet or other conventional networks."

With long-distance wireless as the communications platform, "Winlink stations can communicate with other facilities hundreds or thousands of miles away, without any in-between infrastructure." Using radio, "Winlink can bypass dead, damaged, overloaded, or other non-functional infrastructure," the report said.

In 2008, MARS began allowing governmental agencies to operate within the MARS Winlink system. "Memo" cited several areas where the MARS Winlink system differs from the amateur-only system:

- The large number of dedicated Winlink-only frequencies in the military spectrum.
- No requirement for an amateur radio operator to be present to use the system.
- The large number of remote mail servers, many in "hardened" facilities.
- The capability of encrypting messages.
- The capability of connection to LANs (local area networks).

"Memo" chronicled how in December 2008, NCEM received agency licenses from MARS and started equipment installation. "By June . . . three fixed terminals were installed and running in Raleigh, Kinston, and Conover. The system uses a standard e-mail program, similar to Outlook Express, so minimal training was required."

Radio amateur volunteers continued to fine-tune the system "until they were satisfied that the maximum performance and reliability had been achieved. At that point, they were eager to test the new technology in an exercise."

North Carolina amateur radio volunteers, who regularly train with local and state emergency management personnel, were tapped to help test the new Winlink system during a statewide earthquake drill.

"In the exercise, an earthquake disabled all communications to Buncombe and surrounding counties. Within 10 minutes, the amateur radio partners established traditional voice communications with the affected areas, the western regional coordination center (RCC), and the state emergency operations center (EOC). They then used the

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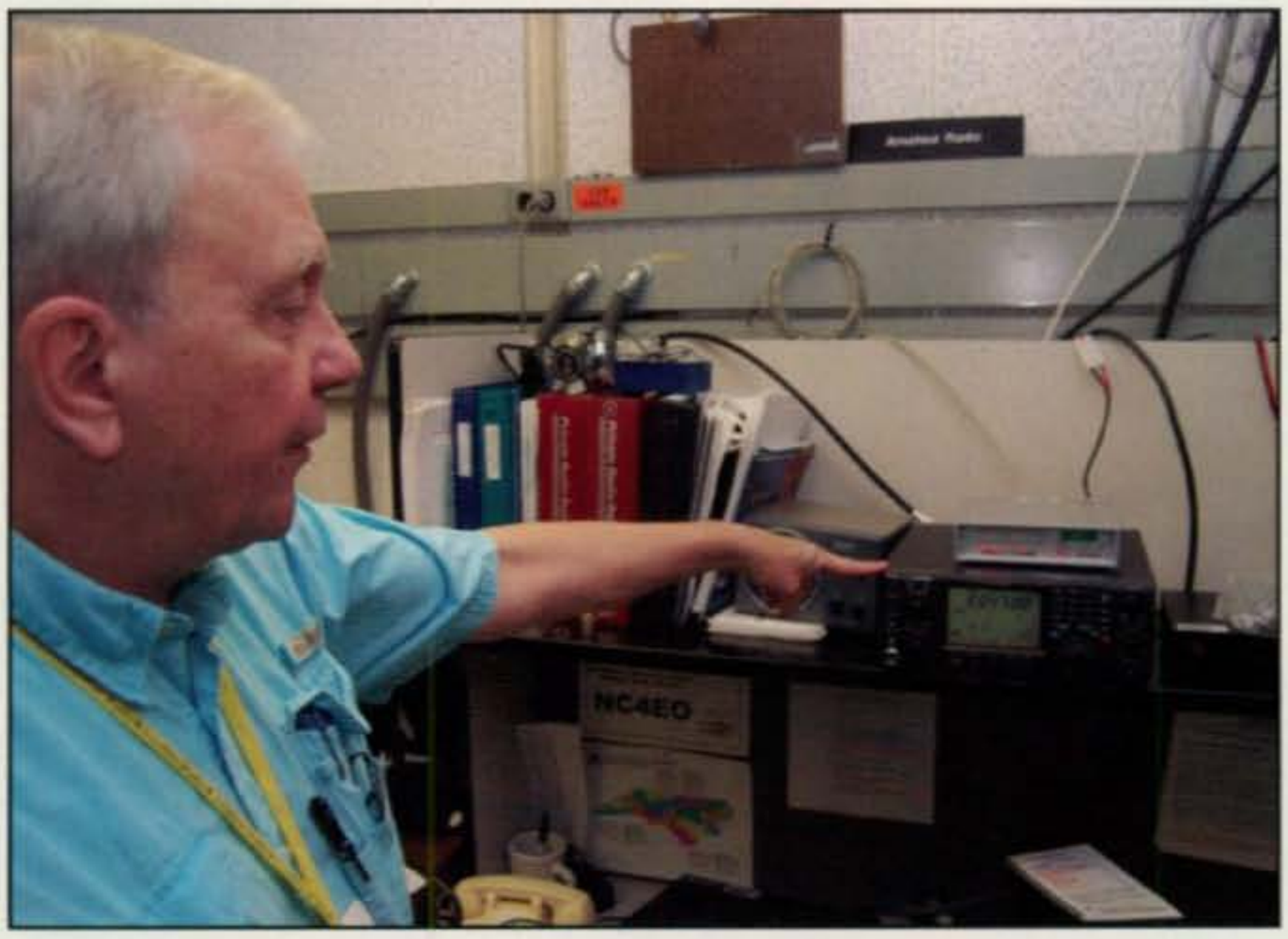


Tom Brown, N4TAB, shows Winlink equipment installed at the North Carolina Emergency Operations Center. (Courtesy of the North Carolina Division of Emergency Management and N4TAB)

Winlink system to establish e-mail communications between amateur/MARS operators in the affected areas, the RCC and the EOC," the "Memo" story reported.

"During the exercise two real-world problems made exercise participants even more dependent on amateur radio and the Winlink system. WebEOC developed some technical problems and contractors accidentally cut fiber-optic lines at the western branch office, disabling the Internet," the story said. "Since the earthquake scenario rendered useless the phone lines, fax lines, and VIPER radio at the western RCC, the only possible remaining communication with outside agencies was through amateur radio and Winlink.

"Within a few minutes of the failure, messages were rapidly moving once again, this time over shortwave radio thanks to the MARS Winlink system. Since the Winlink system is connected to the LAN, NCEM personnel were able to conduct business directly from their regular operating positions without any intervention. It was e-mail-business as usual, only the messages were transported by MARS Winlink instead of the Internet."

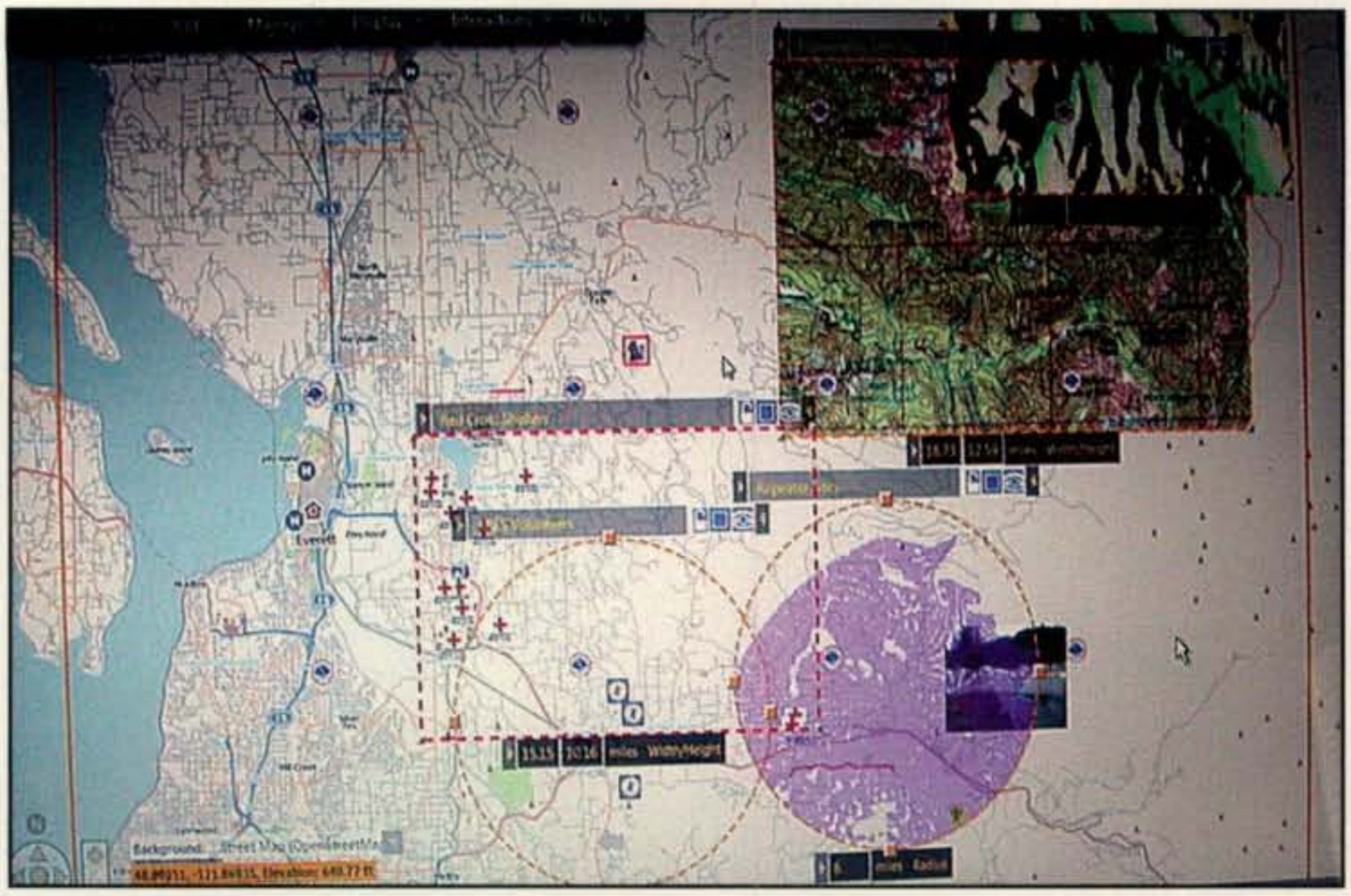
ARRL North Carolina Assistant Section Emergency Coordinator Tom Brown, N4TAB, told the "Memo" the exercise "demonstrated the true capability of the MARS Winlink system by providing e-mail service during a situation where all communication infrastructure would be destroyed. It was a busy exercise. Amateur radio had a lot of activity supported by volunteers across the state."

According to Clay Benton, NCEM Communications Center manager, Winlink gives North Carolina "reliable backup capability to ensure we maintain communications with our first responders and government agencies in the event of the unthinkable: the complete and total loss of conventional communications technologies."

Depiction Program Featured in Public Service webinar

In late October we were fortunate to have taken part in an Internet webinar hosted by the software development company Depiction, Inc., whose product has gotten thumbs up from many in the amateur radio emergency communications arena.

According to David Friedman, KE7GOY, a radio amateur who was an unpaid consultant on the program's development, Depiction provides the



An image captured from a computer screen during the Depiction, Inc. software webinar shows an example of mapping and data display that could have application for amateur radio EmComm operations, developers said. (KI6SN photo)

platform for everyday users—through extensive mapping and information recall—to create interactive and emergency-exercise scenarios by calling up widely available data and their own custom input.

More than 350 attendees listened in and watched as Friedman and Depiction's Kim Buike took viewers through the paces of the software.

In many ways, Depiction looks tailor-made for EmComm coordination, implementation, and training. With a map as its backdrop, Depiction provides the tools for emergency coordinators to manage a smorgasbord of logistical information ranging from locations of people and resources and manpower allocations to flood zone predictions, repeater coverage mapping, and best transit route plotting.

The webinar's highlights included demonstrations on how to:

• Geo-locate all physical assets and volunteers in "depictions" to track deployment locations.

• Integrate maps, elevation plots, weather data, "fly over" imagery, situation reports, and any critical proprietary data into a single depiction that can be saved and re-used off line.

• Use Depiction's antenna line-of-site footprints in geographic frequency allocation.

• Use Depiction's live reporting features to enhance the communication of volunteer movements, resource status, and damage assessments during a disaster.

Depiction was described in the hour-plus-long session as a "real clutter buster" when it comes to planning and coordination, especially with the program's "revealer" function.

With data pre-loaded, ask it to identify and plot shelters, and up they pop on your computer screen. Want to see potential volunteers within a certain radius of an emergency location? A "revealer" will display them. In addition, click on any volunteer and see critical contact and personal information about the individual and his or her capabilities.

Depiction calls upon user-inputted data as well as having the capability to tap into web-based databases for additional, more granular information. That's particularly valuable when inter-agency data is needed.

Buike said Depiction is useful in helping emergency coordinators define members of his or her response team and the role they want each team member to play.

Depiction's Tim Goddard announced in November that the company "just released a new version (of Depiction) . . . that is Winlink compatible, and there are some folks over in New York who have already been playing with it and have configured Paclink to work with Winlink, and work with Depiction seamlessly to send geographic data."

Friedman said Depiction is a valuable tool in playing out "What if . . ." scenarios. "What if there's a levee breach? What areas will be affected by the water?" And after determining the endangered areas, what EmComm people and resources are available to respond? Properly data-loaded, Depiction has the answers.

Virtually any scenario disaster planners dream up can be programmed into Depiction and played out in a training exercise or drill, or during "the real thing."

Since Depiction is a PC program (not yet available for Macs), it does not need to be Internet-connected to function.

Friedman, KE7GOY, is "a disaster response director for Muttshack Animal Rescue and an American Red Cross Government Liaison (in western Washington), as well as Depiction technical advisor who has put the software to work in response multiple disasters across the country," according to Depiction, Inc. "A retired radiologist/emergency-medicine/health physicist, Friedman joined the American Red Cross and amateur radio during Hurricane Katrina and has been involved in emergency management for 35 years."

Buike, a retired military man, "served 27 years in the Navy and rose to the rank of Captain, commanding a destroyer in the Persian Gulf and the Navy's most modern shore facility, Naval Station Everett, before retiring in 2003. Capt. Buike is also a Red Cross volunteer and serves in (his) local county Emergency Operations Center as a Red Cross liaison during community disasters. He has been instrumental in the development of Depiction."

For detailed information about Depiction's capabilities and functions, and for information about purchasing the software, which sells for $199, visit: <http://www.depiction.com/>.

Arizona Radio Amateur Named New Chief of Army MARS

A Southwestern U.S. radio amateur with more than 50 years experience in military and government communications has been named chief of the Army Military Affiliate Radio System (MARS).

In September 2009, Jim Griffin, KE7LJA, of Sierra Vista, Arizona was named to the post by Maj. Gen. Susan Lawrence, commanding general of the U.S. Army's 9th Signal Command. He succeeds Stuart Carter, who held the position since late 2006. Army MARS is a component of the 9th SC.

Before his appointment, Griffin was deputy chief of Army MARS with oversight of construction of the organization's gateway communications station at Fort Huachuca, Arizona. He holds a General class amateur radio license.

"My early days of radio were in the Army as a fixed station repairman," Griffin said during a broadcast to MARS

members. "I started out with vacuum tubes, filament voltages, resistors, capacitors, and other items that are found in museums today.

"I have been stationed in some of the more interesting places of the world such as Japan, Vietnam, France, Germany, Thailand, and Italy. I have run a gamut of positions in radio, microwave, AUTODIN, and satellite as a technician, installer, and instructor."

Griffin's callsign as Army MARS commander is AAA9A.

According to published reports and information from Army MARS public affairs officer Bill Sexton, N1IN/AAA9PC/AAR1FP, Griffin said the organization is "on a steady course based on the 'Road Ahead' planning document that Chief (Stuart) Carter" had previously published. "In fact, (September 2009) marks the completion of retraining of the entire Army MARS membership to meet the plan's long-term goals. Now the work really begins."

According to Sexton, Griffin is from Hawaii and joined the Marines in 1956. "Joining the Army in 1959, he developed a personal specialty of quality control/assurance at major installations around the world. He retired from active duty in May 1979 with a total of 23 years military service and became a civilian staff member in December that year," Sexton wrote.

"The MARS role includes operation of an e-mail-over-radio backup system for participating federal, state, and local agencies, as well as HF radio command-and-control nets in all 50 states," Sexton said. "Both capabilities are maintained in constant readiness in case commercial circuits became severed by (a) natural or manmade disaster. MARS also provides trained members to assist state and local emergency operations centers.

"Because of its dual responsibility to both the Army and the civilian agencies supported by the military in emergencies, MARS members undergo training in both military and civil communications procedures."

In 30 Seconds Duracell Sheds Light . . .

With a narration provided by a member of the famed Lloyd Bridges acting family, the National Hurricane Center's WX4NHC has been front-and-center in a widely distributed radio commercial developed for Duracell batteries.

"This commercial (was) played nationally during hurricane season and (promotes) awareness of amateur radio

and the public service we do to provide emergency communications," said Julio Ripoll, WD4R, first coordinator for amateur radio at the NHC, "especially during and after hurricanes, when we have experienced complete electrical and conventional communications blackouts for periods of days and weeks." The spot features the voice of Jeff Bridges, son of the legendary TV and movie actor Lloyd Bridges."John McHugh, K4AG, and I worked for several weeks with the ACME Marketing Firm and Duracell to help produce the radio commercial that captures the essence of amateur radio volunteer public service and the important role amateur radio performs during emergency communications in 30 seconds."

Ripoll said, "The president and creative director of ACME Idea Co., and the Duracell national representative also flew down to Miami and received a tour of (the) NHC and of the WX4NHC station and learned about our many modes of communications, including our portable VHF/UHF radios and other portable battery operated equipment."

The commercial began airing in August 2009. To hear it, go to: <http://kb9wvi.blogspot.com/2009/08/wx4nhc-duracell-commercial.html>.

According to Duracell parent company Proctor & Gamble, the radio spot, entitled "Hurricane," focuses on "the efforts of an all-volunteer army of ham radio operators for WX4NHC, physically located at the National Hurricane Center campus in Miami.

"The spot narrates the important role that these unique volunteers play during severe weather conditions—enabling communications with emergency medical teams, police, and fire departments when the power goes out. The narration underscores the importance of a reliable battery to power the portable ham radios, which are crucial to the organization's work."

Duracell North America Marketing Director Bob Jacobs said in published reports that with the NHC spot, and a separate TV commercial entitled "Tornado" featuring Air Life Denver helicopter crews, the company is showing how "these heroic teams are working to save the lives of others. When storms strike, the radio operators are donating their time to make sure communications stay intact, and the helicopter teams are on the front lines, facing intense pressures and dangerous conditions to rescue those in need. We're proud that our batteries can help power these life-saving efforts."

As the commercial's closing line says: "It just has to work."

Safety first: A Florida Tragedy and a Grim Reminder

The electrocution of three people in Palm Bay, Florida last October is a grim reminder of the importance of putting safety first when raising antennas.

A man, woman, and their teen-age son were killed when a 50-foot vertical antenna they were erecting came in contact with overhead power lines at the home of Barbara Tenn, KJ4KFF, a General class operator. Those killed were not licensed radio amateurs.

The tragedy underscores the importance of planning and safety and is especially relevant to radio amateurs in public service roles who often put up temporary antennas in emergency locations.

According to information from WFTV and Central Florida News 13, the two adults and teen were attempting to raise the antenna in darkness when they lost control and it contacted a 13,000-volt power line. Neither KJ4KFF nor a 17-year-old boy at the scene were injured in the incident.

Just in: Philly Legislation Could Affect Amateurs' Mobile Operation

Former *CQ* "Public Service" columnist Bob Josuweit, WA3PZO, dropped us this note on deadline for this issue:

"Operating a two-way radio mobile in Philadelphia may cost you $75 a pop (slated to begin December 1, 2009) thanks to a new cell-phone law in effect in the city. While the purpose of the law is to discourage the use of cell phones while driving, there is a clause which prohibits the use of a wireless communication device for voice communication while operating a motor vehicle on any street in the city. Hands-free operation is permitted.

"An article in the *Philadelphia Inquirer* quotes a 9th District police officer saying that there are some exceptions to the new law: If your device is hands free. If you are calling 911. If you are using a two-way radio to conduct official business for the city, state, or feds. Otherwise the law says to put the car in Park or Neutral.

"Local hams have been in touch with ARRL Volunteer Counsel to get their opinion of the bill."

For more information, check the November edition of the Holmesburg Amateur Radio Club newsletter at: <http://www.harcnet.org/>. We'll keep you posted on further developments.

73, Richard, KI6SN

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Ameritron's new solid state no-tune, instant-on, instant bandswitching ALS-1300 desktop linear amplifier gives you 1200 Watts PEP SSB/CW with less than 100 Watts drive. Covers 1.5 to 22 MHz (10/12 Meters with optional MOD-10MK). You'll bust through weak band conditions, heavy QRM and QRN because the ALS-1300 is less than 1 dB down from a full legal limit 1500 Watt amplifier.

Super Reliable!

Eight conservatively rated MRF-150 FETs mounted on two *huge* heat sinks spreads heat evenly. *Four* whisper quiet temperature controlled fans keep the FETs at a safe temperature. You get *unparalleled* Ameritron reliability and trouble-free service. Competing amplifiers using a single expensive device concentrate heat at a single hotspot that greatly reduces reliability.

50-Volt operation gives you highly linear operation with a superbly clean signal.

Put out-of-the-way and Remote Control

The ALS-1300 amplifier and its matching power supply can be placed out-of-the-way and controlled remotely. *Remote Control Head*, **ALS-500RC, $49.95**, lets you monitor data and manually switch bands. *Radio Interface*, **ARI-500, $119.95**, reads band data from your transceiver and automatically bandswitches the ALS-1300 as you change bands on your transceiver.

Features Galore!

An Operate/Standby switch lets you run "barefoot" and *instantly* switch to full power when you need it.

Fast 5 millisecond T/R relays (10 million operation lifetime specs) give you full QSK operation. The T/R relay sub-board is easily replaced if the relays ever fail.

Ameritron's *exclusive* front-panel ALC control prevents overdriving your transceiver.

The ALS-1300 can be keyed by any transceiver that can sink 15 mA at 12 VDC without requiring a special interface.

Super-clean modular construction makes service quick and easy.

Fully Protected!

The ALS-1300 is fully protected to prevent amplifier damage if you: switch to a band different from your transceiver, use the wrong antenna or have overly high SWR, if the heat sink temperature exceeds a safe level, if the dual 600 Watt modules are significantly RF unbalanced. Whenever the amplifier faults, it is automatically bypassed.

If output forward or reflected power exceeds a safe level, output power is automatically reduced to prevent amplifier damage by controlling ALC to the transmitter.

Fully Metered!

Two accurate Cross-Needle meters use *LEDs* with adjustable brightness for backlighting -- no more burned-out meter lamps.

The left meter continuously monitors DC current of both 600 watt amplifier modules.

The right meter is a multi-meter. Read antenna SWR, forward, reflected output power simultaneously (has adjustable PEP meter hold time) . . . amplifier balance . . . ALC between amplifier and transceiver . . . DC drain voltage of each power amplifier.

LEDs show which band is selected (manually bandswitched or automatically with optional ARI-500 Radio Interface) . . . ALC activity . . . when the amplifier is keyed . . . high SWR . . . power amplifier fault.

The desktop size amplifier is a compact 10½Wx6¾Hx19D in. Weighs just 23 lbs.

Hash-Free Switching Power Supply!

The *hash-free* fully regulated 50 VDC, 50 Amp switching power supply is wired for 220 VAC but can be rewired for 110 VAC. Includes six foot cable to ALS-1300. Draws 12 Amps at 220 VAC, 25 Amps at 110 VAC. Has inrush current protection, current-limited outputs, exceptional filtering and RFI suppression. Works on 50-400 Hz, 200-260/ 100-135 VAC making it ideal for remote DX-peditions. 10Wx6½Hx9½D inches. 12 pounds.

Options

MOD-10MK $39.95, low-pass filter assembly gives you 12 and 10 Meter operation. Requires FCC ham license.

QSK-5, $359.95, pin-diode T/R switch gives lightning fast silent QSK operation.

Here's what they say . . .

I have had my amp now for a few days and WOW! I picked the amp up at the factory and Mike was very helpful in showing me the ins & outs of the amp. Mine is S/N 8 and these amps are in high demand. It will truly talk 1200 watts all night long and never get warm. Thanks to Ameritron for the way they treat their customers and taking time that I was satisfied. N5SBZ

I've been using SN3 for about six weeks now. No processors or digital read-outs, but very easy to use and it puts out 1200 watts on most bands with no problem. I have been operating QSK as the internal relays are plenty fast enough. AD5X

I have had this fine amp now for a week and have made a number of QSO's (20). It can make the difference, and has in a number of occasions, getting thru the QRN and making a contact. Some of my QSO's have lasted up to 1 hour and there has not been a single problem...runs cool and gives me excellent results. KB4KKX

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BY FREDERICK O. MAIA,* W5YI

From the Mail Bag: Responses to Your Inquiries

We save the letters and e-mail messages that you to write us, and questions from phone calls. Every so often we try to answer the ones that are of general interest. Let's tackle some this month.

Q: We have heard you mention the Social Security Death Index. What is it and why is it useful to ham radio operators?

A: The Social Security Death Index (SSDI) is an online database of millions of deceased individuals with a U.S. Social Security Number (SSN) whose deaths have been reported to the Social Security Administration (SSA) over the last 50 years. Information in these records includes name, birth date, death date, and last known residence. It can be accessed on the web at: <http://ssdi.rootsweb.ancestry.com/>.

Short (1-by-2 and 2-by-1 format) callsigns are in high demand by Extra Class radio amateurs under the Vanity Call Sign System. Also, the demand far outstrips the available supply. FCC Rules (Section 97.19) provide that callsigns are available for reassignment two years following the expiration or cancellation of an amateur radio license, whichever is sooner.

Due to vanity callsign information websites listing upcoming available callsigns, several applicants usually apply for a short callsign when one shows up. The FCC awards callsigns randomly (by lottery) whenever there are multiple applications for the same callsign on its first full day of availability. Due to this competition, several amateurs applying for the same short callsign will usually not result in it being assigned to them. For example: if ten applications file for a specific callsign when it becomes available, you have a 90% chance of not getting it—not good odds at all!

However, there is a better way. Callsigns can be made available when a radio amateur with an unexpired short callsign has died more than two years ago. Few ham callsigns are canceled by family members when the holder becomes a silent key. The callsign just languishes in the FCC database until it eventually expires and cancels out, which is sometimes several years later.

These callsigns can be canceled from the amateur service database by submitting certain death information to the FCC with a request that the callsign be canceled. The FCC accepts copies of death certificates, newspaper obituaries, and a printout from the SSDI as evidence of death. (It does not accept silent key listings from *QST* or the QCWA.) Send to fax number 717-338-2850. You can also mail the death information to: FCC Amateur Section; Attention: Rebecca Williams, 1270 Fairfield Road, Gettysburg, PA 17325.

Do not wait until the call is actually cancelled to file your vanity callsign application. File shortly after you submit the death information to the FCC. (Be sure that two years and one day have elapsed since the date of death.) That way you will be first in line to get the callsign.

It usually takes up to a couple of weeks for the FCC to cancel a callsign that will be canceled as of the date of death of the holder. When a verified silent key has been deceased for more than two years, the call is immediately available for reassignment.

The trick is to locate a deceased amateur with a short callsign who died more than two years ago. There are many ways to do this, such as checking old silent key lists or doing online searches; <www.qrz.com> and other websites frequently list an amateur's year of birth. Most callsign holders born before 1920 are deceased, although we do have some very active nonagenarians in our ranks. The best website for verifying deaths is the Social Security Death Index (SSDI).

Q: There are some 1-by-2 callsigns becoming available in my call district? What is the best way to get one?

A: See the above question. The best way to get a short callsign is to cancel the unexpired callsign of a radio amateur who has been deceased more than two years. The least successful way (due to competition) is to apply for a callsign that is publicly known to be available on a certain day. Be aware that you do not have to choose a callsign from your radio district. You can select callsigns with any district numeral (Ø through 9).

Q: Why does a person have to pass a lower class ham radio written license examination if he or she can pass the Element 4 (Extra Class) test?

A: In a nutshell, it is because the written ham license examinations are "additive"—that is, most of the question pools from which the written examinations are constructed relates to a specific license. For example, the Technician (Element 2) questions cover beginning privileges, practices, and equipment, are oriented to VHF operation, and are worded at the middle school level of understanding. The General Class (Element 3) questions focus on HF operation. The Extra Class (Element 4) examination requires a higher level of understanding. It covers more advanced electronics and construction practices, plus examining others for ham tickets. Some topics—such as FCC rules, radio-wave propagation, and safety—are covered in all question pools, but with increased degrees of difficulty.

You need to know all of the subject matter included in the lower class exams, not just the material covered in the Extra Class exam. Thus, the question pools serve as an outline of what you

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need to know to climb up the ham radio ladder. Most amateur radio instructors use a specific exam syllabus and its questions as the course guideline for their ham classes. You can't start at the top. You need to climb up one rung at a time, learning as you go.

The current Technician question pool (effective July 1, 2006) will expire on June 30, 2010. The General class question pool (effective July 1, 2007) is valid through June 30, 2011. The Amateur Extra class pool (effective July 1, 2008) is valid until June 30, 2012.

Q: The FCC no longer uses the FCC Form 610, so what do I need to do to renew my license?

A: Licensees may renew for another 10-year term when their license is in a window of between 90 days before expiration to two years after expiration. Although paper documents are still available, nearly all renewals are now completed online. (The new paper document form is now called FCC Form 605.) There is no charge if you handle your renewal yourself on the FCC's website. To renew, go to <http://wireless.fcc.gov/uls>, select "Online Filing," and log in to the ULS License Manager with your FCC Registration Number (FRN) and password. If you do not know your ULS password, the W5YI Group can handle your renewal for you for a small fee. Go to <http://www.w5yi.org/> and click on the "License Renewals" link in the center of the page. The ARRL will also process license renewals, primarily for its members.

Q: How do I get a callsign for our new ham club?

A: Any group of four or more licensed amateurs may form a ham club that is eligible for a club station license. A club station license is granted only to the person who is the license trustee designated by an officer of the club. (A Novice operator may not be a club trustee.) The club must have a name, a document of organization, management, and a primary purpose devoted to Amateur Service activities. It also must be prepared to provide copies of the club's organizational documents.

The application for a new club callsign must be submitted to an FCC-designated Club Station Call Sign Administrator (CSCSA), an amateur radio organization that has agreed to provide voluntary, uncompensated, and unreimbursed services for processing club applications. The club application form must be signed by the new trustee and an officer of the club (it may not be the same person).

Both the W5YI-VEC and ARRL-VEC are CSCSAs. For more information call (toll free) 1-800-669-9594 or 1-800-927-7583. The W5YI Group's application form is located at <http://www.w5yi.org/documents/club_application.pdf>. he new club's first station callsign will be a sequentially issued 2-by-3 format call.

Once issued, the club trustee may change the club callsign to one of his/her choosing (providing the call is available) under the FCC's vanity callsign program. The club callsign selected must come from a callsign group equal to, or lower than, that of the trustee.

Q: Who determines the frequency bands on which radio amateurs may operate?

A: The use of the radio spectrum is regulated by law. Also, because radio signals do not respect national borders, this regulation is necessarily international in scope. National governments enact and enforce radio laws and regulations in their own country. This regulation, however, must be performed

within a framework of regional and global international agreements.

The Geneva-based International Telecommunication Union (ITU) is the worldwide governing body over wire and wireless communications. Its most important function is the allocation of radio frequencies to eliminate harmful interference between stations of different countries. The allocation of radio frequencies consists of dividing the spectrum into a number of segments or bands. Each band is then reserved for specific uses. U.S. amateur radio frequencies must be allocated in accordance with the international guidelines agreed to by the ITU nations. This function is performed in the U.S. by the Federal Communications Commission (FCC). The Amateur Radio Service rules are enumerated in Part 97 of the FCC regulations.

Q: I have heard radio amateurs using 1-by-1 format callsigns on the ham bands. What are the requirements to get one?

A:One-by-one format station callsigns are available for temporary use by any radio amateur to commemorate some sort of "special event," and you determine what the short-term "event" is. Examples include a wide variety of celebrations such as conventions, festivals, dedications, and anniversaries. Even local and neighborhood events qualify. Coordinators have been selected by the FCC to approve and post 1-by-1 callsign reservations.

A one-by-one callsign consists of a single prefix letter (K, N, or W), the region number (Ø to 9), and a single suffix letter (A to Z, except the letter X). There are 750 such callsigns. Amateurs of any license class may reserve a 1-by-1 callsign for up to 15 days. Once you reserve the callsign, you simply substitute the self-selected 1-by-1 callsign for your FCC-assigned callsign during the station ID announcement. Once an hour you must also transmit your FCC assigned callsign.

You can apply for a 1-by-1 callsign by going to <http://www.1x1callsigns.org/> and clicking on "Coordinators." Be sure to read the FAQ (Frequently Asked Questions.) There is no cost to reserve a 1-by-1 callsign.

Q: How come there is an automatic reciprocal amateur radio operating agreement between Canada and the United States, but not with Mexico? How can I operate ham radio in Mexico?

A: There are reciprocal operating arrangements between both Canada and the United States, and Mexico and the U.S. However, they are completely different.

A treaty was signed in 1952 between Canada and the United States providing "that persons holding appropriate amateur licenses issued by either country may operate their amateur stations in the territory of the other country...." Under the terms of the agreement, the visitor must identify using his or her callsign followed by a call-area suffix—for example: W1ABC/VE1 or VE1ABC/W1. U.S. Morse-code-proficient radio amateurs get "Advanced" (all frequency) operating privileges in Canada, otherwise "Basic" VHF and higher frequency only. U.S. and Canadian amateurs must carry a copy of their amateur license and a passport when entering and operating in the neighboring country. (As of June 1, 2009, a birth certificate is no longer accepted as proof of citizenship.)

Since U.S. ham licenses no longer reflect Morse code ability, be prepared to demonstrate your code proficiency if you become embroiled in an enforcement problem while in Canada. (For example, a Technician Class radio amateur may have passed a code test, while an Extra may not have.) There is no additional code test for U.S. hams operating in Canada, nor are you required to carry

SUCH A HAM

Either I've got QRM or my wife got her ticket.

any paperwork indicating that you have passed a telegraphy exam.

Mexico is one of the countries that have signed a standard reciprocal operating agreement with the United States. The FCC allows foreign amateurs from these countries to operate in the U.S. and its possessions with no permit. Mexican nationals simply carry their Mexican amateur license and proof of citizenship. There is no fee. You identify your station using "W" and the number of the FCC call-letter district in which you are operating followed by a slash and your Mexican callsign (for example, W1/XE1ABC).

It is much more complicated (and expensive) for a U.S. citizen to operate ham radio in Mexico. A permit, valid for six months, issued by an SCT (Secretariat of Communications and Transport) office of the Mexican Comision Federal de Telecomunicaciones (Federal Telecommunications Commission or CoFeTel) is required for U.S. amateurs to operate in Mexico. SCT branch offices are located in major Mexican cities, some near border crossings.

Non-U.S. hams must get an invitation letter ("carta responsiva") from a sponsoring Mexican ham. Mexico does not participate in IARP (International Amateur Radio Permits) or CEPT licensing. Station identification while operating in Mexico is "XE1/" prefixed to your home country callsign. Law requires it be given at least every 15 minutes.

To get the permit, a Spanish-language application form must be completed and submitted along with two copies each of your U.S. amateur operator license, proof of citizenship (birth certificate or passport), and immigration documentation indicating the length of time you are allowed to be in Mexico (for most U.S. visitors, this is a tourist form obtained at the border).

There is a hefty fee (tax) for the permit, currently about $85 USD (payable in Mexican pesos). The fees for Mexican amateur radio permits are adjusted every six months, in January and July of each year. This is the same amount Mexican hams must pay for a five-year license.

Radio operation by foreigners in Canada, Mexico, or the United States must be in accordance with the rules and regulations existing in the host country.

Keep those cards and e-mails coming. We'll keep trying to help you through various aspects of the sometimes confusing world of ham radio rules, licenses, and callsigns.

73, Fred, W5YI

world of ideas

BY DAVE INGRAM,* K4TWJ

Fun with Crystals and Galenas

Building simple crystal sets was the first step that ushered many of us into amateur radio in the past, and the pursuit continues to stand as an open door today for introducing many young people to amateur radio. In light of that fact, I strive to feature various and sundry forms of the little gems in this column every couple of years. Why such timeless interest in crystal radios? Opinions vary, but I feel they are educational, fun projects that anyone can put together in a couple of hours, and a well-built crystal set adds a touch of glamour to any den or ham shack it graces.

This year's featured items include a couple of ever-popular sets and some "freebie parts" for getting started homebrewing the same, plus a look at a couple of new delights from Phil, WØXI, and Patricia, NØGZ, Anderson of the world-famous Xtal Set Society. Phil, as you may recall, was the kingpin behind Kantronics and those neat QRP rigs of the 1980s. He also founded the Xtal Set Society (XSS), which has grown admirably in size and coverage. This Kansas-based society produces a bi-monthly informative newsletter and also stocks everything imaginable for building crystal sets and learning about radios. Check out <www.midnightscience.com> or write to the Xtal Set Society at P.O. Box 3636, Lawrence, KS 66046 for more details. Now let's focus on the crystal sets!

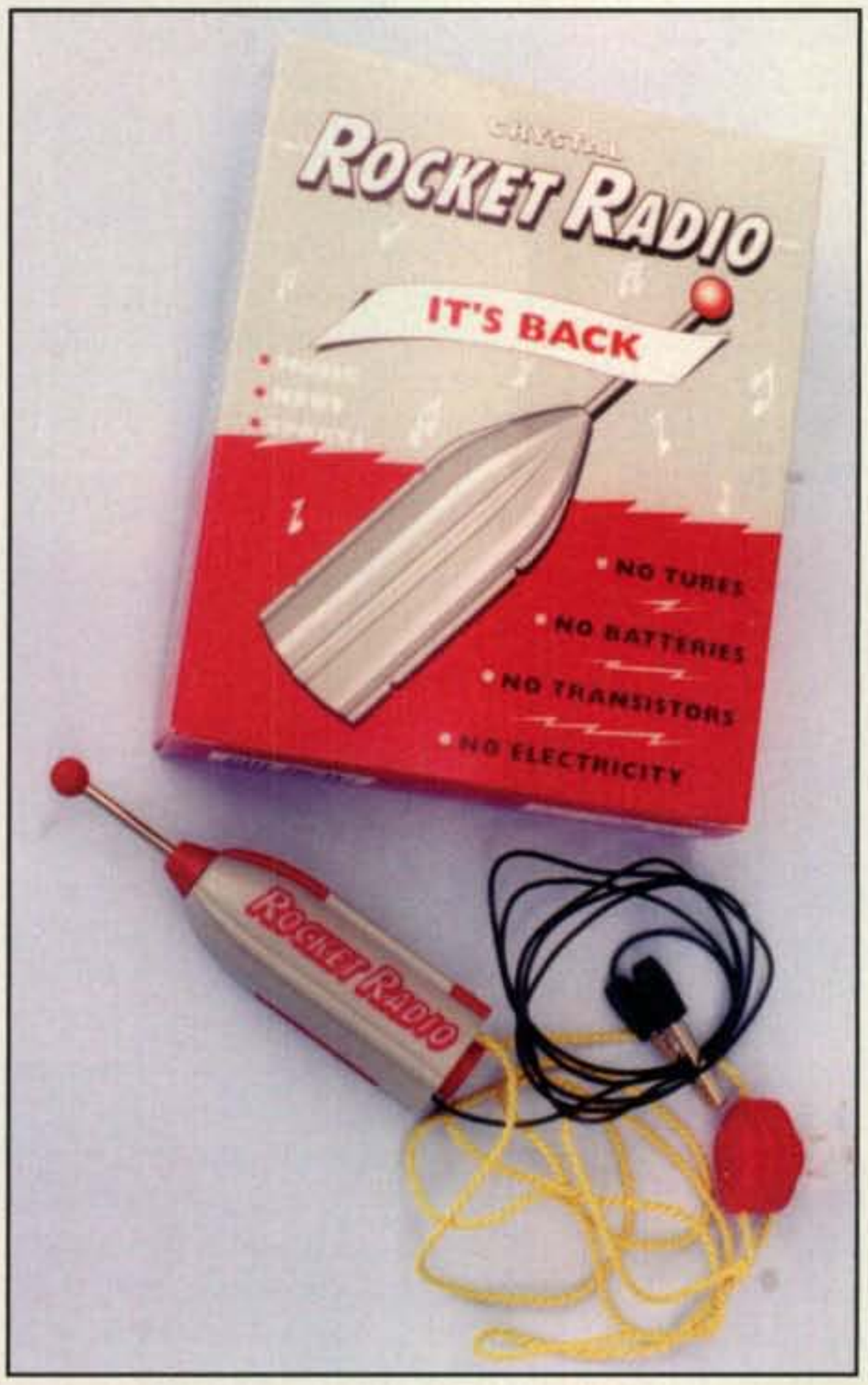

Photo A– Among the most popular crystal sets sold during the 1950s was this pocket-size Rocket Radio. Its loopstick coil was tuned by the sliding nose cone and performance was only fair, but it was a fun item that has now become a highly sought-after collectable.

Oats-Box Radio

One of the most popular and often duplicated styles of homebrewed crystal radios is the classic oats-box set as shown in fig. 1 and photo C. The oats-box's large diameter and air-core center supports a high Q and fairly selective coil, and mating it with a hand-picked crystal or galena chip plus a very-high-resistance earpiece or earphone helps ensure good sensitivity. The typical oats-box coil (if such actually exists!) consists of 60 to 100 turns of number 18, 20, or 24 enamel-coated copper wire wound evenly and accurately over the middle section of the box's outer area. I sense you asking if the smaller 4-inch diameter or larger 5-inch diameter box should be used, and either one will work fine. Secure the wire in place by looping it through two tiny holes punched in the box at each end of the coil. Use fine sandpaper to remove insulation from a strip of coil wire so a narrow piece of metal can slide from coil top to bottom for tuning in stations. I will leave the mechanical design details of that slider/tuner to your creative ingenuity. One possibility is using a thumbscrew-secured metal clip riding on a metal strip attached to the oats box via small "U" brackets. If the slider tuner is not your preference, an alternate idea is substituting a 365-pFd variable capacitor mounted atop the box in lieu of the sliding clip for tuning (fig. 1B).

Would you like to homebrew an even better oats-

Photo B– No name or details accompanied the photo of this "mystery set," but its good-looking velvet vernier-type dial and open-air detector make it an easy-to-duplicate showpiece of the best kind.

*3994 Long Leaf Drive, Gardendale, AL 35071
e-mail: <k4twj@cq-amateur-radio.com>

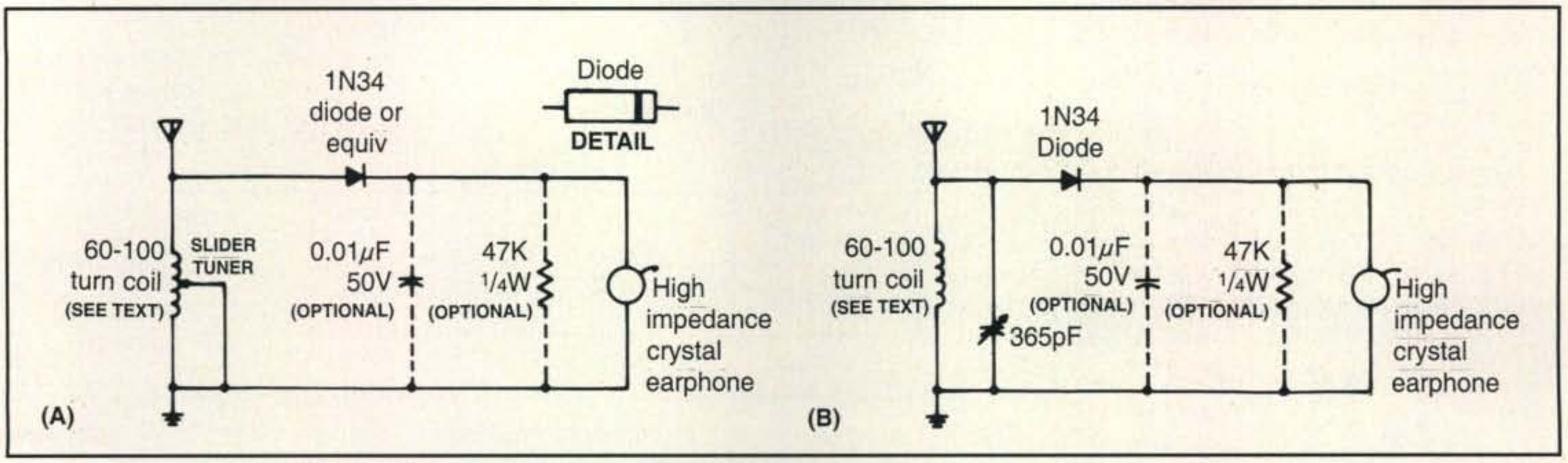

Fig. 1– Generic circuit diagrams are found incorporated in many basic-style crystal sets such as the oats-box version discussed in the text. Circuit A has sliding rod for tuner; B has a variable capacitor for tuner. The glass-encased 1N34 or open-air galena-and-catwhisker type detector can be used.

box radio? Wind its coil with Litz wire. It is a bit scarce and slightly expensive, but it makes a terrific crystal set and is usually available from The Xtal Set Society. Litz wire is comprised of many small strands intertwined so they all take turns being center and outer conductors. The associated higher Q enhances selectivity!

The detector for this oats-box crystal set may be a 1N34 diode, or you can substitute a chip of galena mounted in a homebrew pot and holder as in the early-days crystal sets. Also, old-style Baldwin earphones of 20,000 ohms or greater or a crystal-type earplug of even higher resistance gives optimum results here (highest sensitivity, most volume). The .01-mFd capacitor and 47K-ohm resistor shown in fig. 1 are optional. Experiment with each and note if they improve reception.

The key to good performance with any crystal set is its antenna, and a 40- or 80-meter dipole or doublet usually works well. Another good choice is a single wire 50 feet or longer installed 20 feet or higher. The previous notes may seem academic to old-pro amateurs, but bear in mind that curious onlookers and new licensees may be reading their first issue of *CQ* and a "keep it simple" article always makes a good introduction to our amateur radio world.

Now some exciting news! Paul Phillippe, WBØMPG, recently sent us a box of Fahenstock clips plus a healthy-size piece of "chippable" galena with encouragement to share them with friends building crystal sets and classic one-tube transmitters. If you would like some Fahenstock clips and/or a galena chip, send me a small (and sturdy) box with suffi-

Photo C– The Crystal Set Society has kits of parts to quickly assemble your own oats-box crystal set. This version sports a coil wound with insulated wire and a clip lead you move between screw taps every few turns for tuning. Details are at <www.midnightscience.com>. (Crystal Set Society photo by Phil Anderson, WØXI)

Photo D– This spiffy little 2106 crystal set, also available as a kit from the Crystal Set Society, is fashioned after Marconi's original type 106 receiving tuner. Its 10-inch by 6.6-inch front panel includes a 10-mil thick lexan plastic sheet with black-and-white graphics on the back, and the optional cabinet adds to the set's historical glamour!

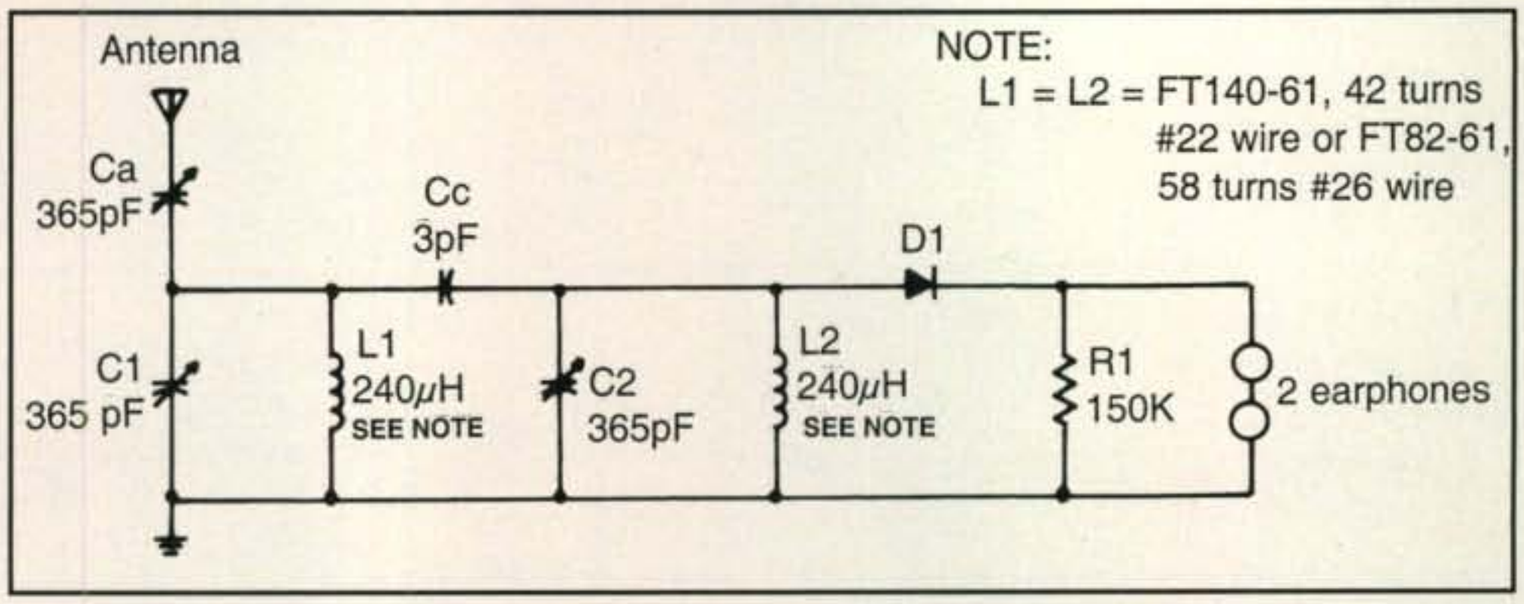

Fig. 2– Circuit diagram of the model 2106 crystal receiver reveals three authentic 365-pFd air-variable capacitors and two 240-µHy toroids in a single- or double-tuned arrangement according to "coupling capacitor cc," or a jumper in its place.

cient return postage and I will send them in return mail to you. I am unsure how far this free stock will stretch, so I suggest first sending me an e-mail to reserve your clips or chips. Be aware, also, that the postal system recently enacted a myriad of stipulations on all forms of mail. Envelopes are subject to crushing, and there are surcharges on thickness and on metal clasps or envelope contents. Boxes of unusual sizes are also subject to surcharges—and various other stipulations. Check with your post office. My e-mail and postal addresses are listed on the first page of this column. Our sincere thanks to Paul for making these items available.

Beyond the Basics

After building a first crystal set and experiencing the fascination of tuning a free-play radio, many newcomers look for something a bit more elaborate and also capable of tuning in the shortwaves (ah . . . the amateur radio connection). The Crystal Set Society has a couple of neat kits for filling that desire.

First is the "My Marconi 2106" set (photo D and fig. 2). This receiver tunes the AM broadcast band (550 to 1650 kHz), it can be front-panel-configured in a single- or double-tuned arrangement, and front-panel terminals also permit easy detector diode changes as desired. The kit is supplied complete with all parts and hardware, including two high-impedance earphones and an 18-page manual. Its wrap-around cabinet is optional.

The "Marconi Shortwave" set (photo E) is akin to a regular crystal set, except its main coil is a bit smaller (14 turns of number 22 wire wound on a 1.5-inch form and an antenna coil of five turns on the same form). Its mating 365-pFd

Crystal Inspiration

As mentioned in the first part of this column, crystal sets have opened the door to amateur radio for people of all ages and backgrounds. Ted Cohen, N4XX, a *CQ* columnist of the 1960s, '70s, and '80s, and co-author of the book *The NEW Propagation Handbook*, published by CQ Communications, has written a novel entitled *Full Circle*. Ted's father dreamed of him becoming a violinist, but Ted's life moved in other directions. While experimenting with a simple crystal set as a grade schooler, he heard and consequently met a neighborhood radio amateur, an experience that ultimately guided him into a life pursuit as an engineer, scientist, and ham radio operator. *Full Circle*, using literary license in change of names, is based on Ted's life, his growth in amateur radio and other venues, and his return to the violin later in life. It is an inspirational read anyone, including young adults interested in amateur radio and/or music, will enjoy. It is available from <www.arrl.org/shop>, and/or <www.authorhouse.com>.

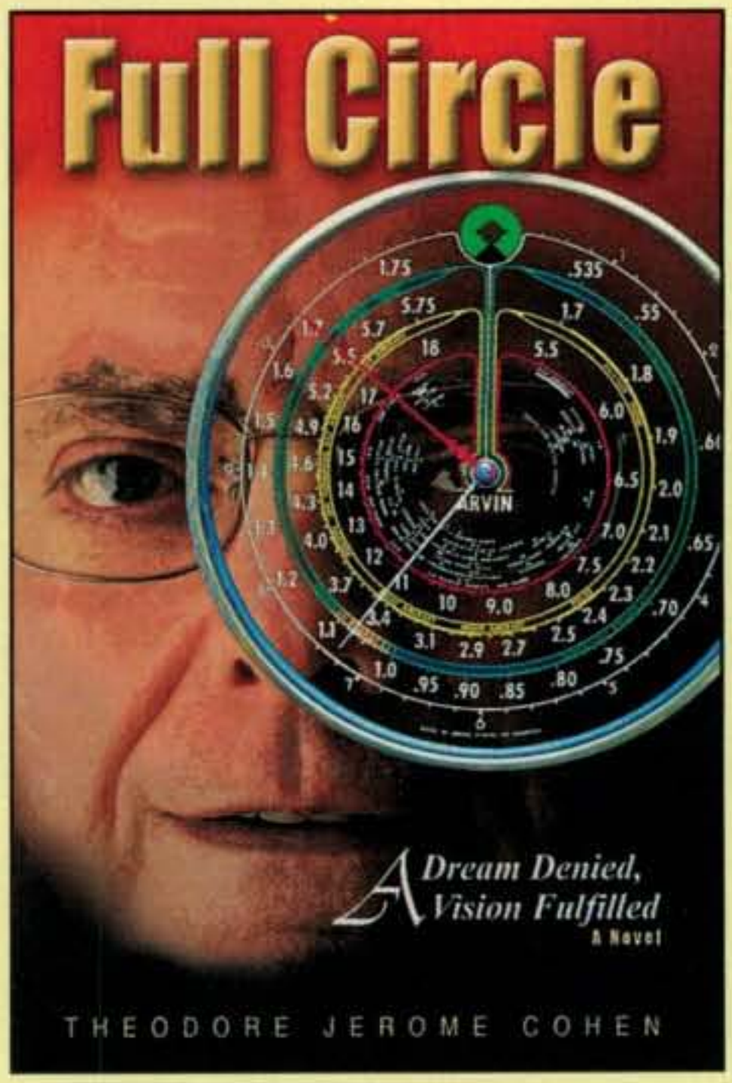

Photo E– A shortwave crystal set? Yes, indeed, and it works reasonably well to boot. This new kit from The Crystal Set Society covers the always active range of 5 to 7.5 MHz and includes a two-transistor audio amplifier to give it "big radio" signal levels. An optional wraparound cabinet (8" × 7"× 6") adds a finishing touch of class.

variable capacitor is connected in series with a fixed 200-pFd capacitor and tunes 5 to 7.5 MHz. An included two-transistor audio amplifier section plus two earphones "round out" this delight and give it "ears" comparable to the Reggie II mini transceiver highlighted in my December 2009 *CQ* "QRP" column. Likewise, coupling a couple of milliwatts from a one-transistor oscillator into this shortwave crystal set will allow it to receive CW signals. More details on both crystal sets are available at <www. midnightscience.com>.

Crystal Spin-Offs

While writing this month's column, I began thinking about some unique uses of crystal sets in the shack—and a winking field-strength meter (FSM) quickly came to mind (fig. 3). Grabbing a handful of clip leads, I connected an LED and 27-ohm resistor across a spare mobile antenna base matching coil. Three series-clipped leads were added at the coil's top to make a 36-inch pickup probe, and a clip lead at the coil's bottom was connected to the station's ground cable.

I fired up a station transceiver, and the little LED blinked cheerfully with transmitted CW. What a mini-glamour treat, especially in a dimly lit shack at night! I then quickly conducted some additional tests and found any coil from 1.5 to 2.5 inches in diameter and consisting of 10 to 15 turns worked fine. Use small LEDs—the ones that light with only 1.5 volts. They work well for power (output) levels between 5 and 300 watts. Reduce probe length as appropriate. Large LEDs require 3 volts (and quite high output power) to light.

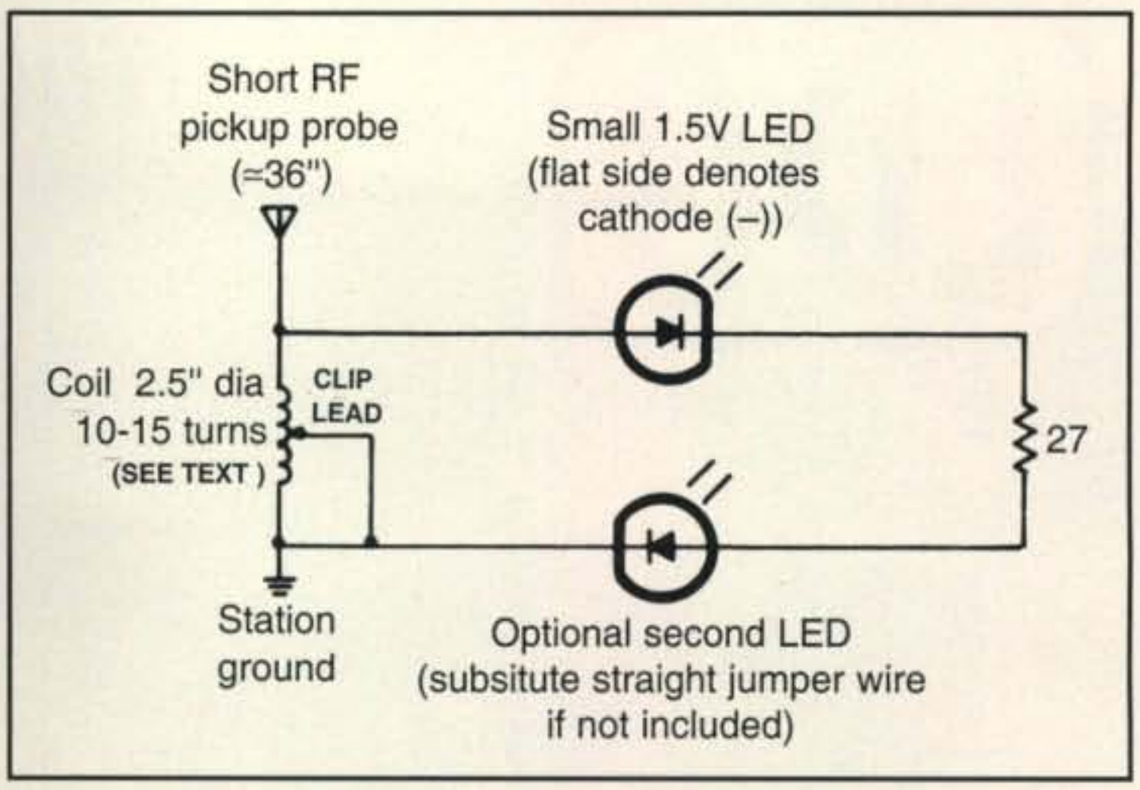

Fig. 3– Circuit diagram of an experimental crystal set serving as a field-strength meter and equipped with an LED in lieu of a meter. (Discussion in text.)

My in-shack FSM is approximately 40 feet from my vertical antenna. Using a 15-turn coil, it shines brightest on 30 and 40 meters. With only 10 turns on the coil, it shines brightest on 20 and 17 meters. I am now looking for a convenient enclosure so the FSM can be used in the shack or in the car. Meanwhile, enjoy using my previous notes to dink and make your own winking field-strength meter.

Conclusion

That winds up this "Crystal Special," friends, and I hope it inspires you or some of the young people in your life to discover or rediscover the simple joys of crystal sets. In working with these spun-off ideas and projects, remember to take photos, sketch circuit diagrams, and share them with us for future crystal columns. 73, Dave, K4TWJ

LDG ELECTRONICS

The #1 Line of Autotuners

NEW! KT-100

LDG's first dedicated autotuner for Kenwood Amateur transceivers. Easy to use - just right for an AT-300 compatible Kenwood transceiver. The KT-100 actually allows you to use the Tune button on the radio. The LEDs on the front panel indicate tuning status, and will show a match in seconds, or even less of you've tuned on or near that frequency before. Has 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. If you have an AT-300 compatible Kenwood radio, you can simply plug the KT-100 into your transceiver with the provided cable; the interface powers the tuner, and the Tune button on the radio begins a tuning cycle. The supplied interface cable makes the KT-100 a dedicated tuner for most modern Kenwood transceivers. ***Suggested Price $199.99***

NEW! IT-100

Matched in size to the IC-7000 and IC-706, the new IT-100 sports a front panel push-button for either manual or automatic tunes, and status LEDs so you'll know what's going on inside. You can control the IT-100 and its 2000 memories from either its own button or the Tune button on your IC-7000 or other Icom rigs. It's the perfect complement to your Icom radio that is AH3 or AH-4 compatible.

Suggested Price $179.99

AT-200Pro

The AT-200 features LDG's new "3-D memory system" allowing up to eight antenna settings to be stored for each frequency. Handles up to 250 watts SSB or CW on 1.8 – 30 MHz, and 100 watts on 54 MHz (including 6 meters). Rugged and easy-to-read LED bar graphs show power and SWR, and a function key on the front panel allows you to access data such as mode and status. All cables included.

Suggested Price $249

NEW! Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required. A coax jumper cable is also induced for fast hook up. ***Suggested Price $129.99.***

NEW! Z-11Proll

Meet the Z-11Proll, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters. The Z-11Proll uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. All cables included. ***Suggested Price $179***

FREE Balun with purchase any new LDG tuner!

*Purchase any new LDG tuner between Oct 15, 2009 and March 15, 2010 and receive a Free balun from LDG Electronics. Simply fill out form (available at www.ldgelectronics.com or via mail - write to 1445 Parran Rd., St. Leonard, MD 20685) and send to LDG along with a copy of your dated sales receipt and LDG will send you a Free RBA-1:1 or RBA-4:1. All forms must be received before March 31, 2010. Limit one free balun per household. Not Transferable.

Free Balun with Autotuner Purchase!*

AT-100Pro

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch, allowing you to switch instantly between two antennas. The AT-100Pro requires just 1 watt for operation, but will handle up to 125 watts. All cables included. ***Suggested Price $219***

radio not included

NEW! AT-897Plus for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897 Autotuner mounts on the side of your FT-897 just like the original equipment and takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price$199***

See AT-1000Pro Review in Nov. '08 CQ

AT-1000Pro

The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts. Tunes from 1.8 to 54.0 MHz (inc. 6 meters), with tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds. 2000 memories. 2 Antenna connections. All cables included.
Suggested Price $599

NEW! YT-100

An autotuner for several popular Yaesu Radios. An included cable interfaces with your FT-857, FT-897 and FT-100 (and all D models) making it an integrated tuner, powered by the interface. Just press the tune button on the tuner, and everything else happens automatically: mode and power are set, a tune cycle runs, and the radio is returned to its original settings. It's the perfect complement to your Yaesu radio.
Suggested Price $199.99

radio not included

FTL Meter 2.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu.
Still Only $49

NEW FTL Meter For Yaesu FT-857(D) and FT-897(D). 4.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu.
Suggested Price $79.99

NEW! M-7700 For IC-7700. It will display S-meter on receive, or power out, SWR, ALC level or supply voltages, all selectable from the radio's menu. What's more, the M-7700 and the virtual meter on your radio can work together.
Suggested Price $79.99

NEW! Z-100Plus

Small and simple to use, the Z-100Plus sports 2000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. ***Suggested Price $159.99***

LDG recommends the S9v 31' Vertical from S9 Antennas!
www.s9antennas.com

Call or visit your favorite dealer today!
Visit www.ldgelectronics.com for a complete dealer list.

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St. Leonard, MD 20685
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Fax 410-586-8475

LDG

BY BRITTANY DECKER,* KB1OGL

Teaching the Teachers

Ever since ham radio started to become popular as a hobby in the early 1900s, kids have always looked towards their mentors, or Elmers, to teach them about the radio world. However, with the Elmers there to help the kids, who is there to help the Elmers? Being of such vital importance to the development of the younger generation's interest in radio, Elmers should have somewhere they can go to get ideas. Like school teachers, these radio mentors often share ideas and techniques for teaching some of the complex concepts involved in radio to high school, junior high, and even elementary school kids! In order to stimulate this sharing of ideas, here are the stories of two Elmers and their experiences teaching radio to kids.

Paul Decker, KG7HF (this columnist's father), became a licensed operator at the age of 13. He has had his license for 25 years, but was inactive for about 15 of those years. After returning to active hamming, a member of his ARES (Amateur Radio Emergency Service) group asked him to help teach a licensing class that was short on instructors. Despite not knowing what to expect, he agreed. He ended up really enjoying the experience and has continued teaching ham radio classes since then. He has been teaching for about two years now, and shares these thoughts:

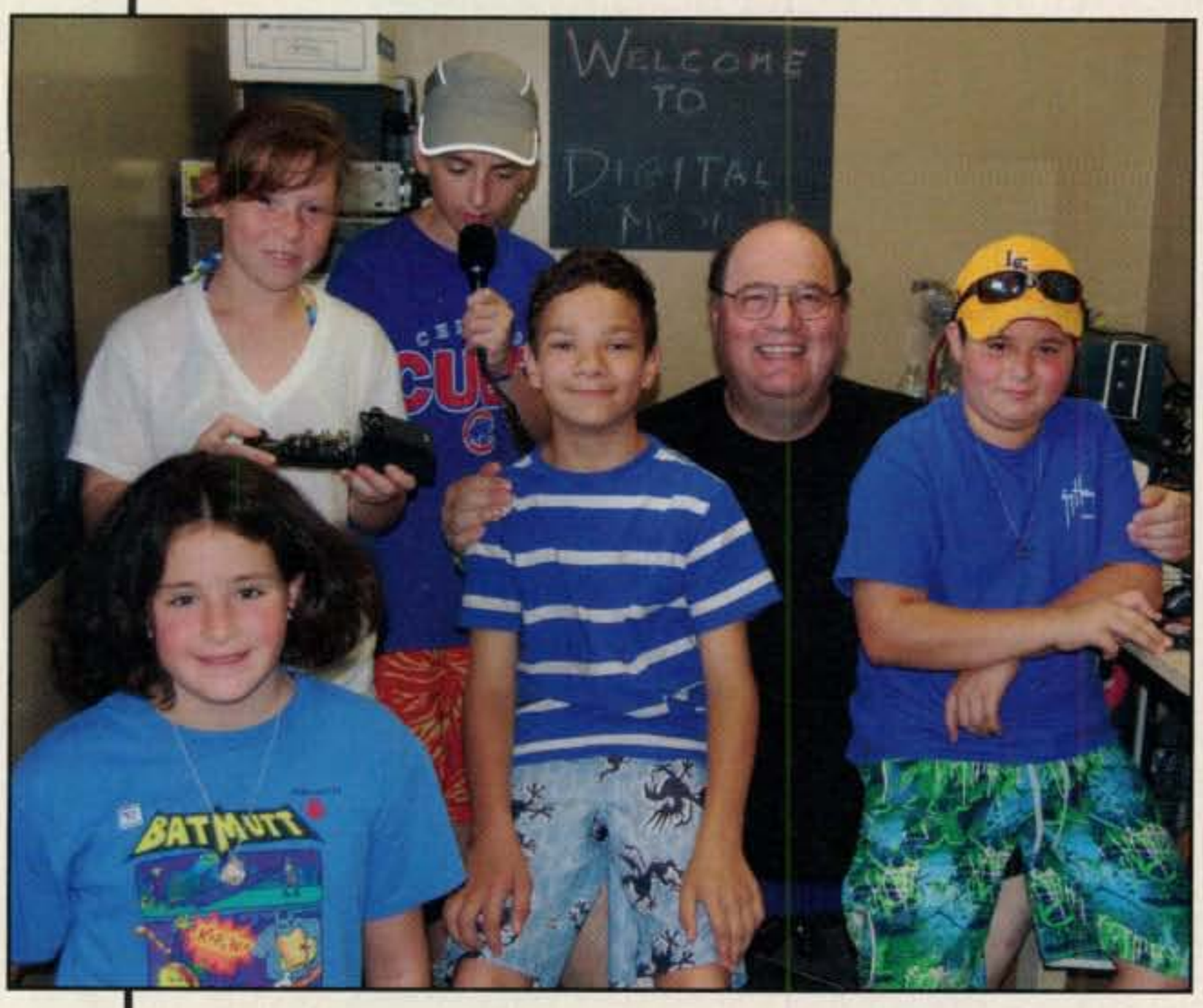
Over the past year, I have been leading a weekend long "Ham Cram" course. This is where we spend eight hours on Saturday and six hours on Sunday studying for the Technician exam, and then take the exam early Sunday evening. The students receive the book two weeks in advance and are assigned reading and study material prior to the classes. During the classes, we use the question pool as an outline. It details where the students are weak and allows us to drill into a particular area where there might be trouble. In addition, it puts the students at ease, as they get to see the question and answers prior to the test. For the most part, the classes have consisted of adults, generally people interested in working with public service and emergency communications, but sprinkled into the mix are usually a couple of youths. What is interesting about the youths is, of course, when mixed in with the adults they are generally shy. The trick is to get them engaged and comfortable. Unlike school, our classes consist of shouting out the answer to a question ... whoever gets it first yells out the answer. I found that once they get used to this new environment, sometimes it's hard to find the off switch and they keep shouting out the answers!

Recently, I had the privilege of teaching a class for a small group of Girl Scouts a few towns over from us. It was really a treat to have a small class. We even were given a classroom in the local high school, equipped with all the goodies—large white board, markers, desks, and a ceiling-mounted digital projector to connect to the laptop. This class was different from the traditional "ham cram" in that we spent three hours each Monday for four weeks, and then had a final review just before the test. I learned a few things from teaching this class. The first thing is that demonstrations are really helpful. For example, we did a lab with Ohm's law where we chose resistors from my "junk box," applied a voltage from a power supply, and then calculated the current, voltage, or resistance, whatever we didn't know; we then measured the unknown values to test how well our calculations went. This lab turned into a great game. We also got a great segue into the power formula when we smoked a resistor or two.

Although it is sometimes challenging to teach, I teach because I think the hobby of ham radio has a lot to offer someone. Wherever you turn, there is something good within the hobby. Whether it be learning to design and build your own gear, working with non-profit agencies such as the Red Cross or Salvation Army for disaster preparedness, writing software such as WSJT to explore weak-signal communications, or simply meeting and talking with someone you just met on the other side of the world, there is something in the hobby for everyone. Because our hobby is so broad, I enjoy showing others, both young and old, and hope to get them interested in the hobby. Who knows where they might take it, or where it might take them?

Also, teaching is not just seriousness. There is some goofing around among the students and instructors. My favorite teaching experience was with the Girl Scouts, although, unfortunately, only one scout out of four passed the license exam. Even so, one of the most memorable times was when after a particular class they

*c/o CQ magazine



Joel Colman, NO5FD, in the ham radio room with campers from Henry S. Jacobs Camp. (Photo courtesy of Henry S. Jacobs Camp)

came up to me and said that the class and experiments we did were the best and clearest explanation and that they fully understood what the lesson was, even though it was highly technical in nature, at least to 14-year-olds.

Paul Decker, KG7HF

Paul expressed a couple of things as challenges he experienced when teaching. First, he said that many times during class the challenging part isn't getting the students to show their interest, but channeling their interest so that it remains on topic. Since there is limited time to teach the students so much information before the test, the discussions and questions should remain on topic, and while it is fun and good to go off topic every once in a while, there is not time for too much of this.

Another challenge Paul faced was the conveying of information in a clear, concise way. Many of the concepts that had to be taught dealt with math and science that would normally be taught in upper-level high school classes. He found ways to deal with these challenges, though, mainly through the use of demonstrations. In fact, his demonstrations were so helpful that the students thanked him for them at the end of the class. Visuals are often an extremely useful tool in teaching, and as a student myself, I find that they help with understanding, remembering, and later recalling information.

Summer Camp Hamming

Joel Coleman, NO5FD, first got into CB radio back in 8/9th grade. Aspiring to be a ham radio operator from an early age, he finally decided to study for his Novice license while he was in college, and received his first call of KA8OCF. He began teaching ham radio in summer camps in 1982 and has been doing so since then. He has taught several community ham radio license classes, in St. Louis and in New Orleans. He has been the Emergency Coordinator for Orleans Parish, Louisiana, for over four years, and is a member of the Delta DX club and the Jefferson Amateur Radio Club. As for his full-time work, he is the cantor and youth director at Congregation Temple Sinai, which is the largest synagogue in the state of Louisiana. Here is what Joel has to say:

For the past ten summers, I have been introducing amateur radio at the Henry S. Jacobs camp in Utica, Mississippi. This is a residential Jewish camp primarily serving youth from Texas, Louisiana, Florida, Alabama, and Tennessee. I have the opportunity to teach several times a day. Some campers sign up and they have about six hours worth of class time. While this time period does not allow me to teach a licensing class, it is certainly enough time to give the campers a fun introduction into this wonderful world of amateur radio.

One of the realities of summer residential camps is that each camp day is filled to the max with a myriad of programs. Every minute at camp is programmed from the time the campers wake up untill they have their final snack before bedtime. So introducing an amateur radio program with the goal of the campers taking an exam is just not possible.

This summer I taught amateur radio at two residential camps, Camp Maas in Ortonville, Michigan, and once again at Jacobs camp. Jacobs camp provided the funding for me to use the new FlexRadio 3000. I find that the campers were able to visualize the amateur radio band with the pan adapter. In addition, the audio recording capability is really remarkable. I am able to record enough bandwidth that simulates a lot of activity (such as a contest or good band conditions). This way I can have the kids listen for callsigns, phonetic use, etc. In addition, the SDR software allows me to easily record a QSO

that a camper just completed, and then take the recorded file and burn it as an mp3 and give it to the campers. They can go home with a recording of their amateur radio contacts.

I use Echolink when band conditions are poor. This summer the campers spoke to a ham operator from his taxi cab in Fairbanks, Alaska. The kids were impressed. Once on Echolink we spoke to New Zealand. I asked the kids what language they speak in that country. One camper raised his hand and said, "Kiwi?" I also find the campers really enjoy learning Morse code. These text-savvy kids think CW is cool!

This summer I decided to have the kids participate in the IARU DX contest. I had a Netbook computer loaded with the logging software specific to the contest, and had the campers make QSOs and do the logging and make the contacts. They loved logging in callsigns and then seeing how many points each was worth. They did not want to leave the activity because they were having just too much fun. I didn't think the campers would enjoy making fast QSOs, but they loved it.

A fun way of teaching campers how to properly use radios, talking into the microphone properly, speaking clearly, pressing the microphone button and then speaking is by playing a game I call "Cops and Robbers." Basically the game is "Hide and Go Seek" using FRS radios. This game requires four FRS radios. Radios 1 & 2 are on one frequency, while radios 3 & 4 are on another. When a group of kids comes to the radio room, they are split into two groups, criminals and police. A staff person goes with the criminals to hide somewhere, using an FRS radio on Channel 1. A staff person goes with a group of kids as the police, using an FRS radio on Channel 2. As the police walk around, they call to police headquarters (the ham radio room), where a kid has been selected to be the police dispatcher.

The police tell the dispatcher where they are located ("We are at the main office," for instance). The dispatcher turns to the ham radio operator, and tells him where the police are located. The ham radio operator (who is running this program) calls the criminals and tells them where the police are currently located. The criminals then tell the ham radio operator if the police are hot or cold, warm, burning up, etc. Then the ham radio operator tells the dispatcher to call the police and tell them if they are hot or cold, etc. Using this cycle of communication, the police get warmer and warmer (closer and closer to the criminals) until they are found. Once they are found, everyone reports back to headquarters and then switch roles, with the police now hiding as criminals, etc.

Doing this game twice takes about 45 minutes. Just about any age can play the game, from eight years to teenage years. It is important that staff is assigned to each group, to make sure they are hiding in a safe place. This game is simply a version of hide and go seek, using radios. Everyone loves to play cops and robbers, and it has always been a big hit at camp.

While campers who spend time in this summer camp amateur radio program do not come away with an amateur radio license, they nevertheless come away with a full appreciation for our hobby. They also know how much fun amateur radio is by making QSOs, competing in contests, and learning Morse code.

Joel Colman, NO5FD

As an instructor at a camp, Joel came across a couple of different challenges. First, since he was in a camp setting with many campers, the relationship was at a much less personal one-on-one level than may be experienced in a classroom with ten students. The problem presented with this is that it is hard to know exactly what the campers will enjoy and what they will not enjoy. Thus, for a while it is like feeling around in a dark room, until you find that one activity they can't get enough of, which for Joel was making fast QSOs. Just like demonstrations and visuals, kids also enjoy hands-on activities rather than trying to describe the process of logging and the typical QSO.

Joel came up with his own innovative idea in order to teach kids through the use of a game. This game made use of a classic well-known kids' game, applied to amateur radio. This makes amateur radio more accessible and kid-friendly. While building vital operating skills, it provides a fun activity that lasts up to 45 minutes for only two turns.

Communicate!

The main problems that ham instructors face today are communication issues. The instructors don't know what the kids want or how they want to be taught. My advice to fix this problem is *communicate*. The teachers and the students must communicate at the start of the classes or before they even begin. This helps the teachers, because it takes the guesswork out of teaching, and they won't have to wonder whether their students will enjoy this or that activity, or if method A is clearer than method B to explain something. The students can get a better learning experience from the class if they are given the opportunity to suggest to their instructors which activities they will enjoy, and which methods they should use or concepts they should spend the most time on. If the classes start in this manner, each group will be different and have a different lesson plan, but it will make it easier to teach, and guarantee the students a much better learning experience.

73, Brittany, KB1OGL

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kit-building

BY JOE EISENBERG,* KØNEB

The Trouble with Toroids

Among the components found when sorting through the parts bag of a kit, I think toroids are the most feared among kit builders. This month I will try to dispel some of those fears and make some suggestions on how to best deal with them and make them a fun part of your kit experience.

I know many kit builders shudder when they empty their bag of parts and see those little donuts and small hanks of wire in the kit. A toroid is really simply an inductor wound on a ferrite core so as to make the coil physically smaller and require less wire to create the same inductance as one wound in open air. A good example of a similar thing is the ferrite-rod antennas common to most AM broadcast receivers. Those antennas are made by winding a thin insulated wire around a ferrite rod to create an inductance that when combined with a capacitor becomes resonant in the AM broadcast band and acts as a more efficient antenna than an open coil of wire.

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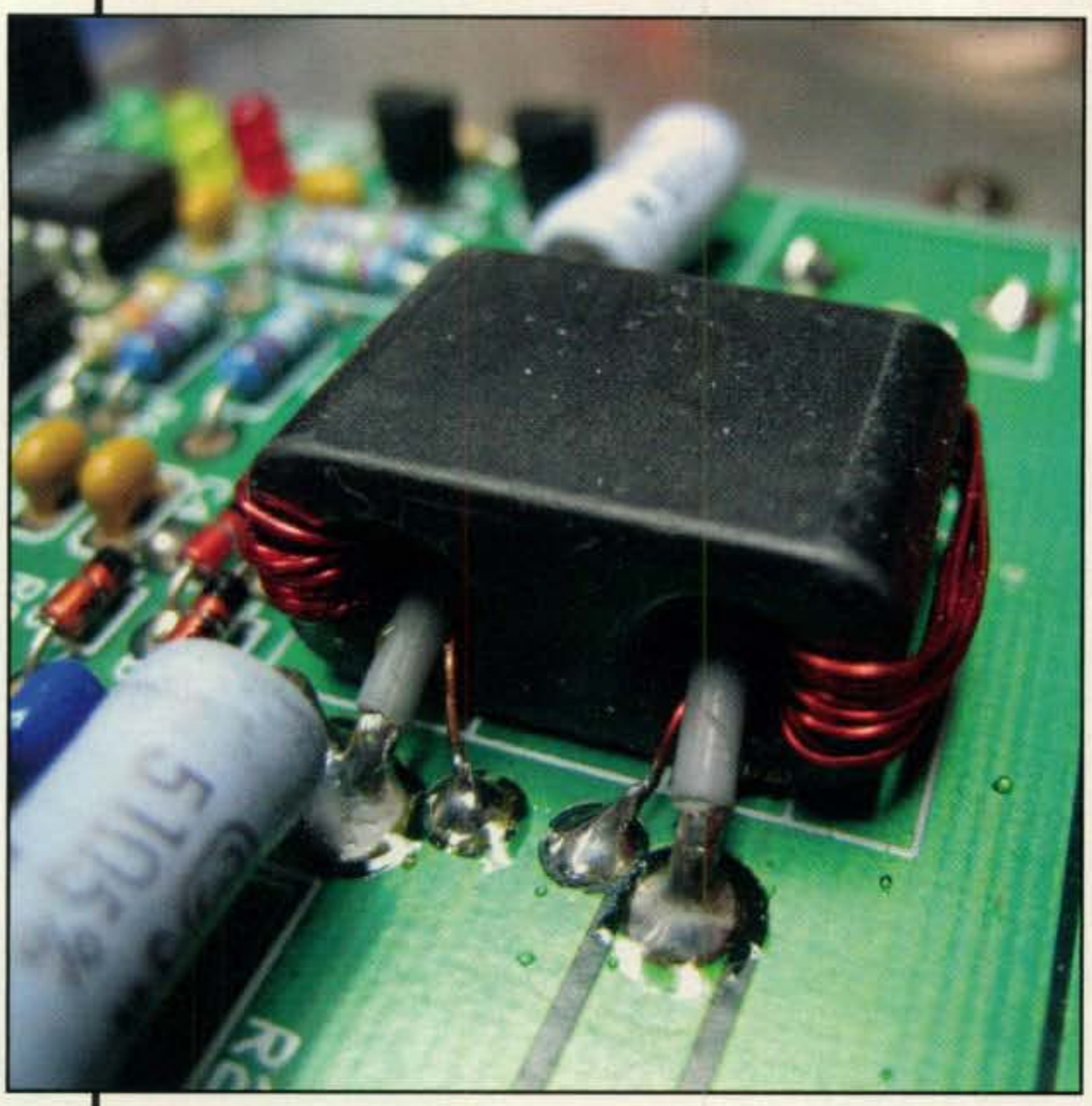


Binocular-style toroid. This is easier to wind than it looks.

Toroids are common in many HF-band radio kits due to their compact size. The type and size of the donut-shaped ferrite core determines its effect on the number of turns and size of wire needed to provide the desired inductance. Some kits have ferrite cores of different sizes and densities, and some are marked with different colors that are used to distinguish them. Make sure you use the proper core and wire size and gauge specified for each toroid as called for in the kit's directions or it will not function as desired.

I am a member of HBQRP (NØQG), the Midwest Home Brewers and QRP group. (http://www.hbqrp.org). We meet monthly in a pizza place between Omaha and Lincoln, Nebraska to show off our latest projects and do group kit building. One of our members, Dar, W9HZC, has a great suggestion when facing toroids as part of a kit. He suggests doing them first, since they do take time and care to do correctly. He then tags each with its part number—such as L1, L2, T1, etc.—and stores them in a bag along with the kit parts. That way, when he is ready to assemble the kit itself, his toroids are already done and simply get stuffed in the board and soldered in place as quickly as the rest of the components. Doing them first also means you are not tired, and can bring your full attention to making them accurately.

Many builders often complete the entire board except for the toroids and then the kit stays unbuilt for a long time, sometimes not being completed at all. I have found the time spent winding them to be relaxing and enjoyable, and doing them first means that when I am ready to complete my kit, the toroids are no longer a burden, but just another component ready to go.

Here are my suggestions for winding toroids:

1. Be sure you are using the correct wire and core. Some kits have multiple sizes and types of cores, some very similar in appearance. The wire is often a specific color and gauge, so pay attention to which wire and which core you are using.

2. Be careful when winding a toroid so as not to kink the wire or nick the insulation on the enameled wire or overlap the turns. These things are very easy to do, especially with very thin wire. Cutting the wire to the length asked for in the manual will assist you in knowing how much further you have to go. Most kits give you a generous amount of wire, just in case you need to redo a toroid or need extra length to easily strip the insulation from the leads. Do not pull too hard on the wire as you thread it through, as some wire can be brittle. However, do make sure it is wound tightly enough so the turns do not move easily. If they are loose, the resulting tuned circuit can be less than stable. The number of turns is counted as the number of

times that the wire passes through the center of the core. Most manuals go into this in detail. Don't worry about precisely counting the turns at first. Just keep winding until you think you are close and then use a magnifying glass to help you count them. I use groups of five turns, counting five at a time, slightly separating them with a mini screwdriver tip or similar object.

3. Leave enough wire on both ends to easily be able to remove the insulation and mount it on your board.

4. Use a small cigarette lighter to first quickly burn off the insulation from the wire, taking care not to burn off any insulation on the core itself. It only takes a couple of seconds to do this. Then use an emery board to get rid of any carbon left over. Follow that by tinning the wire so that it makes good contact and solders easily to the board when completed. I often grab a handful of free promotional emery boards at fairs and trade shows to keep in my kit-building stash. Watch for them! Be sure to correctly label the toroid if not using it right away.

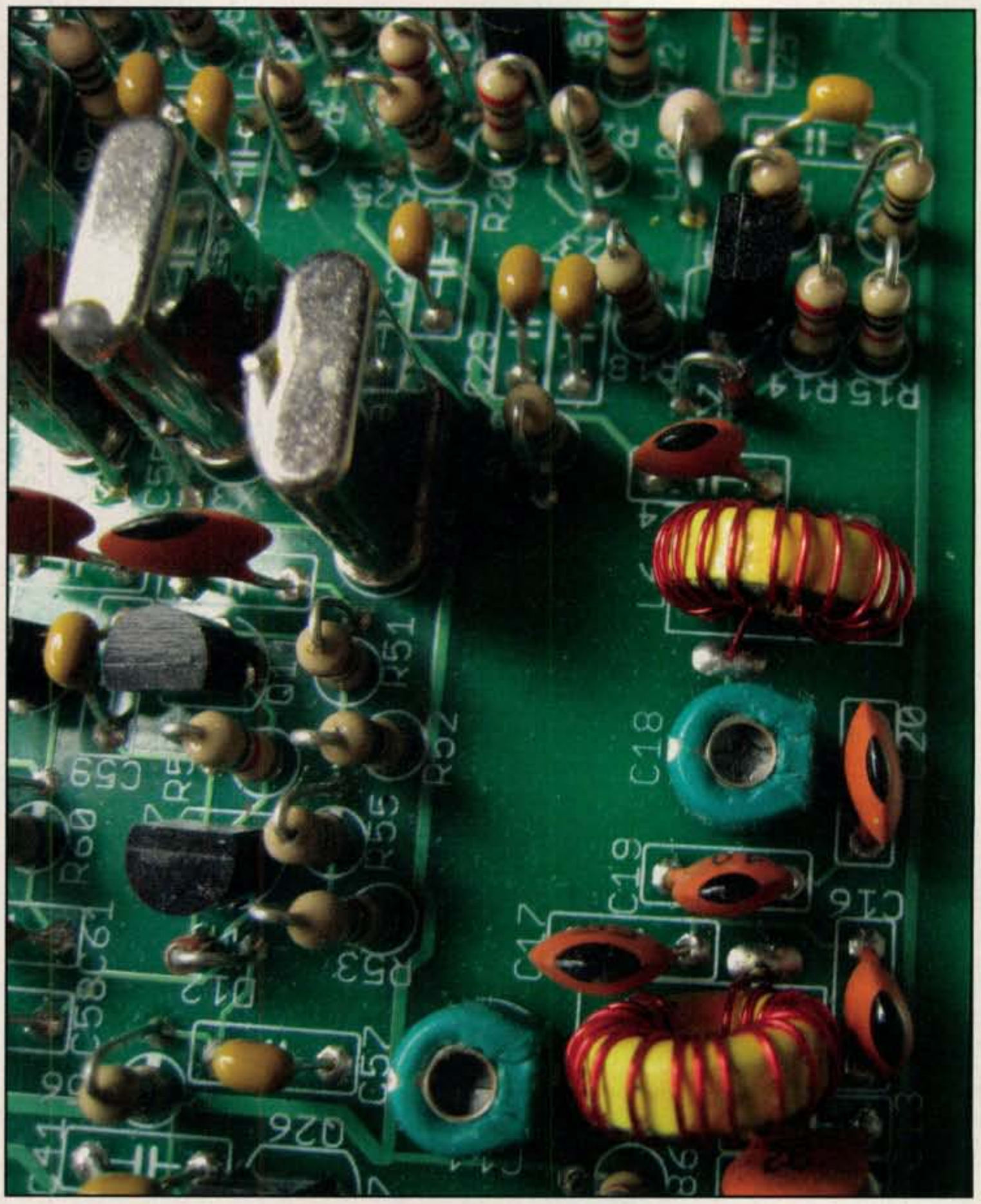
5. Carefully inspect it for any nicks, kinks, or overlapping wires to be sure it is ready to go. Double-check the wire type, core type, and number of turns.

6. When mounting the toroid, be sure to carefully place the wires in the proper holes as called for in the manual and solder, making sure that the solder flows smoothly and is not in a "bubble." The solder joint should look more like a "Hershey's Kiss." The core should rest on the board itself, and not be only supported by the thin wires. Stability makes for a better inductor. Sometimes a tiny dab of glue helps to keep it in position.

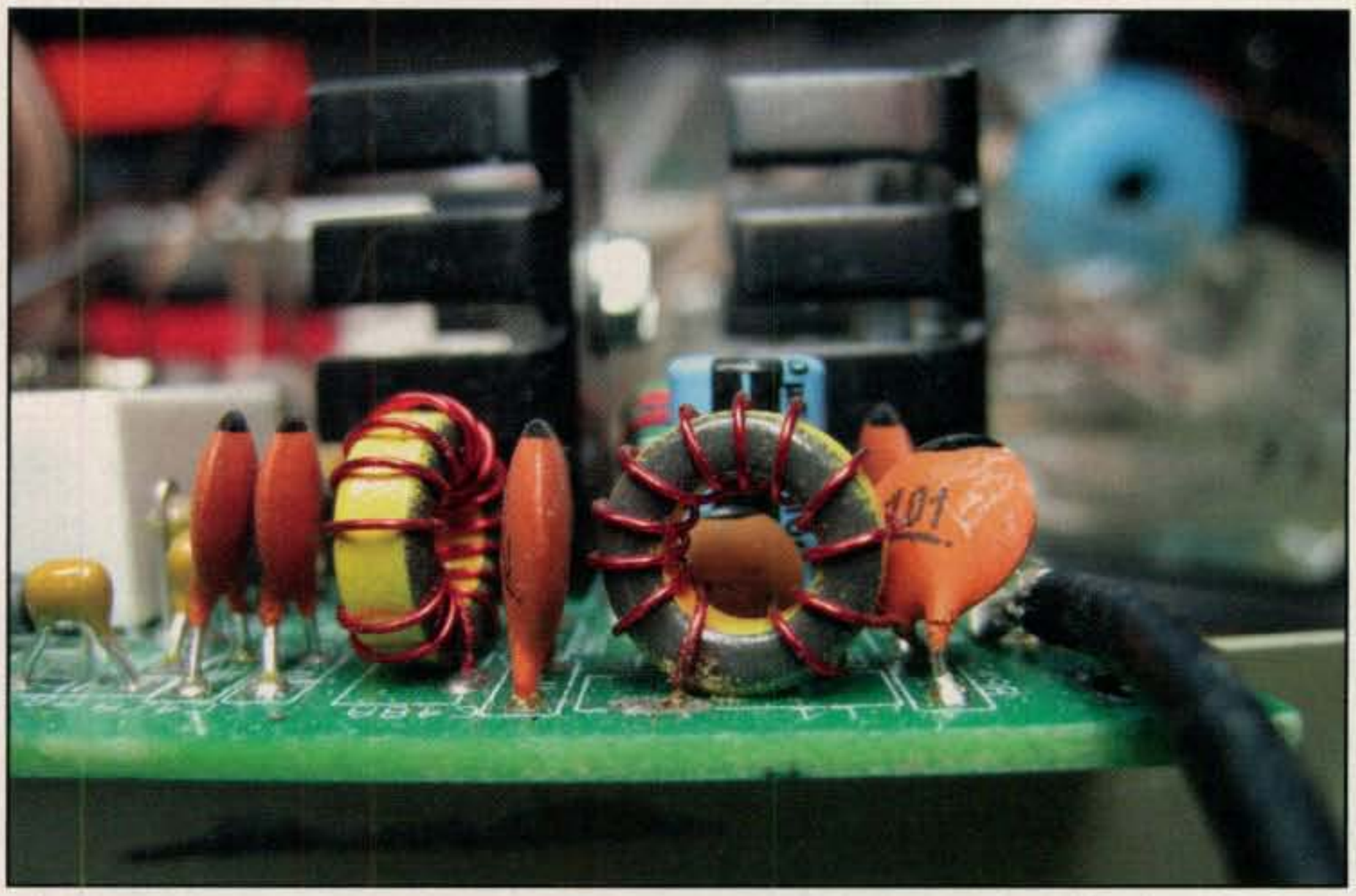
7. Check your finished toroid with an ohmmeter to see if there is continuity from one end to the other before and after mounting. On bifilar (two wires) and trifilar (three wires) toroids, or transformer toroids, it is especially important to check to be sure there is no continuity between the different colored leads, yet there is continuity between leads of the same color.

8. Be sure that your toroid doesn't have any bare wire touching an adjacent component or is in a position to rub against an adjacent part, causing a future short.

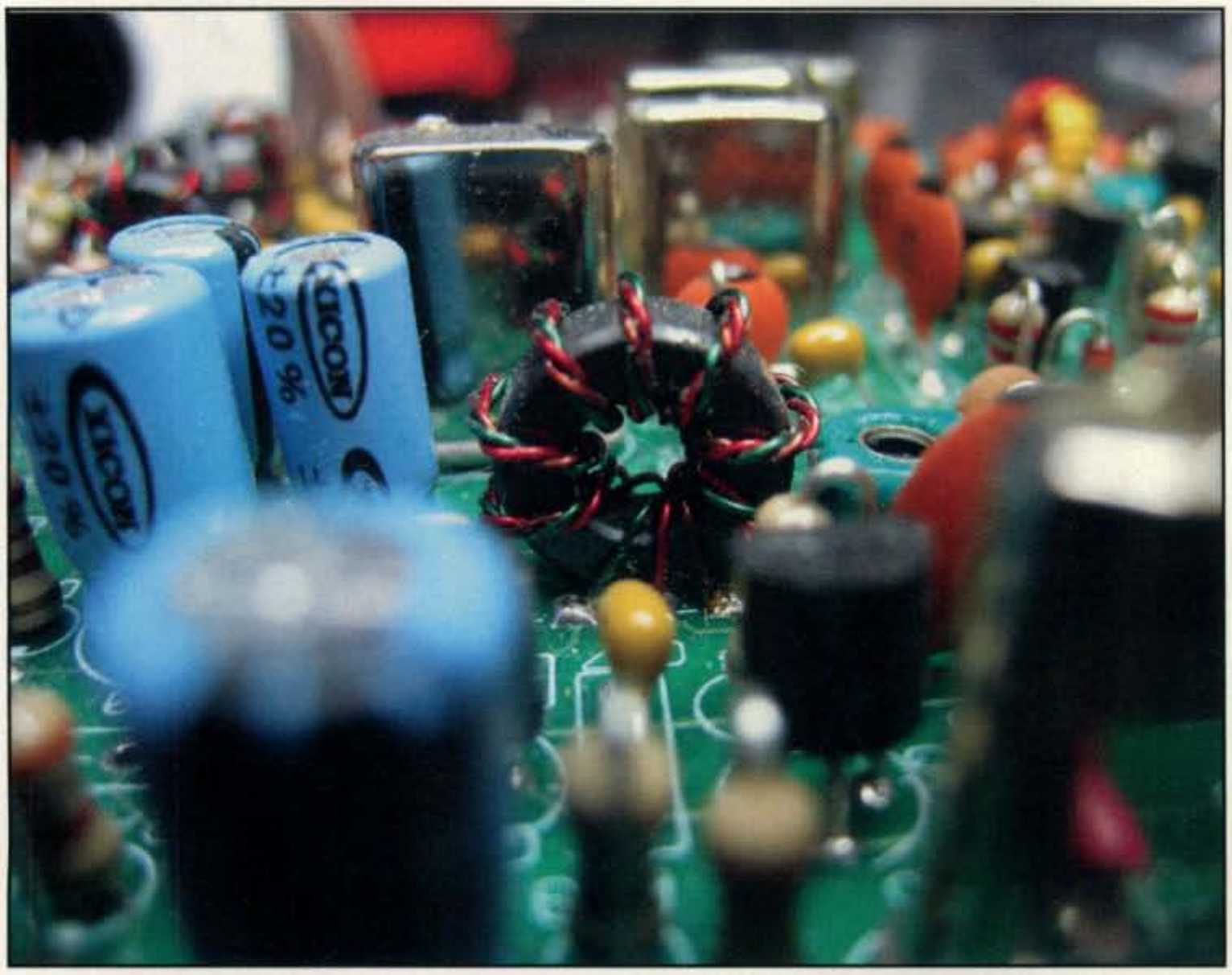
As with my previous suggestion of having common spare resistors, capacitors, and other parts available, you can get spare toroid parts as well. There is a toroid kit that comes with several different common types of toroid cores and wire along with a special toroid



A pair of single-wire toroids mounted vertically and seen from the top.



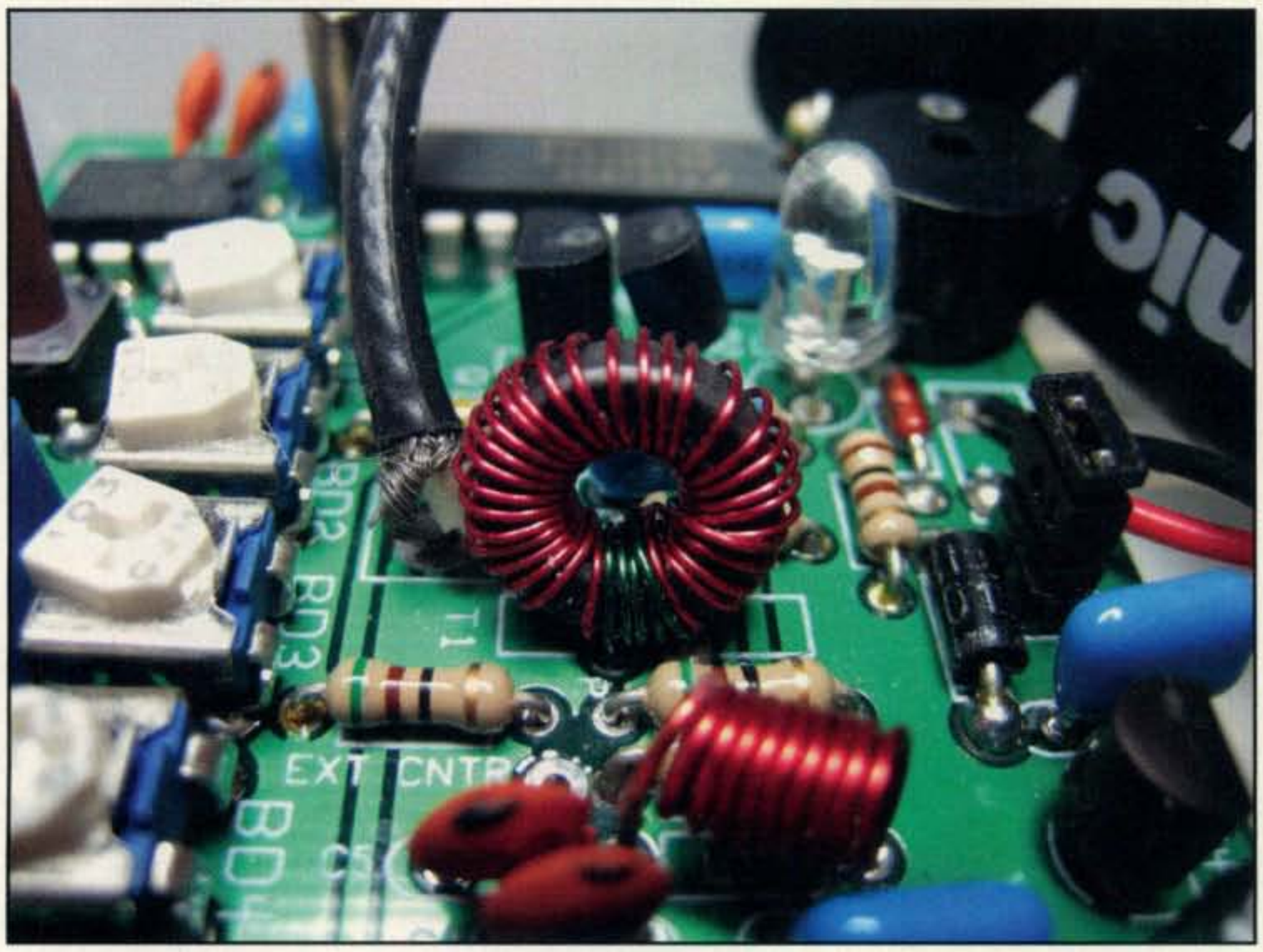
Another view of two single-wire toroids, seen this time from the front and side.



A trifilar toroid. Notice three different color wires twisted together and wrapped around the core.

holder to use when winding them. This kit is called "Preparation T" and is sold by Rex, W1REX, at <www.qrpme.com>. Doug Hendricks, KI6DS, also has a kit of spare toroid cores and wire which comes in handy should you need the correct spare wire and core or want to improve or modify your kit. His toroid kit is available at <www.qrpkits.com>.

Take advantage of the long winter nights and cold days to spend some quality time building a kit! Until next month . . . 73 de KØNEB



A toroidal transformer. There is a primary and a secondary using two different colors of wire (look closely to see the green wire at the bottom).

antennas

BY KENT BRITAIN,* WA5VJB

Potpourri: Velocity Factor, 75-ohm Coax, and Stacked Yagis

This month we will be looking a variety of antenna topics, most inspired by questions from you, our readers.

Photo A– Dielectric horn antenna for 76 GHz.

Velocity Factor

At a recent club meeting I got a request to explain the velocity factor of coax. Velocity factor is a consideration for all types of transmission lines, both open wire and coax. Velocity factor even affects the length of your antenna elements. It is a measure of how much certain materials slow down a radio wave from its theoretical speed of the speed of light.

There are two ways to explain why a radio wave doesn't travel as quickly as it should:

First is the optical explanation. When light, or any electromagnetic wave, travels though a substance, that wave is slowed down. Light slows down when it passes though glass, air, water, or any other clear substance, which is why a lens can be used to bend and focus light waves. Likewise, radio waves traveling through plastic or even air travel more slowly than in free space. Also, it is also possible to use a lens to bend and focus radio waves. In photo A we have a 76-GHz horn antenna with a lens. It is because the radio wave travels more slowly through the center and thicker portion of the lens, and at the same time travels more quickly through the thinner outer edges of the lens, that the waves can be brought to a focus.

However, treating radio waves like light is really only practical when get above several GHz. Yes, you can use a lens to increase the gain of your 2-meter antenna. Start with a slab of low-loss plastic 60 feet by 60 feet and about 10 feet thick.

Next would be the transmission line, or low-pass filter model. The center wire in coax acts like an inductor. The space between the center conductor and the shield forms a capacitor. Together this is shown in fig. 1 as a series of inductors with parallel capacitors. The wave has to charge each capacitor as it travels along the coax. This takes time and slows down the radio wave. Seventy-two-ohm coax has a smaller center conductor than 50-ohm coax, so the capacitors have lower values in 72-ohm coax than they do in 50-ohm coax. In general, a radio wave travels down a 50-ohm coax cable about 66% as fast as it does in air. For 72-ohm coax, the radio wave travels about 80% as fast as it does in air. Therefore, the velocity factors of the two cables are 66 and 80, respectively.

There is also a *lot* of difference in VF, or velocity factor, of solid vs. foam coax, and a *lot* of difference among manufacturers. If you need exactly one-half wavelength or something, be sure to check the manufacturer's data or measure it yourself. Measuring velocity factor of coax sounds like a good topic for a future column.

Back to fig. 1, the diagram for the transmission line is also the schematic for a low-pass filter. Now you know why coax has more loss as you go up in frequency.

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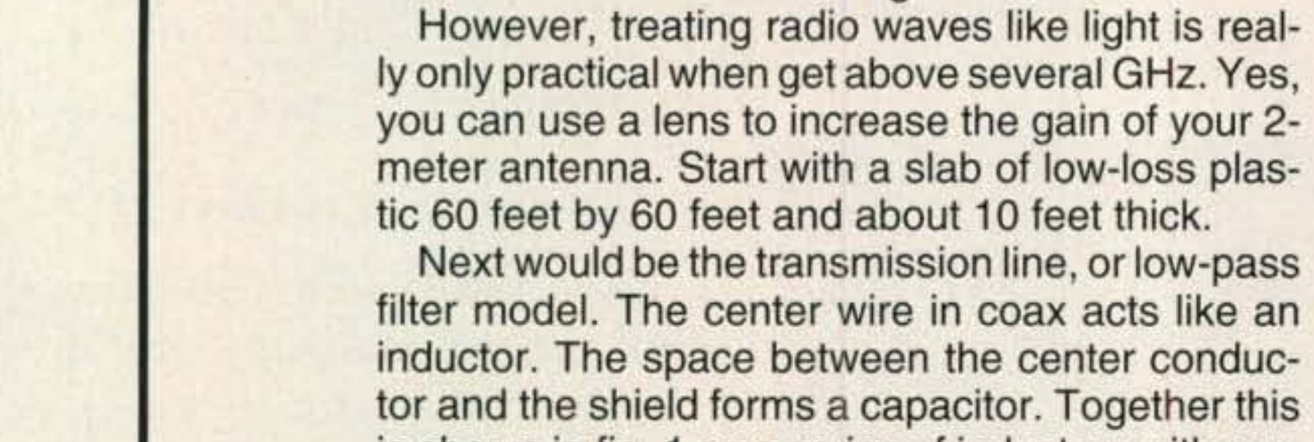

Fig. 1– Diagram of a section of transmission line.

Using 75-ohm Coax

There seems to be a tradition among hams of avoiding 75-ohm coax like it's the plague. Actually, it's great stuff that usually has less loss than 50-ohm coax. Cable TV companies get their coax in 5000-foot rolls. When they get to the end of the roll, that last hundred feet or so is pretty worthless to them. Often, you can get them to give you leftovers for nothing, or next to nothing.

There are several ways to use 75-ohm coax in your ham station. First is with any rigs with a tune-load control. This includes just about any transmitter or amplifier with a tube final. Pi-output sections on older rigs and most amplifiers will tune impedances from 30 ohms to 1000 ohms or so; 75 ohms is well within their tuning range and will load up just fine.

Many antennas are easily modified from 50 to 75 ohms. For Yagis with gamma or T-bar impedance matching, you just move the slider to the posi-

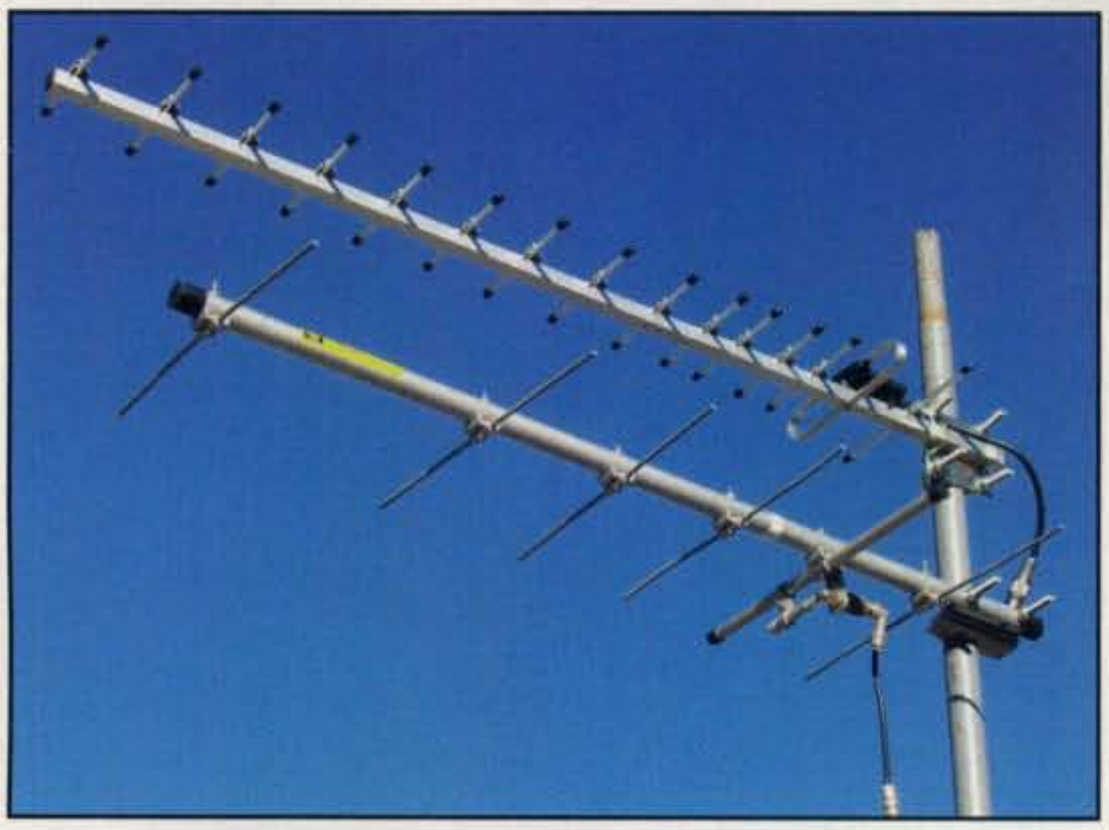

Photo B– Close-stacking of Yagis for different bands.

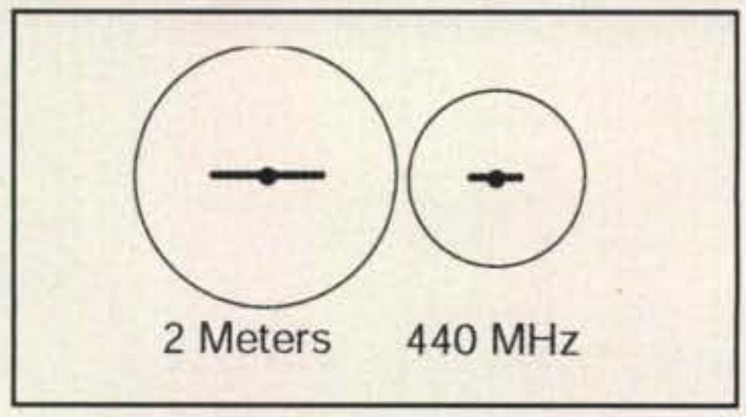

Fig. 2– Relative capture areas of two Yagis for different bands.

tion with the best SWR. In the case of my "Cheap Yagis," I have published 75-ohm versions of many of the antennas. For these, the element spacing is a bit wider and the lower loading of the driven element matches out at 75 ohms instead of 50 ohms. For verticals with base-mounted loading coils, you just move up the tap point slightly for a 75-ohm match.

Another option for 75-ohm coax is to just use it! If you just connected 75-ohm coax in a 50-ohm system you will have a 75/50 mismatch, or a 1.5 to 1 SWR that adjusting the tip of the antenna just won't tune out. A 1.5 SWR is really nothing in the world of antennas, though, and with the much lower loss of 75-ohm coax you come out way ahead. One method suggested by KF5N was to make up a handful of 75-ohm jumpers of different lengths and try different combinations between your rig and the coax. The idea is to find the extra length that makes the total transmission line an odd quarter-wave multiple. A feedline of 50 ohms odd quarter-wave of 75 ohms to 50 ohms works out to be a good impedance match and a low SWR. In my case, this worked great on the 6-meter beam fed with 3/4-inch 75-ohm hardline.

Stacking Yagis for Different Bands

On one of the microwave reflectors, the pundits had quite a field day with this one, and as usual the opinions were 20 dB stronger than the facts. At a recent microwave conference, we set up the antenna range and measured over 50 different antennas. While we were at it, we looked at the interaction between Yagis mounted close together as in photo B and in fig. 2, which is a drawing of the relative capture areas of a 2-meter and a 440-MHz beam. This is, of course, scaleable to any two ham bands.

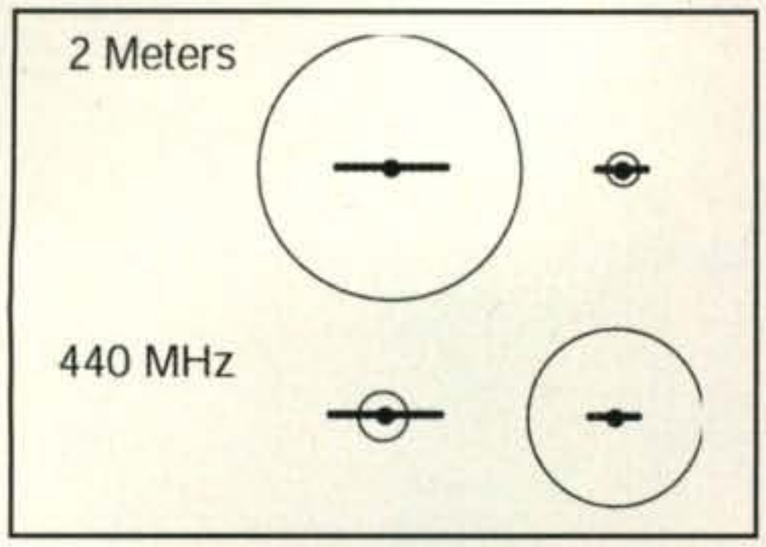

Fig. 3– Relative capture areas of two Yagis, but on the other Yagi's design frequency.

Some will say that the antennas need to be stacked far enough apart that their capture or aperture areas do not touch, or very far apart. But then they mix their math terms.

In fig. 3, we directly compare 2-meter to 2-meter and 440-MHz to 440-MHz beams. The aperture area of a 440-MHz beam is darn near *nothing* at 2 meters, and the aperture area of a 2-meter beam is very small at 440 MHz. Interaction between the Yagis is quite small on the other Yagi's design frequency.

Since this was a microwave conference, we did our testing with a 432-MHz Yagi and the effects of nearby 902-MHz and 1296-MHz Yagis. We have a lot more testing to do, but the 902-MHz and 1296-MHz beams had to be moved down to where the booms touched before gain dropped even 1 dB. Also, most of this was caused by an SWR increase in the 432-MHz beam by the other antenna's elements being next to its driven element. I have much more work to do, and this is not the time of year for a lot of outdoor work on the antenna range, but it sure looks like Yagis for different bands can be mounted a lot closer together than we once thought.

Reader Q&A

Everette asks about using a CB SWR meter on other bands: Your 27-MHz SWR meter should work fine on most ham bands. The CB meters often get a bit confused on 146 MHz or 450 MHz, but they work fine on the lower bands. The "power," or watts, setting is calibrated at 27 MHz and will not be accurate on the ham bands. However, it will show you are putting out power. Of course, too, the "modulation" position on your meter isn't necessary since there is very little AM activity on the ham bands. Thus, you can save those Social Security pennies and keep using your old SWR meter.

From Martin we have a question on ground radials: Why do we see only three or four radials on a VHF quarter-wave ground plane, but they want you to have many radials on a ground-mounted HF vertical?Yes, the textbook does recommend 120 radials for a ground-mounted broadcast vertical. The problem is the poor conductivity of soil. When the radials are isolated and insulated, as when mounted in the air on a ground plane, the currents stay in the radials, which are usually constructed out of a good conductor. However, when ground mounted, those currents are just warming up earthworms. The extra radials improve the electrical conductivity of the ground and raise the efficiency of the antenna. Elevated radials for an HF vertical, where the radials are mounted several feet off the ground, are more difficult to build, a bit of a tripping hazard, and you need a lot of real estate, but elevated radials on HF are very efficient.

As always, we welcome your questions and topic suggestions. Just drop a note to my QRZ.com address or an e-mail to <wa5vjb@cq-amateur-radio.com>. For other antenna articles and projects, you are welcome to visit <www.wa5vjb.com>. 73, Kent WA5VJB

CQ Our 65th Anniversary 1945 2010 CQ

Timeline of Ham Radio History 1945–2010

To help celebrate CQ's 65th anniversary, we've put together a timeline of significant events in ham radio history from 1945 to the present. Each month this year, we'll present five or six years' worth, and then put the whole list on our website when we're done. (Since this is a timeline and not a textbook, we had to be selective. We apologize in advance if we leave out something of importance to you.)

This month, we'll cover the years 1945–1950:

1945–1950: Ham Radio's Rebirth, Dawn of the Transistor Age

1945: Ham radio begins to return to the air after WW II shutdown. First band authorized, 2½ meters on August 21, four days after VJ Day. *CQ* launched in January.

1946: Nearly all pre-war ham bands re-authorized, but with some changes, as 6 meters replaces 5 meters and 2 meters replaces 2½ meters. The 160-meter band remains off limits, used for LORAN navigation.

1947: International radio conference in Atlantic City, New Jersey, results in loss of parts of 80, 40, and 20 meters, balanced out by the addition of the 15-meter band. SWR meter and grid-dip oscillator (GDO) introduced. *CQ* reactivates *Radio* magazine's WAZ (Worked All Zones) Award program, which celebrated its 75th anniversary in November, 2009.

1948: Transistor invented, setting in motion the communications and electronics revolution that continues to this day; hams this year saw the introduction of single sideband (SSB) and the cubical quad antenna.

1949: *CQ* co-sponsors the Radio Amateur Scientific Observation (RASO) project in conjunction with the United States Air Force, a two-year project to study propagation, primarily sporadic-*E* on 6 meters; project supervised by *CQ* Managing Editor Oliver Perry Ferrell.

1950: As television grows in popularity, so does TVI, or television interference. Hams respond by going mobile and by designing circuits to help reduce interference. *CQ* carries six articles this year on fighting TVI.

Next month, we'll look at 1951 through 1956, the peak years of the Cold War.

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beginner's corner

BY WAYNE YOSHIDA,* KH6WZ

Post-Holiday Items for the Ham Shack

This month my mind wanders around a bit to consider post-holiday cheers and woes, prompted by this odd Christmas gift I received from one of my sisters (photo 1). No, this is not a camera trick; the cups are slanted to one side. These are just a little bit too quirky for me. I probably will save this item for "re-gifting" at the next office party.

Knowing that many people get similarly strange gifts, I decided it might be a good idea to take a look at some more interesting and useful gifts a ham can give as well as receive. Also, if you get either cash or gift certificates, I can suggest some ways to spend your money. At the very least, I hope to help reduce the activity at the returns desk at the local shopping emporium.

Non Radio-Specific Items Adapted for Radio Use

Among the easy, useful, and inexpensive gifts ham radio folks appreciate are wearable items. These items are not necessarily "ham radio dedicated" items, and they are not limited to T-shirts and baseball hats. Take a look at the day pack in photo 2, which is a common item in sporting-goods and department stores around the world. For active ham operators, a bag like this can be the basis of a portable ham radio station by adding a portable radio and a spare battery pack in addition to any outdoor gear and food or snack items. Notice the carabiner clipped to the top loop on the pack. The carabiner is a handy device that can be used to hang the bag or other item when you are out and about.

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e-mail: <kh6wz@cq-amateur-radio.com>

Photo 1– No, this is not a camera trick. These drinking glasses are slanted to one side. I am going to leave my ham radio catalogs at my sister's house so she can get some better gift ideas!

Photo 2– I use this small pack to hold various necessities while doing outdoor ham radio events. Add a handie-talkie radio, external antenna, extra battery pack ,and some snacks and I am ready to go.

Photo 3– This crank-to-charge flashlight is a very useful item. It includes a cable with a USB connector so it can also charge a cell phone.

Photo 4– A booster battery can be used to jump-start a vehicle. It is also a very handy source of 12-VDC power for ham radio sets.

While browsing at the sporting-goods store, take a look at the other useful items that can be adapted for ham radio use, such as fishing vests, day packs, fanny packs, and duffel bags. Other camping items such as portable stoves and canopies can be used for emergency preparedness or outdoor radio events. Especially useful are the new solar-charged or "free-play" flashlights and broadcast radios, since some of them have a power outlet that might be used to power a small HT. I found the crank-to-charge flashlight (photo 3) in the "as-is bin" at a hardware store. For $10 it was a pretty good deal. It came with a USB cord, so the flashlight can be used to charge a cell phone or other device.

Portable power supplies (batteries) are also available in alternative places. In this case, the emergency booster battery shown in photo 4 can be found in auto-parts, recreational-vehicle, and marine stores. These units are usually large gel-cell batteries in a handy carrying case and include a charger. These units are nice to have in case you need to jump-start your vehicle because you forgot to turn off your mobile rig.

I found some handy nylon pouches at the local hardware store (photo 5). They are great for organizing and protecting small items such as spare HT battery packs, small tools, and cable adapters.

Also, if you own an HT or two, one of the first accessory items to purchase is an extended antenna, since the rubber-

Photo 5– These inexpensive nylon pouches are great for organizing, storing, and protecting small accessory items such as battery packs and adapters.

Photo 6– A station clock is a great decorative yet functional accessory for any ham station. This analog clock was on sale at a local office -supply store. It has an "atomic time" function that automatically re-sets for Daylight Savings Time. A by-pass switch enables one to set the clock to a different time zone, such as Universal Time.

flex antenna that comes with the radio is usually not that great. Ask your favorite radio salesperson for advice on gain antennas and other accessories for your HT.

In and Around the Shack

In the garage, basement, or whatever room you use for your station, an excellent accessory item is a wall clock. Whether analog or digital, a 24-hour clock can be an interesting and useful room decoration, as shown in photo 6. You can have one clock for local time and one clock can be set to Greenwich Mean Time (GMT), or the newer term, Universal Time (UT). Be careful in selecting clocks for displaying time outside of your area, however. The new "atomic clocks" will automatically re-set your UT clock back to your own local time! The clock in photo 6 has a switch so you can by-pass the atomic time capability. By the way, digital clocks are easy to build, there are many digital clock kits available, and building one may be a great educational experience for any ham.

Speaking of clock kits, I ran across a fascinating and very different clock kit on the internet. It is called the "Transistor Clock" and uses discrete devices (individual transistors) rather than integrated circuits (ICs). Take a look at this very interesting and educational kit; the URL is mentioned in the "Sources" box. I ordered one, and expect it to be a fascinating wall decoration in my new house.

To help keep peace and quiet in a house full of non-hams, a good pair of headphones or a headset with a boom microphone is always a great accessory for any radio. I also find that using headphones increases my ability to understand weak signals, sometimes very important in contest or net operation. Many headsets or headphones are available for all ham radio equipment, from the smallest HT to the biggest HF home station. Take a look at the advertisements in this magazine to see what is available.

Photo 8– Saving coins is one way to come up with some "extra" spending money for ham radio goodies.

For the transmit side of your station, a wide variety of microphones and keys is available. When operating a mobile rig in the car, the hand-held microphone that probably came with your rig is usually just fine. However, for stationary or desktop operating, that "pickle" in your hand may become inconvenient during long radio sessions. Having a desk microphone can decrease fatigue and increase operating enjoyment. All the major radio manufacturers have a line of desk microphones, and there are very good after-market microphones available, too (photo 7).

Speaking of long operating sessions, a comfortable chair for your home station is a necessity. I must confess that I have used an old dining-room chair in my operating position, but a few years ago I bought a huge executive's chair from a used office-furniture store. It has a high back and is comfortable enough to sleep in. It is completely adjustable for seat height and back tilt angle.

Many useful and informative items are available from the CQ Bookstore and the American Radio Relay League book store. These on-line stores have much more than ham radio books. DVDs, CD-ROMs, clothing, and other items are available as well.

Found Money?

On a recent rainy weekend I decided to stay home and do some house cleaning. However, I got distracted after a few minutes and looked at a sack of coins I have been saving for the last several months (photo 8). As I counted and rolled the loose change, I was surprised to discover that the total came to almost $100—enough to put into the savings

Photo 7– While a mobile microphone is great when you are operating a rig in a car, long operating sessions inside the shack call for a nice desktop microphone such as this one.

account toward a new station accessory. You might want to search your usual hiding places for loose coins, too. Also, try to stay away from those change-counting machines that seem to be everywhere these days, as most all of them take a hefty service charge from your money. A better idea is to spend a few minutes—or hours, depending on your pile of coins—counting and rolling them yourself (but check with your bank to see if it will accept rolled coins from customers).

Now you have some ideas on how to spend some of the money from returning items and store credits or gift certificates. Also, loose change can quickly add up to a nice sum toward a new rig or station accessory!

73, Wayne, KH6WZ

Sources

Remember to browse your local department stores, auto-parts stores, and office-supply outlets for accessory ideas. Handy ham-radio accessories do not always have to come from a ham-radio-only store. Here are some of the online sources, too.

Non-Radio Accessory Items
Brookstone: <http://www.brookstone.com/>

Books, Videos, Calendars
CQ Bookstore: <http://store.cq-amateur-radio.com/StoreFront. bok>, plus see the ads elsewhere in this issue
American Radio Relay League (ARRL) Bookstore: <http://www. arrl.org/catalog/>

Solar-Powered Gadgets and Other Useful Items
C. Crane Company: <http://www.ccrane.com/>

Digital Clock Kits, Other Electronic Kits
Ramsey Electronics: <http://www.ramseyelectronics.com/>

The Transistor Clock
KABtronics: <http://www.transistorclock.com/>

Headphones, Headsets, Microphones
Heil Sound: <http://www.heilsound.com/amateur/>

how it works

BY DAVE INGRAM,* K4TWJ

Budget HF'n with Tube-Type Gear

As you may recall, our recent "How it Works" columns discussed an alternate and reduced-cost means of joining today's HF-band activities by seeking out and lightly refurbishing an older model tube-type transceiver. Those columns explained how to recognize the more popular rigs, check them out, replace a few tubes and filter capacitors, and use a beautiful "oldie" on the air today.

This time we take another, and quite possibly the most exciting, step of all toward "affordable HF'n"—finding, fixing up, and putting together a separate receiver and transmitter setup for real radio fun. This approach may seem unusual to newer amateurs—those of you who joined our ranks after transceivers became the rage—but rest assured, it is an exhilarating experience of the best kind. That's not hype friends; it's fact!

Many people restore cars from the "good old days" and drive them as a special treat two or three times a week, and you can recapture that same romantic fun in amateur radio, and at lower cost to boot, with an older "tube rig." As any misty-eyed old pro will surely agree, nothing compares to the sheer glitz and glamour of a transmitter-receiver station with its soft glowing tubes, large half-moon or slide-rule dials, and real analog meters.

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e-mail: <k4twj@cq-amateur-radio.com>

Photo A– As shown by this somewhat scarce (and reasonably priced) Lafayette KT-200, a variety of vintage receivers surface at hamfests both large and small. Previous research allowing you to recognize their name, model, and possibly "track record" of performance is most beneficial for making a quick buying decision before the little gem is sold. Look at those half-moon dials, that analog meter, all begging for a nice home!

Photo B– This well-kept Johnson Adventurer transmitter purchased at an unbelievably low price at a hamfest produces a beautiful vacuum-tube-quality 25-watt signal on the 80 through 10 meter bands. Plug in a crystal, add a VXO circuit in series with the crystal, and it can easily cover 10 to 20 kHz of a favored band segment.

There are some caveats or shortcomings I should mention upfront, however. Forty or fifty-year-old receivers typically drop off in sensitivity on bands above 20 meters, but work well on lower bands such as 160, 80, 40, and 30 meters. Also, transmitters that operate SSB or AM with big-time plate modulation are now prized (and expensive) collectibles. That narrows our discussion to simple, lightweight, and low-cost gear, and operating the highly effective mode of CW.

Don't cringe. CW continuously proves it reaches out farther and more effectively than SSB, more rare DX and budget-restricted stations operate CW, and combining CW with Q codes lets you communicate with amateurs of all lands even though you cannot speak a foreign language. Hampered by CC&Rs? Need to maintain a low profile? CW is the answer—plain and simple.

One other point warrants mention. Tube gear uses real high voltage that, if accidentally touched, can inflict dangerous, possibly fatal, shocks. Know your technical abilities and limitations. If you have not worked with tube gear, do not open a cabinet exposing tubes and high voltages without an experienced pro by your side to guide you. Just use the gear (with cabinet well sealed) *after* your guide has checked it out and given it a "clean bill of health" so-to-speak. Now let's focus on the hunt and fun!

The Hunt is On!

Searching for a tube-type transmitter and receiver from past times may prove slightly more challenging than seeking out an older model transceiver—and you may not find both units at the same time or place—but the search is worth the effort. A logical starting point for becoming familiar with older gear and its capabilities is looking

MFJ high-accuracy *Digital* SWR/Wattmeter

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MFJ's high-accuracy digital SWR/Wattmeter gives you three 10-bit frequency compensated power ranges!

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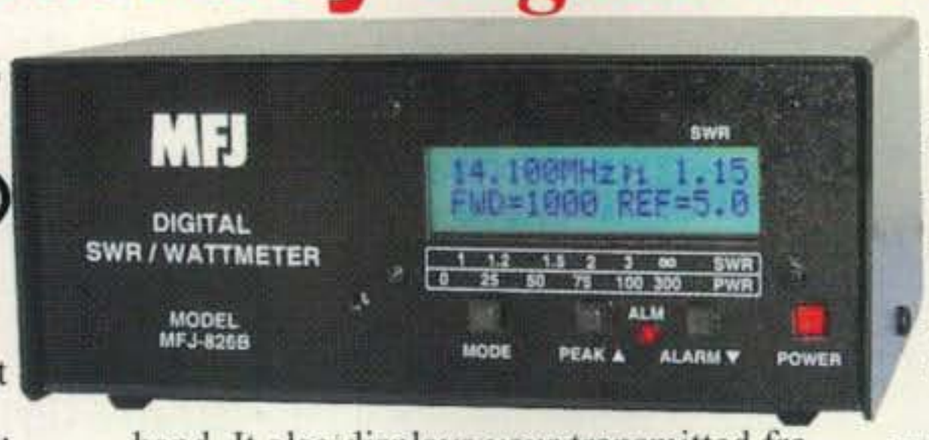

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This one you can SEE! Extra-long scales gives you highly accurate SWR and power measurements. Huge numbers makes reading easy across your shack.

Like your analog watch, one glance at the meter needle gives you fast and accurate readings without actually reading the scale.

MFJ's exclusive *TrueActive™* peak reading circuit captures *true* peak or average forward and reflected power readings.

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Exclusive MFJ Wattmeter *Power Saver™* circuit turns on meter only when RF power is being measured.

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Lighted 3" Cross-Needle Meter, SWR/Watts, 1.8-200 MHz, Fwd/Ref pwr, 30/300W. Compact.

MFJ-862
$59.95

Lighted Cross-Needle Meter, SWR/Watts, 144/220/440 MHz, 30/300 Watts Fwd, 60/6 W Ref.

MFJ-864
$99.95

Lighted Cross-Needle,SWR/Watts, 1.8-60/144/440 MHz, 30/300W Fwd, 6/60W Ref. Hook up HF&VHF/UHF rigs.

MFJ-815C
$109.95

Lighted 3" C/N Meter, SWR/Watts, 1.8-30 MHz, 300/3000W Fwd, 60/600W Ref. True Peak.

MFJ-812B
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Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, compensates for run down battery, wiring voltage drop, car off . . .

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Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, provides full performance/efficiency, prevents output signal distortion and transceiver shutdown. Compensates for run-down battery, wiring voltage drop or when car is off. Provides up to 25 Amps peak with 90% efficiency. Selectable 9/10/11 Volts minimum input voltage prevents battery damage from over-discharging. RF sense turns MFJ-4416B off during receive to save power and increase efficiency. Adjustable 12 to 13.8 VDC output pass-through voltage improves efficiency and lets transceiver run cooler. Has output over-voltage crowbar protection. *Anderson PowerPoles®* and high-current 5-way binding posts for DC input, regulated output. 7¾Wx4Hx2⅛D inches.

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Filters and reduces AC power line RFI, hash, noise, transients, surges generated by computers, motors, RF transmitters, static/lightning by 30 db and up to 60-80 dB with a good earth ground. Super fast, *nano-second* overvoltage protection. Four 3-wire 15A, 120VAC outlets.

Transceiver Surge Protector

MFJ-1163, $69.95. Protects your expensive transceiver from damaging power surges. Capacitive decoupling and *ultra-fast* MOVs protection. 4 AC outlets.

MFJ all-in-one *Transmit Audio Console*

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MFJ all-in-one *Transmit Audio Console* gives you an *8-Band Equalizer* for full quality ragchewing audio *or* powerful, pileup penetrating speech . . . Adjustable *Noise Gate* gives you transparent, back-ground noise reduction . . . Clean low-distortion *Compressor* gives you more powerful, richer, fuller sounding speech and higher average power SSB . . . Smooth *Limiter* keeps audio peaks from over-driving your transmitter, prevents SSB distortion and splatter. *Universal Mic-Interface* lets you use any microphone with any transceiver. Has low-noise preamp, mic voltages, PTT jack, impedance matching, level controls, RF/audio isolation, VU meter, headphone monitor, auxiliary input.

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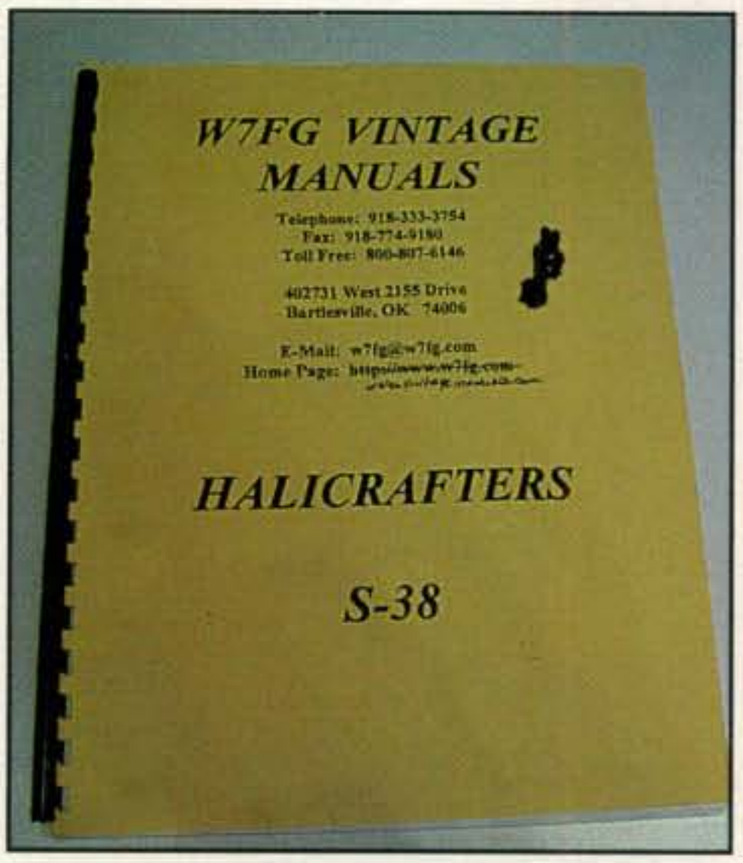

Photo C– Can't find the accompanying manual for a hamfest-purchased vintage receiver or transmitter? Check out <www.vintagemanuals.com>. It has thousands of well-reproduced manuals for transmitters and receivers, etc., at fair-and-square prices.

through ads in back issues of *CQ, QST,* and *73* magazines, and the ideal timeframe is the 1950s and 1960s. Many larger libraries and ham clubs have a nice collection of magazines from those eras[1], and close browsing may even turn up some good reviews of gear from famous manufacturers such as Hallicrafters, National, Hammarlund, Johnson, Heathkit, Knight, and more. Other popular names are Collins, Drake, Squire Sanders, and Central Electronics, but they have become pricey collectables and we are taking the "basic and low-cost" road to fun.

Your best hunting grounds probably will narrow down to hamfest flea markets and attics or basements of older amateurs. I have heard of several occasions when budding newcomers acquired small and basic receivers and transmitters in remarkably good condition, and the only cost involved was fully cleaning out said attic or basement rather than simply taking a couple of desired items. In the process, however, one new amateur found an antenna tuner, SWR bridge, antenna switch. and a like-new hand key. Nice!

When shopping at hamfests, remember the early bird gets the worm. Try to arrive before the doors open and notice the gear folks move in prior to setup. An on-the-spot purchase often proves quite fruitful. Several years ago, for example, a friend found (and immediately purchased) a Johnson Adventurer transmitter in superb condition for $5 and a National receiver for only $50. He also found and purchased at the same fest a couple of new tubes for the receiver and two tubes for the transmitter, all for $20 dollars, bringing the total cost of the full station to $75. Installing those "most important tubes" is an always worthwhile move, as it ensures gear will deliver its best possible performance. "Most important tubes" include the receiver's RF amplifier and one or two IF amplifier tubes (often the same type/number) plus maybe a BFO tube. Transmitter tubes usually narrow down to the oscillator or driver, a power amplifier, and a rectifier tube.

Check Out and Clean Up

After returning home, your first steps of action will probably involve closer study and checkout plus a simple cleaning and "fix-up" of an acquired receiver and transmitter. A soft-bristle brush and a can of compressed air work well for chassis cleaning. Follow that with a few Q-tips® for carefully cleaning tight spots, and contact cleaner for intermittent switches and controls as discussed in our November 2009 "How it Works" column. Exercise care and avoid moving internal wires or bending plates on tuning capacitors. Also, do not adjust any screws on IF "cans." The only time to consider IF adjustment is when a full analysis with test gear such as a signal generator and spectrum analyzer or wideband oscilloscope indicate it is necessary. That warning may sound trivial to old pros, but remember folks of all levels of expertise and background read *CQ* magazine.

Receiver checkout typically involves connecting a dipole or random-length wire (20 feet or longer), hunting for ham band activity with the main tuning dial, and then tuning in separate signals with the band-spread dial. Problems? Dial calibration has probably changed with age. Hunt for WWV near 5.0, 10.0, and/or 15.0 MHz, and then mentally add the noted "correction factor" to the main dial for close-to-accurate tuning of a ham band.

Judging whether a receiver is normal or low in sensitivity without a separate rig for comparison is almost impossible, so installing a new RF amplifier tube (that's the one closest to the antenna input connection on a circuit diagram) is suggested. I recall several occasions when this simple tube swap gave an old receiver a totally new lease on life, so it is well worth the effort.

Did you note any hum in the receiver or a raspy sound on tuned-in signals? The power supply's (multi-section) filter capacitor has probably deteriorated with age. Be sure the receiver has been unplugged from an AC outlet for 10 or 20 minutes, and then (and hopefully under an old pro amateur's guidance) remove its cabinet or bottom plate and turn the receiver upside down. Look for a large (2- or 3-inch long) capacitor, probably with two or three wires extending from it, near the power transformer and rectifier tube area. The capacitor will typically be

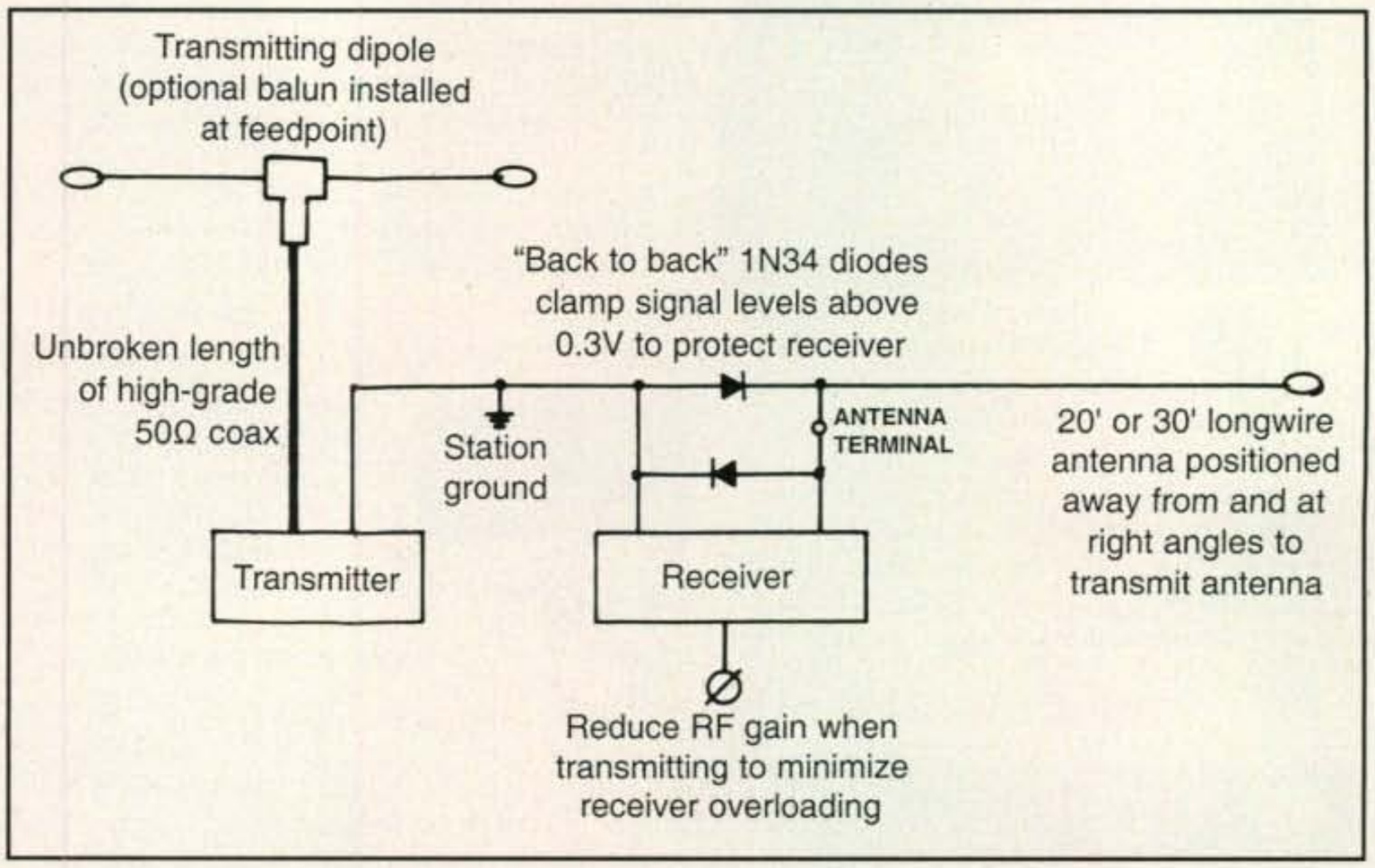

Fig. 1– Outline for simple, "quick and easy" antenna system to use with a separate transmitter/receiver setup as discussed in the text. "Back-to-back" diodes prevent your strong transmitted signal from degrading a receiver's front-end stage(s). A receiver's RF gain or receive/standby switch can also be activated to avoid loud bleeps and squeals when transmitting.

Photo D– A couple of hamfest flea-market acquired RF and IF amplifier tubes can breathe new life into a vintage receiver and they are usually available at reasonable cost. Check your receiver's or transmitter's manual or look at its existing tubes for proper numbers before asking for help locating the tubes.

marked "20 mFd red, 20 mFd blue, 10 mFd brown, 250 volts," indicating three capacitors in one, uh, paper-tube "thingy," all sharing a common ground (black). Those values and colors are only generic examples, incidentally, and vary somewhat among receivers and transmitters or different models.

I also encourage replacing filter capacitors in older transmitters, as it ensures a strong and clean-sounding signal. Replace filter wires one at a time to avoid confusion or cross-wiring. Chances are high you will not find exact value replacement filters for a receiver or transmitter, but you can "make them" by connecting the minus (–) wire from each ground and adding insulation called "spaghetti" over the plus (+) wires. As mentioned in our November column, replacing filters with higher (but not lower!) capacitance and voltage rating (such as 40 or 80 mFd at 380 volts, for example) is quite acceptable. Re-

placing filters requires accuracy (watch those wires, avoid shorts, and get it right the first time!). Check out afterwards—with live wires and high voltage—is dangerous, so ask an old pro for guidance or keep your hands clear of under-chassis wires. Turn the rig on its side, switch it on, and then plug it in and look for arcs.

Photo E– Many times conventional tubes can be replaced with four-digit industrial equivalents and the resulting performance plus extended tube life make them "good buys." Tube dealers usually have a cross-reference or replacement guide on tube types.

When satisfied, unplug it, wait a few minutes, and then re-install the cabinet.

Transmitter checkout goes a couple of steps further, typically involving connecting its output to a dummy load and wattmeter to measure power. Again I must emphasize following directions in your rig's instruction manual. Generally, the procedure involves peaking the grid drive control, then quickly tuning the PA plate for minimum (a dip in current), and carefully increasing loading while "re-dipping" the plate. If output power is low, installing new driver and power-amplifier tube(s) is good practice. Before you do, however, take a few minutes to "get the feel of the tuning process" and to log control settings. Then with that knowledge and experience to your credit, the new tubes need never be taxed or abused.

You don't have a wattmeter? Many of us were in that same situation when starting out, so we used a 40- or 60-watt incandescent light as a power-estimating dummy load. Just connect and load the bulb like it is an antenna. The rig-sensed SWR from the light bulb will be rather high, so keep test time short—and do not try this trick with a solid-state transceiver, as it can damage output transistors in a short period of time.

Conclusion

We now approach the most important and exciting topic of all—interconnecting and operating your separate receiver and transmitter station. Unfortunately, we have also begun to overflow allocated column space and must shift that discussion into our next "How it Works" column (March 2010). Meanwhile, you can have more fun than ever by using your recently acquired receiver to check out favorite band activities. You might also connect a homebrewed dipole to your transmitter, a random wire positioned away from (and at right angles to) that dipole to the receiver, and try calling or answering some CQs. Be forewarned and do not fret over missed contacts. Many times operators use narrow CW filters and only hear other stations exactly on their transmit/transceiver frequency. I will describe a simple VXO circuit to sidestep that dilemma next time.

73, Dave, K4TWJ

Note

1. All back issues of *CQ*, going back to 1945, are online at <hamcall.net/cq> and may be accessed at a very reasonable cost.

what's new

BY JOHN WOOD,* WV5J

A New Year of "What's New"

It's a brand new year and a brand new month and we've got a lot of brand new items to look at in *CQ*'s January "What's New" column. We'll start with a look at three of the new products for the new year from MFJ Enterprises, take a tour of a SolderBuddy, mount a foray into ultrasonic communications, and examine an automated approach to consumer electronic recycling.

MFJ Ultra-Compact 0–24 VDC Switching Power Supply

Many hams have a recurring need for power supplies to provide the DC their radios require, so it's a given that lots of hams will be interested in the MFJ-4218MV (photo 1), a compact switching power supply that features adjustable output from 0 to 24 VDC and empowers you to power more than your HF or VHF radio.

With adjustable output voltage, this power supply allows you to run low-voltage accessories1.5V, 3V, 5V, 9V—or any voltage from 0–24 VDC. That should also appeal to plane and boat pilots who use 24-volt equipment in their respective cockpits. Also, MFJ makes it easy for hams to find their typically preferred voltage by installing a detent setting on the voltage control at 13.8 VDC.

The MFJ-4218MV includes a pair of five-way binding posts for output connection, large backlighted dual meters for output voltage and current, a HashSQUASH™ Filtering System to address a potential noise problem inherent in switching power supplies, plus output protection for the inevitable shorts, overloads, and over-temperature events. It also has a load fault indicator with auto reset after each fault is detected.

Rated output current is 18 amps at 13.8 VDC or 9 amps at 24 VDC, and the input voltage can be selected at 110 or 220 VAC. It weighs 2.2 pounds; measures just 6 inches wide, $2^1/4$ inches high, $6^3/4$ inches deep; and is priced at $129.95.

MFJ All-Band Ground Radial System

MFJ is adding to its 2010 catalog an all-band ground radial system designed for the MFJ-2990 and other vertical antennas when a radial system is required. Priced at $34.95, it's being touted as an easy way to add a radial system to provide the necessary return path for ground currents to reduce ground losses.

The MFJ-1932 (photo 2) consists of two sets of four radial wire assemblies that provide a total of

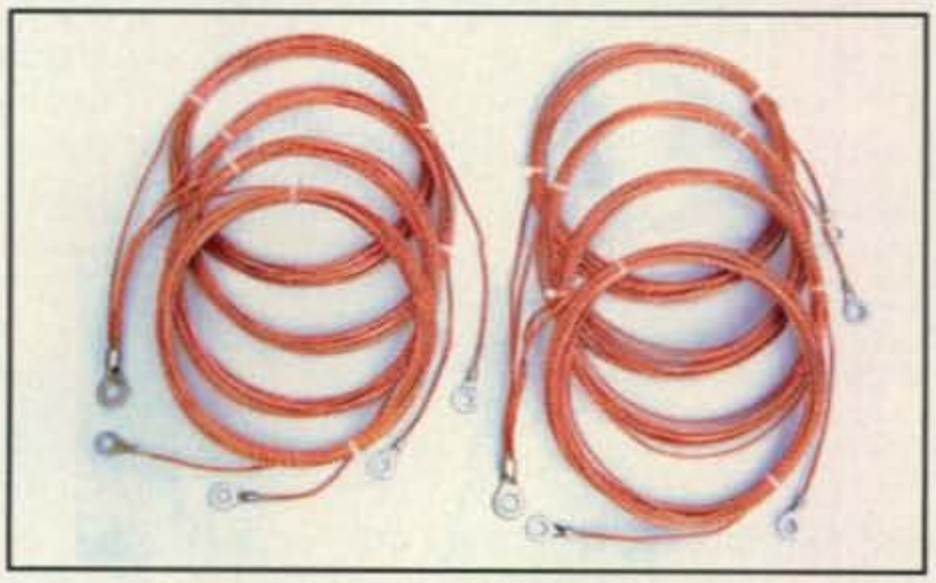

Photo 2– MFJ makes grounding vertical antennas a snap with its MFJ-1932 All-Band Ground Radial System, a package that includes two sets of four radial wire assemblies to make eight 14-foot radial wires. It's designed to work with the MFJ-2990 and other vertical antennas that require a radial system. (Photo courtesy of MFJ)

Photo 1– Versatility and flexibility are built into the MFJ-4218MV Ultra-Compact 0–24 VDC Switching Power Supply that is rated at 18 amps at 13.8 VDC and can vary output voltage from 0 to 24 volts DC. Weighing only 2.2 pounds, it comes with backlighted voltage and current meters, five-way binding posts, and MFJ's HashSQUASH filtering system. (Photo courtesy of MFJ Enterprises)

Photo 3– Working on QRP radios, running on-the-air QRP signal trials, or setting up antennas can all be made a little easier through the use of the compact MFJ-813 QRP Wattmeter and SWR Bridge which reads forwarded and reflected power from zero to 5 watts and covers 1.8 to 50 MHz. (Photo courtesy of MFJ)

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eight 14-foot radial wires. Each wire has a 1/4-inch ring lug on one end for attaching to the antenna ground point and a solder lug on the other end for securing the wire run.

MFJ QRP Wattmeter, SWR Bridge

One more new product from our friends at MFJ Enterprises of Starkville, Mississippi is its new QRP wattmeter and SWR bridge for use on the amateur HF bands.

Priced at $39.95, the MFJ-813 (photo 3) reads forward and reflected power from 0 to 5 watts on a calibrated meter scale, while also reading SWR and relative power at any power level from 100 milliwatts to 50 watts. MFJ includes a Bruene-style bridge circuit in this meter to detect both RF current and RF voltage, which it says works across a wide range of load impedances, operating frequencies, and power levels.

MFJ adds that this compact meter covers 1.8 to 50 MHz and is useful for working on QRP radios, running on-the-air QRP signal trials, or setting up antennas in the field. It's built inside a black aluminum cabinet that measures 4.5 inches wide, 2 1/4 inches high, and 3 inches deep and interfaces with the world through two SO-239 UHF connectors.

Like all of its products, the all-band ground radial system, QRP Wattmeter and SWR Bridge, and the MFJ-4218MV switching power supply are protected by the company's No Matter What™ one year limited warranty. For a free catalog, contact MFJ at toll-free 800-647-1800, or go to <http://www.mfjenterprises.com>

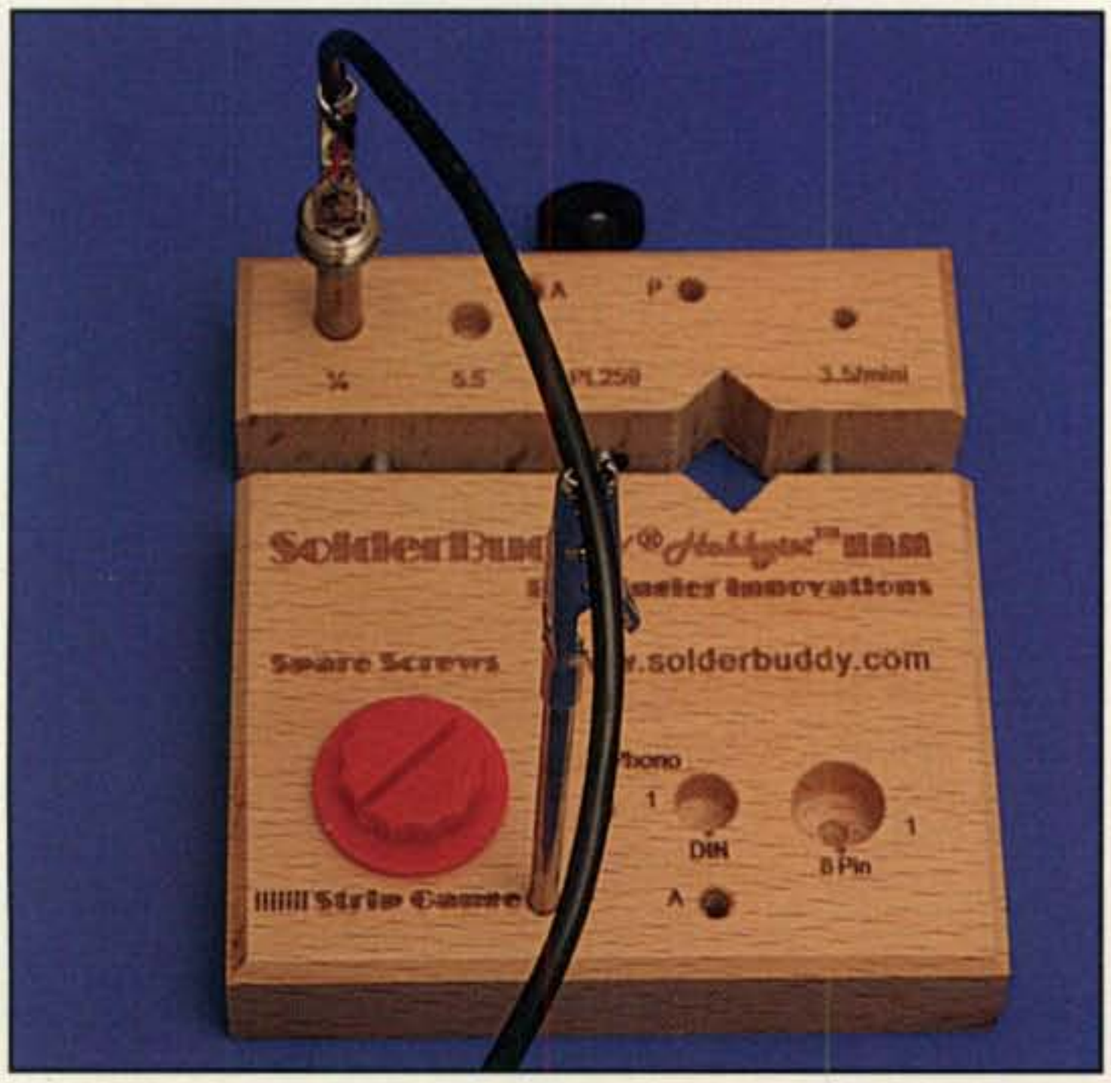


Photo 4– Help for hams who need to repair cables or solder connectors is now available thanks to the SolderBuddy Hobbyist Ham, a different approach to keeping connectors in one place when you work on them. The wooden SolderBuddy also incorporates a small vise and a screw holder and is priced at $37.50. (Photo courtesy of SolderBuddy)

SolderBuddy Hobbyist Ham Model

The new SolderBuddy Hobbyist Ham Model (photo 4) is designed to help the ham when repairing cables or installing connectors. Made of wood, it has provisions for all standard connectors from quarter-inch, 5.5-mm, 3.5-mm, mini plugs to PL-259 coax connectors, phono, DIN or 8-pin, RJ-45 connectors.

The new Ham Model has an integrated vise to keep securely in place a variety of connectors or odd-shaped items needing solder repair. The SolderBuddy even includes a screw storage bin for keeping errant screws in a known location.

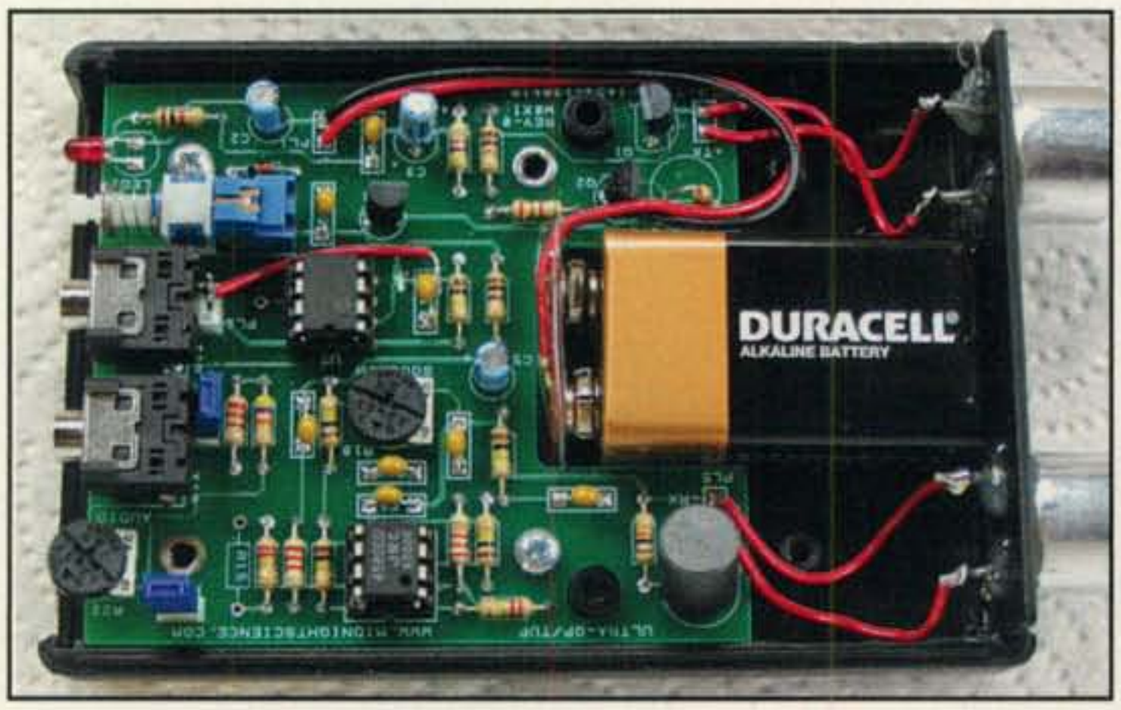


Photo 5– The Xtal Set Society has introduced a new way to learn and practice CW with its Ultra-QP, a 40-kHz Ultrasonic Kit with Frequency-Division Receiver & Transmitter that makes code communication a seemingly quiet experience. The kit, priced at $49.95, uses piezo transducers to make one-on-one or group CW communications possible without the need for RF equipment. (Photo courtesy of the Xtal Set Society)

Photo 6– ecoATM has installed its first automated eCycling Station for eWaste recycling take-back programs and trade-in promotions in Omaha, Nebraska. The units provide an in-store trade-in solution that benefits consumers, electronics retailers, and consumer electronics manufacturers. (Photo courtesy of ecoATM)

It also has a stainless steel Post 'N Clip system to hold wires or cables in proper alignment while soldering, and an accessory port for the MAG-3 3X magnifier or other SolderBuddy accessories that will be offered at a later time. The SolderBuddy weighs in at just over six ounces.

To purchase a SolderBuddy Hobbyist Ham, priced at $37.50 each, visit <solderbuddy.com> or call SolderBuddy at 770-476-5337.

The Ultra-QP™ Ultrasonic Receiver/Transmitter Kit

Imagine participating in a local CW QSO party held not on the air, but in a room where each participant receives and in turn sends to the group as a way of learning and practicing CW communications—all in total silence. Yes, now it's possible with the Ultra-QP™ (photo 5), a new kit with a frequency-division receiver and transmitter from the Xtal Set Society that uses ultrasonic sound to help people learn the art of CW communications.

Let's take a minute here, courtesy of the society, to do a little exploring and learning about the technical architecture and operation of this unique ultrasound frequency-division receiver and transmitter.

According to the kit's creator, The Xtal Set Society, the receiver amplifies the output of a pressure-to-voltage 40-kHz piezo transducer by over 20,000 and then a PIC micro-controller converts the analog signal to digital and divides it down to human-listening range at 700 Hz. The PIC then supplies a constant level of audio via an RC and volume control network.

During transmit, the PIC develops a 40-kHz square wave which is used to drive a TX transducer via a PNP-NPN transistor pair. Near full break-in QSK and a side tone are also supported by the PIC.

No RF equipment or license is required. The completed PCB, 9V battery and other parts fit inside a plastic clamshell case that measures 4.38 inches by 2.95 inches by 1 inch. Transmit and receive piezo transducers mount on the front panel, while the back panel features a power switch with LED, key jack, audio stereo jack, and volume control. The audio jack accepts a crystal earphone (included), hi-z phones ,or 8-ohm stereo headphones (user supplied).

The Xtal Society suggests kit buyers "build a little, test a little" and follow this philosophy in each assembly section by writing step-by-step instructions that are followed by test instructions. A 9V battery and a VOM are supposedly all that are needed to take the measurements required for success in building this kit. Assembly time for the average kit builder is about one hour.

For further information on the Ultra-QP, go to <www.midnightscience.com/article-u3.html>. Orders may be placed by phone by calling 405-517-7347 or via <www.midnightscience.com>. Price of the Ultra-QP, 40-kHz Ultrasound CW Transceiver Kit is $49.95.

ecoATM Installs Automated eCycling Station

Recycling used electronic components may be a little easier now that ecoATM of San Diego, California has installed its first automated eCycling Station for eWaste recycling take-back programs and trade-in promotions (photo 6).

The installation was made at the Nebraska Furniture Mart in Omaha, Nebraska on September 21, 2009 and has proven to be an immediate success, both in the number of recycled devices and the resulting trade-up purchases. By automating the buy-back and payment process, the system offers financial incentives to consumers for all used mobile-phone models and will soon support other consumer electronics, regardless of their condition.

ecoATM units provide an in-store trade-in solution that benefits consumers, electronics retailers, and consumer electronics manufacturers. ecoATM claims it is the only company to develop patent-pending, automated eCycling stations that electronically and/or visually inspect virtually any consumer electronic device, connect them with secondary market buyers and recyclers through pre-auction/auction systems, and administer trade-in promotions for retailers and manufacturers.

ecoATM states its automated approach to recycling makes it easy for consumers to give their used phones a second life or to recycle them.

ecoATM plans to launch additional eCycling Stations with several more national retailers over the next quarter in San Diego, Boston, Dallas, and Seattle. For more information about ecoATM, visit <www.ecoATM.com>.

Wrap Up

That's all for this month, but look for more new and exciting products in the February "What's New" columnn.

73, John, WV5J

Note: *Listings in "What's New" are not product reviews and do not constitute a product endorsement by CQ or the column editor. Information in this column is primarily provided by manufacturers/vendors and has not necessarily been independently verified. The purpose of this column is to inform readers about new products in the marketplace. We encourage you to do additional research on products of interest to you.*

BY JOE LYNCH,* N6CL

Echoes of Apollo Winning Strategies

Dr. David Leeson, W6NL, is Founding Chairman and past CEO of California Microwave, Inc.; Consulting Professor of Electrical Engineering at Stanford University; IEEE Life Fellow; and author of *Physical Design of Yagi Antennas,* published by the ARRL. The following, written by Dr. Leeson, outlines the mentoring strategies that he used for the successful Echoes of Apollo EME (Earth-Moon-Earth) operation last year. These are winning strategies that can be used in any major project:

As the big day for the Echoes of Apollo project drew near I wanted to share some project management concepts that I have learned from years of business, auto racing, and radio contesting. These concepts particularly relate to the end game leading to a fixed date when performance is absolutely required (such as the "Echoes" deadline).

The big deal is control of lead time and the related issue of having time to recover from expected last-minute glitches. I have a few rules I've put together for my own students' projects:

1. "Don't change the plugs between the practice and the race." Any last-minute change, no matter how innocent-seeming, has the potential to cause a glitch from which you can't recover in time. If you follow racing, you will have noticed the surprising number of cars that either can't start or will fail in the first laps of a big race, like the Indy 500. These are examples of disasters caused by last-minute "improvements" that cause unrecoverable side effects.

A close-to-home issue would be the LNA over-voltage problem, which can be avoided by a check list that includes measuring all new interface voltages before connecting up the actual equipment. It also points out the requirement for standby spares, about which I will talk more later. This doesn't mean you shouldn't try to fix something that goes wrong, but if you must, there are two other rules:

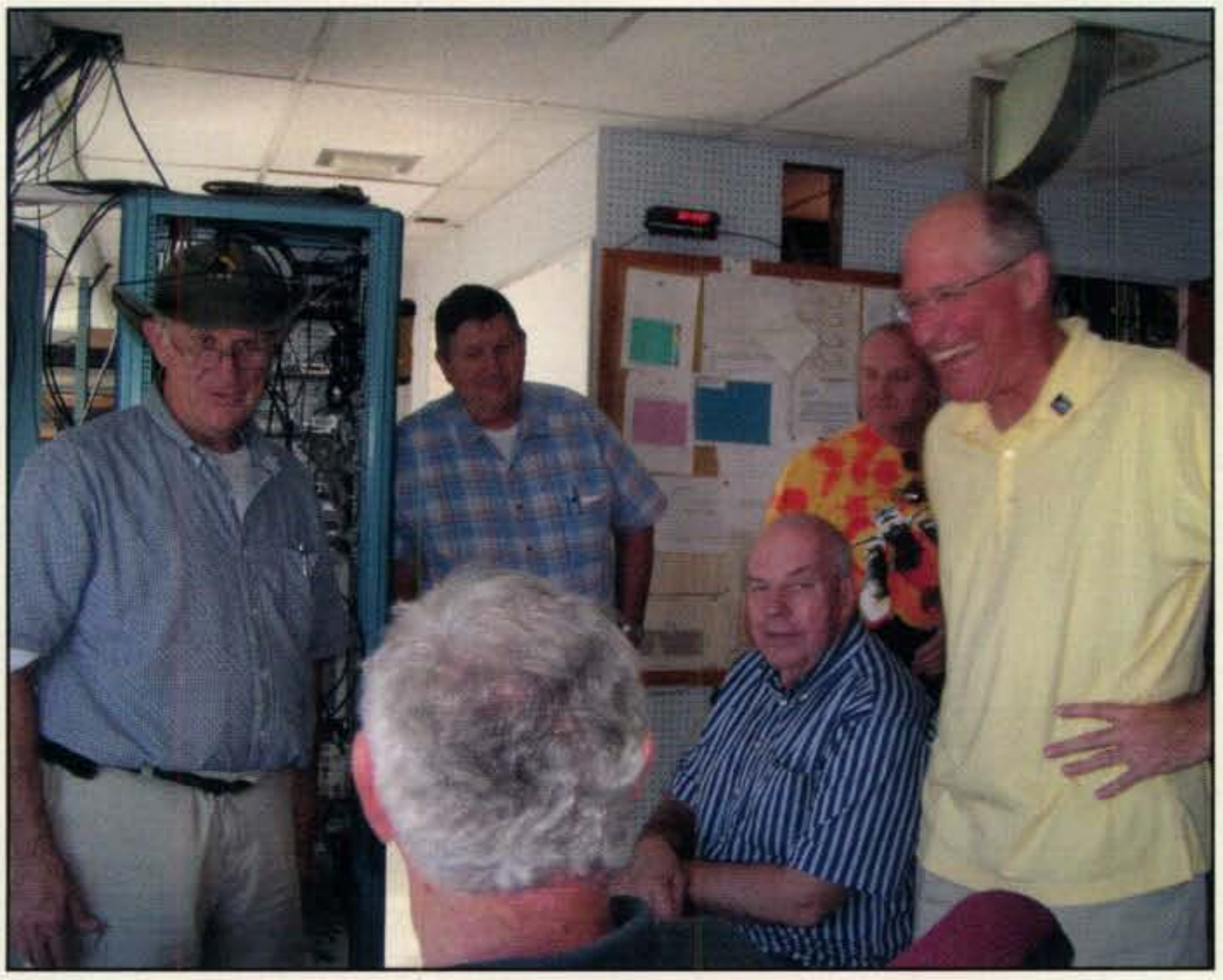
2. "Every 5-minute job takes 24 hours." I'm sure you've experienced this in preparation for contests, presentations, etc. This is especially true when one is under time pressure, which is a great distraction in itself. It helps to

e-mail: <n6cl@sbcglobal.net>

VHF Plus Calendar

Jan. 1	Moon perigee
Jan. 3	Excellent EME conditions
Jan. 3–4	*Quadrantids* meteor shower predicted peak
Jan. 7	Moon last quarter
Jan. 10	EME conditions
Jan. 15	New Moon
Jan. 15	Solar eclipse
Jan. 16–18	ARRL VHF Sweepstake (See text for details)
Jan. 17	Moon apogee; Poor EME conditions
Jan. 23	Moon first quarter
Jan. 24	Moderate EME conditions
Jan. 30	Moon perigee
Jan. 30	Full Moon
Jan. 31	Excellent EME conditions

—EME conditions courtesy W5LUU



Stanford Research Institute Control Room photo taken during last year's Echoes of Apollo EME event. Left to right as follows. Standing: Mike Staal, K6MYC; Dr. Michael Cousins, SRI Dish Director; Stephen Muther, WF6R, SRI; Jim Klassen, N6JMK. Seated: Dave Smith, W6TE; and Wayne Overbeck, N6NB. (Photo courtesy of SRI)

label everything, especially cables and connectors. A sub-category of this is "integration takes more than half of project time," even if you have been careful to specify and test each module beforehand so you don't invest valuable time in unproven assets.

3. "Somebody has to watch for potential disasters." At the end when you must make a change it is imperative that someone else watch carefully to identify any risks. At the very end, no one is qualified (because they can't possibly fix anything that gets broken) to make any changes that aren't required to repair an outright failure. I still have vivid memories of having a partner point out from a viewpoint behind a tambour cabinet that if I drilled a hole for wires inside the back with the doors open, I'd be drilling a hole in the door, too.

I always prefer to run a complete acceptance test well beforehand (you have to define it adequately to simulate the actual application), and then keep my hands in my pockets. This philosophy resulted in two SCCA national racing championships, and 40+ World First results in radio contests in the last decade from our station in the Galapagos (talk about a lack of local resources!). Therefore, my rules to keep from running out of lead time are:

4. "Test everything well ahead of the actual event, then leave it alone." I'm sure others can give you examples from satellite experience, in which *that one* must be completely reliable, rather than being treated as part of some statistical problem. I had the same experience with unmanned airplanes, where we ran a complete test of all systems that had to be successful before anyone got to sleep, then checked it again in the morning before we launched.

Be aware that the act of testing itself has some risk of screw-ups, so you must be conservative. This is perhaps a restatement of the "don't change plugs" rule: There is power in knowing when to keep your hands in your pockets! You must also be quite firm about who can touch anything during the end game, as well-meaning volunteer helpers can wreak havoc.

5. "Try to have a hot-standby, or at least its equivalent in spares." At the last minute, there's no time to be fiddling trying to fix something when you can just replace it. Even so, the spare has to be either already on-line or quickly available, along with an installation check list.

6. "If the spare isn't considered as good as the original, or at least adequate, it won't get used at all; *instead* the precious time and effort will be wasted trying to fix the 'better' unit that has failed." The issue of acceptance testing applies to backup systems or spares as well as the primary system.

7. "Since Murphy's Law always applies, you had better be good at diagnostics." If something fails, my two rules of diagnostics are (a) "measure everything before you change anything" and (b) "if something isn't working and you don't change something, it will go right on not working." So "think, then act."

The standard diagnostic technique is to play "20 Questions" by asking yes-no questions that have equal-probable answers. This converges the most rapidly. However, it's observed that if something fails, it's often from the last thing you touched. So try to think it through before acting. Then make a change big enough to notice.

A couple of examples: In my HF station at home, everything is automated, so when I change bands on the rig, the antennas, filters, and computers follow. At one point, I changed bands and nothing followed. I was tempted to leap into action, tearing out cables and all. But a moment's reflection revealed that I had been on 40 meters SSB, where you operate split for working DX. The antennas follow the transmit antenna only, so nothing would change when I changed bands on the receiver. Going out of split, then changing, restored everything without any risky changes.

Now I know to avoid this, and caution guest ops against it. In our less-automated Galapagos station, I use a check list for band changing, even though I've done it thousands of times.

Another example, from racing: My car didn't have any provision for battery charging, so I would put in a newly charged motorcycle battery for each session. Once I was

out on the track for a critical qualifying session, and the engine cut out in all left turns, a losing situation. In my mind I saw a table; across one axis were the things that could cause this and on the other were the steps I'd taken since things last ran right. At the cross between "battery connector" and "battery change," a light went on! I pulled into the pit, leaped out, threw open the back of the car, and tightened the loose connection that I had visualized at the battery. In seconds I was back on track, qualified on the pole, won the race, and was very pleased about what I'd learned as a kid in a radio/TV repair shop.

8. An example of a change that carries some lead-time risk is the switch to circular polarization. How will you determine that it's got the right handedness? How will you tell if it works to get the same S/N you have previously tested with all the other stations in the network? What will you do if it doesn't work? When will you make that determination? Suppose the reflector is damaged in the process; then what's the backup? This is a time when one person has to do the work and another qualified person must observe and watch for potential problems (the feed-arm cable breaks or is let out too far, the reflector or the feed arms are bent, etc., etc.).

9. At this point you have to assume that every step has a substantial risk, even if there is some benefit to be gained. Another typical problem that could come up is some form of mistake in aiming of the dish. How will you check the aiming and tracking? You can see that it's now time to be a real worrywart, asking at each step, "What can go wrong, how will I know, and what will it take to avoid the agony of trying to fix something without adequate lead time?"

Dave's strategies came in handy throughout the run up and actual operations during the Echoes of Apollo event. More worldwide coverage of the event will be found in the Winter 2010 issue of *CQ VHF* magazine.

Current Contest

The ARRL VHF Sweepstakes is scheduled for the weekend of January 16–18. For ARRL contest rules, see the issue of *QST* prior to the month of the contest or the URL: <http://www.arrl.org>.

Current Meteor Shower

The *Quandrantids,* or *Quads,* is a brief but very active meteor shower. The expected peak is on 3–4 January with up to 40 meteors per hour. The actual peak can occur three hours before or after the predicted peak. The best paths are north-south. Long-duration meteors can be expected about one hour after the predicted peak.

For more information on the above meteor shower prediction see Tomas Hood, NW7US's "Propagation" column elsewhere in this issue. Also visit the International Meteor Organization's website: <http://www.imo.net>.

Calls for Papers

Calls for papers are issued in advance of forthcoming conferences either for presenters to be speakers, or for papers to be published in the conferences' *Proceedings,* or both. For more information, questions about format, media, hardcopy, e-mail, etc., please contact the person listed with the announcement. The following conference organizers have announced calls for papers for their forthcoming conferences:

Southeastern VHF Society Conference: Technical papers are solicited for the 14th annual Southeastern VHF Society Conference to be held in Morehead, Kentucky on April 23–24, 2010. Papers and presentations are solicited on both the technical and operational aspects of VHF, UHF, and microwave weak-signal amateur radio. In general papers and presentations on non-weak-signal related topics will not be accepted but exceptions may be made.

The deadline for the submission of papers and presentations is February 5, 2010. All submissions should be in Microsoft Word (.doc) or alternatively Adobe Acrobat (.pdf) files. All text, drawings, photos, etc. should be black and white only (no color). Submissions for presentation at the conference should be in PowerPoint (.ppt) format, and delivered on either a USB memory stick or CDROM or posted for download on a website of your choice.

Send all questions, comments, and submissions to the program chair, Robin Midgett, K4IDC, via e-mail at <K4IDC@comcast.net>. For further information about the conference see the website: <http://www.svhfs.org>.

Central States VHF Society Conference: Technical papers are solicited for the 44th annual Central States VHF Society Conference to be held in St. Louis, Missouri on July 22–24, 2010. Papers, presentations, and posters on all aspects of weak-signal VHF and above amateur radio are requested. You do not need to attend the conference, nor present your paper, to have it published in the *Proceedings.* Non-weak signal topics generally are not considered acceptable. However, there are exceptions. Please contact the folks below if you have any questions about the suitability of a topic. Strong editorial preference will be given to those papers that are written and formatted specifically for publication, rather than as visual presentation aids. Submissions may be made via the following electronic formats (preferred): via e-mail; uploaded to a website for subsequent downloading; on media (3.5-inch floppy, CD, USB stick/thumb drive). Deadline for submissions: May 1, 2010. For more details, contact CSVHFS President Ron Ocho, KOØZ, at <ko0z@arrl.net>.

And Finally . . .

As I pull together this column in mid-November, I am beside my wife Carol, W6CL, in a local hospital in Tulsa, Oklahoma. In the hospital, awakening at 3 AM to Carol's request for a glass of water was a very happy interruption, considering that she is recovering well and therefore is still by my side. To many of you, thank you very much for your thoughts and prayers for Carol.

As we start a new year, let us all be mindful of loved ones, family, and friends and all that they mean to us. For we in the ham radio community, many of us are fortunate to have made friends all over the world through the hobby. That is just one of the many things that ham radio contributes to each of our lives, no matter what facets of the hobby interest us.

New year blessings to all, and until next month… 73 de Joe, N6CL

2010's First Short-Term Award

BY TED MELINOSKY,* K1BV

Australia's national society, the Wireless Institute of Australia, is commemorating the 100th anniversary of its founding with a short-term award for contacts made during 2010. This is the first short-term award for 2010 as far as I know.

Australia's WIA Centenary Award

The Wireless Institute of Australia (WIA) celebrates the 100th anniversary of its founding in 2010. A special award has been established to commemorate this notable event. Look for and make contact with special event station VK100WIA during the period March 1 to August 31, 2010. From May 1 to May 31 the special callsign VK100WIA will be activated by the WIA, and from June 1 to October 31 the callsign will be activated by affiliated clubs throughout Australia.

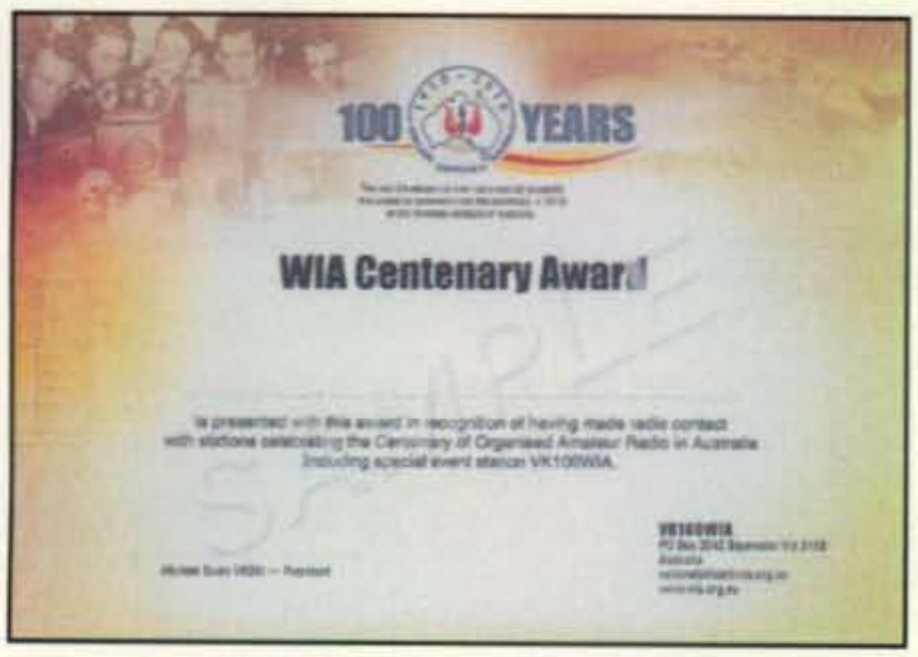
The award will be issued to radio amateurs in Australia who accumulate 100 points, and amateurs outside Australia who accumulate 50 points. A contact with VK100WIA operated by the WIA or operated by a club is worth 10 points (only one contact with VK100WIA operated by the WIA and only one contact with each club count for the award) and there must be a minimum of two contacts with VK100WIA. Contacting any WIA member between May 1 and October 31 is worth 5 points. (Example: Working VK100WIA at 10 different clubs would make you eligible for the award. Working 16 WIA members gives 80 points, but then two contacts must be made with VK100WIA.)

Any mode may be used; cross-mode and cross-band contacts are permitted. Satellite mode may be used, but contacts via terrestrial repeaters are not eligible for the award. Send $5 Australian dollars or 3 IRCs and a list of contacts (QSLs not required) to the award manager at the address listed below. The award manager reserves the right to verify claims by reference to operating logs or any other resource. The WIA website will list activation locations and times for VK100WIA and a commemorative QSL will be available.

Listen around the bands or visit the WIA website <www.wia.org.au> for frequent updates of the club's roster. Participating clubs will also promote their plans in more detail.

If you meet the requirements of the rules above, send your application by January 30, 2011, accompanied by the payment of $5AUD or 3 IRCs, to: WIA Centenary Award, P.O. Box 2042, Bayswater, VIC 3153, Australia. Internet: <http://www.wia. org.au/newsevents/centenary/ award/>.

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



The Wireless Institute of Australia (WIA) celebrates the 100th anniversary of its founding in 2010. Make contact with special event station VK100WIA to earn this short-term award.

USA-CA Special Honor Roll

Donald McKnight, W3DLM
USA-CA All Counties #1188
September 27, 2009

USA-CA Honor Roll

500
W3DLM.....3482
XE1L.....3483

1000
W3DLM.....1783
XE1L.....1784

1500
W3DLM.....1499
XE1L.....1500

2000
W3DLM.....1386

2500
W3DLM.....1304

3000
W3DLM.....1214

The total number of counties for credit for the United States of America Counties Award is 3077. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 12 Wells Woods Road, Columbia, CT 06237 USA. DX stations must include extra postage for airmail reply.

FIRAC Awards

The Federation Internationale Des Radio-Amateurs-Cheminots (FIRAC) is composed of about 1775 amateur radio operators in 31 countries who are employed by the railway industry in their respective country, with the majority of the groups (20) located in Europe. The association was founded in 1964 and at least 12 of these groups offer an award for contacting their members. The theme of the awards is usually railroad oriented with some great images of historic engines and rolling stock. Their WWW sites typically contain a current list of members valid for the award.

FIRAC is composed of amateur radio operators who are employed by the railway industry. Various groups offer awards for contacting members. This award is sponsored by a group of Austrian railroadmen.

Austria's FIRAC Award – OE. This group of Austrian railroadmen offers the award for contacting FIRAC members. It is available in three classes:

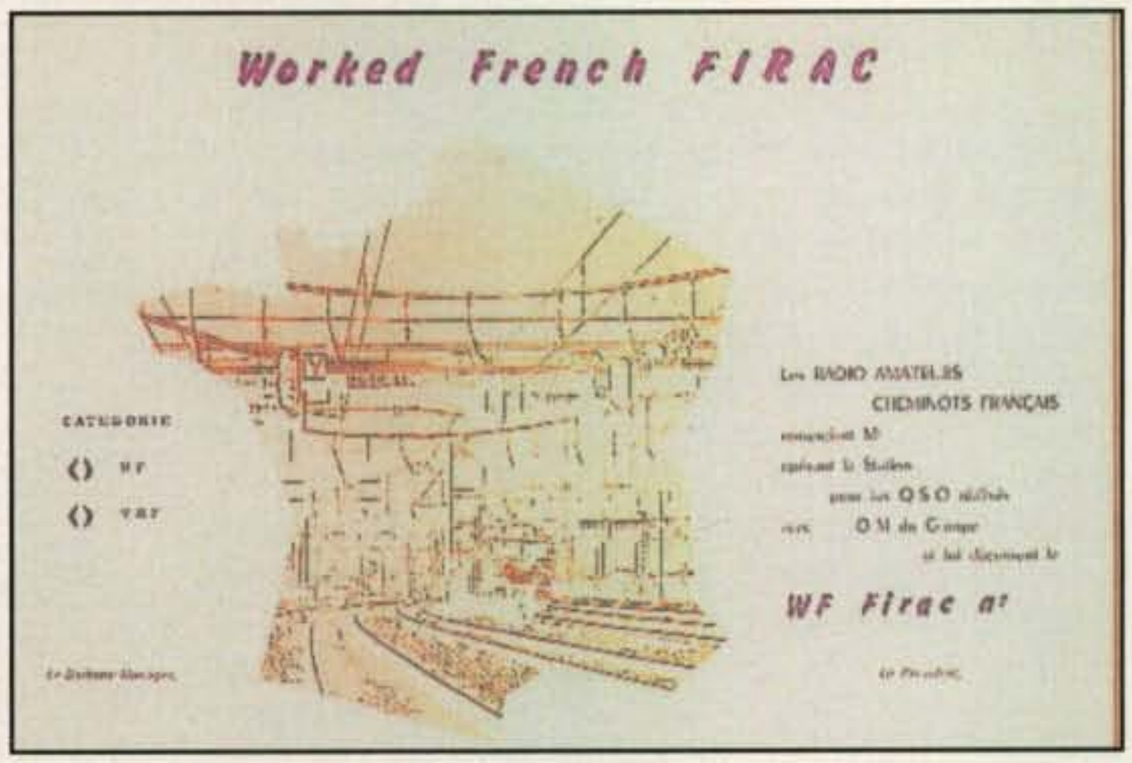
(A) VHF/UHF/SHF—work/hear 10 members all over the world, including at least 2 different OE districts.

(B) HF/VHF/UHF/SHF—work/hear 30 members all over the world including stations from at least 3 OE districts and at least 5 stations on HF.

(C) UHF/SHF only—work/hear 7 FIRAC members all over the world including at least 3 different OE districts.

SWL okay. All modes, plus /M or /P contacts, count for the award. Send GCR list and fee of 10 Euros or $US10 to: Herbert Vacinek, OE1HVC, Malborghetgasse 29/1/3, A-1100 Vienna, Austria. Internet: <http://www.qth.at/firac/>.

England is handling the award for contacting members in different FIRAC groups.



Work French railway worker amateur radio operators after January 1, 1972 to earn the Worked French FIRAC award.

England's FIRAC Award. England is handling the award for contacting members in different FIRAC groups. The International Association of the Railway Radio Amateurs (FIRAC) issues this award to all radio amateurs and SWLs on HF for earning at least 100 points for contacts with members of at least 10 different FIRAC groups, or on VHF at least 25 points for contacts with members of at least 3 different FIRAC groups.

At present there are the following national FIRAC groups: DL, F, G, HA, HB, I, LA, LX, LZ, OE, OH, OK/OM, ON, OZ, SM, SP, S5, YO, YU, Z3. MC (miscellaneous countries in which there are members, but no national group exists): 4L, 4X, CT, ES, PA, Russia (RK, RW, UA), TA, Ukraine (UB, UR, US, UT, UX) USA, (AB, K, N, W)VK, VU.

Each contact with a member = 2 points; contacts with FIRAC club stations = 5 points; contacts with MC members count 10 points.

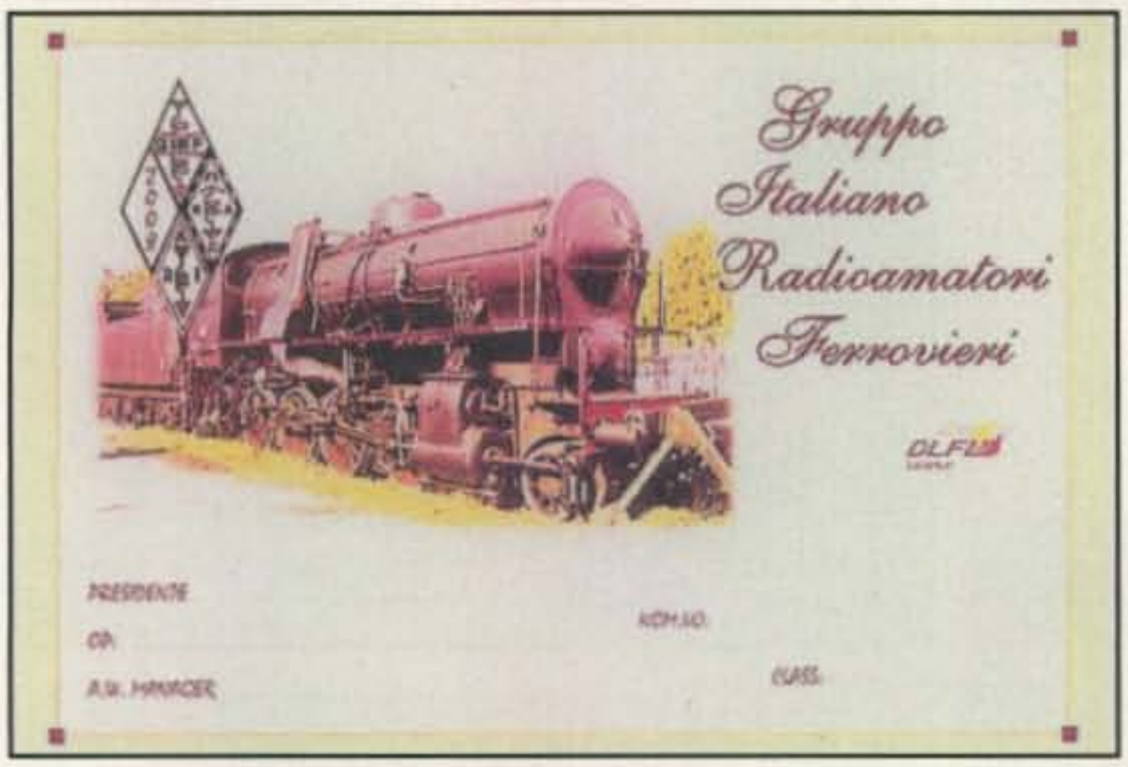
Valid member stations may only be worked once per band. Contacts by repeater or internet (for example, Echolink) do not count for award purposes. The award application sheet may be downloaded from the FIRAC homepage at: <http://www.firac.de>.

On the Cover

It's January, so it must be time to work on the antennas, right? Greg Hanson, KI8AF, of Marquette, Michigan, says jokingly that "We don't do antenna work up here unless there's two feet of snow on the ground!" His Gap Challenger vertical is now accompanied by a 48-foot tower, but as a QRP CW aficionado, Greg is somewhat of a minimalist. Code, he says, "works so much better than phone," especially when operating at low power.

His main QRP rig is an Elecraft K1, although he also has an Oak Hills 500 and a variety of QRP kits, as well as a Yaesu FT-840 and a Kenwood TS-520. Greg enjoys island-hunting, also on CW, and mostly on QRP. He says his most memorable QRP contact was his first DX contact, with Ireland, using a "38 Special" from the NorCal QRP Club on 30 meters. Greg and a couple of friends had built a few of them together … "I mean, a $25 rig, and we had more fun with those rigs!" he recalled. "We tried to work all states with them and got up to 47 or 48 until conditions deteriorated, and they still haven't gotten much better, so we're still trying to get Alaska and Hawaii."

Greg has been a ham since 1996, but his interest goes back to his youth, when he lived next door to a ham who provided an introduction to the hobby. School, the Navy, work, and raising a family all got in the way of pursing a license, he says, but once his kids were grown, he decided it was time. Greg says he gets on the air at least a couple of times a week—"Whenever I come down to the basement, I turn on the rig, just to see what's happening"—and is active in the local Hiawatha Amateur Radio Association, serving for the last several years as editor of the club newsletter. *(Cover photo by Larry Mulvehill, WB2ZPI)*



The Gruppo Italiano Radioamatori Ferrovieri (GIRF) offers an award that may be earned each year between March 1 and March 15.

Send log extract and fee of 5 Euros to the award manager: Geoff Sims, G4GNQ, 85 Surrey Street, Glossop, SK13 7AJ Derbyshire, England. E-mail: <g4gnnq@hotmail.co.uk>.

Worked French FIRAC. Work French railway worker amateur radio operators after January 1, 1972. French applicants need 9 contacts, other Europeans 6, and the rest of world 3. A QSO with club station F6RAC or F5KTR = 3 points; a QSO with any other club station = 2 points. On VHF, 3 QSOs are needed and a QSO with club station = 2. SWL okay but the applicant must submit the actual cards.

Send GCR list and fee of 4 Euros or 10 IRCs to Roland Rousseau F6FKK, 15 Avenue Du Coustou, F-31650 Saint Orens De Gameville, France. Internet: <http://le.grac. free.fr/>.

Italy's Diploma GIRF 2010

The Gruppo Italiano Radioamatori Ferrovieri (GIRF) offers an annual award that may be earned each year between March 1 at 00:00 UTC until March 15 at 24:00 UTC. Paid-up members of the group are eligible to make contacts valid for the award, including time, report, name, QTH, and a progressive number of the contact. They will be active on 160 through 40 meters using SSB, CW, and RTTY. Points required:

Italian stations: amateur radio and SWL, 40 points
Foreign stations: 20 points
GIRF member stations must make 100 contacts.

The same GIRF station may be contacted once per day but only on different bands and modes.

Each such QSO = 1 point. Special wild-card, or "jolly," stations will be active and will be worth 3 points only for non-GIRF stations.

Every year the award design is different, generally showing interesting railroad subjects. Send log extract and fee of 10 Euros for GIRF stations and $15 for others no later than April 30 of the year. Apply to: Mariutti Gianfranco, Via Postioma 112, I-31020 Villorba (TV), Italy. Internet: <http://xoomer.virgilio.it/girf/>

We'd like to hear from any groups or individuals who sponsor awards. Please contact me at the e-mail or snail-mail address shown on the first page of this column.

73, Ted, K1BV

dx

BY CARL SMITH,* N4AA

K4M in the History Books plus Proper IDing On The Air

November turned out to be a very busy month, at least in the Pacific Ocean. As I write this in mid-November, I've lost count of the number of DXpeditions that were scheduled to run from various islands throughout the region. I find it interesting that some of them actually had overlapping dates on the same island. I sure hope they took band filters!

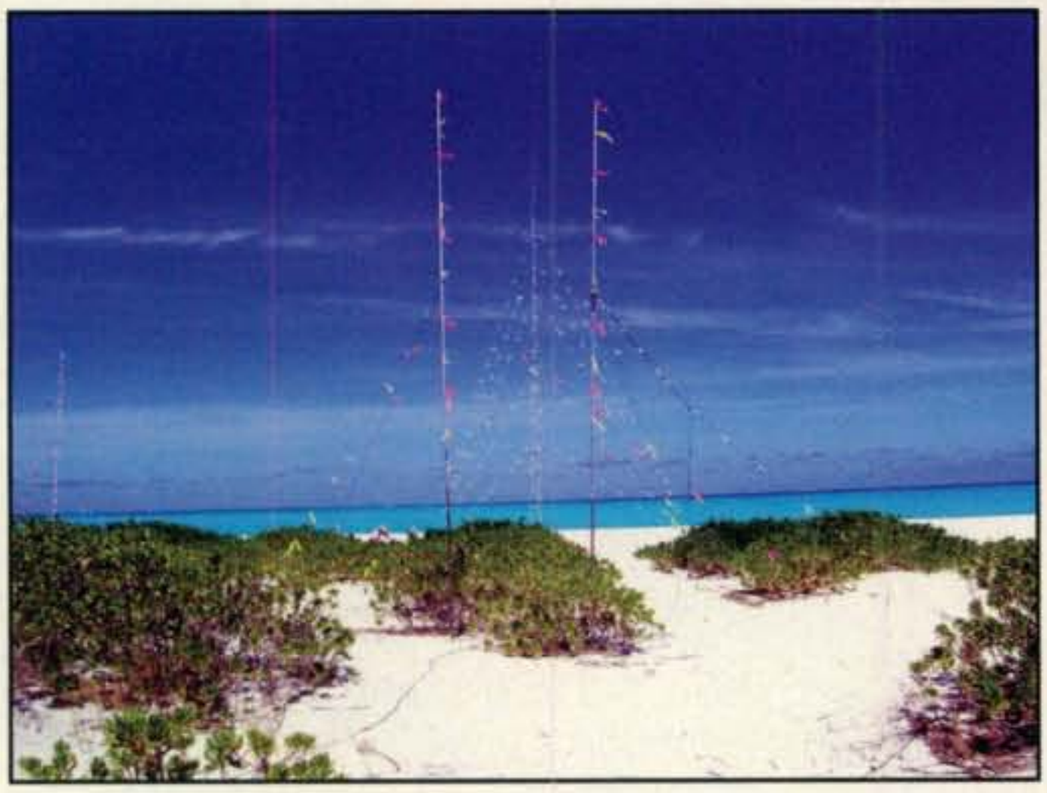
I guess this points out the necessity of checking well in advance before making the decision to go to a particular location. Bill Feidt, NG3K, does a good job of listing upcoming DXpeditions on his website (www.ng3k.com), assuming he is advised that one will be taking place. Some would argue the point that DXpeditions don't want to announce their intentions ahead of time, and I suppose there might be some reason for such logic, but I'm not totally convinced of that. Certainly, there is no reason for secrecy of an operation from a place such as Palau, Samoa, or other places that are not even close to the top of the Most Wanted lists. I'll probably get some feedback for my comments on this, but there are pros and cons, and debate is healthy … right?

Midway – K4M

The DXpedition to Midway Island, K4M, is now in the history books. The team had unforeseen setbacks but finally got to the island after their transportation aircraft was repaired and declared airworthy. I'm including a picture of one of the "antenna fields" on Midway. They all were vertical arrays and the guy lines had to have little "flags" tied to them to warn the birds they were there. The Wildlife Service is very protective of the animals, and especially the birds, on these Pacific islands. The K4M team had to adhere to the islands' bird protection policy, which they did very well.

From the K4M website (http://www.midway2009.com) we find the operation ran from October

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



The antennas on Midway (K4M) had to be "flagged" for the protection of the birds who could have been hurt flying into all that aluminum. (Photo courtesy of Tom, N4XP)

The CQ DX Field Award Program

Mixed

102 .....GØDEZ

CW

157 .....DL2DXA

Mixed Endorsements

225 .....HAØDU/240
200 .....OK1AOV/205
150 .....JA7OXR/150
28 MHz .....GØDEZ

SSB Endorsements

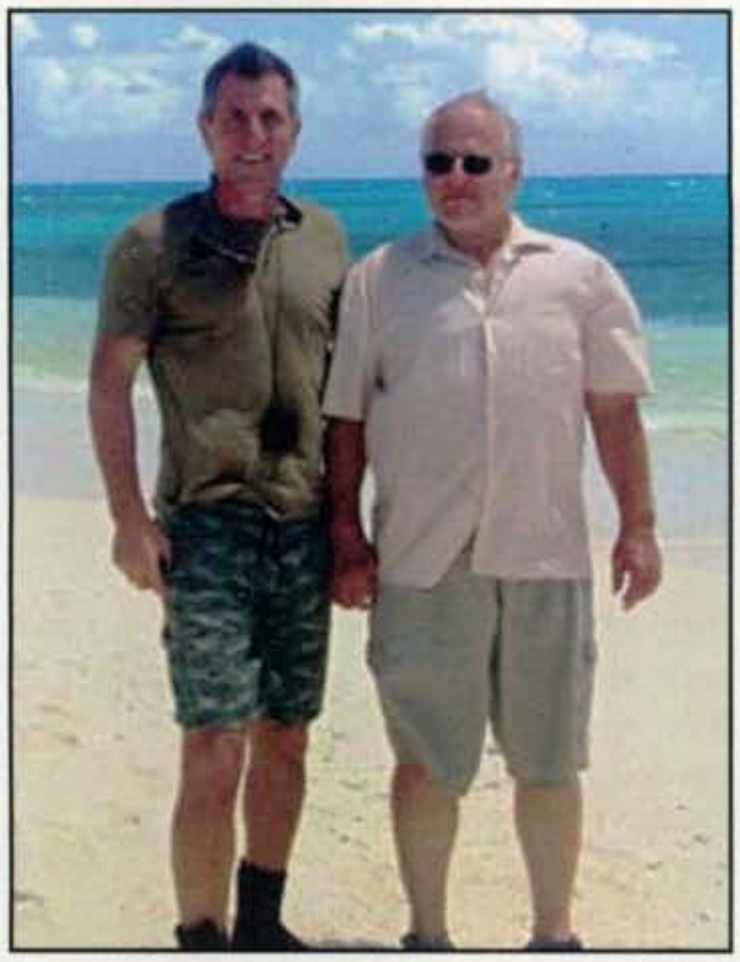
175 .....JN3SAC/175

CW Endorsements

200 .....DL2DXA/209
200 .....JN3SAC
175 .....OK1AOV/196

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. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio. com> website, or may be obtained by sending a business-size, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Please make all checks payable to the award manager.

This is a graduating class in Paraguay. The group was studying for their amateur license with classes conducted by the Radio Club of Paraguay. The significant story is there is no requirement for them to know Morse Code to obtain the license. However, the students did learn the code and passed the test at 5–7 wpm. How great is that? (Photo courtesy of The Radio Club of Paraguay)



George, AA7JV, and Tomi, HA7RY, as they arrived on Chesterfield for a three-week run as TX3A. They concentrated on the low bands and developed some antennas to help them in that endeavor. (Photo from the TX3A website)

11–19, with the last QSO being logged at 1020Z, October 19th. Here are a few of the stats for the operation: Total QSOs—61,077 with 18,465 unique callsigns. As you might expect, North America got over 28,000 of those, followed by Asia with 17,500 and Europe with nearly 13,000. Oceania got 1,350, South America almost 900, and Africa managed just under 200. Even Antarctica got in the log with one QSO. As for modes, CW got the top spot with just over 37,100 Qs, followed by SSB at almost 21,000 and RTTY in third with nearly 3,000. Overall, it looks like Midway will be well down the Most Wanted List for this year. Congratulations to the entire K4M team for a job well done!

IDing on the Air

As I have noted before, I get mail from readers of this column from time to time. It's always a pleasure to get this input, as it let's me know there are folks reading my efforts. I've had a couple of notes on a subject that I have touched on in the past. The subject? DX stations who fail to identify themselves on a regular basis.

We all have heard this, usually regarding DXpeditions. While we can appreciate the desire to work as many stations as possible from a rare spot, that is no excuse for not telling us who you are! A case in point would be the situation mentioned in the first paragraph of this column. Two or more stations operating from the same entity or even nearby entities can easily be confused. With your antenna pointed pretty much in the same direction, how would you know if you were working Palau or Micronesia if you didn't hear a callsign? We see the same thing happen in contests when a station goes for 10, 15, or even 20 minutes before finally sending a callsign. More

The WPX Program

Mixed

2077 .....AB4SF
2078 .....AGØA
2079 .....KM2O
2080 .....KD1OG

Digital

39 .....AB4SF

CW: 3350 WA5VGI. 5750 WA2HZR.
SSB: 2550 WA5VGI. 2750 UT7DX.
Mixed: 450 KM2O. 1250 K7UA. 2650 WZ4P. 4050 WB2YQH.

30 Meters: OK1MP
17 Meters: OK1MP
12 Meters: OK1MP
6 Meters: OK1MP

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MDD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GO, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, WB8CNL, 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, WA8YTM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8UB, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, N3XX, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MS, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IK4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBF, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, I7PXV, S53EO, DF7GK, S57J, EA5BM, DL1EY, DJ1YH, KUØA, VE2UW, 9A9R, UAØFZ, DJ3JSW, OE6CLE, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, K4LQ, KØKG, DL6ATM, VE9FX, DL2CHN, W2OO, AI6Z, RU3DX, WB9IHH, CT1EEN, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, KT2C, UA9CGL, AE5B, KØDEQ, DKØPM, SV1EOS, UAØFAI, N4GG, UA4RZ, 7K3QPL, EW1CQ., UA4LY, RZ3DX, UA3AIO, UA4RC, N8BJQ, UA3BS, UA9FGR, UT3UY, WA5VGI, UT9FJ, UT4EK, K9UQN, UR5FEO, LY2MM, N3RC, OH3MKH, RA3CQ, UT3IZ.

160 Meter Endorsements: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8ILC, K9BG, W1CU, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR2QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N6JV, ONL-4003, W5AWT, NN3XX, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA1CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, DJ1YH, KUØA, VR2UW, UAØFZ, DJ3JSW, OE6CLD, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, CT4NH, EA7TV, LY3BA, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, DL6ATM, W2OO, RU3DX, WB9IHH, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, UA9CGL, SM6DHU, KØDEQ, DKØPM, SV1EOS, N4GG, UA4RZ, 7K3QPL, EW1CQ, UA4LY, RZ3DX, UA3AIO, UA4RC, N8BJQ, UA3BS, UA9FGR, UT3UY, WA5VGI, UR5FEO, N3RC, UT3IZ.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage for airmail) to "CQ WPX Awards," P.O. Box 355, New Carlisle, OH 45344 USA. Note: WPX will now accept prefixes/calls which have been confirmed by eQSL.cc. Other electronic QSL confirmation means are not accepted.

*Please Note: The price of the 160, 30, 17, 12, 6, and Digital bars for the Award of Excellence are $6.50 each.

CQ DX Awards Program

SSB

2536.....JA5DBE
2537.....K9BQL

CW

1096 .....WA6JJB

SSB Endorsements

330.....NØFW/339
330.....N7WR/336
320 .....XE2NLD/321
310 .....G3KMQ/312
200 .....WA6JJB/227
SSTV JA5DBE

CW Endorsements

330.....NØFW/338
330.....W7IIT/331
330 .....K3JGJ/336
320 .....K1FK/328
300 .....KØKG/306
275 .....HA5LQ/287

RTTY Endorsements

330.....OK1MP/329

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. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio.com> website, or may be obtained by sending a business-size, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 339 active countries. Please make all checks payable to the award manager.

The WAZ Program

6 Meters

89 .....K4OM (25 zones)

20 Meter SSB

1184.....W6GAK 1185.....OK1JMJ

20 Meter CW

591 .....4Z5SG

40 Meter CW

273.....K8PT 274 .....GØDEZ.

All Band WAZ

Mixed

8627 .....W4DVG 8630 .....EA5ARC
8628 .....W4HY 8631 .....K9UP
8629.....HB9TQL 8632 .....JA6FUV

SSB

5121 .....IW5AB

RTTY

204.....DJ9MH

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, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577. 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 Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

typically heard on CW, it happens on SSB as well.

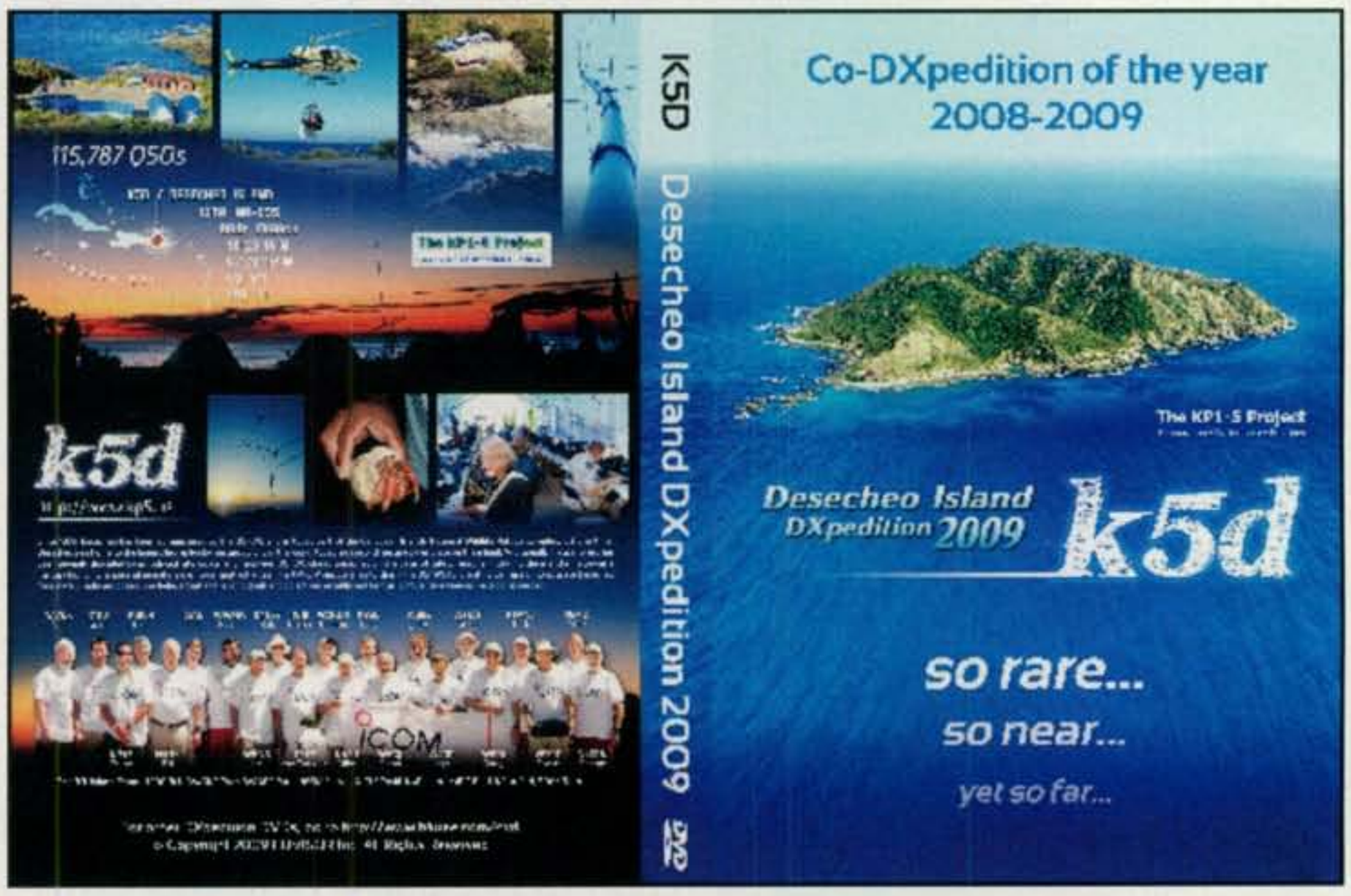
Why should I waste my time sitting there listening for a callsign when I could be making Qs up the band? Oh yes, I could ask the guy for his call, but more often than not the query is ignored. You can't log a Q without a callsign, now can you? If I can't log that station, his log is going to take a "hit" when he shows a Q that can't be verified since he was never logged by me.

It's time we started doing the right thing when we're operating from a DX location or in a contest. I don't of anyone who is getting paid to make the most Qs. Give the call at least every 10 Qs or 10 minutes, whichever comes first.

Desecheo K5D Video

The end of September I had the pleasure of seeing the video of K5D, Desecheo. The video was still "under construction" at that time and it had not been "polished," but those who had seen it were very complimentary about the content and quality. Many individuals collect these videos and a lot of DX clubs have libraries of them available to the members. I confess that I have a pretty significant library of them myself. This one has been added to my collection, and I encourage you to at least see it and/or encourage your DX club to put it on the shelf for others too. See a photo of the DVD in this column; it is available at <http://www.kp5.us>.

The DX Magazine's annual Most Wanted Survey results will be out in January. I'll give you a sneak peek at the top ten. Desecheo is not there. As a matter of fact, Desecheo is not even in the top 100. The K5D team obviously did a great job on the need for KP5. We only hope that someone can somehow manage to gain permission to go to Navassa, KP1, as it still holds its place in the Top Ten. Regretfully, the 2009 operation from Marion Island, ZS8, did nothing to help the need for that one. If you want to see the overall Top 100



The new K5D DVD is receiving rave reviews and is available at <http://www.kp5.us>.

5 Band WAZ

As of November 1, 2009, 793 stations have attained the 200 zone level and 1661 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 or 40 meters):

S51U, 199 (27)
N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
IK1AOD, 199 (1)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W3NO, 199 (26)
RU3FM, 199 (1)
N3UN, 199 (18)
W1JZ, 199 (24)
W1FZ, 199 (26)
SM7BIP, 199 (31)
N4NX, 199 (26)
N4MM, 199 (26)
EA7GF, 199 (1)
N6HR/7, 199 (37)
JA5IU, 199 (2)
RU3DX, 199 (6)
N4XR, 199 (27)
HA5AGS, 199 (1)
VE3XN, 199 (26)
YU7GMN, 199 (10)
K7LJ, 199 (37)
RA6AX, 199 (6 on 10m)
RX4HZ, 199 (13)
KØGM, 199 (17)
S58Q, 199 (31)
KQØB, 199 (2 on 10)
K9OW, 199 (34 on 10)
N5AW, 199 (17)
JH7CFX, 199 (2)
IN3ZNR, 199 (1)
G3VKW, 199 (31)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
K4CN, 198 (23, 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)
F5NBU, 198 (19, 31)
OE2LCM, 198 (1, 31)
WK3N, 198 (23, 24)
W9XY, 198 (22, 26)
KZ2I, 198 (24, 26)
W7VJ, 198 (34, 37)
K9MIE, 198 (18, 21)
W9RN, 198 (26, 19 on 40)
W5CWQ,198 (17, 18)
I5KKW, 198 (31&23 on 20)
IV3MUC, 198 (1&31 on 40)
UA4LY, 198 (6&2 on 10)
JA7XBG, 198 (2 on 80&10)

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

K9UP (197 zones)
SP7GAQ (182 zones)

5 Band WAZ updates:

K8PT (196 zones)

***Please note: Cost of the 5 Band WAZ Plaque is $100 shipped within the U.S.; $120 all foreign (sent airmail).**

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, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577. 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 Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

Most Wanted, it will be posted on the DX Publishing website, <www.dxpub.com> on/about January 15th.

Netherland Antilles

There has been a lot of speculation about what will happen to the Netherlands Antilles at the end of 2010, the four islands perhaps being split into four separate countries. I have not yet seen any official announcement, however. Rumors abound, but without an official announcement these are purely rumors and should be treated as such. If/when anything is released by the Netherlands government, we'll know who, what, when, where, and how.

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.

MIXED

6139.....9A2AA	4232 .....VE3XN	3772 ...WA5VGI	3150.....W9IL	2704 .....K2XF	2116.....AE5B	1741.....AB5C	1362..WD9DZV	815.....KL7FAP
5653.....K2VV	4150 .....I2PJA	3735 .WB2YQH	3091 .....9A4W	2674 .....N8BJQ	2192.....N2SS	1705.....W2EZ	1359 .....N3RC	726 .....K5IC
5426 .....W1CU	4146 .....N6JV	3684 .....IK2ILH	3007.....W2WC	2475 ....W6OUL	2001 .....AB1J	1662 ....SV1DPI	1337.....K6UXO	723.....KØDAN
5031.....W2FXA	4082 .....I2MQP	3609 ..YU7BCD	2998.....K9UQN	2440 .....K5UR	1951 .....KØKG	1651 ..KC9ARR	1322 .....AA4FU	682 .....AI8P
4669.....EA2IA	3980.....N9AF	3522 ..ON4CAS	2965...OZ1ACB	2397.....VE6BF	1930.....W2FKF	1643 .....N1KC	1269.....K5WAF	680 ....IWØHOU
4618.....N4NO	3937 .....S53EO	3494 .....W9OP	2873 .....W2ME	2378.....W3LL	1891.....VE9FX	1634 .....AG4W	1016 ..RA1AOB	662 .....JA7OXR
4592.....9A2NA	3930.....KØDEQ	3325..SM6DHU	2845 ...JN3SAC	2358.....I2EAY	1858.....W7CB	1593 .....S55SL	976.....KM6HB	650.....N3YZ
4430 .....YU1AB	3821.....KF2O	3227 .....K9BG	2752.....K1BV	2353 .....W2OO	1820.....KX1A	1446.....DF3JO	964.....K8ZEE	644 .....KWØH

SSB

5065 .....IØZV	3616.....EA2IA	2857.....4X6DK	2451...EA3GHZ	2140 ..SV3AQR	1927.....AE5B	1678.....K9UQN	1404 .....AG4W	1031 ....IK8OZP
4505 .....VE1YX	3505.....N4NO	2817 .....IN3QCI	2431 .....G4UOL	2094.....I8LEL	1915 .....W2OO	1649 .....N8BJQ	1386 ....IK4HPU	978 .....EA7HY
4371 .....F6DZU	3323...OE2EGL	2711 ...LU8ESU	2326 .....CX6BZ	2093.....W2WC	1879.....K3IXD	1643 ...JN3SAC	1385 .....AE9DX	951 .....KU4BP
4323.....K2VV	3213...CT1AHU	2709 .....KF7RU	2300..SM6DHU	2076 .....K2XF	1891 .....W2FKF	1623.....VE9FX	1377 .....EA3NP	924.....VE6BF
4184 .....OZ5EV	3133.....KF2O	2642 ..YU7BCD	2297.....W9IL	2072 .....K5UR	1795 .....KQ8D	1611 .....W2ME	1258 .....N1KC	875.....K7SAM
4116 .....I2PJA	3108.....I4CSP	2595.....EA1JG	2209....IK2QPR	2071 .....N6FX	1756 .....KI7AO	1480.....AB5C	1145...EA3EQT	717.....KØDAN
3843.....I2MQP	2914.....KØDEQ	2521 ...WA5VGI	2201 .....NQ3A	1944 ...DL8AAV	1729 ....W6OUL	1464 ..VE7SMP	1083.....KX1A	637.....K5WAF
3669.....9A2NA	2860 .....I8KCI	2471 .....I3ZSX	2142.....W3LL	1935...SV1EOS	1714 ....IK2DZN	1463.....I2EAY	1042 ....IZØBNR	605 ....WA2BEV

CW

5254 ..WA2HZR	3607 .....EA2IA	2723....EA7AZA	2502 ...JA9CWJ	2276.....IØNNY	1927.....W6OUL	1403.....AG4W	1053 .....K5WAF	749 .....AE5B
5085 .....K9QVB	3223 .....9A2NA	2632.....W2ME	2483....JN3SAC	2223 .....VE6BF	1848 .....I2EAY	1334 .....RUØLL	1030 .....AA5JG	695.....S55SL
5002 .....K2VV	3267 ...WA5VGI	2623 ..SM6DHU	2419 ....IK3GER	2141 .....N8BJQ	1804 ..EA7AAW	1317 .....K6UXO	915.....N1KC	608 .....IK2SGV
4146.....N6JV	3241 .....KØDEQ	2618 .....K9UQN	2415 .....W2WC	2101 .....I2MQP	1643 .....W2OO	1299 ..WA2VQV	842 ....WD9DZV	
4128 .....N4NO	2838 .....I7PXV	2727...YU7BCD	2373.....W9IL	2089 .....K2XF	1497 .....AC5K	1223 .....KX1A	824 .....VE9FX	
3827.....VE7DP	2837 .....KF2O	2626 .....W8IQ	2324 .....OZ5UR	1979 .....K5UR	1445 ....EA2CIN	1220.....AA4FU	821 .....HB9DAX	
3760.....LZ1XL	2727...YU7BCD	2621 .....KA7T	2308 .....N6FX	1966 .....W9HR	1407 .....WO3Z	1109.....VE1YX	753 .....F5PBL	

DIGITAL

1284 .....W3LL	1009..GUØSUP	909 .....N8BJQ	721 .....KØDEQ	653 .....AG4W

A New Year

The lack of sunspots has caused a lot of DXers to go looking for other challenges. Many of our friends and neighbors have been affected by the economic downturn, too. We complain about the solar flux being so low, yet there are those who have been forced to move or sell their property to try and make ends meet. I can only wish them well. I am reminded of the man who complained because he had no shoes, until he saw a man who had no feet.

As we begin a new year, let's all think about what the past year has been like for us and perhaps make some of those "resolutions" to do better.However, if we're going to make those resolutions, let's really try to keep them.

Until February, enjoy the chase and do Have Fun!

73, Carl, N4AA

CQ DX Field Award Honor Roll

The CQ DX Field Award Honor Roll recognizes those DXers who have submitted proof of confirmation with 175 or more grid fields. Honor Roll lisiting is automatic upon approval of an application for 175 or more grid fields. To remain on the CQ DX Field Award Honor Roll, annual updates are required. Updates must be accompanied by an SASE if confirmation is desired. The fee for endorsement stickers is $1.00 each plus SASE. Please make all checks payable to the Award Manager, Billy F. Williams. Mail all updates to P.O. Box 9673, Jacksonville, FL 32208.

Mixed

K2TQC....265	KF8UN....205	K8OOK....189
HAØDU....240	W6OAT....205	BA4DW....188
W1CU....228	OK1AOV....205	9A5CY....187
VE7IG....227	N4MM....201	RW4NH....187
HA1RW....220	VE3ZZ....201	K2SHZ....182
VE3XN....217	JN3SAC....200	K1NU....180
N8PR....217	W4UM....198	W5ODD....177
KØDEQ....216	N4NX....192	NØFW....176
HA5WA....206	ON4CAS....191	
F6HMJ....206	HA9PP....190	

SSB

W1CU....209	VE7SMP....190	NØFW....176
W4ABW....202	N4MM....184	DL3DXX....175
KØDEQ....192	W4UM....182	JN3SAC....175

CW

DL6KVA....225	DL3DXX....203	OK2PO....184
W1CU....220	JN3SAC....200	N4MM....179
DL2DXA....209	OK1AOV....196	N4NX....177
KØDEQ....207	W4UM....191	

QSL Information

3B8/ON4LAC via ON4LAC
3B9/ON4LAC via ON4LAC
3D2ØCR via DJ8NK
3D2G via PG5M
3DAØJK via WB6OJB
3DAØSS via GI4FUM
3V8SS via AA8YH
3Z7ØIIWW via SP6OPZ
3Z7ØRG via SP9KAG
3Z7ØWIZ via SP5PJX
4W6AL via CT1GFK
4W6FR via VK4FW
5B/G3RWF via G3RWF
5B/HA5PP via HA5PP
5B/HG3IPA via HA3JB
5NØOCH via DL3OCH
5Q5NA via DK5NA
5R8UO via DF8UO
5WØKH via DL2FAG
6V7Q via F8IJV
6W/EI6DX via RX3RC
6Y1V via OH3RB
7Q7BJ via G4AHK
8J12ØTDC via JA1YUC
8Q7AK via G7COD
8R1PY via PY2WAS
8R8USA via 8R1AK
9A/DL7DF via DL7DF
9A/IV3OTE via IV3OTE
9A/SQ9C via SQ9C
9A1CPB via 9A4W
9A2NA/P via 9A2NA
9A48IFATCA via 9A4WW
9A8M via 9A3JB
9G5TT via I2YSB
9G5XX via I2YSB
9H3AB via PA1SL
9H3DX via PA2AM
9H3DZ via PA2AM
9H3ON via PG9W
9H3S via PA3HGP
9H3X via PE1NGF
9H3YM via PE1OFJ
9H3ZR via PB9ZR
9H9PA via PB9ZR

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," 106 Dogwood Dr., Paris, TN 38242; phone 731-641-4354; e-mail: <golist@golist.net>; <http://golist.net/>.)

contesting

BY JOHN DORR,* K1AR

Contesting Resolutions for 2010

January's Contest Tip

Keep an eye on your RIT/XIT controls. I'm amazed at how many stations call others way off frequency, usually due to "cockpit error." I've had personal experience, especially on CW, of logging guys as much as 500 Hz or more off my run frequency. Of course, the corollary to this is to make sure that the stations you "work" are actually calling you and not someone else. This business of managing your run frequency is tricky and your score can go up or down depending on how well you do!

It seems that during this time of year we resolve to resolve. We plan on a massive weight-loss program, commit to joining a gym, plan to arrive at work early, spend more time with our kids, promise to go to the doctor, etc. You are likely to be all too familiar with the drill. For most of our resolutions, achieving consistency past January 15th is the exception rather than the rule.

If you apply the concept to contesting, it turns out we can develop quite an inspiring (or shall we say imposing?) list for ourselves as well. While there is some "tongue in cheek" thinking that has gone into this year's list, I hope it inspires you to at least consider your contesting habits and become a better operator as a result. This list begins with me; no calling the kettle black this time around. However, there is not a contester on this planet who can't improve and benefit from considering this month's topic. So, as contesters, let's also resolve to resolve.

In 2010, I Resolve To:

Submit my logs well before the mailing deadlines. Given that virtually every contest administrator is now accepting electronic logs, ignoring this resolution falls into the lazy category. Unless you are one of those "post-contest log massager" types (a topic we need to discuss in the future), use this year as a personal benchmark for submitting your contest logs right away! By the way, for the 2009 CQ WW DX SSB contest, over 4000 logs were submitted in the first two weeks after the contest. For you folks, this resolution has already been accomplished. Keep up the good work!

Always sign my entire callsign in every contest. Oh boy, there's nothing more frustrating than having a good run going only to have a loud signal come back with only part of his callsign. Let's return this practice to the DX nets where it started and leave it out of contesting—please!

Religiously repeat the entire callsign of the station I am working during each QSO. One of the best opportunities to improve your accuracy is to ensure that you repeat the call of a station you are working (especially when you only partially copied the callsign in the first place). It's just great operating technique. By doing this, you can assure the caller that you copied his call correctly and give him the opportunity to correct your mistake if you got it wrong. As our teenagers often say, "Duh!"

Never intentionally take someone else's frequency. This one may seem self-explanatory, but nevertheless it is a good resolution to take to heart in 2010. There is always the challenge of finding precious real estate in a major contest. This is especially true with the poor propagation we are continuing to experience, often making 20 meters the only band that matters. That said, we need to be good citizens of our radio privileges and that begins with treating our peers with respect.

Never log a QSO unless I am absolutely sure of the callsign and exchange. This one seems obvious, doesn't it? Continuing advances in log checking combined with peer pressure are ensuring that our resolve to improve accuracy in 2010 will pay rich dividends in our scores and respect by others. Congratulations to all who improved this past year!

Always verify the callsign of the station I am working from a callout from a DX Cluster before actually logging call. This one is another source of poor operating – assuming someone else copied the correct callsign when working a DX Cluster spot. "K1AR's Law": Assumptions equal score reductions. I'm amazed at how many operators simply use their computing resources to run the contest for them. Whether it's inadvertently operating "out of band" or simply logging a bad callsign, the responsibility for contest accuracy and proper operating remains with you—no one else!

Always solder the ground on my PL-259 connections. OK, I'm guilty of this one, too. Although a bit of a tongue-in-cheek resolution, proper construction techniques will only make your station better. Solder is the contester's friend. Overall attention to construction details is a lifetime companion.

Plan this year's antenna projects during the winter and begin construction on the first warm spring weekend. Working on antennas when it's

Calendar of Events

All year	**CQ DX Marathon**
Dec. 26	RAC Winter Contest
Dec. 26-27	Stew Perry Topband Challenge
Jan. 2–3	ARRL RTTY Roundup
Jan. 2–3	EUCW 160M Contest
Jan. 9–10	North American CW QSO Party
Jan. 10	NRAU – Baltic Contest
Jan. 16	LZ DX Contest
Jan. 16–17	HA DX Contest
Jan. 16—17	North American SSB QSO Party
Jan. 23–24	BARTG RTTY Sprint
Jan. 29–31	**CQ WW DX 160M CW Contest**
Jan. 30–31	REF CW Contest
Jan. 30–31	UBA SSB DX Contest
Feb. 6–7	Vermont QSO Party
Feb. 6	Minnesota QSO Party
Feb. 6–7	Mexico RTTY Int'l Contest
Feb. 6–7	Delaware QSO Party
Feb. 7	North American CW Sprint
Feb. 13–14	**CQ WW WPX RTTY Contest**
Feb. 26–28	**CQ WW DX 160M SSB Contest**

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warm out? Yeah, right! Well, we can try to plan, can't we? I'm actually one of the worst planners when it comes to this topic. Given I don't particularly enjoy antenna work, it's easy to put if off. Ironically, once I get enough motivation to get started, the task is rarely as difficult as I anticipated. So bring on the warm weather in 2010, and for now sharpen your pencils!

Ensure that my entire station will be ready for the fall operating season 30 days before the start of the CQ WW DX SSB Contest. This one is probably a corollary to the previous resolution. That said, everyone will benefit by a little advance planning. Hooking up computer networks and SO2R (single operator, two radios) boxes on Friday afternoon before a major contest is a sure path to unnecessary stress and a lower score.

Answer all of my incoming bureau QSL cards. Well, my pile usually stands at about 2000 unanswered cards at any point in time (although it has been growing in recent years), which is better than some and worse than many. LoTW (Logbook of The World) and other initiatives help us deal with this administrative burden in 2010. Banging out just 100 responses per week is another way to attack the problem. Not unlike antenna work, the hardest part of addressing this resolution is getting started. Once you're on a roll, the battle has already largely been won.

Be courteous to my fellow contesters. We engage in a competitive environment called contesting, so courtesy sometimes takes a back seat. However, we also owe each other respect, not only when on the air, but when we engage in e-mail or face-to-face dialog. Until the perfect contester is born (and there is none being scheduled at the moment), there will always be something for us to discover about each other.

Enter the category I've actually operated. Fortunately, the vast majority of us are honest and ethical operators. We say what we do and do what we say. However, there is the small fringe that chooses to push the rules past the limit or just outright cheat. Whether it's using the DX Cluster while claiming single operator unassisted or using high power when you submit a log as low power, there is only one word for this resolution in 2010—stop! You know who are and now is the perfect time to reset your ethical priorities. 'Nuff said!

Periodically check to see if someone else wants to operate when participating at a multi-op. Sure, most of us want the high-rate operating times when participating at a multi-op station. However, a little consideration for others in 2010 will go a long way to your being known as a true team player the next time.

Always act as if I were using *my* callsign when operating from someone else's station in a contest. Ah, yes, the "hide behind the call" syndrome. The fact is that whether it's your callsign or someone else's, as contesters we have an obligation to operate responsibly on the air. Do the right thing in 2010!

Final Comments

By taking a few minutes to consider how we can be better contesters and ham radio citizens in general, 2010 should be a better radio year for all of us. Also, there is nothing like the turning of the year to be a bit introspective about our approach to the sport. It's my desire that this month's topic will make you think and maybe even identify more resolutions for next year and beyond.

Speaking of 2010, here's to it being a fantastic year for you and your family. We live in a challenging world; let's do our part to make it a little bit better for everyone. See you in the next contest!

73, John, K1AR

propagation

BY TOMAS HOOD,* NW7US

Good Conditions Forecast for 2010

A Quick Look at Current Solar Cycle Conditions

(Data rounded to nearest whole number)

Sunspots
Observed Monthly, October 2009: 5
Twelve-month smoothed, April 2009: 2

10.7 cm Flux
Observed Monthly, October 2009: 72
Twelve-month smoothed, April 2009: 69

***Ap* Index**
Observed Monthly, October 2009: 3
Twelve-month smoothed, April 2009: 4

One Year Ago: A Quick Look at Cycle 23 Conditions

(Data rounded to nearest whole number)

Sunspots
Observed Monthly, October 2008: 3
Twelve-month smoothed, April 2008: 3

10.7 cm Flux
Observed Monthly, October 2008: 68
Twelve-month smoothed, April 2008: 70

***Ap* Index**
Observed Monthly, October 2008: 6
Twelve-month smoothed, April 2008: 7

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for January 2010

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 1, 4-7, 10-11, 18, 21-28, 31	A	A	B	C
High Normal: 3, 8-9, 15-17, 30	A	B	C	C-D
Low Normal: 2, 13-14, 19, 29	B	C-B	C-D	D-E
Below Normal: 20	C	C-D	D-E	E
Disturbed: 12	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 S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, 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 in *The New Shortwave Propagation Handbook* by George Jacobs, W3ASK; Theodore J. Cohen, N4XX; and Robert B. Rose, K6GKU.

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 2 will be good (B) on January 1st, poor (D) to fair (C) on the 2nd, fair (C) on the 3rd, good (B) on January 4–7, etc.

3. As an alternative, the Last-Minute Forecast may be used as a general guide to space weather and geomagnetic conditions through the month. When conditions are Above Normal, for example, the geomagnetic field should be quiet and space weather should be mild. On the other hand, days marked as Disturbed will be riddled with geomagnetic storms. Propagation of radio signals in the HF spectrum will be affected by these conditions. In general, when conditions are High Normal to Above Normal, signals will be more reliable on a given path, when the path is ionospherically supported.

The new solar cycle is picking up some steam. Flux readings during the last months of 2009 at times rose above 80. We are no longer seeing long periods without sunspots. While there are still days with zero spots, there are becoming fewer of them.

Here is an overview of expected propagation conditions for 2010 on each amateur band from 6 to 160 meters.

6 Meters: While we are seeing a slow and steady increase in solar activity, it is not yet enough to wake up 6 meters via *F*-layer propagation. We should see action on 6 meters during the summer season's troposcatter and sporadic-*E* activity. Aurora will play a minor role during the spring and fall. Meteor-scatter propagation might offer an occasional peak in activity, as well.

10 and 12 Meters: These bands will be poor to good, except during times of sporadic-*E* activity. Expect most DX openings to be on north and south paths, although by fall solar activity may well be high enough to support a great DX season on 10 meters. Most of the time solar activity will not support propagation on the higher bands, except for possible openings on paths between lower latitudes and locations on the other side of the equator (north/south paths).

15 Meters: This band will be fair during the first part of the year, with occasional worldwide openings during the daylight hours of all seasons. Later in the year, as solar activity increases, this band will become a hot day-time activity center for most latitudes. Generally, though, openings during the first half of the year will be short, except for the strong and frequent north/south path openings. By the end of 2010, we should be in a more rapid climb in solar activity, so this band will be open for worldwide DX more often.

17 Meters: This band should behave much like 15, but you will find it open more often, with it remaining open for DX an hour or two longer than 15 meters.

20 Meters: Twenty is again going to be the main player during the year. Expect good conditions during the daylight hours, with DX openings possible to limited areas throughout the year. DX conditions on this band tend to peak for a few hours after local sunrise and again during the sunset period. There will be moderate night-time openings during the spring and fall seasons.

30 Meters: As Cycle 24 begins to offer more sunspot activity, conditions on this band will offer strong openings, especially a few hours before sunset until a few hours after sunrise. In 2010, 30 meters will be an exciting band for those low-power digital signals. Winter brings longer nights, providing the right mix for exceptional worldwide DX.

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40, 60, 80, and 160 Meters: These are nighttime DX bands. Great worldwide DX should continue on 40 meters from about two hours before sunset to approximately two hours after sunrise during all seasons. Expect coast-to-coast DX on 60 meters. DX openings on 80 and 160 should peak during the early spring, late fall, and winter months. Expect somewhat stronger signals than those of last year.

January Propagation

It should be a toss-up between 17 and 20 meters for some great DX openings during the daylight hours. These bands should open to most areas of the world, often with very strong signals. Seventeen meters may have a slight edge before noon, with 20 meters taking the lead after noon and becoming the optimum DX band during the late afternoon hours. Short-skip openings between distances of about 1200 and 2300 miles should be excellent during the daylight hours. Excellent short-skip openings are expected on 15 and 17 meters from shortly after sunrise through the early evening hours for distances between 1000 and 2300 miles. Twenty meters is expected to be a solid band with openings for both DX and short-skip. DX conditions should peak during a window of an hour or so right after sunrise and again during the late afternoon and early evening hours. Short-skip openings between approximately 1300 and 2300 miles should be possible from just after sunrise to as late as midnight. Shorter distance openings should also be possible from mid-morning to mid-afternoon.

The optimum band for DX conditions during the hours of darkness should be 40 meters. Expect openings to most areas of the world from shortly before sundown, through the hours of darkness, until shortly after sunrise. Signal levels may be exceptionally strong at times. During the daylight hours, short-skip conditions should be optimal for openings between approximately 100 and 600 miles. Skip will lengthen during the late afternoon, and by nightfall short-skip conditions should be optimal for openings between 800 and 2300 miles.

Expect 60 meters to play a significant role in night-time DX across the United States. With very low noise levels this month, the weaker signals of 60 meters will be easy to copy.

Because atmospheric noise levels will be at seasonally minimum levels in the Northern Hemisphere during January, 80 and 160 meter bands should also be hot. Expect some good openings to many parts of the world on 80 meters during the hours of darkness and the sunrise period. Short-skip openings between distances of 50 and 250 miles should be optimal on 80 meters during the daylight hours. During the later afternoon and early evening hours short-skip openings should increase to between 250 and 1500 miles, and by nightfall openings up to and beyond 2300 miles should be possible.

Expect some DX openings on the 160-meter band during the hours of darkness. Openings toward Europe and the east should peak at about midnight. Openings toward the South Pacific and in a generally southerly direction may be possible just before daybreak, as well as openings into Asia and North Pacific. Short-skip openings up to 1300 miles should be possible during the hours of darkness, and frequently the skip will extend out as far as 2300 miles. During the daylight hours intense ionospheric absorption will severely limit openings, although at times some may be possible up to 150 miles or so.

VHF Conditions

Sporadic-*E* can occur during January, so be on the lookout.

Moderate 2009 CQ WW DX SSB Contest Conditions

The 2009 CQ World-Wide DX SSB Contest weekend of October 24–25 started off with great geomagnetic activity conditions. Geomagnetic activity was very quiet, making for a very stable ionosphere. Sunspot counts were incredible, though! On October 24, the sunspot count was 16, and it was 19 the next day. The 10.7-cm solar flux index was 76 both days. All of the HF contest bands were usable, including 10 meters! The contest yielded great results for almost all participants compared with the last several years.

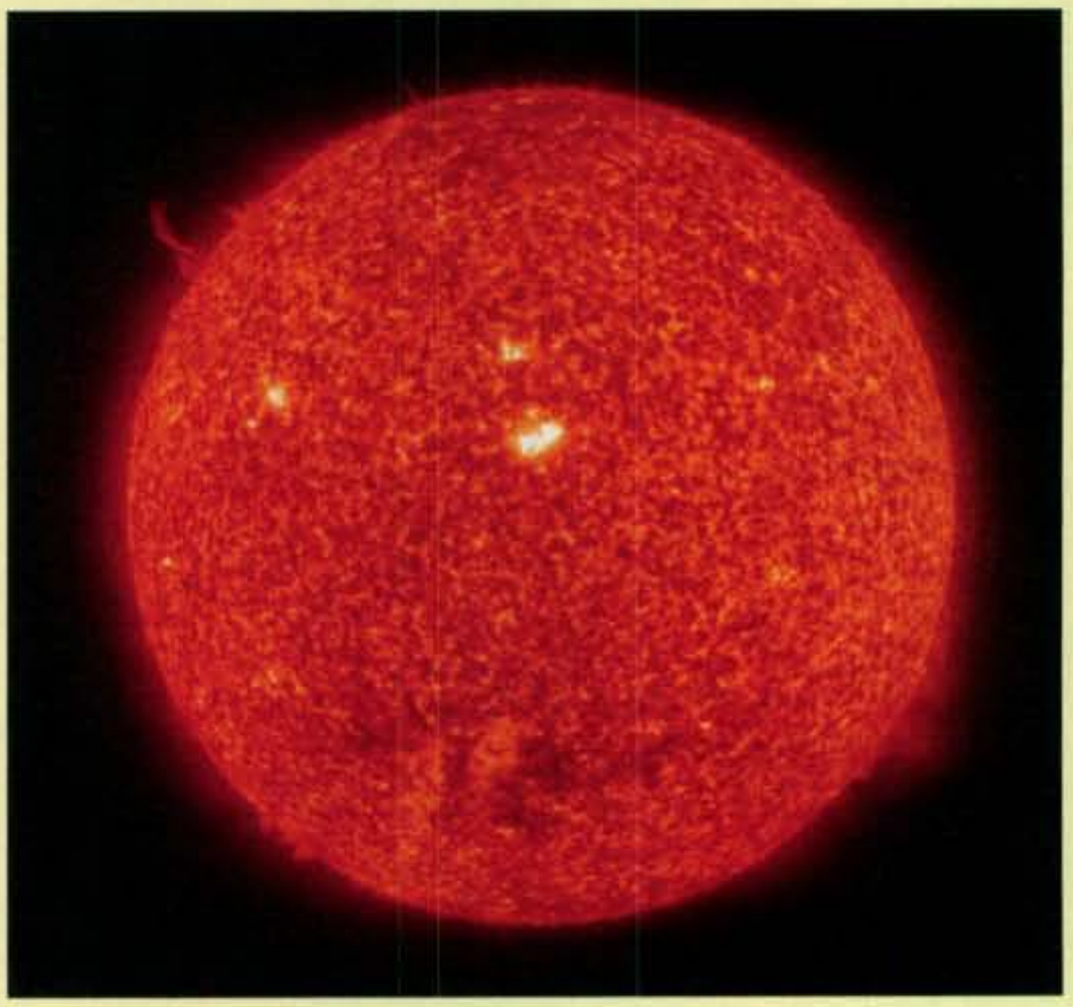


Fig. 1– The 2009 CQ WW SSB contest was incredible when compared with the last few years. This view of the Sun on October 24 at 1919 UTC reveals a very large sunspot region with a sunspot count of 21, which pushed the 10.7-cm flux up to 76. Even 10 meters played a major role in contest activity. (Source: SOHO/NASA)

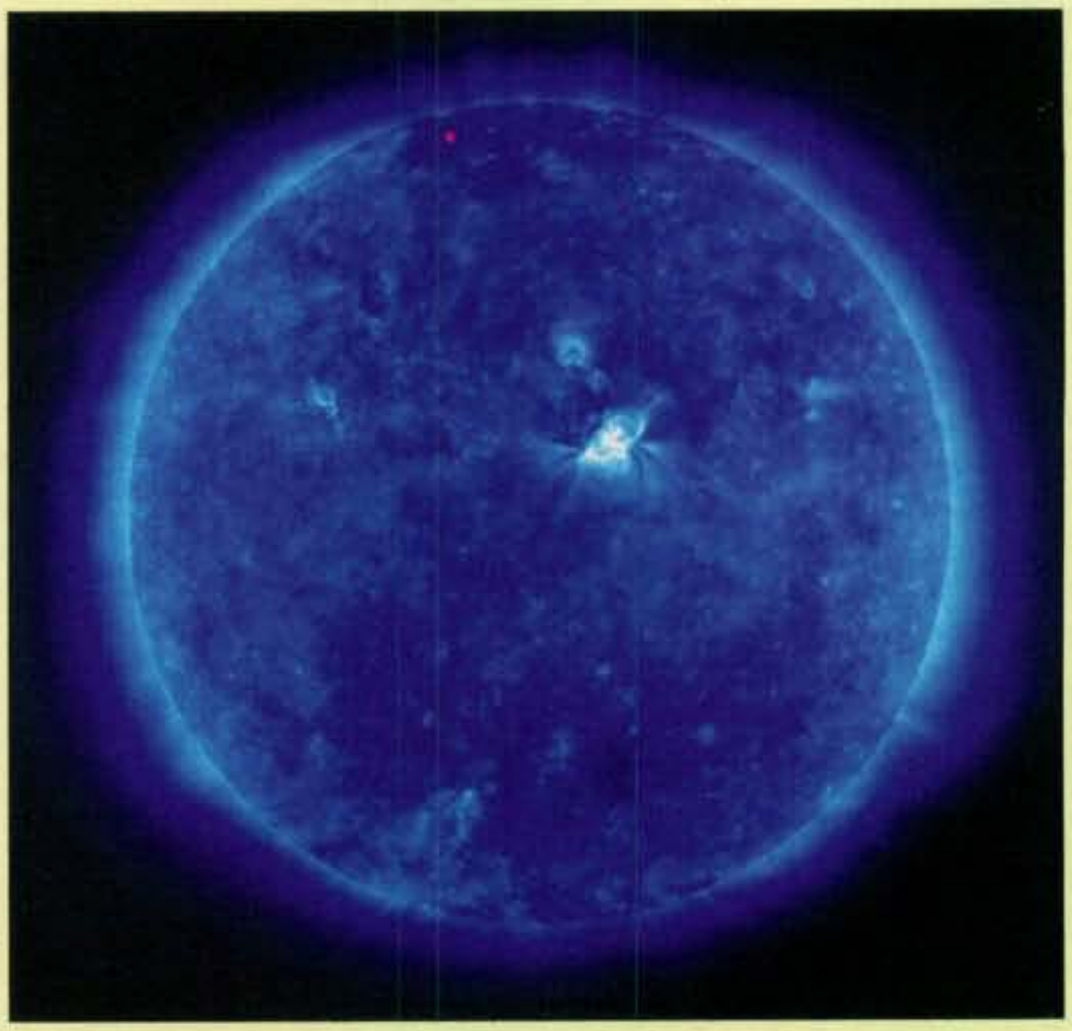


Fig. 2–This view of the Sun, taken at 1300 UTC, October 25, 2009, reveals the strong magnetic fields punching through the active sunspot region that woke up the entire HF spectrum during the 2010 CQ WW DX SSB Contest weekend. (Source: SOHO/NASA)

This has happened right around New Year's Day and that week. After that, it is rare.

The *Quadrantids* meteor shower is the major meteor shower for January and appears from January 1 to January 5. The maximum should occur on January 3. This shower can sometimes be quite intense, so it may be a good idea to set up some 2- and 6-meter schedules. Morning meteor openings may be the best bet during this month.

Check out *CQ VHF* magazine's propagation column for an in-depth look at propagation on VHF and above.

Current Solar Cycle Progress

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 72.3 for October 2009, continuing a slow but steady monthly rise. The 12-month smoothed 10.7-cm flux centered on April 2009 is 69.3. The predicted smoothed 10.7-cm solar flux for January 2010 is about 75, give or take about 6 points.

The Royal Observatory of Belgium reports that the mean monthly observed sunspot number for October 2009 is 4.6, showing a sure rise since March (0.7). The lowest daily sunspot value during October 2009 was zero, occurring on the 2–10, 12–22, and 31. The highest daily sunspot count for October was 19 on the 25–28. The 12-month running smoothed sunspot number centered on April 2009 is 2.2. A smoothed sunspot count of 16 is expected for January 2010, give or take about 7 points.

The observed monthly mean planetary *A*-index (*Ap*) for October 2009 is 3 (the lowest yet of this solar cycle minimum). The 12-month smoothed *Ap* index centered on April 2009 is 4.3. Expect the overall geomagnetic activity to be quiet during most days in January. At the time of writing, the forecast holds that January will be a very quiet month with little to no geomagnetic storminess. Refer to the "Last-Minute Forecast" on the first page of this column for the outlook on what days this might occur.

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. You may e-mail me, write me a letter, or catch me on the HF amateur bands. Please come and participate in my online propagation discussion forum at <http://hfradio.org/forums/>. See you on the air!

73, Tomas, NW7US

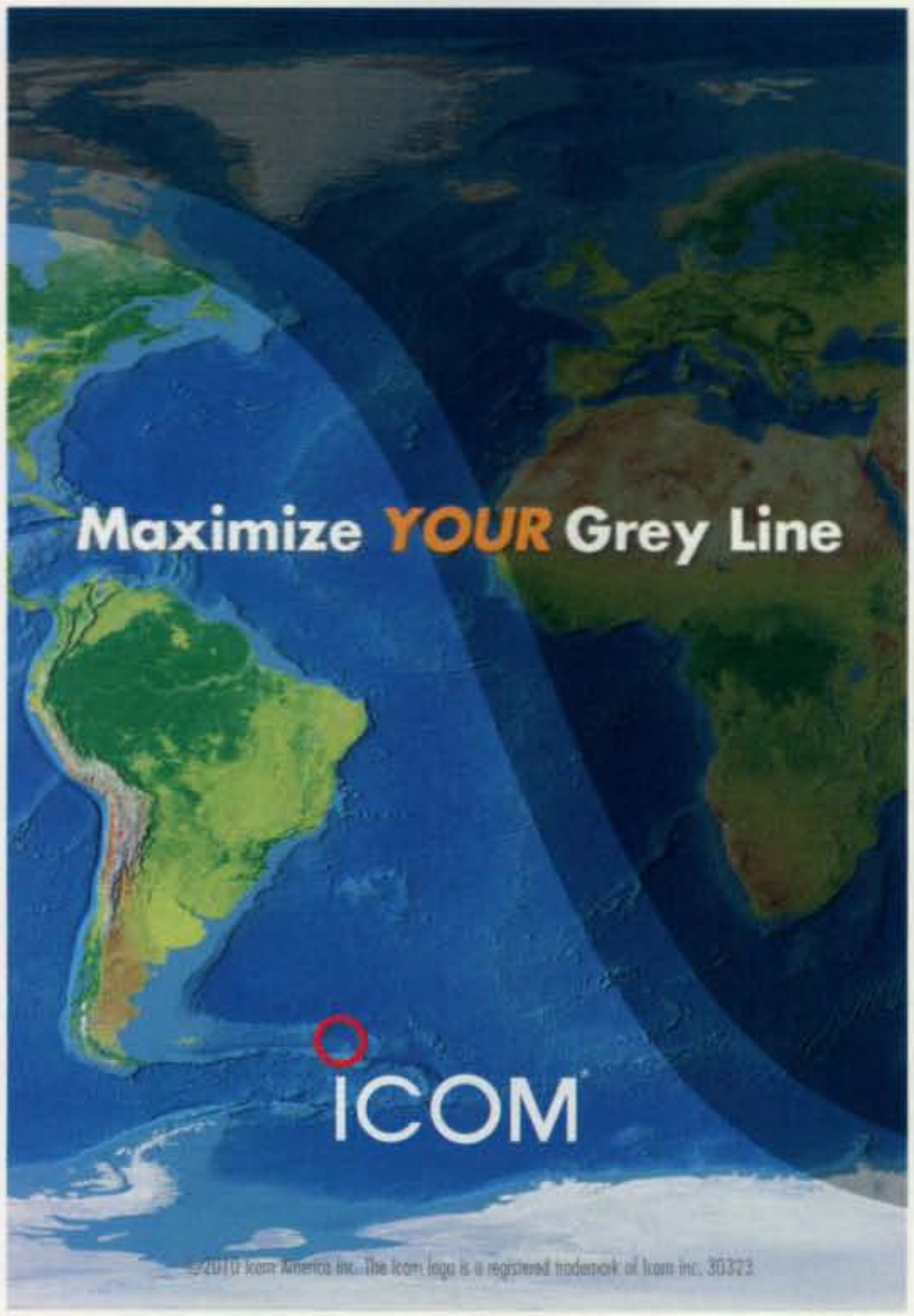
Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

2009 WPX SSB RESULTS
SINGLE OPERATOR
NORTH AMERICA
United States

NY1Q	**A**	**2,291,100**	**1472**	**700**
			(OP: N1HRA)	
AK1W	*	1,226,736	841	504
			(OP: K5ZD)	
KZ1K	*	1,110,900	1047	529
ND1X	*	943,250	1076	490
NW1E	*	654,192	788	413
			(OP: W1XX)	
K1FWE	*	463,050	500	350
W1BYH	*	381,248	492	322
W1KQ	*	344,761	438	307
AD1DX	*	297,470	502	302
K1AR	*	293,314	485	287
N1SV	*	272,130	662	282
AE1T	*	108,225	236	195
K1SEZ	*	101,065	267	205
KB1ODO	*	96,660	303	180
KA1VMG	*	74,534	217	166
W1UJ	*	39,560	165	115
K1KNJ	*	27,265	103	95
K1DG	*	10,797	67	59
KB1PXE	*	10,695	77	69
W1WEF	*	3,116	48	41
KQ2M/1	**14**	**7,034,082**	**2651**	**1082**
AD1L	*	78,323	180	167
AE1P	**7**	**252,774**	**497**	**279**
WJ1R	*	8,064	53	48
AA1O	**3.7**	**46,320**	**192**	**120**
KA1CQR	*	9,381	75	59
K1VW	**1.8**	**12,530**	**101**	**70**
***NV1N**	**A**	**2,351,175**	**1511**	**705**
			(OP: N1UR)	
*KA1API	*	104,125	233	175
*KB1PAJ	*	65,565	182	141
*WB1FJH	*	53,730	203	135
*NE1H	*	50,552	176	142
*KR1A	*	42,640	158	130
			(OP: KL7JT)	
*KA1C	*	40,248	161	129
*W2JU/1	*	39,508	156	119
*WO1N	*	35,369	142	113
*N4WO/1	*	34,970	188	130
*KB1FRK	*	23,504	133	104
*W1WH	*	21,714	115	94
*N1IMW	*	18,576	116	86
*W1ASB	*	14,450	96	85
*N1NN	*	12,874	98	82
*W1FA	*	9,880	70	65
*K1NPT	*	9,514	88	71
*KJ4DHB/1	*	7,875	69	63
*K1VU	*	5,664	55	48
*KB1JUF	*	2,814	47	42
*N1QN	*	1,026	19	19
*N1XQ	*	1,012	25	22
***N1WRK**	**21**	**3,534**	**40**	**38**
***KG1V**	**14**	**47,619**	**165**	**143**
*NX1Y	*	4,181	39	37
*KF1D	*	3,570	46	42
***NJ1H**	**3.7**	**62,568**	**162**	**132**
WN2O	**A**	**1,673,685**	**1277**	**585**
			(OP: N2GC)	
K2PS	*	169,231	466	229
AB2ZY	*	120,342	263	186
WS9M/2	*	89,265	220	165
WM2Z	*	86,327	237	173
WA2ETU	*	50,864	172	136
NE2I	*	50,148	172	126
W2MC	*	47,376	148	126
K2NV	*	46,150	144	130
K2BBQ	*	40,960	151	128
K2MFW	*	21,150	108	94
KA2VZX	*	4,366	37	37
KC2KZJ	*	4,329	39	37
K2XA	*	1,200	26	25
K2AMI	*	434	14	14
N2RJ	**14**	**1,425,000**	**1028**	**600**
KM2O	*	107,439	237	177
NQ3N/2	*	95,370	299	187
W3JK/2	*	7,644	52	52
N2DWS	*	608	19	19
KY2J	**7**	**126,480**	**302**	**186**
			(OP: W2XL)	
W2UJ	**3.7**	**94,355**	**223**	**167**
AI2N	*	24,564	124	92
AA2NA	*	5,763	64	51
***WA2JQK**	**A**	**461,719**	**576**	**361**
*NP3D/NY2	*	287,100	409	300
			(OP: EW1AR)	
*N2FF	*	231,777	357	273
*KS2G	*	220,865	377	271
*AB2TC	*	217,035	354	265
*N2ZN	*	127,312	298	218
*WA2MCR	*	123,410	315	205
*W2TZ	*	104,676	229	183
*KD2MU	*	73,206	234	166
*W2GDJ	*	54,740	168	140
*WB2KLD	*	50,697	152	131
*N2MTG	*	36,120	145	120
*K9CHP/2	*	34,314	158	129
*KC2OGR	*	32,214	127	118
*KC2QJB	*	30,564	129	108
*WA2LXE	*	26,900	128	100
*N2MH	*	25,908	132	102
*K3QE/2	*	23,904	123	96
*W2VU	*	19,505	106	83
*AB2ZI	*	8,456	56	56
*KB3GQK/2	*	5,335	61	55
*WB2LEB	*	4,620	58	44
*KC2UCJ	*	3,268	44	43
*N2ZUL	*	1,711	31	29
*KC2OVM	*	741	21	19
***WB2AIV**	**21**	**1,296**	**29**	**27**
*W2LHL	*	799	17	17
***K2HVE**	**14**	**13,659**	**99**	**87**
*KC2TYZ	*	3,225	47	43
*KG2AF	*	2,262	45	39
*N2AMW	*	792	26	22
*KC2JRQ	*	1	1	1
***AA2DS**	**7**	**714**	**22**	**21**
***W2LP**	**3.7**	**9,891**	**86**	**63**
***KC2RKU**	**1.8**	**2,556**	**45**	**36**
WY3P	**A**	**8,898,968**	**3133**	**1066**
			(OP: N3KS)	
K3ZO	*	5,797,440	2202	880
N1WR/3	*	1,826,250	1368	625
N3UM	*	811,200	830	480
W3GH	*	367,920	643	315
N3YW	*	325,416	395	298
KW3A	*	217,854	544	247
WI3K	*	111,926	251	191
WØBR/3	*	98,283	229	181
K3RMB	*	29,016	124	104
K3ISH	*	10,200	61	60
AI3Q	**14**	**42,496**	**143**	**128**
AD8J/3	**7**	**16,830**	**58**	**66**
W3BGN	**3.7**	**778,508**	**774**	**404**
***W3LL**	**A**	**744,224**	**689**	**416**
*KB3LIX	*	297,348	438	284
*ND3R	*	168,260	322	235
*N3ALN	*	112,996	333	212
*K3TN	*	35,535	147	115
*AD4G/3	*	32,625	188	125
*N3KUN	*	23,800	140	100
*K3VED	*	22,892	108	97
*N3CHX	*	10,080	71	56
*N2US/3	*	7,150	51	50
*N3JNX	*	6,966	66	54
*W3EDP	*	6,318	64	54
*KB3EXB	*	6,298	51	47
*N1IG/3	*	2,829	47	41
*K3YDX	*	2,088	39	36
*KB3SCZ	*	1,914	39	33
*NU3Q	*	270	15	15
***WA2VQV/3**	**14**	**27,848**	**121**	**118**
*K3LAB	*	3,825	49	45
***AI3G**	**7**	**3,784**	**55**	**43**
K4ZW	**A**	**7,143,392**	**2711**	**992**
K5RQ/4	*	2,520,180	2225	718
K4FX	*	1,824,984	1302	639
K4PV	*	1,496,082	1390	597
AA4NU	*	1,306,942	1219	559
AD4EB	*	1,256,564	1233	548
N4WZ	*	848,072	1202	467
AK4K	*	633,386	867	442
			(OP: W4LT)	
KT6V/4	*	496,252	771	388
W4EEH	*	428,465	599	335
W4KW	*	424,011	511	331
KU8E/4	*	339,300	481	300
K4IE	*	258,312	353	282
N3FP/4	*	175,032	379	234
KD2JA/4	*	166,439	296	217
W2YE/4	*	143,662	294	218
NE4M	*	136,904	338	218
KX4D	*	126,126	304	198
WD8QIJ/4	*	111,474	246	198
W2OO/4	*	98,700	214	188
WK4P	*	97,280	262	190
W6GBG/4	*	76,779	254	171
K7CS/4	*	76,319	224	167
W4NZ	*	73,839	203	151
N4CW	*	70,794	172	171
N4DXI	*	70,370	207	155
N4LV	*	63,510	194	145
W4WSW	*	45,540	193	138
KI4FIA	*	44,044	228	143
N4LZ	*	40,796	164	124
K3IXD/4	*	38,522	127	103
W4AS	*	32,000	109	100
WV4V	*	30,660	122	105
W4OJC	*	26,928	111	102
KT4Q	*	26,228	88	83
W8DQ/4	*	22,746	122	102
N3JT/4	*	21,680	94	80
NJ4F	*	18,879	99	87
KI4VCT	*	13,440	99	80
KJ4CNN	*	13,134	84	66
K4XZ	*	12,450	93	83
WA4ZXV	*	10,902	74	69
WX4G	*	10,488	63	57
KW2N/4	*	8,820	67	63
K4DZR	*	5,160	46	40
K4SV	*	3,135	33	33
WC2Z/4	*	1,250	25	25
K4MF	**28**	**6,118**	**52**	**46**
NJ4U	**21**	**448,944**	**641**	**376**
			(OP: K4EA)	
KV4T	*	155,040	350	228
K4BP	**14**	**38,199**	**125**	**119**
WO4O	*	24,661	96	91
N4MM	*	4,407	40	39
W4GHD	*	180	9	9
W4NP	**7**	**535,481**	**987**	**393**
K4KZZ	*	461,714	668	341
AG4W	*	341,000	684	310
NY4PD	*	224,077	460	269
AA4D	*	20,007	83	81
KA8Q/4	**3.7**	**15,618**	**65**	**57**
N4DW	*	574	15	14
***N4XL**	**A**	**912,636**	**949**	**502**
*W4TMN	*	591,624	662	396
*KT4ZB	*	553,380	783	401
*WB4JFS	*	435,600	574	330
*K4MDX	*	419,012	597	356
*AB4GG	*	373,584	596	344
*KS4X	*	291,828	394	293
*NA4K	*	276,885	494	293
*W4YE	*	246,120	391	280
*K4CX	*	195,529	406	251
*KU4MT	*	140,970	323	222
*NM4M	*	135,378	297	207
*AA4UC	*	121,783	314	193
*AI4FR	*	112,881	312	191
*KI4VEU	*	93,420	247	180
*K4REB	*	88,914	213	174
*AI4GR	*	81,220	255	155
*NB4M	*	72,488	207	164
*K4DLI	*	67,230	203	162
*K4OD	*	66,805	205	155
*NN4DF	*	66,600	182	148
*W4TKI	*	63,550	208	155
*N1ADY/4	*	57,256	175	136
*AJ4JD	*	57,232	214	146
*W4SKI	*	56,322	210	149
*KU4WD	*	56,007	186	147
*WS4F	*	54,684	197	147
*KI3O/4	*	54,648	198	138
*KI4TZU	*	51,054	183	134
*WN4AT	*	40,748	163	122
*N4RTD	*	40,320	169	126
*N3UC/4	*	35,937	150	121
*W4NBS	*	33,228	131	117
*K4CQW	*	32,828	151	116
*K4FTO	*	31,860	158	118
*WA4EMU	*	30,555	111	97
*KD4MZM	*	26,416	136	104
*K9RIM/4	*	24,276	129	102
*W4GMH	*	23,030	159	98
*N4VA	*	22,750	114	91
*K4GOP	*	22,557	136	103
*KE4KY	*	20,839	107	91
*AI4G	*	19,400	144	97
*KM4RK	*	18,318	107	86
*K4SQ	*	17,286	99	86
*K3VIN/4	*	17,160	104	88
*W4JHU	*	16,968	104	84
*W4NI	*	15,691	77	71
*AI4KM	*	14,850	104	90
*KJ4BIX	*	14,013	89	81
*W4IHI	*	12,960	80	72
*K4GDW	*	9,765	78	63
*W4SQL	*	9,685	83	65
*WN4DX	*	8,288	61	56
*AI4QR	*	7,874	83	62
*KG4ZDM	*	7,290	65	54
*W4BK	*	7,056	72	63
*WC4MBC	*	5,551	62	61
*K9JG/4	*	5,512	62	52
*W4WNT	*	5,096	61	49
*KR1ST/4	*	4,998	59	51
*N4CWP	*	4,650	60	50
*WB3O/4	*	4,048	48	46
*WA4JA	*	3,864	52	42
*AA1AR/4	*	3,555	49	45
*W4HRC	*	3,010	37	35
*NR4C	*	2,010	33	30
*KJ4SAM	*	1,566	29	29
*N3TG/4	*	1,269	27	27
*KX4O	*	1,200	32	25
*KI4EEY	*	1,014	28	26
*AF4KL	*	722	20	19
*WD8RYC/4	*	560	14	14
*K2VX/4	*	330	15	15
*KJ4CNC	*	280	15	14
***NA4W**	**28**	**44,748**	**175**	**113**
			(OP: K4WI)	
*K4QVK	*	2,106	30	27
*KB2NEJ/4	*	1,100	21	20
***K9OM/4**	**21**	**217,620**	**464**	**279**
*KV1P/4	*	1,980	30	30
*NO4K	*	608	22	19
*K8OSF/4	*	420	15	15
***WB2TFM/4**	**14**	**91,317**	**293**	**183**
*KG4ZDY	*	1,995	38	35
*KØRRP/4	*	1,080	24	24
*KC4YBO	*	640	16	16
*AK4IK	*	340	17	17
***AA4FU**	**7**	**1,479**	**32**	**29**
*N4FFP	*	2	2	2
***KU4BP**	**3.7**	**262,350**	**561**	**275**
*K4EU	*	23,324	154	98
*W2DZO/4	*	5,544	76	56
***K4WI**	**1.8**	**64**	**8**	**8**
*KTØP/4	*	9	3	3
NR5M	**A**	**6,378,560**	**3619**	**992**
K5TR	*	4,414,326	3235	854
WM5R	*	3,852,993	2964	827
K5ER	*	913,086	1165	457
KZ5J	*	265,156	567	302
N5VU	*	160,200	366	225
K5LAD	*	153,410	360	230
K5ZCJ	*	121,952	268	206
AB5I	*	108,941	277	197
K7IA/5	*	87,480	222	180
N7FF/5	*	32,248	173	116
NØIRW/5	*	26,656	129	98
K5PAR	*	11,880	76	66
KE5QBZ	*	1,120	32	28
KZ5MM	**28**	**99,693**	**290**	**159**
			(OP: W5PR)	
N5DO	**21**	**57,456**	**171**	**133**
KC5TA	**14**	**2,623**	**44**	**43**
NN5J	**7**	**2,936,156**	**1726**	**692**
			(OP: KIBMB)	
NE5D	**1.8**	**22,022**	**141**	**91**
			(OP: K5RX)	
***WD5K**	**A**	**1,127,744**	**1077**	**526**
*N5AW	*	220,726	347	254
*WØVX/5	*	193,792	347	256
*KE5LQ	*	101,752	291	184
*WA5IYX	*	82,450	264	170
*AB5C	*	76,254	227	179
*K5MV	*	74,415	232	165
*NU5DE	*	60,356	201	158
			(OP: N5KF)	
*KØBWQ/5	*	59,079	227	141
*AB5XZ	*	52,773	213	147
*N5DGK	*	52,182	152	117
*KE5OG	*	41,922	198	137
*W5CF	*	37,465	187	127
*KK5JY	*	30,873	160	123
*N5HMH	*	19,656	143	104
*KX5RW	*	17,381	111	91
*KD5JKH	*	15,522	98	78
*N5UWY	*	13,090	91	85
*KB5HPL	*	12,166	99	77
*AE5PW	*	9,177	84	69
*WS5K	*	8,515	90	65
*KM5Z	*	7,820	86	68
*K5PI	*	5,712	57	51
*W8OU/5	*	3,854	44	41
*AI5G	*	3,772	50	46
*WK5P	*	3,276	43	42
*NA5O	*	3,225	60	43
			(OP: AA5JG)	
*KD5RXN	*	3,174	51	46
*AE5LQ	*	2,592	43	36
*K3TD/5	*	2,187	28	27
***NØRB/5**	**21**	**21,336**	**94**	**84**
*N5DTT	*	3,404	37	37
*N5ESA	*	3	1	1
***NN5Z**	**14**	**351,220**	**681**	**340**
			(OP: K5PX)	
*NZ5A	*	19,690	148	110
*K5KDD	*	3,150	36	35
*W5THT	*	1,150	23	23
*KD5RDR	*	20	5	4
NY6N	**A**	**3,994,056**	**2325**	**738**
			(OP: W6YI)	
W6TK	*	1,605,176	1724	566
KC6X	*	1,135,728	1142	528
WX6V	*	1,003,458	929	474
WA6KHK	*	643,302	1057	418
N6AA	*	578,340	538	340
N6IE	*	447,040	970	352
KI6VC	*	413,826	1081	334
N6NF	*	399,342	627	339
KI6CG	*	335,908	486	316
WA6ST	*	286,445	472	295
KG6D	*	277,412	630	311
NF6A	*	180,250	296	250
			(OP: K6XX)	
K6LRN	*	156,128	309	224
KI6T	*	128,260	281	220
N6AJR	*	128,068	336	202
NK6A	*	94,248	288	187
N6CK	*	92,685	328	185
WB6JJJ	*	85,444	213	164
WW6O	*	81,012	232	172
K6YK	*	74,152	232	184
WV6N	*	62,400	193	150
AF6T	*	57,246	195	141
			(OP: K6TD)	
W6KC	*	41,624	177	121
K6UUW	*	36,915	127	107
N6GEO	*	36,162	175	123
AE6RF	*	34,410	195	111
K6NA	*	33,915	103	85
KI6CDF	*	18,360	114	90
W7CB/6	*	18,328	93	79
AF6NI	*	9,052	86	73
KG6ZHC	*	5,152	62	56
WK6LA	*	2,880	49	40
			(OP: K6LA)	
K6HNZ	**14**	**1,105,125**	**1262**	**525**
KJ3X/6	*	520,188	873	402
			(OP: K1DQV)	
KT6YL	*	466,111	840	383
KB6A	*	265,146	546	321
N6BY	*	456	19	19
***NX6T**	**A**	**1,290,096**	**1435**	**527**
			(OP: K6AM)	
*AA6YX	*	251,394	509	293
*AA6K	*	242,328	386	276
*N6UWW	*	241,860	457	278
*N6IEF	*	138,859	329	239
*KG6OJB	*	99,203	296	169
*AF6AV	*	90,950	264	170
*AF6EV	*	75,036	239	156
*K6TV	*	45,540	178	138
*K6AAB	*	44,954	198	133
*KQ6X	*	41,652	159	117
*N6EF	*	37,557	165	117
*W6FB	*	36,226	169	118
*N6RZR	*	35,475	167	129
*WB6HYH	*	31,350	139	114
*KS6M	*	27,336	150	102
*KE6SHL	*	24,525	150	109
*KI6TXC	*	23,324	115	98
*NQ6L	*	22,351	150	103
*AC6E	*	18,343	102	83
*AA6EE	*	16,150	104	85
*KI6QDH	*	15,456	121	84
*K6AWO	*	14,190	105	86
*K6WSC	*	13,280	104	80
*AK6X	*	12,150	108	75
*N6ZE	*	8,040	76	60
*N6QZS	*	6,786	81	58
*K6CSL	*	6,125	65	49
*K6AUC	*	5,217	49	47
			(OP: N6NG)	
*N6SPB	*	5,170	63	47
*W6VAR	*	4,230	60	45
*KI6LTC	*	3,408	62	48
*K6JRA	*	1,550	31	31
*KA6GDT	*	1,222	28	26
*KG6YPH	*	1,175	30	25
*KI6GVI	*	1,125	27	25
*K6TT	*	384	16	16
*N6OU	*	378	15	14
*N5KO/6	*	360	12	12
*NS6T	*	200	12	10
*WO1NDR/6	*	102	6	6
***W6AFA**	**14**	**427,482**	**668**	**381**
*AE6YB	*	67,032	240	171
*K6BBQ	*	546	24	21
*KG6FWT	*	1	1	1
***KI6LZ**	**7**	**378,708**	**617**	**382**
*NT6X	*	7,800	66	60
***WA6WPG**	**3.7**	**22,936**	**121**	**94**
N7TT	**A**	**2,619,162**	**2218**	**738**
K7ZZ	*****	**2,583,168**	**2085**	**672**
AB7E	*	2,458,239	2192	707
W7ZR	*	1,616,598	1804	587
WA7LT	*	1,192,996	1066	548
NN7ZZ	*	949,395	1041	501
W7AT	*	897,324	1015	444
			(OP: W7EW)	
NB7V	*	599,368	1047	392
KC7V	*	598,536	797	408
NR7DX	*	512,924	740	397
			(OP: K7ABV)	
NF7E	*	367,965	694	333
WT7RC	*	279,310	476	310
			(OP: N7WR)	
KS7T	*	233,905	430	287
K7AR	*	231,946	395	286
W6AEA/7	*	226,368	351	288
WG7X	*	189,484	538	254
N7VF	*	175,560	356	210
KF7P	*	167,233	421	253
K7DSL	*	138,516	319	204
W6RLL/7	*	116,805	284	195
N7RO	*	108,030	422	195
KD7MSC	*	99,198	257	198
N6TW/7	*	85,212	189	162
N7VS	*	79,540	260	164
KI7Y	*	78,408	274	162
W7GKF	*	73,416	229	161
KN7K	*	66,825	251	165
K7FA	*	49,410	180	135
KW7I	*	44,604	185	126
KG7P	*	42,900	191	132
WR5G/7	*	41,168	153	124
K7EDX	*	37,022	117	107
K7XV	*	36,952	135	124
AD7UP	*	28,944	140	108
W7CAR	*	27,648	167	108
KV7DX	*	16,968	95	84
			(OP: KN5H)	
W7ABC	*	15,504	107	83
KB7UJI	*	8,856	84	72
W7IJ	*	6,670	60	58
KN5H/7	*	4,275	45	45
N7BRU	*	1,113	21	21
KK7CG	*	522	20	18
W7WA	**14**	**4,440,531**	**2627**	**939**
W7EB	*	619,245	1050	417
W7PU	*	88,239	279	201
K7EIQ	*	14,352	93	92
KC7UP	*	9,490	67	65
K7NWS	*	7,192	70	62
			(OP: W7VXS)	
W7EKG	*	3,680	47	46
KD7DCR	*	936	18	18
N6MZ/7	*	3	1	1
K7WP	**7**	**412,050**	**724**	**335**
W6XI/7	*	22,140	101	82
***K7ZSD**	**A**	**966,656**	**1005**	**472**
*K7PRW	*	172,840	430	232
*WAØWWW/7	*	154,050	323	237
*N7UR	*	124,898	321	197
*K7JE	*	99,828	215	188
*N4LS/7	*	89,308	258	166
*W7QN	*	83,333	246	167
*W7RV	*	53,550	158	126
*WY7LL	*	50,283	246	151
*W4LSC/7	*	47,244	151	127
*WE6EZ/7	*	44,280	205	135
*W7FYW	*	41,328	157	123
*W7KAM	*	39,750	166	125
*KA7ARK	*	36,504	172	117
*NS7B	*	29,561	126	103
*AD7MQ	*	29,150	165	106
*NE7D	*	27,432	139	108
*N7CKJ	*	26,368	131	103
*N7KCX	*	25,830	126	105
*N7QS	*	17,204	106	92
*W7GMC	*	16,562	118	91
*KE7LOQ	*	16,104	99	88
*K7TR	*	14,235	95	73
*W7ASF	*	12,936	108	88
*KD7RUS	*	12,561	102	79
*KE7FBY	*	11,440	101	80
*KD7RHI	*	7,797	77	69
*KC7H	*	7,605	79	65
*W7JFF	*	5,100	62	51
*KF7ADK	*	4,316	59	52
*W7YS	*	3,240	52	45
*KE7XM	*	2,106	27	27
*N6TPT/7	*	1,316	33	28
*K6UM/7	*	1,122	25	22
*AG1T/7	*	56	7	7
***W7UPF**	**21**	**36,270**	**136**	**117**
*K7MY	*	31,570	121	110
*W3CP/7	*	11,730	76	69
***AD7J**	**14**	**333,585**	**440**	**353**
			(OP: W7FP)	
*KN7T	*	110,880	347	210
*K7ACZ	*	96,048	199	174
*KE7VUX	*	2,530	51	46
*W7VXS	*	560	23	20
*NG7Z	*	42	7	7
*W3DRM/7	*	8	2	2
*K7GIM	*	3	1	1
***K7AWB**	**7**	**1,040**	**17**	**16**
WN8R	**A**	**308,432**	**441**	**296**
W8OHT	*	299,598	517	299
N8OC	*	152,672	264	208
W8GNM	*	151,728	265	218
W8LGX	*	126,480	302	204
AF8V	*	107,215	262	205
N8DSG	*	46,336	151	128
N8AA	*	17,775	83	79
W8MET	*	1,332	18	18
WB8O	**14**	**66,744**	**178**	**162**
KT8X	*	5,546	50	47
N8II	**7**	**498,292**	**772**	**347**
W8JMF	*	1,350	15	15
KG9Z/8	**3.7**	**3,572**	**54**	**47**
***WB8TLI**	**A**	**723,600**	**677**	**432**
*WZ8T	*	596,992	690	424
*NX8G	*	131,236	318	218
*KD8GOX	*	106,805	268	205
*WB8JUI	*	104,200	284	200
*AL7BA/W8	*	92,543	223	179
*AB8JR	*	75,650	231	170
*WT8E	*	74,934	229	181
*K8WV	*	67,116	177	141
*K8ME	*	63,027	216	149
*N8HP	*	50,715	192	147
*WB8LZA	*	36,432	174	132
*W8TM	*	32,973	105	87
*K4YJ/8	*	30,128	141	112
*KJ8O	*	27,965	176	119
*AF8C	*	25,500	121	100
*N8AE	*	24,252	124	94
*N2OPW/8	*	21,201	111	111
*KD8JDC	*	20,615	133	95
*W8RU	*	19,855	108	95
*W8IDM	*	18,818	111	97
*KD8HHG	*	17,313	107	87
*NF8M	*	11,020	94	76
*W8KNO	*	5,668	62	52
*KB8MYC	*	1,485	27	27
*KD8GRG	*	1,081	28	23
*N8QE	*	221	13	13
*WU8Y	*	128	8	8
*N8XTH	*	112	8	8
***NV8N**	**14**	**820,500**	**897**	**500**
*KE8FO	*	24,582	118	102
*N8WAV	*	6,466	60	53
*N8ROK	*	3	1	1

***N8BV**	**7**	**20,768**	**100**	**88**
***NR8U**	**3.7**	**12,792**	**111**	**78**
*AA8L	"	119	8	7
WE9V	**A**	**535,800**	**639**	**376**
K9ZO	"	262,319	490	277
N9WKW	"	161,280	323	224
K9JIG	"	114,036	300	204
NA9US	"	103,224	243	187
K9EN	"	97,970	238	202
AI9L	"	85,084	228	178
N9UY	"	80,675	231	175
W3HDH/9	"	17,548	97	82
KC9IL	"	10,764	79	69
N9NA	"	6,783	62	51
ND9E	"	405	15	15
W9SE	**28**	**102**	**6**	**6**
K9CT	**14**	**2,241,589**	**1524**	**721**
W9EXY	"	1,481,116	1065	626
K9DN	"	106,284	240	204
W9LX	"	47,084	167	149
N9FC	"	27,160	100	97
K9UQN	"	2,310	39	35
K9NW	**7**	**1,012,455**	**1223**	**453**
AB9H	"	565,862	925	374
KX9DX	"	184,992	524	246
WB9AYW	"	399	19	19
K9SH	**3.7**	**190,995**	**486**	**255**
KK9V	"	11,016	93	68
***KS9K**	**A**	**1,232,160**	**970**	**510**
				(OP: N4TZ)
*WW9R	"	301,837	704	287
*N9LYE	"	220,594	441	271
*K9JE	"	173,430	334	246
*KC9CDW	"	132,662	395	226
*W9QL	"	131,864	401	212
*NJ9Z	"	61,740	202	140
*KB9YGD	"	58,896	283	144
*WB2L/9	"	51,652	219	148
*WR9Y	"	45,880	216	148
*N9WEW	"	31,806	170	114
*KW9N	"	29,754	121	114
				(OP: K9MI)
*KC9KIO	"	25,536	150	112
*KC9IRQ	"	24,786	147	102
*KD4ULW/9	"	13,800	86	75
*W9VQ	"	13,248	80	72
*AI9I	"	10,824	72	66
*W89L	"	10,650	92	75
*KC9FZT	"	6,720	80	64
*N9BT	"	5,194	65	53
*K9TCD	"	4,773	44	43
*KC9GRD	"	4,182	64	51
*K9AIH	"	4,094	58	46
*WD9HDT	"	3,080	51	44
*KA9CLP	"	2,555	37	35
***W9IIX**	**14**	**94,525**	**224**	**199**
*KØCD/9	"	71,331	236	177
*W9ILY	"	23,232	103	96
*KC9AMM	"	8,040	73	67
*KC9DFU	"	4,800	55	50
*NØICV/9	"	133	8	7
***K9SQL**	**7**	**196,458**	**459**	**239**
*KA9O	"	91,866	289	183
*N9TF	"	73,260	277	165
NØQO	**A**	**3,708,432**	**2490**	**849**
KØRH	"	1,656,235	1960	599
KCØMO	"	1,155,944	1255	524
				(OP: KØOU)
WØBH	"	934,467	1423	467
KØDEQ	"	575,928	783	421
NØUY	"	178,500	392	250
KØGAS	"	164,304	388	252
WBØN	"	161,532	325	252
KØFX	"	157,504	260	214
WAØMHJ	"	117,162	236	207
NØRN	"	92,050	202	175
WWØAL	"	71,890	232	158
NCØB	"	56,502	172	146
W7KU/Ø	"	54,279	194	163
NAØBR	"	35,230	158	130
KØXTR	"	25,482	130	93
NSØM	"	24,960	115	96
KBØL	"	7,884	77	73
N6BXO/Ø	"	2,400	30	30
KCØVEU	"	2,144	33	32
KDØACO	"	1,155	23	21
WØLSD	**21**	**12,416**	**71**	**64**
WØEWD	**14**	**1,499,887**	**1309**	**631**
KØPK	"	340,119	540	351
WØPPF	"	40,044	162	141
NØUNL	"	26,550	128	118
WØCEM	**7**	**286,847**	**723**	**293**
KØETV	"	111,241	312	199
***NX7TT/Ø**	**A**	**1,826,260**	**1766**	**635**
*WBØTSR	"	259,880	450	292
*KBØYH	"	228,897	429	261
*KØKP	"	150,516	319	222
*AIØL	"	140,798	408	226
*WAØLJM	"	98,406	297	198
*KØWHV	"	71,822	219	173
*KUØDM	"	67,200	212	168
*WØETT	"	59,124	200	156
*KKØSD	"	47,085	190	129
*NØAG	"	45,486	210	133
*WSØZ	"	39,693	194	131
*WØPC	"	28,084	169	119
*NØLLH	"	18,972	130	93
*NNØQ	"	18,601	122	89
*WØCBH	"	15,792	98	84
*KKØG	"	15,750	128	90
*WØRO	"	13,575	94	75
*KCØUUT	"	12,236	93	76
*KCØYJO	"	11,858	103	77
*WGØM	"	8,500	110	68
*KØACP	"	4,998	53	49
*ACØOJ	"	4,947	65	51
*KSØWV/Ø	"	4,646	59	46
*KDØEPN	"	2,470	43	38
*KØMIS	"	1,872	42	36
*KØANS	"	1,364	34	31
*KBØTLC	"	1,134	33	27
*KØAP	"	1,081	23	23
*NGØK	"	952	32	28
*KCØGLA	"	891	29	27
*WØNFS	"	378	20	18
*KCØYHU	"	132	11	11
***KAØEIC**	**28**	**12**	**2**	**2**

***NØUU**	**21**	**22,015**	**97**	**85**
*W9ELN/Ø	"	468	14	12
***AAØNK**	**14**	**93,314**	**232**	**194**
*K4LSU/Ø	"	18,912	108	96
*KDØDRQ	"	15,326	125	97
*NØGOS	"	14,536	117	92
*NØUJJ	"	1,107	32	27
*KFØIQ	"	1,064	32	28
*NØHIO	"	960	26	24
*W9TTT/Ø	"	48	6	6
*KCØFUE	"	9	3	3
***NYØT**	**7**	**17,936**	**118**	**118**
*KCØEEP	"	20	5	5
Alaska				
AL1G	**14**	**432,236**	**669**	**301**
***KL7R**	**A**	**50,160**	**161**	**110**
*AHØAH/KL7	"	3,430	41	35
***KL1SF**	**14**	**19,800**	**97**	**90**
*WL7UQ	"	15,265	92	71
Barbados				
8P5A	**A**	**17,863,617**	**5184**	**1173**
				(OP: W2SC)
Canada				
VA1MM	**A**	**1,115,196**	**882**	**398**
VE1MC	"	1,035,468	706	441
*VA3YP	"	708,645	570	357
*VE3KPP	"	612,125	605	295
*VE3TU	"	357,831	438	261
*VE3OBU	"	249,390	321	255
*VE3FH	"	225,356	330	212
*VE3JM	"	179,450	259	194
*VE3MCF	"	146,520	253	185
*VE3TW	"	126,195	222	179
*VE3NB	"	55,062	131	126
*VA3GML	"	51,584	147	128
*VE3JI	"	43,834	130	101
*VE3CKG	"	11,948	63	58
*VA3HUN	"	1,740	30	29
***VA3WPV**	**28**	**48**	**4**	**4**
***VE3RHD**	**14**	**12,765**	**85**	**69**
*VA3ARK	"	4,370	48	46
*VE3AJ	"	1,550	27	25
*VE3OIL	"	434	15	14
*VA3RJ	"	420	15	14
VE4EAR	**A**	**1,914,220**	**1091**	**565**
***VE4TV**	**A**	**36,400**	**141**	**100**
VE5ZX	**14**	**2,342,150**	**1558**	**695**
VE5ZC	"	2,336	38	32
***VA5LF**	**A**	**4,180**	**50**	**44**
VE6FN	**A**	**220,190**	**360**	**227**



VO2NS	"	353,288	439	316
***VE1ZA**	**A**	**274,833**	**314**	**261**
*VE1RAR	"	96,701	191	149
*VO1OR	"	17,252	83	76
***VA1XBN**	**14**	**4,830**	**42**	**42**
***VE9CEH**	**3.7**	**136,186**	**246**	**149**
VE2GSO	**A**	**122,286**	**272**	**178**
VA2WDQ	"	77,560	174	140
VE2DWA	**1.8**	**7,480**	**53**	**40**
				(OP: LU7DW)
***VE2XAA**	**A**	**755,298**	**513**	**426**
*VA2RIO	"	92,040	198	177
*VE2AWR	"	31,416	125	84
***VE2AIU**	**14**	**1,127**	**26**	**23**
*VE2GLA	"	874	20	19
VC3A	**A**	**13,203,475**	**3529**	**1175**
				(OP: VE3AT)
VE3EJ	**A**	**13,139,096**	**3473**	**1156**
VE3CX	"	4,569,840	2064	720
VE3TA	"	2,218,032	1088	584
VE3NE	"	2,181,250	1117	625
VE3WIB	"	1,621,370	937	562
VE3RZ	"	1,098,499	801	397
VE3OI	"	440,895	438	247
VA3EC	"	98,696	225	169
VE3WBR	"	25,315	98	83
VA3CFK	"	11,088	67	63
VA3FP	**21**	**24,840**	**110**	**92**
VA3XH	**7**	**296,588**	**338**	**212**
***VE3DZ**	**A**	**783,356**	**603**	**404**
***VA3SWG**	**A**	**747,091**	**626**	**347**
VE6SF	**14**	**976,950**	**875**	**501**
***VE6LE**	**A**	**64,042**	**172**	**142**
VE7XF	**A**	**558,182**	**518**	**397**
VA7ST	"	410,060	509	290
VE7TUG	"	45,000	154	120
VE7GBK	"	1,425	26	25
VE7ON	**14**	**78,030**	**197**	**170**
***VE7UQ**	**A**	**364,770**	**447**	**270**
*VE7HA	"	202,215	345	221
*VE7FCO	"	96,836	213	172
*VA7CRZ	"	91,930	213	145
*VE7IN	"	65,928	163	134
*VE7RSV	"	32,100	117	100
*VA7GAP	"	5,499	54	47
***VE7JT**	**14**	**25,553**	**122**	**101**
VY1CQ	**A**	**72,174**	**170**	**138**
Cayman Islands				
ZF1A	**14**	**4,929,930**	**2759**	**837**
				(OP: ZF2AH)
***ZF2AE/ZF8**	**A**	**6,016**	**50**	**47**
				(OP: AA5UK)
Costa Rica				
***TE2M**	**7**	**13,600**	**52**	**50**
				(OP: TI2KAC)
Cuba				
***CO7PH**	**A**	**50,927**	**170**	**127**
***CO2JD**	**3.7**	**132,000**	**215**	**150**
*CO8AW	"	6,080	46	40

Dominican Republic				
***HI3GSB**	**21**	**7,616**	**71**	**56**
*HI8PJP	"	6,210	51	46
***HI3CCP**	**14**	**1,243,212**	**1197**	**491**
***HI3TEJ**	**7**	**2,869,380**	**1061**	**570**
Greenland				
OX2A	**A**	**2,762,448**	**1225**	**624**
				(OP: OX3KQ)
Grenada				
J37T	**A**	**14,697**	**81**	**71**
				(OP: VE3EBN)
Guadeloupe				
***FG1PP**	**A**	**61,994**	**169**	**139**
Guatemala				
***TG9AXF**	**14**	**1,313,637**	**1207**	**507**
Haiti				
***HH2/I8UZA**	**14**	**48,512**	**159**	**128**
Honduras				
***HQ2W**	**14**	**186,244**	**427**	**202**
***HQ9R**	**7**	**639,480**	**519**	**292**
Martinique				
FM5BH	**A**	**8,429,961**	**3126**	**917**
***FM1HN**	**14**	**703,764**	**623**	**452**
Mexico				
XE1MEX	**A**	**38,080**	**126**	**112**
***XE2AUB**	**A**	**470,525**	**626**	**319**
*XE1GRR	"	170,046	392	201
*XE2RV	"	16,898	96	71
***XE2YWH**	**28**	**574**	**14**	**14**
***XE1CQ**	**21**	**98,892**	**282**	**164**
Nicaragua				
YN2BQ	**14**	**3,656,289**	**2152**	**767**
Panama				
***HP3FTD**	**A**	**65,016**	**168**	**126**
***HP1RIS**	**28**	**34,196**	**139**	**103**
***HP1ALX**	**14**	**2,340**	**32**	**30**
Puerto Rico				
WP4SK	**A**	**1,126,080**	**1246**	**414**
***NP3CW**	**A**	**188,718**	**408**	**213**
*WP3GW	"	186,093	304	207
*NP4G	"	65,668	171	138
*KP4RAY	"	5,289	47	41
Sint Maarten				
PJ7MF	**7**	**103,752**	**153**	**131**
St. Lucia				
J6/W5JON	**A**	**65,340**	**188**	**135**

Virgin Islands				
WP2Z	**7**	**2,600,516**	**983**	**542**
				(OP: K8MJZ)
AFRICA				
Canary Islands				
EA8MQ	**A**	**49,062**	**148**	**111**
EA8LS	**14**	**421,449**	**443**	**329**
EF8G	**7**	**36,720**	**85**	**80**
				(OP: EA8CNB)
***EC8ADW**	**A**	**1,579,008**	**1007**	**512**
*EA8BTM	"	939,078	775	406
*EA8OM	"	321,720	373	280
*EC8AFM	"	43,290	138	111
*AM8A	"	24,682	92	82
				(OP: EA8DD)
***EA8/DL3KVR**	**21**	**567,930**	**587**	**330**
*EC8AQQ	"	182,320	291	215
Ceuta and Melilla				
***EA9BO**	**A**	**1,944**	**28**	**27**
Guinea-Bissau				
J5UAP	**14**	**1,263,522**	**864**	**501**
Italy (Africa)				
IG9/I2ADN	**28**	**12,060**	**79**	**60**
***IH9YMC**	**21**	**4,719**	**48**	**39**
Madeira Islands				
***CT3HF**	**A**	**522,389**	**495**	**343**
*CS3MAD	"	352	9	8
				(OP: CT3EN)
***CT3FJ**	**14**	**11,328**	**67**	**59**
Morocco				
CN2R	**A**	**20,336,577**	**4897**	**1219**
				(OP: W7EJ)
5D5A	**14**	**11,356,980**	**3583**	**1070**
				(OP: IK1HJS)
***CN2BC**	**A**	**4,208,064**	**1966**	**707**
				(OP: DL7BC)
*CN4P	"	2,349,050	998	550
				(OP: CN8NK)
*CN8SG	"	1,643,665	1025	485
*CN8YE	"	684,495	610	369
Namibia				
***V55X**	**A**	**932,824**	**710**	**452**
				(OP: V51YJ)
Senegal				
6W1RW	**A**	**13,847,382**	**3609**	**1041**
				(OP: F6BEE)
6W1SJ	**14**	**7,066,140**	**2581**	**930**
				(OP: E78A)
***5V7E**	**21**	**848,166**	**593**	**426**
				(OP: RW3TN)
South Africa				
***ZS4JAN**	**A**	**23,760**	**121**	**88**
*ZS2EC	"	945	21	21
*ZS1JY	"	448	14	14
Tunisia				
3V8BB	**A**	**14,745,708**	**3589**	**1086**
				(OP: YT1AD)
***3V8SS**	**A**	**1,554,597**	**831**	**451**
Armenia				
***EK3SA**	**A**	**416,835**	**432**	**295**
Asiatic Russia				
RC9O	**A**	**10,441,809**	**2995**	**963**
				(OP: UA9PC)
UA9CLB	**A**	**9,482,064**	**2723**	**912**
RN9MA	"	1,151,892	782	441
RA9CB	"	458,325	452	315
RU9CC	"	389,700	445	300
UA9BS	"	255,780	315	245
RW9USA	"	253,827	331	237
RV9UF	"	184,644	300	223
RA9JBA	"	130,592	254	176
RK9KWI	"	30,736	121	113
UA9CGL	"	9,150	56	50
RU9UE	"	3,840	28	24
RZ9HG	**14**	**3,560,010**	**1739**	**795**
RZ9UI	"	1,567,892	1118	593
RA9JM	"	796,824	700	434
RA9AE	"	600,400	570	380
RX9JP	"	573,800	587	380
RK9DM	"	442,532	503	349
RK9UN	"	201,960	424	264
RW9TP	"	94,940	208	188
RA9AMO	"	30,765	116	105
RA9AP	"	29,172	102	102
UA9QQ	**7**	**239,514**	**244**	**191**
RX9UKF	**3.7**	**67,068**	**148**	**108**
RV9SV	**1.8**	**134,514**	**192**	**141**
***RA9FTM**	**A**	**2,277,196**	**1088**	**586**
*UA9ACJ	"	860,256	592	348
*RA9AAA	"	789,234	642	398
*UA9TF	"	335,013	387	301
*RZ9CJ	"	305,347	365	241
*UA9AGX	"	283,985	339	257
*RA9YAI	"	254,203	375	233
*RX9CCJ	"	219,672	287	216
*UA9QCZ	"	196,212	294	197
*RZ9UGN	"	162,936	295	219
*RX9WX	"	141,648	204	156
*RZ9WU	"	59,290	131	110
*RX9DJ	"	48,240	157	134
*RZ9HA	"	43,810	152	130
*RW9WW	"	37,392	119	114
*RV9UB	"	27,522	114	99
*RA9CIN	"	26,986	121	103
*RA9KM	"	18,000	91	80
*UA9CBM	"	16,704	73	64
*UA9XF	"	13,760	76	64
*UA9JFH	"	8,944	59	52
*RA9MJ	"	6,625	58	53
*UA9MD	"	3,040	39	38
*RU9YF	"	2,808	38	36
*UA9YJI	"	1,140	22	20
*UA9XHT/9	"	416	20	16
***RA9UAD**	**28**	**4**	**2**	**2**
***RZ9YF**	**21**	**37,248**	**173**	**128**
*RW9RA	"	7,040	79	64
*UA9QA	"	5,757	71	57
*UA9FGJ	"	3,555	53	45

*RA9FEU	*	650	28	25
*UA9QF	*	280	17	14
*RV9CQ	*	143	11	11
*RA9XU	14	366,135	437	317
*UA9OMT	*	289,792	398	283
*UA9UBL	7	635,116	454	332
*RA9FEL	*	294,556	258	211
*UA9WIK	*	42,585	98	85
*RA9MLR	*	3,072	24	24
UAØIDZ	A	1,186,776	1108	477
UAØDC	A	1,004,864	859	448
RVØAU	*	987,152	740	412
RAØFU	*	621,054	731	378
RWØUU	*	491,040	730	352
RWØUM	*	393,415	632	311
UAØACG	*	389,360	509	310
UAØOA	*	289,680	500	272
UAØDAM	*	148,824	296	216
RAØSU	*	133,525	268	175
RKØAB	*	116,058	224	174
UAØAPV	*	83,050	175	151
UAØCW	*	35,088	128	102
RXØQA	*	25,088	115	98
RWØAQ	*	15,192	86	72
RUØAE	*	2,214	29	27
RWØBM	21	450	17	15
RAØQC	14	1,342,550	975	550
RAØAA	*	806,835	713	447
RAØQD	*	703,120	745	440
RUØAW	*	44,850	168	138
RAØUF	*	23,312	121	94
RKØUT	*	10,494	72	66
*RVØSR	A	1,069,453	889	473
*UAØCNX	*	197,457	396	249
*RAØACM	*	185,703	313	239
*UAØSR	*	130,398	303	211
*RAØLE	*	35,995	154	115
*UAØZS	*	22,971	110	93
*RAØAPW	*	3,686	38	38
*RVØAL	21	174,040	314	229
*RUØSU	*	45,066	169	111
*UAØOD	*	7,980	84	70
*RUØAKB	14	754,548	663	454
*UAØSJ	*	583,200	590	405
*RWØCV	*	82,388	222	172
*UCØLAF	*	25,546	128	106
*RWØCOA	*	5,460	63	52
*RNØJX	*	152	9	8

Azerbaijan

*4K9W	A	56	8	7

China

BA7IO	A	101,384	379	184
BD7MVZ	21	102,305	376	185
BG3DLX	14	133,042	398	221
BA4ALC	7	170,864	271	181
BG3DDB	*	53,192	167	122
*BA1AN	A	457,925	700	325
*BD7NWF	*	155,006	487	194
*BD4CZX	*	105,840	340	168
*BD4JUU	*	87,857	263	163
*BD8ATI	*	67,971	269	163
*BD1FBV	*	65,702	218	133
*BG4AHF	*	61,152	251	147
*BG5HST	*	58,625	202	125
*BG5HSC	*	34,749	194	117
*BG6JNB	*	33,060	149	114
*BG7AWU	*	22,016	115	86
*BD7KBH	*	17,800	131	89
*BA5BO	*	11,580	89	60
*BG6JEQ	*	10,626	98	77
*BD4TQ	*	9,504	88	66
*BD4ITM	*	9,234	91	57
*BG4EXL	*	7,564	81	62
*BD4IBW/4	*	6,480	58	48
*BG4IKE	*	4,851	65	49
*BD5CEI	*	2,664	49	36
*BG7RDC	*	2,485	45	35
*BG2AUE	*	1,550	37	31
*BG6QIO	*	1,404	27	27
*BG1UFP	*	1,053	31	27
*BG5DNA	*	888	25	24
*BG4JWU	*	720	21	20
*BG5RAS	*	672	17	16
*BG4MLL	*	651	21	21
*BG4IWG	*	525	18	15
*BD5HPC	*	442	17	13
*BG4MCG	*	420	22	21
*BD5HLI	*	400	17	16
*BG4LKG	*	360	20	18
*BG4SOM	*	196	14	14
*BA3AX	28	35	5	5
*BD7KQT	21	33,280	215	128
*BD7OH	*	21,726	142	102
*BG7IEU	*	875	31	25
*BG4JZY	*	429	15	13
*BD7MSN	14	214,110	486	270
*BG3DCI	*	52,206	263	154
*BD4WZH	*	21,736	137	104
*BD2BT	*	19,350	95	90
*BG4LGF	*	9,372	93	71
*BG4DVK	*	5,832	61	54
*BG7NFM	*	3,408	69	48
*BG8BBP	*	2,067	43	39
*BD6AIF	*	1,591	41	37
*BD7MFB	*	714	21	21
*BG4IGL	*	696	27	24
*BG4TBJ	*	119	10	7
*BG9TX	*	117	9	9
*BG3EO/1	*	80	11	10
*BG4IOH	*	30	6	6
*BG7JYX	7	6	1	1

Cyprus

5B4AII	A	17,320,771	4249	1093
(OP: RW3QC)				
5B4ZN	*	94,752	166	141
H22H	7	4,347,408	1261	624
(OP: 5B4MF)				
H2T	3.7	1,592,770	667	415
(OP: 5B4XF)				
C4M	1.8	343,728	287	217
(OP: 5B4AGM)				
*C4Z	21	149,682	276	202
(OP: 5B4AIZ)				

Georgia

4LØA	A	11,299,200	3325	960
(OP: 4L4WW)				
*4L2M	3.7	609,677	390	277
*4L4CC	*	370,728	304	228

Hong Kong

VR2XMT	28	12,236	148	76
*VR2WHA	21	2,204	46	38
*VR2PW	14	47,481	199	147

India

VU2SWS	A	223,288	324	247
*VU2NKS	A	347,776	433	304
*VU2HFR	14	52,080	178	140
*VU3DJQ	7	39,204	90	81

Israel

4Z4DQ	14	3,639,600	1829	720
*4Z5PJ	A	27,192	95	88
*4Z5MY	*	4,144	38	37
*4Z5TK	*	12	2	2
*4Z5UN	7	443,681	307	263
(OP: UU2JM)				

Japan

JE1LFX	A	206,712	351	216
JF1SEK	*	188,467	321	229
7J1ABD	*	39,728	137	104
JO1SIM	*	23,490	138	81
JH1OVY	*	420	16	15
JA1MJN	21	230	13	10
JH1ACA	14	467,744	528	376
JN1NDY	*	434,444	522	347
JI1ALP	7	1,392	16	16
JA1HGY	*	510	10	10
*JA1GLE	A	79,560	221	130
*JM1LRQ	*	46,529	209	119
*JJ1MZH	*	27,083	118	73
*JK1NSR	*	24,900	133	83
*JA1HNW	*	13,248	96	69
*JA1IZ	*	12,172	75	68
*JE1REU	*	7,290	63	54
*JA1TBX	*	7,007	59	49
*JA1VGV	*	6,188	46	34
*JH1FNU	*	2,752	33	32
*JA1OQ	*	2,430	36	30
*JI1UDD	*	286	12	11
*JI1DSU	*	110	11	10
*7N2UQC	28	779	23	19
*JP1IXV	21	8,694	70	63
*JA1RYC	*	7,800	72	52
*JK1BII	*	2,838	42	33
*JA1DBG	*	1,716	30	26
*JG1ALA	*	1,281	26	21
*JF1VGZ	*	882	24	18
*JE1QCL	*	350	15	14
*JF1HJX	*	279	11	9
*JA1LBZ	*	128	8	8
*JI1LAI	*	18	4	3
*JN1DNV	*	12	2	2
*7M1MCT	14	1,518	23	23
*JG1GCO	*	1,125	30	25
*7L3DGP	*	1,032	30	24
*JL7FBV/1	*	210	11	10
*JH1RDU	7	1,008	15	14
*JE1SPY	3.7	8,964	72	54
JA2BNN	A	263,340	409	231
JR2PMT	*	193,752	325	216
JJ2CJB	*	78,971	200	157
JA2FSM	*	6,204	51	44
JA2ZJW	14	907,426	803	442
(OP: JI2MWH)				
JF2FIU	*	17,854	99	79
JJ2PUG	7	266	7	7
*JA2PFO	A	179,333	341	187
*JA2CUS	*	100,000	210	160
*JA2GHP	*	12,122	96	58
*JQ2OUL	*	663	19	13
*JA2VSU	21	4,032	51	42
*JR2AAN/2	*	800	24	20
*JG2KKG	14	320,019	439	311
*JA2KKA	*	1,300	28	26
JS3CTQ	A	179,325	284	225
JA3EY	*	73,036	187	124
JR3NZC	*	70,350	164	134
JA3IKG	14	26,695	112	95
JH3GCN	7	129,927	182	161
JA3YBK	3.7	266,842	295	202
(OP: JS1PWV)				
JI3BFC	*	3,680	36	32
*JL3MCM	A	97,300	281	140
*JM3PLL	*	19,728	118	72
*JH3PTC	*	15,438	92	62
*JA3JM	*	12,120	91	60
*JO3RCK	*	1,026	26	19
*JR3SZZ/3	*	473	16	11
*JF3VUA	*	340	13	10
*JF3BFS	21	60,243	224	129
*JI3FSI	*	6,783	67	51
*JA3BBG	*	5,670	61	45
*JR3RIY	*	3,185	41	35
*JR3KAH	*	1,659	29	21
*JA3PYH	*	1,488	31	24
*JA3KDJ	*	864	22	18
*JF3IYW	14	46,284	171	133
*JA3UWB	*	43,602	165	129
*JA3DAY	*	15,428	85	76
*JG2CNS/3	*	780	22	20
*JR3NDM	*	350	15	14
*JO3EVM	*	12	2	2
*JL3RDC	7	732	13	12
JA4NQD	A	11,220	87	60
JR4GPA	14	46,930	159	130
JM4WUZ	3.7	9,264	57	48
*JE4MHL	A	102,050	259	157
*JI4WHS	*	16,146	97	69
*JA4AQR	*	4,920	46	41
*JI4JGD	*	901	21	17
*JR4LRY	21	8,476	76	52
*JR4URW	7	15,104	72	59
JA5FBZ	21	194,964	428	211
JJ5GMJ	14	1,415,953	997	539
JA5APU	*	144,504	268	223
*JA5ND	21	198	10	9
JA6BZI	A	510,848	518	307
JA6BWH	*	177,012	318	198
JA6WJL	28	9,100	97	50
*JA6DIJ	A	132,990	317	186
*JQ1AHZ/6	*	5,371	61	41
*JA6WFM	21	38,860	175	116
*JL6IPK	7	18,841	111	83
JA7NVF	A	4,059,346	1813	787
JA7COI	*	678,592	684	368
JA7BME	*	464,625	511	315
JH7DUM	*	9,676	70	59
JA7KY	*	1,482	22	19
JR7MAZ	*	432	14	12
JA7OWD	28	6,419	77	49
JA7JH	*	1,040	26	20
JH7XMO	14	1,562,946	1071	561
JA7XBG	*	1,048,488	828	474
JA7AKH	*	332,997	428	303
JA7BJS	*	223,964	363	236
JG7EHM	*	2,272	33	32
*JO7APG	A	2,442	34	33
*JR7WAB	14	670,410	673	390
*JA7HYS	*	9,685	68	65
*JA7LLL	*	7,685	56	53
JA8ECS	A	225,900	324	251
JH8SIT	14	97,559	216	181
*JA8IJI	A	42,672	152	112
JF9KVT	A	53,937	194	117
JA9CCG	14	9,450	72	63
*JA9TOY	14	20,293	107	91
*JH9URT	7	29,467	98	79
JAØJHA	A	7,700,208	2682	944
JAØUMV	21	21,736	127	88
*JHØNEC	A	293,454	412	274
*JAØAVS	*	11,008	72	64
*JRØBUL	28	275	13	11
*JHØEPI	14	52,578	156	138

Kazakhstan

UPØL	A	8,249,064	2538	852
(OP: UN9LW)				
UN9L	*	2,996,092	1349	596
UP6P	*	1,591,865	977	515
(OP: UN6P)				
UN7QF	*	643,302	654	361
UN2E	*	619,605	497	315
UN7PL	*	574,530	511	330
UN6G	21	18,040	113	88
UP2L	14	6,996,448	2557	1048
(OP: UA9BA)				
UP7A	7	1,771,588	751	434
(OP: UN7AL)				
*UN9GD	A	13,504	74	64
*UN4PG	21	18,662	100	86
*UN/RX9TL	14	128,600	247	200
(OP: RX9TL)				
*UN7RL	*	111,786	244	186
*UO7ØF	*	82,597	193	151
*UN6LN	*	22,050	96	90
*UN5C	*	4,452	43	42
*UN/RU9MX	7	80,343	128	113

Kuwait

9K2K	14	1,121,580	825	465

Kyrgyzstan

EX8MAT	A	952,740	754	395
EX2T	21	37,920	177	120
EX2X	14	829,840	757	440
*EX8AB	14	2,844	36	36

Macau

*XX9AU	21	4,895	86	55
*XX9LQ	14	1,470	32	30

Mongolia

*JT1BV	A	959,650	872	425
*JT1BZ	14	130,968	351	214

Ogasawara

*JD1BIA	21	2,706	41	33

Saudi Arabia

HZ1HN	14	22,606	96	89

Singapore

9V1UV	A	1,950	32	25
*9V1DE	A	29,319	125	87

South Korea

HL5UOG	A	23,621	123	79
HL5JCB	*	6,298	58	47
*DS5TOS	A	26,788	97	74

Taiwan

BW2/JP1RIW	A	292,608	812	256
(OP: JP1RIW)				
BW6/XX9LT	*	107,160	345	188
(OP: XX9LT)				
BV1EK	*	56,613	199	113
BX5AA	14	747,792	953	432
*BU2AE	14	38,571	204	129
*BV4VR	7	15,120	68	60

Thailand

HSØEHF	14	34,404	136	122
HSØZHI	7	4,500	32	30
*HSØZCW	A	1,274,905	1122	535
*HSØZHC	*	635,004	847	372
*HSØZCX	*	89,262	254	162
*E2ØYLM	28	49	7	7
*E21YDP	21	267,509	553	293
*E21EIC	14	1,418,175	984	573
*E2ØWXA	*	290,764	491	314
*HS1JNB	*	1,856	33	29

Turkey

*TA7EB	A	43,758	112	99
*TA2IB	21	14,755	81	65
*YM3D	1.8	103,168	148	124
(OP: TA3D)				

UK Bases on Cyprus

ZC4LI	A	96,432	202	168
ZC4VJ	21	165,628	314	188
(OP: G3AB)				

United Arab Emirates

*A61C	21	128,724	282	204

Vietnam

XV1X	A	134,757	342	189

West Malaysia

9M4DXX	A	401,580	604	345
(OP: 9M2TO)				
9M2DRL	*	86,013	321	171

EUROPE

Aland Islands

OHØR	A	6,412,140	2755	980
(OP: OH2PM)				
OHØJFP	7	3,489,882	1834	726
(OP: SMØTQX)				

Andorra

*C31CT	3.7	34,034	131	119

Austria

OE6MDF	A	822,940	748	460
OE1C	*	147,136	310	242
(OP: OE1MHL)				
*OE3DMA	A	255,850	408	301
*OE6HLF	*	81,512	246	184
*OE3JTB	*	59,805	165	135
*OE/OM4KK	7	40,119	142	129
(OP: OM4KK)				

Azores

CU2AF	1.8	24,820	100	85
*CU5CQ	A	375,210	568	330

Balearic Islands

*EC6UD	21	2,460	31	30

Belarus

EV1R	A	2,240,430	1515	690
EU1AZ	*	1,703,208	1270	618
EW4MM	*	577,187	651	377
EV2A	*	395,944	529	344
(OP: EW2AA)				
EW8DJ	*	98,975	232	185
EW8DX	3.7	337,365	482	315
*EW2BX	A	276,660	457	290
*EU2MM	*	139,260	271	220
*EW1NA	*	30,174	120	107
*EW7LE	*	27,911	124	113
*EU1EU	*	23,088	127	111
*EW3LN	*	12,390	77	70
*EW7DK	*	8,060	68	65
*EW6EW	21	434	17	14
*EW6DX	14	115,661	304	217
*EU6AA	*	113,792	304	224
*EW1IP	*	99,750	272	210
*EU1DZ	*	72,944	230	194
*EW8OM	*	46,916	181	148
*EW6GL	*	7,250	63	58
*EW6DM	7	76,160	196	160
*EW2TT	3.7	14,774	88	83
*EU6AF	*	6,300	51	50

Belgium

ON8VK	A	1,616,472	1186	628
OQ7T	*	1,436,246	1201	593
OP4B	*	196,128	407	288
ON6LEO	*	73,100	203	170
OQ5M	14	159,372	318	233
(OP: ON5ZO)				
OR2A	3.7	147,128	327	212
(OP: ON7YX)				
*ON7CD	A	1,211,370	965	542
*OT7E	*	340,680	454	340
*OR6C	*	144,356	308	239
*ON3DV	*	82,962	264	198
*ON4PJA	*	66,300	210	156
*ON3AR	*	64,124	200	164
*ON5JD	*	38,199	143	119
*ON4LWX	*	638	22	22
*ON4SAX	*	264	12	12
*ON3ND	14	10,692	96	81
*OP4A	7	115,830	229	198

Bosnia-Herzegovina

*E77C	A	10,080	69	63
*E74AA	14	524,955	762	443
*E79D	7	615,134	658	401
*E78ATM	3.7	113,524	254	202

Bulgaria

LZ4RR	A	970,240	970	512
LZ1BJ	*	185,310	482	290
LZ1IKY	*	98,894	258	197
LZ2JR	*	68,480	183	160
LZ2BE	*	15,225	80	75
LZ1GU	*	1,292	20	19
LZ2PL	*	1,040	20	20
LZ5K	14	1,575,232	1530	652
LZ3FN	*	76,095	210	171
LZ8A	*	59,658	216	183
*LZ1DM	A	298,485	472	297
*LZ2SX	*	107,744	258	208
*LZ2FM	*	81,180	235	180
*LZ3TL	*	15,040	86	80
*LZ2NG	*	6,820	59	55
*LZ1WJ	*	6,384	52	48
*LZ1HW	*	448	14	14
*LZ1ND	21	75,429	195	153
*LZ9V	*	5,324	58	44
(OP: LZ1WG)				
*LZ2JA	14	217,722	491	277
*LZ5GM	*	2,790	48	45

Crete

SV9DJO	A	92,256	234	186
SV9GPV	21	408,720	684	393
SV9CJO	14	89,200	252	223
*SV9COL	A	253,877	484	331

Croatia

9A5K	21	185,234	364	262
9A5W	14	3,031,077	1801	777
9A5E	7	4,400,935	1896	805
9A5Y	3.7	3,013,851	1632	713
(OP: 9A3LG)				
9A6A	*	1,992,888	1391	622
*9A6KTB	A	225,180	391	270
*9A6Z	*	165,213	343	261
*9A8A	*	12,558	75	69
*9A5ST	28	672	16	16
*9A5MT	21	2,201	31	31
*9A7IUP	14	891	29	27
*9A2GA	3.7	12,300	79	75

Czech Republic

OK2SAR	A	264,260	434	292
OK1XQ	*	202,510	367	263
OK1KMG	*	6,670	65	58
(OP: OK1UDJ)				
OK1FPS	21	88,350	250	186
OL3Z	14	2,754,189	1591	747
(OP: OK1HMP)				
OL9Z	*	2,241,528	1483	708
(OP: OK2PVF)				
OK1WIP	*	62,304	238	177
OK1GTH	3.7	756,432	855	432
OK1NI	1.8	162,604	357	236
*OL2T	A	217,588	405	266
*OK1MKU	*	210,386	352	262
*OK1HEH	*	166,080	354	240
*OK2YZ	*	137,540	293	230
*OK2BRX	*	78,120	229	180
*OK2WYK	*	71,064	209	168
*OK1JOC	*	55,870	178	151
*OK2SWD	*	49,113	188	153
*OK1DKR	*	39,772	145	122
*OK2EC	*	28,013	135	109
*OK4FD	*	16,128	92	84
*OK1VHV	*	7,611	67	59
*OK5XX	*	4,830	53	46
*OK1URO	*	714	22	21
*OK1DKA	21	6,960	57	48
*OK2QX	*	4,484	45	38
*OK1BLU	*	96	6	6
*OK1DI	14	83,168	229	184
*OK2PBG	*	18,490	108	86
*OK5SWL	*	406	14	14
(OP: OK2SWD)				
*OK6Y	1.8	162,855	354	235
(OP: OK2PTZ)				
*OK1JOK	*	14,280	96	84
*OK2BJC	*	11,026	80	74
*OK5AD	*	5,994	60	54

Denmark

OZ7AM	A	1,595,440	1167	616
OZ5EV	*	393,224	460	398
OZ8DX	*	28,800	122	100
*OZ1ACB	A	303,050	474	319
*OZ2DAN	*	186,592	387	272
*OZ1JVX	*	125,080	296	212
*OZ1KVM	*	122,688	289	213
*OZ4NA	*	88,506	224	198
*OZ1DGQ	*	851	23	23

England

G1MIE	A	73,632	211	177
G7VRK	*	49,545	171	135
M1LMO	*	47,092	160	122
G4ERW	14	566,874	672	409
MØWLF	*	553,320	612	424
MØMQV	*	513	19	19
*G3ZQH	A	520,740	665	396
*2EØRCV	*	436,934	588	362
*GØHVQ	*	282,256	455	299
*G4DFI	*	200,271	402	277
*G4ENZ	*	91,632	249	184
*G4NXG	*	83,328	215	168
*2EØPLA	*	78,192	232	181
*M3ENF	*	70,125	198	165
*G6UBM	*	64,476	196	162
*GØMLY	*	60,897	196	159
*MØSDY	*	57,510	179	162
*G7RTI	*	56,575	199	155
*MØCKX	*	47,304	172	146
*G3PIA	*	40,608	157	144
*G3VAO	*	39,618	158	142
*G8ZRE	*	35,378	163	133
*G4KIU	*	22,977	126	111
*M1ADX	*	15,360	109	96
*GØCMP	*	6,336	72	66
*G3RSD	*	4,185	48	45
*GØRPM	*	3,397	48	43
*MØGKC	*	2,967	44	43
*GØFPU	*	1,782	33	33
*MØPKZ	*	680	19	17
*G1FON	14	80,892	257	214
*2EØTQR	*	11,648	101	91
*G4BXT	3.7	238,260	372	285

Estonia

ES4RX	14	1,824	32	32
ES5RIM	7	8,614	63	59
*ES7GM	A	248,292	422	297
*ES2IPA	*	50,050	190	154
*ES6RMR	14	6,324	62	62
*ES1LS	7	145,255	279	209

European Russia

RA1AGL	A	2,446,140	1710	691
RU1AB	*	538,353	622	381
RN1NU	*	107,627	284	221
RZ1ZZ	14	1,257,708	1299	652
*RW1CW	A	1,620,408	1269	631
*UA1CEI	*	792,656	803	463
*U1BA	*	125,892	311	234
*RA1QIT	*	115,132	227	214
*U1BD	*	104,276	264	199
*RA1QDP	*	49,848	171	134
*RA1AFR	*	29,425	121	107
*U1BB	*	27,007	134	113
*UA1AFZ	*	26,544	129	112
*RA1AOP	*	4,896	50	48
*RU3XY/1	*	1,333	31	31
*UA1AAR	*	403	13	13
*UA1CER	*	8	4	2
*UA1OMS	21	432	12	12
*UA1AQA	14	428,676	632	417
*RV1CC	*	7,446	58	51
*RV1AE	*	3,600	53	48
RS3A	A	3,924,000	2140	872
(OP: RA3CW)				
RA3CM	*	1,825,200	1481	676
RN3ZC	*	1,754,812	1377	614
RZ3TZZ	*	1,236,060	1022	567
(OP: RA3TE)				
UA3KA	*	746,648	825	469
RW3DA	*	337,610	479	371
UA3MEJ	*	87,205	192	163
RU3OP	*	41,514	127	111
RX3AEX	*	20,394	110	103

RA3XE	*	15,750	96	90	**UA6AKD**	**3.7**	**14,400**	**88**	**80**	DK1AX	*	194,814	376	274	*DN5QA	*	45	5	5	*IK5PVX	*	39,300	154	131
UA3BM	*	10,440	61	60	***RU6YZ**	**A**	**355,355**	**564**	**355**	DJ5TD	*	189,222	363	282	***DL7ULM**	**21**	**1,988**	**30**	**28**	*IV3ARJ	*	36,600	136	120
RN3REY	*	3,959	37	37	*RN6MA	*	180,120	352	228	DF2QZ	*	187,256	328	263	*DO1AYJ	*	1,944	30	27	*IZ2EEV	*	36,585	149	135
UA3QOS	**21**	**9,856**	**78**	**56**	*UA6HHE	*	121,390	307	199	DM2BPG	*	177,415	385	259	***DJ0MCZ**	**14**	**213,486**	**414**	**299**	*IN3FHE	*	36,480	128	128
RA9USU/3	**14**	**832,320**	**1077**	**544**	*RK6BBZ	*	102,336	252	192	DF5BX	*	177,380	380	245	*DL5JS	*	108,706	279	226	*IW2BZY	*	30,910	129	110
RN3GA	*	188,846	382	287	*RX6LD	*	102,150	274	227	DL8DXF	*	161,126	313	238	*DJ7IK	*	85,200	253	200	*IZ5IMD	*	24,453	112	99
RU3UR	*	161,312	385	284	*RU6HJ	*	76,075	224	179	DG0CC	*	130,530	349	229	*DL3ZAI	*	61,050	193	165	*IK2UCK	*	23,422	108	98
UA3DAM	*	25,215	142	123	*RA6LOO	*	74,048	223	178	DG2NMH	*	128,760	296	222	*DM3MM	*	47,829	182	149	*IK3XTY	*	17,575	133	95
RA3TT	*	15,300	113	102	*RV6LCI	*	60,204	212	174	DL7DS	*	126,218	291	223	*DL9LM	*	46,357	191	151	*IK2WFN	*	15,876	94	84
RN3DDS	*	840	21	21	*RK6AQM	*	56,722	185	158	DC1JAG	*	122,604	269	204	*DL9LF	*	42,768	157	144	*IZ1MDJ	*	13,689	88	81
RK3DTC	*	312	12	12	*RA6HJA	*	25,530	130	111	DL5AN	*	75,020	194	155	*DL4JYT	*	41,890	170	142	*IZ4DUX	*	13,612	98	83
RL3AF	**7**	**84,780**	**200**	**157**	*RW6AHO	*	16,185	90	83	DJ0AH	*	70,952	202	181	*DL3BRA	*	41,144	180	139	*I1YGQ	*	13,494	86	78
RX3QM	**3.7**	**75,768**	**202**	**164**	*RN6DR	*	9,301	76	71	DL8YR	*	69,255	208	171	*DJ5LY	*	22,898	117	107	*IN3SJG	*	13,416	95	86
***UA3BL**	**A**	**1,058,109**	**999**	**507**	*RA6DT	*	5,904	53	48	DL/PA1TT	*	67,236	187	156	*DL1DXA	*	4,326	49	42	*IK1WEG	*	11,136	73	64
***RK3MWI**	*****	**966,966**	**937**	**539**	*RV6ALI	*	1,976	28	26	DK7AN	*	64,558	189	169	*DL1MHJ	*	3,535	36	35	*IK4AUY	*	10,206	70	63
			(OP: UA3MSA)		*RW6CW	*	1,368	21	18	DM3ML	*	56,092	173	148	*DF5BM	*	3,450	52	46	*IZ8LLH	*	8,174	61	61
*UA3ABJ	*	513,600	627	400	*UA6HFI	*	1,020	21	20	DL1YFF	*	53,157	170	141	*DF3AX	*	3,344	47	44	*IZ8GNH	*	7,208	73	68
*RN3DBA	*	461,131	603	407	*RA6XB	*	216	9	9	DL1JGG	*	49,075	170	151	*DK7MCX	*	2,394	39	38	*IZ1DXS	*	6,720	61	56
*RA3NC	*	323,832	483	309	***RD6LP**	**21**	**3,276**	**41**	**36**	DJ6TB	*	48,764	169	146	*DG6DAF	*	2,030	36	35	*IZ1MLS	*	6,324	55	51
*RX3QDF	*	235,106	400	269	***RW6AH**	**14**	**146,784**	**342**	**264**	DR7T	*	35,226	125	114	*DL7LZ	*	640	20	20	*IZ3DVU	*	5,586	52	49
*RA3VLD	*	229,824	423	304	*UA6ARR	*	40,166	164	151				(OP: DL1HCM)		*DN1MSF	*	126	8	7	*IZ1DLY	*	5,456	67	62
*RD3DG	*	159,162	326	246	*RA6FZ	*	25,942	131	119	DL6DVU	*	31,136	136	112	*DL2DSD	*	65	5	5	*IV3YWT	*	3,276	40	39
*R3AA	*	134,420	292	220						DK1LRS	*	25,942	136	119	***DM4DX**	**7**	**45,696**	**169**	**128**	*IZ5NFD	*	3,240	43	36
*RU3LA	*	125,928	254	212			**Faroe Islands**			DJ1YFK	*	17,877	110	101	*DL1TS	*	43,596	147	126	*IK2LFD	*	3,198	47	41
*RK3FM	*	112,476	267	206	**OY9JD**	**7**	**2,674,004**	**1790**	**658**	DF9FS	*	14,630	105	95	*DL0DBO	*	13,286	76	73	*IK8LJA	*	3,135	36	33
*RL3AJ	*	108,243	282	211	***OY9R**	**A**	**86,658**	**260**	**202**	DL5ST	*	11,096	76	73				(OP: DL2ZA)		*IV3NVB	*	2,911	41	41
*RZ3QZ	*	102,102	239	187						DF2HL	*	4,500	46	45	*DJ6TK	*	5,500	53	50	*IZ5OQX	*	2,709	44	43
*RA3XCZ	*	93,181	261	197			**Finland**			DL9GFB	*	1,995	37	35	***DO2ML**	**3.7**	**103,155**	**236**	**195**	*IW7BIM	*	2,205	37	35
*UA3OQ	*	92,738	253	178	**OH8L**	**A**	**6,444,900**	**2617**	**1023**	**DN2LD**	**14**	**205,425**	**352**	**249**	*DO1SSB	*	97,970	260	202	*IW3SRC	*	576	19	18
*RN3ARA	*	83,880	237	180				**(OP: OH8LQ)**					**(OP: DL2AA)**		*DK9HN	*	95,816	239	203	*IK2RLS/2	*	322	14	14
*RX3VF	*	75,620	212	190	OH7WW	*	60,352	198	164	DH0GDS	*	27,966	137	118	*DO1WHU	*	56,700	189	162	*IZ8LIP	*	220	11	11
*UA3DCU	*	69,459	201	169				(OP: OH3LQK)		DL1LQL	*	2,223	39	39	*DO1CS	*	13,600	95	85	*IK5VXL	*	192	8	8
*RA3RGQ	*	53,280	165	148	OH5KW	*	25,440	109	96	DN1TB	*	240	10	10	*DG5SBK	*	12,720	88	80	*IW0GVG	*	84	6	6
*RD3BY	*	49,010	164	145	OH9GIT	*	13,050	83	75	**DL1SWB**	**7**	**576,420**	**647**	**390**	*DO1TGM	*	8,505	65	63	***IW0HBY**	**28**	**8,750**	**68**	**50**
*RA3VR	*	46,417	169	133	OH6XY	*	12,480	73	65	DJ0IF	*	160,062	318	222	*DL2RZG	*	4,560	53	48	***IK2YGZ**	**21**	**10,672**	**58**	**58**
*RA3VE	*	42,059	168	137	**OG1M**	**14**	**980,832**	**989**	**544**	**DL3KZA**	**3.7**	**273,807**	**500**	**301**						***IW1QN**	**14**	**622,170**	**696**	**446**
*RA3MAW	*	40,242	131	114				**(OP: OH1VR)**		***DA0R**	**A**	**620,858**	**708**	**427**			**Greece**			*IZ8EFD	*	107,877	295	231
*RA3MB	*	37,647	153	141	OH2OT	*	365,379	545	411				**(OP: DL6DCD)**		**SX1L**	**14**	**1,588,344**	**1721**	**687**	*IZ1DGG	*	77,644	247	188
*RZ3ARO	*	37,338	159	127	OH4MDY	*	94,544	258	152	***DB8NI**	**A**	**567,008**	**747**	**416**				**(OP: SV1GE)**		*IZ0CEZ	*	52,316	200	164
*RX3AU	*	36,915	134	115	**OH6M**	**7**	**114,558**	**244**	**183**	*DR4G	*	547,365	599	401	**SV1GRD**	**1.8**	**24,378**	**106**	**102**	*IZ2JQP	*	16,456	109	88
*RN3ZIN	*	32,770	135	113				**(OP: OH6LBW)**					(OP: DJ0GM)		***SV1UT**	**21**	**45,745**	**158**	**126**	*IK7WPD	*	13,846	97	86
*RA3MAV	*	31,644	138	108	**OG5B**	**1.8**	**291,648**	**446**	**294**	*DF8XC	*	536,760	685	420						*I1QBI	*	3,645	45	45
*RN3FY	*	22,990	127	110	***OH3DP**	**A**	**4,752**	**48**	**48**	*DJ8UV	*	441,501	597	367			**Guernsey**			*IZ8FSL	*	3,360	52	48
*RD3DS	*	19,885	105	97	*OH1TD	*	2,924	43	43	*DL4ZA	*	427,912	558	356	***MU0GSY**	**A**	**480,924**	**628**	**366**	*IK4XQT	*	1,632	38	34
*UA3RN	*	12,844	87	76	*OH8FKU	*	2,592	38	36	*DL1NKS	*	360,804	510	321						*IZ0CEY	*	377	13	13
*RU3FF	*	10,400	71	65	*OH8FAL	*	2,009	44	41	*DC7NF	*	352,240	515	340			**Hungary**			*IW3SAR	*	84	7	7
*UA3DSS	*	9,648	77	67	*OH6GFI	*	520	20	20	*DJ8EW	*	334,978	493	337	**HG8R**	**A**	**6,321,780**	**2643**	**1018**	*I3YYY	*	9	3	3
*RA3RBL	*	8,673	51	49	***OH5TS**	**14**	**527,172**	**678**	**445**	*DH6DAO	*	188,860	362	266				**(OP: HA8JV)**		***IK1YED**	**7**	**92,000**	**229**	**184**
*RN3LA	*	7,254	64	62	*OH4MFA	*	10,716	79	76	*DG5LAC	*	187,264	355	266	HA5NB	*	425,712	582	362	*I0KHP	*	79,800	197	168
*RA3EA	*	7,050	48	47	*OH8KVY	*	5,063	64	61	*DK6BT	*	166,112	314	232	**HA8TP**	**14**	**280,475**	**464**	**325**	*IK2AHB	*	31,866	129	113
*RX3MX	*	5,720	54	52	***OH6JYH**	**3.7**	**3,486**	**46**	**42**	*DF2PH	*	164,084	338	254	**HG3A**	**7**	**4,268,768**	**1837**	**826**	*IW3SNR	*	29,792	99	92
*RW3QF	*	5,246	44	43						*DG8DP	*	162,526	340	247				**(OP: HA3MY)**						
*RL3FO	*	4,400	52	50			**France**			*DO1MGN	*	157,311	357	231	**HA1YI**	**1.8**	**289,800**	**470**	**300**			**Kaliningrad**		
*UA3UBT	*	3,002	43	38	**F4DSK**	**A**	**479,560**	**597**	**380**	*DG3DAT	*	146,410	326	242	***HA7PO**	**A**	**251,986**	**399**	**287**	**RV9WZ/2**	**A**	**122,016**	**274**	**186**
*RL3FA	*	2,323	26	23	F5BBD	*	476,797	597	397	*DN6WT	*	141,421	317	227	*HA0ML	*	99,600	252	200	**RW2F**	**3.7**	**3,087,400**	**1748**	**718**
*UA3QIX	*	1,350	28	27	F5VJK	*	409,584	534	371				(OP: DO1KRT)		*HA2MN	*	36,685	138	115				**(OP: UA2FB)**	
*RA3RVZ	*	1,095	16	15	F6IGS	*	395,928	516	351	*DM2AWM	*	135,744	306	224	***HA6NL**	**7**	**688,040**	**613**	**412**	***RA2FB**	**A**	**212,300**	**394**	**275**
*RA3XD	*	1,040	22	20	F4DVX	*	346,199	493	361	*DL3JPN	*	134,441	298	233	*HA3JO	*	3,002	39	38	*R2MWO	*	420	12	12
*RU3PU	*	390	14	13	F6KPQ	*	216,524	391	308	*DL2UX	*	130,569	301	213	*HA7AVU	*	2,992	34	34				(OP: UA2FX)	
*RA3TUT	*	338	13	13				(OP: F4FFZ)		*DF2KD	*	122,744	297	229	***HA1FF**	**3.7**	**113,360**	**256**	**208**					
***UA3YAA**	**21**	**3,686**	**44**	**38**	F6DZU	*	156,750	293	250	*DF6WE	*	116,380	292	220	*HA6IGM	*	97,310	250	185			**Latvia**		
*UA3DCM	*	3,496	41	38	F5CQ	*	80,190	210	162	*DK7CH	*	101,656	273	194	***HA8BE**	**1.8**	**325,876**	**479**	**317**	**YL2CI**	**A**	**1,871,254**	**1387**	**638**
***RN3DY**	**14**	**604,572**	**786**	**498**	F6FLU	*	19,796	105	98	*DL6NAL	*	101,462	269	194						YL7X	*	1,450,504	1143	583
*RA3XDX	*	342,693	566	377	**F5BZB**	**7**	**2,616,817**	**1555**	**691**	*DL3WKG	*	101,016	247	207			**Iceland**						(OP: YL2LY)	
*RU3SE	*	135,708	332	258	**F5LJA**	**1.8**	**238,965**	**442**	**267**	*DK1VFA	*	95,642	274	194	**TF3CW**	**A**	**853,440**	**941**	**480**	YL9T	*	398,096	589	358
*UA3VVB	*	100,320	246	228				**(OP: F1UVN)**		*DO6HMA	*	94,122	220	189	TF3SG	*	33,681	135	103				(OP: YL2TW)	
*RV3DHC	*	35,280	164	144	***F4FDA**	**A**	**465,792**	**580**	**384**	*DM3HZN	*	83,764	216	172	**TF3ZA**	**14**	**1,088,472**	**1336**	**616**	YL3DR	*	170,984	325	268
*RA3DGH	*	34,425	180	153	***F5LIW**	**A**	**452,580**	**558**	**380**	*DL6RBH	*	77,385	220	165	TF3AM	*	100,188	342	242	YL8M	*	5,016	47	44
*RZ3ABC	*	27,144	139	117	*F6HKA	*	413,868	547	379	*DL8UVG	*	76,860	231	180	TF8GX	*	14,238	121	113	**YL2BJ**	**14**	**1,041,600**	**1062**	**560**
*RU3XB	*	13,916	106	98	*F4FFH	*	207,432	384	268	*DL7ED	*	74,200	234	175						**YL2SM**	**1.8**	**414,726**	**572**	**338**
*RA3GP	*	10,990	77	70	*F4DLL	*	193,248	369	264	*DH2PG	*	73,755	199	165			**Ireland**			***YL2NK**	**A**	**51,653**	**189**	**157**
*UA3DK	*	4,747	49	47	*F5PAL	*	190,905	350	267	*DC8SG	*	72,651	201	183	**EI2JD**	**A**	**754,728**	**820**	**472**	*YL2CR	*	18,042	105	97
*RN3DEJ	*	3,700	53	50	*F4FEP	*	180,564	335	246	*DG3NEC	*	68,676	214	177	EI9FVB	*	186,400	334	233	*YL6W	*	4,185	48	45
*RZ3XA	*	3,024	40	36	*F5POJ	*	140,114	294	221	*DL5JH	*	66,220	211	172	**EI4GYB**	**7**	**335,551**	**456**	**307**				(OP: YL2GD)	
*RV3RF	*	1,677	46	43	*F4AGR	*	132,500	272	212	*DK7FP	*	63,358	195	158	***EI/ON4EI**	**A**	**1,111,428**	**1074**	**502**	***YL3BZ**	**21**	**2,625**	**39**	**35**
***UA3FX**	**7**	**147,849**	**255**	**221**	*F1UJS	*	80,931	201	159	*DJ5KW	*	62,530	216	169	*EI7CC	*	166,257	358	261	***YL2GQG**	**3.7**	**90,240**	**231**	**188**
*RN3DFN	*	2,739	34	33	*F4FSV	*	70,269	207	177	*DL1DTL	*	60,000	189	160	*EI4GNB	*	135,207	283	249	*YL2GUV	*	9,072	64	63
*UA3LQQ	*	2,449	33	31	*F6EWX	*	49,098	158	147	*DL1HSI	*	56,210	195	146	*EI4II	*	60,060	192	156					
*RW3VZ	*	16	2	2	*F4ASK	*	48,488	185	152	*DL6ATI	*	55,335	190	155	*EI4GAB	*	26,418	134	111			**Lithuania**		
***RW3MB**	**1.8**	**25,956**	**126**	**103**	*F1EPQ	*	48,471	193	151	*DB7BU	*	50,204	192	154	***EI4CF**	**21**	**34,768**	**139**	**106**	**LY8O**	**A**	**5,970,363**	**2613**	**987**
					*F6BAT	*	46,200	175	154	*DJ1EH	*	49,558	170	142						LY2T	*	1,245,056	1088	568
RO4W	**A**	**3,403,460**	**1961**	**835**	*F4CUI	*	43,754	151	131	*DC8QT	*	48,816	163	144			**Italy**			LY4CW	*	389,874	553	359
			(OP: RD4WA)		*F5NBK	*	34,387	154	137	*DF8JK	*	47,112	181	151	**IR1G**	**A**	**3,552,120**	**1833**	**828**	LY7M	*	280,601	473	277
RV4HC	*	2,060,053	1605	673	*F1AEY	*	27,360	127	120	*DM9JM	*	45,612	139	126				**(OP: IZ1LBG)**		LY2AE	*	237,510	412	273
RY4I	*	1,016,712	1060	523	*F4FHV	*	24,192	118	112	*DP5X	*	42,504	165	138	IN3ZNR	*	1,177,680	1018	560	LY2VA	*	91,460	242	170
			(OP: RM4HZ)		*F2RO	*	22,568	111	104				(OP: DL3EBX)		I4AUM	*	978,360	895	526	LY3CY	*	66,000	202	165
RU4WD	*	564,993	710	439	*F5LCU	*	19,497	106	97	*DK6RF	*	42,028	154	133	IK8SEU	*	314,336	505	352	**LY1G**	**28**	**121**	**11**	**11**
UA4SKW	*	470,463	420	301	*F1SMV	*	17,381	103	91	*DH1OK	*	41,976	159	132	IK2SND	*	267,652	450	316	**LY2FN**	**7**	**23,862**	**88**	**82**
UA4NC	*	172,319	341	239	*F5QF	*	6,815	54	47	*DO9PL	*	41,310	167	135	IZ1OQB	*	219,224	409	268	**LY2IJ**	**1.8**	**11,928**	**79**	**71**
UA4RZ	*	142,888	276	212	*F1ADG	*	6,468	51	49	*DJ4WM	*	36,853	163	137	IR1A	*	166,279	329	257	***LY9A**	**A**	**2,113,824**	**1506**	**681**
RA4LBS	*	23,086	111	97	*F4FBP	*	5,824	60	56	*DL8ZAJ	*	36,738	139	117				(OP: IK1GPG)		*LY4T	*	1,066,500	980	500
RX4WX	**14**	**129,241**	**314**	**259**	*F5KSE	*	5,184	48	48	*DK1AUP	*	32,116	145	124	IZ0GYP	*	152,928	260	216	*LY2TS	*	782,768	779	482
RU4HU	*	98,735	268	217				(OP: F6IHY)		*DK5DC	*	30,456	128	108	IW0HLZ	*	138,237	297	213	*LY1DJ	*	132,240	318	228
RU4CO	*	32,688	173	144	*F4CGJ	*	4,806	56	54	*DO5AWE	*	30,015	144	115	IW0GTA	*	127,832	260	232	*LY2BBF	*	121,325	292	211
***RN4WA**	**A**	**383,736**	**552**	**354**	*F8DYD	*	4,500	47	45	*DL7VRG	*	29,718	141	117	IZ2ODM	*	105,646	237	202	*LY2SA	*	62,884	191	158
*RK4PB	*	234,379	409	289	*F9DK	*	2,555	36	35	*DK4KJ	*	27,251	130	119	IZ5ILK	*	102,660	223	177	*LY2OM	*	45,370	157	130
*RV4HV	*	155,400	327	259	*F5MLJ	*	403	14	13	*DL5ALW	*	27,030	113	102	IZ0BVU	*	89,760	220	176	***LY2OU**	**14**	**428,000**	**621**	**400**
*RA4ACX	*	138,087	326	229	*F4EWS	*	112	8	8	*DO1HGS	*	24,852	112	109	IW0GYC	*	28,305	121	111	*LY4OO	*	46,565	167	139
*RN4NF	*	115,192	228	187	*F4FWN	*	24	4	4	*DO3ME	*	23,762	127	109	IK2SAR	*	27,639	120	111	*LY1NDN	*	5,141	57	53
*RV4CO	*	56,301	193	147	***F6DRP**	**14**	**113,740**	**279**	**235**	*DJ4PK	*	22,898	125	107	IZ1DUI	*	20,160	95	90	***LY2MM**	**7**	**274,920**	**396**	**290**
*RA4SE	*	52,448	196	149	*TM4D	*	105,256	284	223	*DM6DL	*	15,488	95	88	**IW0BCF**	**21**	**73,350**	**198**	**150**	*LY2ND	*	75,508	194	172
*UA4NX	*	28,302	128	106				(OP: F5TLN)		*DJ1HF	*	14,964	92	86	IW2CLM	*	37,584	138	108	***LY4O**	**3.7**	**228,215**	**391**	**277**
*RK4FAD	*	25,800	124	100	*F8DNX	*	27,690	148	130	*DO1GVT	*	14,378	96	79	**IZ0PSC**	**14**	**237,140**	**406**	**334**	*LY2CO	*	167,466	322	247
*RZ4HX	*	23,310	126	105	*F4BDG	*	6,307	55	53	*DG8FAY	*	14,271	81	71	IW5EFX	*	65,736	203	166	*LY3S	*	138,040	294	232
*RA4NCC	*	11,972	92	82	***F8CGL**	**7**	**156,368**	**302**	**232**	*DL1VJL	*	13,860	76	70	IZ2JCO	*	44,696	175	151	*LY4G	*	12,975	81	75
*RN4HIF	*	9,591	75	69	*F5SSK	*	83,248	194	172	*DA3T	*	13,694	87	82	**I5FCK**	**7**	**1,862,500**	**1003**	**596**					
*RA4PX	*	7,965	71	59	***F5VLV**	**1.8**	**53,491**	**178**	**149**				(OP: DL8DXL)		IK8UND	*	413,374	496	338			**Luxembourg**		
*RA4HMT	*	7,935	79	69	*F5DRD	*	120	8	8	*DF8UO	*	13,600	87	80	IK2IKW	*	1,798	29	29	**LX7I**	**A**	**6,437,567**	**2586**	**983**
*RA4FUN	*	1,320	24	22						*DL4EBW	*	12,727	95	89	IZ0FVD	*	286	11	11				(OP: DF1LON)	
*RV4LS	*	810	19	18			**Germany**			*DL8DUL	*	12,672	95	88	**IK3HMB**	**3.7**	**1,148,450**	**1009**	**515**	LX4A	*	354,861	521	351
***RW4LQ**	**21**	**10,152**	**69**	**54**	**DL3TD**	**A**	**6,757,824**	**2613**	**976**	*DJ5TX	*	11,792	73	67	I4FYF	*	947,716	867	476	***LX1ER**	**A**	**423,850**	**500**	**350**
*UA4LW	*	2,958	39	34	DJ5MW	*	2,221,704	1426	708	*DL0KB	*	11,454	78	69	IO3X	*	336,156	478	327					
***UA4WCM**	**14**	**243,984**	**511**	**368**	DH2WQ	*	2,171,496	1365	692				(OP: DL2GBB)		***IZ2JPN**	**A**	**308,840**	**419**	**280**			**Moldova**		
*RN4HBU	*	63,083	255	199	DB2B	*	1,210,758	1093	541	*DO1KUB	*	11,011	79	77	***IK7NXU**	**A**	**290,788**	**417**	**310**	**ER5AA**	**7**	**190,548**	**289**	**237**
*RU4SS	*	49,875	198	175				(OP: DL8OBF)		*DO1NCM	*	9,316	73	68	*IZ1JLF	*	220,150	372	259	***ER2RM**	**A**	**265,482**	**440**	**294**
*RK4HZM	*	483	23	23	DK1KC	*	968,156	946	497	*DJ6UP	*	8,442	74	63	*I5DOF	*	218,856	384	264	*ER4LX	*	260,304	386	272
*RW4PJS	*	253	11	11	DL9GWD	*	749,480	777	457	*DO1ANW	*	8,316	78	66	*IK2HLM	*	195,320	377	257	*ER3CT	*	6,555	61	57
***RN4SN**	**7**	**299,970**	**314**	**270**	DF0BV	*	730,620	673	451	*DK3UO	*	6,032	52	52	*IZ1JLN	*	163,476	348	239	***ER5DX**	**14**	**5,040**	**50**	**35**
*RN4HFJ	*	161,136	267	216				(OP: DL1MAJ)		*DO7DU	*	5,687	52	47	*I2WIJ	*	153,352	293	232	***ER3HW**	**1.8**	**112,256**	**261**	**198**
***RA4PTI**	**3.7**	**8,642**	**70**	**58**	DK5JM	*	582,561	685	441	*DL1AZA	*	3,840	50	48	*IK8PLE	*	114,330	282	206					
					DG1EA	*	561,180	635	398	*DL9FB	*	3,696	44	44	*IK3SSW	*	99,424	247	208			**Montenegro**		
UA6UDV	**A**	**2,325,120**	**1608**	**692**	DK8EY	*	559,248	606	382	*DJ5MY	*	3,198	43	39	*IK7RVY	*	94,528	269	211	***4O3Z**	**A**	**149,796**	**333**	**219**
RL6YXX	*	1,124,010	1073	621	DK8CQ	*	508,557	595	397	*DL4RCK	*	2,870	35	35	*IZ2INZZ	*	86,456	207	202					
			(OP: RU6CQ)		DF9OO	*	505,134	602	399	*DC8WPA	*	2,730	40	39	*IZ5ILF	*	66,830	196	163			**Netherlands**		
RU6CH	*	437,016	672	417	DJ6OZ	*	390,848	432	394	*DJ0WB	*	2,622	40	38	*IK2YSJ	*	66,411	201	157	**PI4BRD**	**A**	**1,720,813**	**1253**	**617**
RU6YJ	*	105,378	245	193	DJ9HX	*	260,710	377	290	*DO8YX	*	2,380	36	35	*IZ4DIG	*	60,648	197	168				**(OP: PA2M)**	
RA6AR	*	23,760	118	110	DL9DYL	*	255,300	385	276	*DG1LS	*	2,006	34	34	*IZ5MMK	*	55,386	188	153	PF7M	*	590,480	676	440
UA6LPY	*	7,544	51	41	DD1JN	*	237,634	415	262	*DG7RO	*	1,000	25	25	*II1W	*	54,352	179	158	PA0JNH	*	291,006	401	306
RX6AM	**14**	**1,430,202**	**1472**	**698**	DL8EAQ	*	237,510	404	290	*DM2AJK	*	840	24	24				(OP: IW1FGZ)		PA2MRT	*	147,804	295	218
RZ6HF	*	145,124	401	284	DL6RBO	*	227,880	392	270	*DL2DYL	*	280	11	10	*IZ1NBX	*	49,149	181	129	PA9OD	*	136,517	278	211
RK6CM	*	378	14	14	DJ2ST	*	213,532	322	253	*DF8TI	*	264	12	12	*IZ5HSK	*	40,348	147	131	PA1TX	*	125,440	284	224

PA3FMC	*	122,904	297	216
PA3GCV	*	112,266	255	198
PC5W	*	99,000	246	200
PA7JWC	*	88,650	255	197
PA3AAV	*	74,424	203	168
PE1RDP	*	21,131	133	113
PA5TT	*	11,900	77	70
PA7PA	*	8,880	64	60
PF5A	14	1,026	31	27
PAØVST	*	1,007	19	19
*PA1CM	A	686,880	706	424
*PA1WLB	*	425,064	662	356
*PAØMIR	*	394,710	543	354
*PF4T	*	369,408	530	384
*PF9A	*	326,040	491	330
*PA8KW	*	280,881	443	309
*PD1KSA	*	228,137	453	299
*PE2KM	*	157,368	345	249
*PG1R	*	143,389	313	223
*PE1RLF	*	134,750	296	245
*PD7BZ	*	127,650	283	230
*PHØAS	*	112,148	253	212
*PD3MDM	*	106,502	259	206
*PD2JAM	*	106,395	260	205
*PD5LO	*	91,142	240	199
*PA2W	*	78,540	229	187
*PE1LGZ	*	76,260	227	186
*PDØHM	*	67,124	219	173
*PA3EWG	*	58,366	196	154
*PA1UL	*	57,155	195	161
*PA3ARM	*	56,400	196	150
*PA5VK	*	55,384	191	161
*PE2JMR	*	48,430	171	145
*PAØB	*	40,469	173	143
*PE1LTY	*	33,798	148	129
*PA3JD	*	32,375	140	125
*PA3HFJ	*	25,740	129	117
*PAØRHA	*	19,032	114	104
*PD3EM	*	18,988	112	94
*PA4SDV	*	18,834	100	86
*PE2RPS	*	18,404	100	86
*PD3GSN	*	16,745	99	85
*PI4WLD	*	16,471	97	91
			(OP: PAØMIR)	
*PD2LLS	*	16,020	98	89
*PA3HGF	*	13,224	96	76
*PE1KL	*	10,857	86	77
*PA7PYR	*	10,419	75	69
*PA4B	*	9,928	84	73
*PA2CVD	*	9,372	84	71
*PA3HCD	*	8,540	75	70
*PAØFEI	*	5,875	58	47
*PA3DBS	*	4,888	62	52
*PA9CC	*	4,539	52	51
*PA3GBI	*	4,488	53	51
*PA3GEO	*	3,450	53	50
*PA3CMF	*	2,565	47	45
*PA8TWN	*	1,300	26	26

Northern Ireland

GI5K	A	10,467,204	3553	1074
			(OP: MIØLLL)	
GI6DEY	*	147,264	299	236
*MIØM	A	401,432	557	361
			(OP: MIØSAI)	
*GI4AAM	*	45,087	153	133
*GI4SJQ	*	19,992	112	102

Norway

LA2AB	A	265,694	401	286
			(OP: SP2ASJ)	
LA1PHA	*	148,362	312	237
LA5HPA	*	60,216	184	156
LA6KOA	14	137,000	383	274
LN9Z	7	2,110,779	1443	621
			(OP: LA5KO)	
*LA7GNA	A	46,656	188	162
*LA7TN	*	44,238	186	146
*LA2GN	*	8,448	74	66
*LA6BNA	*	1,080	24	24
*LA8TIA	*	798	20	19
*LA1VNA	14	12,218	90	82
*LA7WCA	3.7	38,912	146	128

Poland

SP9LJD	A	4,340,514	2016	886
SP6AXW	*	349,800	492	330
SP2GJI	*	323,407	490	329
SP5KCR	*	189,054	324	243
			(OP: SP5JTF)	
SP1MVG	*	137,588	272	212
SP5LS	*	68,786	196	163
SP8HXN	*	61,899	182	141
SQ1BHH	*	18,080	93	80
SP5ELA	*	40	4	4
SQ6R	21	16,511	93	79
SP2FAP	14	139,328	286	224
SP2AVE	*	60,984	212	168
SN3Q	*	37,466	156	131
			(OP: SP3FLQ)	
SP1TMB	*	4,488	49	44
SP1MWN	*	2,407	30	29
SO6X	7	2,779,036	1572	676
			(OP: SP6IXF)	
SP4TKR	*	2,356,302	1383	663
SP3LPG	*	1,290,300	958	550
SP9JZT	*	315,700	387	287
SP2MHC	*	612	17	17
SN3A	3.7	2,521,636	1483	683
SO8A	*	2,486,025	1457	675
SP7MTF	*	1,862,883	1312	607
SQ8JX	*	455,588	583	371
SP5GMM	*	21,244	97	94
SN3R	1.8	656,367	754	411
			(OP: SP6HEQ)	
SO8R	*	318,396	485	314
*SP3GXH	A	500,707	636	361
*SQ8LSC	A	421,767	499	381
*SP5XSL	*	218,680	425	284
*SP5XOV	*	218,139	345	267
*SP8EDO	*	206,954	389	253
*SP6OPZ	*	168,256	338	239
*SP2OVQ	*	151,570	319	230
*SP5X	*	151,264	298	232
*SP8QJM	*	150,536	330	248
*SQ2EAN	*	115,710	294	203
*SP1O	*	111,870	244	198
*SP6LUV	*	90,342	219	189
*SP6JZP	*	88,380	236	180
*SQ9E	*	88,236	247	171
*SP9RTL	*	82,984	239	184
*SN9ØSW	*	81,512	245	184
			(OP: SP9ODM)	
*SP4ICD	*	80,224	237	184
*SP7FBQ	*	66,633	202	167
*SQ2TOM	*	64,548	181	163
*SP4AAZ	*	62,010	192	159
*SQ9MEI	*	59,943	198	159
*SN9L	*	54,720	192	152
*SP8NR	*	52,700	159	155
*SQ4CTS	*	47,124	141	126
*SP6TGR	*	47,012	168	146
*SP6OWA	*	41,151	162	129
*SP2DKI	*	38,934	160	126
*SP4ICP	*	32,016	142	116
*SP6MLX	*	24,990	116	105
*SP9CLO	*	23,793	113	103
*SP6A	*	23,463	112	99
*SQ1FYX	*	20,800	118	100
*SP4DDS	*	19,082	105	94
*SP3SPK	*	17,640	100	98
*SQ6NES	*	16,280	96	88
*SP6NVK	*	15,088	105	92
*3Z5ØKPN	*	12,166	84	77
			(OP: SQ5MX)	
*SN1A	*	11,165	87	77
			(OP: SP1EG)	
*SQ9LOM	*	10,902	82	69
*SP2GLS	*	10,752	75	64
*SP5APW	*	10,585	83	73
*SP5UAR	*	4,644	48	43
*SP6PLH	*	4,230	50	47
*SN2M	*	3,612	47	43
			(OP: SP2XF)	
*SP6EIY	*	2,905	40	35
*SP1II	*	2,816	33	32
*SP9AUV	*	2,625	36	35
*SQ2LYC	*	1,316	31	28
*SP8KPK	*	1,204	27	28
*SP6IHE	*	510	11	10
*SP6EF	21	6,384	51	48
*SQ9LOJ	*	126	7	6
*SP3NNH	14	288,960	427	320
*SP4YPB	*	196,101	391	269
*SP4LVK	*	106,080	265	204
*SP9DNO	*	65,620	208	170
*SQ3JVW	*	46,580	169	137
*SP3J	*	30,192	134	111
*SP9KRT	*	29,154	172	129
			(OP: SP9ADU)	
*SP5DRE	*	23,730	130	105
*SP9EWM	*	14,190	102	86
*SP3BVI	*	13,973	103	89
*SN3C	*	11,454	80	69
*SQ3WW	*	7,906	75	67
*SQ3RX	*	3,486	47	42
*SP8OOB	*	3,465	51	45
*SQ5NPX	*	522	18	18
*SN3X	7	1,242,938	975	526
*SO6V	*	1,057,472	914	496
			(OP: SP6DVP)	
*SP8TJU	*	118,921	251	209
*SQ3HMM	*	86,190	184	169
*SP3FYX	*	72,930	209	165
*SP7FDV	*	71,048	199	166
*SP9EML	*	61,632	169	144
*SP8ONB	*	25,654	105	101
*SP6TRH	*	3,344	40	38
*SP6EWB	*	40	4	4
*SP9H	3.7	221,236	390	284
*SP4SHD	*	208,104	352	276
*SN3B	*	106,502	264	206
			(OP: SQ3JPV)	
*SP6QKX	*	31,535	133	119
*SP8LZC	*	27,440	128	112
*SP6JIR	*	19,065	110	93
*SP9CLU	*	11,218	79	71
*SQ8MXJ	*	828	25	23
*SN9P	1.8	89,397	234	189
			(OP: SQ9GAI)	
*SP6EUA	*	67,545	213	171

Portugal

CT8K	A	2,274,026	1332	706
			(OP: CT1ILT)	
CT1BOL	*	1,111,292	1021	559
CT1JLZ	14	6,153,800	3189	1061
			(OP: OK1RF)	
CT1EWA	3.7	14,476	83	77
*CT1EOD	A	251,852	450	316
*CT1HMN	*	54,970	137	115
*CQ8L	*	42,167	169	149
			(OP: CT1EGF)	
*CT1IUA	28	9,741	66	51
*CT1AOZ	*	1,260	26	20
*CT1EGW	14	220,402	346	346
*CT1DZY	*	14,973	109	93
*CS7CQK	7	153,120	260	220
			(OP: CT1COK)	
*CT1EEK	*	47,616	134	124

Romania

YO4QZ	A	547,428	778	399
YO4DW	*	65,175	204	165
YO9BXE	*	26,059	126	103
YO5BBD	21	19,197	94	81
YO2R	*	11,466	77	63
			(OP: YO2RR)	
YO2BPZ	14	13,330	91	86
*YO3CZW	A	1,193,753	1156	517
*YO7LFV	A	1,098,625	1000	517
*YO5OHY	*	302,400	490	300
*YR9F	*	182,961	334	261
			(OP: YO9FNP)	
*YO7MGG	*	145,856	285	212
*YO8BPY	*	117,120	271	192
*YO9XC	*	91,314	245	178
*YO6QT	*	83,106	233	171
*YO6HSU	*	77,751	219	159
*YO5QCD	*	73,548	203	162
*YO6ADW	*	71,810	206	167
*YO2MHD	*	71,736	235	183
*YO8RFS	*	67,808	190	163
*YO8COK	*	66,633	206	167
*YO3CCC	*	59,566	197	158
*YO4US	*	57,600	205	160
*YO4GNJ	*	51,156	185	147
*YO9IKW	*	41,610	133	114
*YO2MIL	*	34,867	145	119
*YO5DAS	*	32,640	142	120
*YO2LXW	*	25,252	131	107
*YO9HG	*	24,168	125	106
*YO5CZZ	*	12,474	77	66
*YO3CVG	*	11,505	74	65
*YO5CCQ	*	11,234	89	82
*YO2MCK	*	10,117	71	67
*YO7ARY	*	9,828	61	52
*YO5CTY	21	481	14	13
*YO9CWY	14	45,347	193	137
*YO2LFP	*	23,310	138	111
*YO5CUQ	*	6,844	65	58
*YO5OED	7	534,543	587	381
*YO5BQQ	*	100,467	216	183
*YO7LBX	*	86,800	208	175
*YO2MBG	*	23,688	107	94
*YO4RSS	*	21,945	109	95
*YO4FTC	*	21,360	97	89
*YO9AGI	3.7	76,890	210	165
*YO4RIW	*	43,520	150	128
*YO5CCX	*	13,260	84	78
*YO6BZL	1.8	51,561	182	153

Sardinia

IMØ/IKØFMB	A	1,316,061	1386	617
			(OP: IKØFMB)	
*ISØDFC	14	13,559	98	91

Scotland

GM7V	A	1,429,294	1122	551
GMØFGI	*	165,378	350	258
*GM7TUD	A	92,224	219	176

Serbia

YT7R	A	382,470	523	330
YU7U	*	85,440	199	160
			(OP: YU7BH)	
YTØZ	21	242,814	389	286
			(OP: YU1ZZ)	
YT1BB	14	4,293,024	2350	908
YT2T	*	4,178,164	2447	947
YT8A	7	5,501,639	2016	869
			(OP: YU1EA)	
YT8WW	3.7	1,213,650	1065	522
*YT2AAA	A	324,995	498	311
*YU3MMM	*	217,854	398	266
*YT2VPA	*	162,792	347	238
*YT3AA	*	34,686	153	141
*YT1CC	*	29,495	103	85
			(OP: YU1AAV)	
*YU7ONE	*	18,600	106	93
*YT2U	*	11,470	80	74
*YU1IV	*	7,353	61	57
*YU2DX	14	47,430	203	153
*YU2A	*	42,920	155	145
*YU7KM	*	29,210	150	115
*YU1ADO	*	26,448	131	114
*YT2ACA	*	20,292	147	114
*YT9A	*	2,173	47	41
*YU1SZ	*	646	18	17
*YT1AD	3.7	885,256	855	463
			(OP: YT3W)	

Shetland

GZ5Y	14	67,320	218	180
			(OP: GM4SSA)	

Sicily

IT9JQY	A	117,248	315	229
IR9Z	14	252,252	540	364
			(OP: IT9VCE)	
*IT9PCU	A	122,795	307	205
*IW9FI	*	121,800	311	232
*IT9JDH	*	100,768	272	188
*IT9YAO	*	41,720	166	149
*IT9WTY	*	8,584	59	58
*IT9AUG	28	5,895	53	45
*IW9/KJ4DJL	*	765	18	17
*IU9A	14	1,353,660	1441	660
*IT9LED	*	79,497	281	219
*IT9RWB	7	231,296	384	278

Slovakia

OMØWR	7	573,806	658	379
OM3TWM	*	34,884	129	114
OM3RRC	3.7	32,214	130	118
			(OP: OM4TQ)	
OM6ØKAP	*	29,103	125	109
			(OP: OM3PA)	
*OM4DN	A	244,252	438	269
*OM6AL	*	206,455	424	263
*OM6TX	*	150,228	334	234
*OM8AQ	*	126,786	283	226
*OM7PY	*	100,600	248	200
*OM4JD	*	84,315	197	165
*OM3NI	*	70,357	185	161
*OM4DA	*	55,627	193	143
*OM4ADR	*	29,640	139	120
*OM4TW	*	13,520	89	80
*OM3CQF	*	11,972	82	73
*OM3TB	14	8,833	89	73
*OM8LA	7	23,433	117	107
*OM7AB	3.7	342,104	516	328

Slovenia

S57DX	A	5,956,720	2396	967
S53M	*	115,070	265	185
			(OP: S51FB)	
S55OO	*	92,926	251	194
S5ØAL	*	38,760	157	136
S59T	*	128	10	8
S56M	28	24,300	131	90
S57S	*	9,211	85	61
S5ØK	14	4,585,434	2224	903
S57AL	*	3,714,522	1987	826
S5ØA	*	3,622,515	1939	845
S51F	7	1,606,368	1075	577
S53MM	3.7	2,294,124	1481	651
*S56WPF	A	181,548	341	246
*S53F	*	73,935	191	155
*S57NCP	*	37,343	121	107
*S58MU	*	33,720	148	120
*S52W	*	13,604	92	76
*S59EIJ	*	128	10	7
*S57NTR	21	1,900	26	25
*S52OT	7	956,284	836	476
*S56WJL	3.7	14,560	88	80
*S58RU	1.8	17,622	98	89

Spain

EA1AUT	A	11,270	79	70
EA1AW	*	6,804	65	63
EA1EJ	*	2,574	35	33
AN1A	7	686,256	714	408
			(OP: EA1AST)	
AM1C	*	223,130	353	265
			(OP: EA1NT)	
EA1AAW	3.7	155,940	266	226
*EA1EVR	A	591,045	792	455
*EA1ET	*	408,250	513	355
*EA1JO	*	267,270	407	302
*EA1DKV	*	141,360	307	228
*EA1OT	*	101,848	296	232
*EA1XT	*	85,192	209	184
*EA1GPL	*	44,478	165	126
*EA1GWL	*	27,270	147	135
*EA1PO	*	8,160	56	48
*EC1ABR	*	2,520	37	35
*EB1CFH	21	9,145	62	59
*AO1B	14	330,064	563	392
			(OP: EA1YB)	
*AO1J	*	319,415	495	331
*EH1K	*	210,735	442	315
*EB1EVX	*	26,796	148	132
*EA1ASG	*	6,545	58	55
*EA1DST	*	2,160	44	40
*EA1JJ	3.7	594	19	18
AN2K	A	164,952	298	237
*EH2R	A	377,508	438	326
*EA2WD	*	224,037	402	279
*EA2CE	*	51,054	169	134
*EC2ADN	*	10,368	84	81
*EA2BVV	14	5,589	76	69
EE3R	A	1,180,452	898	546
EE3E	*	1,157,274	957	522
			(OP: EA3ELZ)	
EA3RR	*	927,276	873	498
EA3DTD	*	121,408	285	224
EA3CEC	*	34,224	147	124
EA3PT	14	1,013,706	1166	597
EA3BOX	7	1,708,497	1072	577
EE3Y	*	77,688	194	166
			(OP: EA3EYD)	
EA3ATM	3.7	749,023	679	457
*AM3EGB	A	328,224	441	312
*EA3CI	*	325,523	399	293
*EB3JT	*	264,404	377	284
*EA3NA	*	108,960	276	227
*EB3FLY	*	62,646	205	159
*EA3FHP	*	15,510	105	94
*EA3GNR	*	8,064	58	56
*EA3CZ	*	4,524	52	52
*EA3BIP	*	4,320	41	40
*EA3GUG	*	1,334	30	29
*EA3CZR	*	198	11	11
*AO3E	21	210	10	10
			(OP: EC3PL)	
*EB3CML	7	360	10	10
EA4KD	A	2,620,744	1554	742
EA4TG	*	410,589	694	411
EA4EER	21	148,941	322	247
*ED4A	A	252,324	437	326
			(OP: EA4TV)	
*EA4SG	*	60,187	140	139
*EA4/UY7CW	*	32,743	172	137
*EA4FJJ	*	29,875	137	125
*EA4ETW	*	18,145	111	95
*EB4EPA	*	1,888	35	32
*EA4YK	14	43,016	152	152
*EA4CT	7	2,607	43	33
EA5DFV	A	1,731,660	1382	665
EC5AB	*	485,583	559	399
EA5EV	*	118,800	280	200
EA5ON	*	101,736	266	216
EB5GGB	*	42,458	167	142
AO5W	21	22,018	130	109
			(OP: EA5DWS)	
AO5R	14	419,868	790	436
			(OP: EC5CC)	
EC5WW	7	114,600	230	200
EA5GVV	*	16	2	2
*EE5U	A	152,260	292	230
*EA5ASM	*	142,766	323	247
*EA5FWW	*	80,983	192	161
*EB5CNK	*	77,686	208	179
*EA5BAH	*	46,035	183	155
*EA5XY	*	43,470	136	126
*EB5HRX	*	26,625	155	125
*AN5W	*	12,665	96	85
			(OP: EA5ZD)	
*EA5DIT	*	7,748	61	52
*AO5GVZ	*	4,092	46	44
			(OP: EA5GVZ)	
*EB5WC	*	3,154	38	38
*EB5GIV	*	1,260	28	28
*EA5CZM	*	782	18	17
*EF5W	*	580	20	20
			(OP: EC5CWG)	
*EA5PS	*	336	14	14
*AO5L	14	115,968	347	256
			(OP: EA5OL)	
*EA5TS	*	77,027	216	197
*EA5AVW	*	38,781	154	139
*EA5JON	*	570	20	19
*EB5BVI	7	84	6	6
AO7A	21	177,158	380	283
			(OP: EC7DX)	
EH7H	14	376,200	699	418
			(OP: EA7ELY)	
EB7DX	*	72,625	218	175
AM7M	7	2,975,700	1269	650
			(OP: EC7ANC)	
*EE7R	A	667,371	724	447
*EF7A	*	512,300	808	470
			(OP: EC7ABV)	
*EA7CWA	*	119,400	252	199
*EB7CIN	*	37,820	145	122
*ED7H	*	37,465	162	127
			(OP: EA7HE)	
*EA7IBK	*	35,670	149	123
*EA7HYL	*	29,493	126	113
*EA7EN	*	21,758	96	86
*EC7DOZ	*	13,937	87	77
*EA7VJ	*	2,001	29	29
*EA7FXS	*	748	23	22
*AO7T	14	257,890	577	370
			(OP: EA7KJ)	
*EC7AT	7	100,992	221	192
*EA7FRX	*	39,050	123	110
*EA7ILI	*	4,928	47	44

Sweden

SM6FJY	A	117,949	289	211
SM7DXQ	*	62,800	190	157
SE5T	*	47,775	162	147
SA5ATV	*	14,948	106	101
SM7BJW	*	11,766	79	74
SM5U	14	130,009	309	223
			(OP: SM5UGC)	
SA1A	1.8	98	7	7
			(OP: SM1TDE)	
*SGØM	A	94,575	257	195
			(OP: SAØAQT)	
*SE5S	*	69,600	194	174
*SA7J	*	31,008	153	136
			(OP: SM7XGG)	
*SM7TZK	*	30,250	153	125
*SE2A	*	12,201	101	83
*SA7AOI	*	5,967	55	51
*SM5OSZ	*	4,032	45	42
*SM4YPH	*	1,218	21	21
*SMØQ	14	69,700	256	205
			(OP: SMØOGQ)	
*SF3E	*	18,483	126	101
			(OP: SM3EAE)	
*SM6C	1.8	3,159	39	39

Switzerland

HE8MH	A	1,790,100	1524	585
			(OP: HB9OCR)	
HE8EFJ	*	194,400	351	270
HB9BGF	*	697	18	17
*HB9WDY	A	106,530	270	201
*HE8TSU	*	62,484	202	164
*HB9WNA	*	29,700	122	110
*HB9TSA	*	1,562	26	22
*HB9EPH	*	780	20	20

Turkey (Europe)

TA1FA	14	36,504	190	156
*TA1HZ	A	51,054	166	134
*TA1DX	*	720	21	20
*TA1CM	1.8	37,332	136	122

Ukraine

EO5M	A	8,632,428	3621	1108
			(OP: URØMC)	
US5D	*	3,362,964	1865	803
			(OP: UT7DX)	
UW1M	*	2,076,456	1520	718
			(OP: UR5MW)	
UY7MM	*	1,449,529	1248	589
UW8SM	*	809,044	785	446
UY5ZZ	*	685,500	779	457
UX2X	*	577,668	658	364
			(OP: UT2XQ)	
UW2Q	*	522,899	617	377
			(OP: UR6QS)	
UT6EE	*	424,660	533	340
URØIQ	*	308,880	425	330
UT7MA	*	210,938	362	266
US3IZ	*	207,690	343	230
UR4IOR	*	140,817	307	219
UTØEA	*	137,238	226	178
UR4IXM	*	125,775	290	215
			(OP: US6IPD)	
UX5UO	*	121,623	271	213
UV7QA	*	75,839	225	181
UT3IM	*	49,932	156	146
USØKW	*	37,944	148	124
UX5IO	*	742	14	14
UV2L	21	8,816	73	58
UT4Q	*	8,083	80	59
			(OP: UR5QRB)	
UW5U	14	956,449	1061	559
UV5U	*	353,977	536	373
			(OP: UX1UA)	
UR5ZMK	*	108,070	284	214
UY8LM	*	106,020	287	228
UT5ECZ	7	283,968	383	288
URØQX	*	77,736	178	158
US2YW	3.7	1,089,680	1003	514
UT3SA	*	799,374	818	461
UX1UX	*	534,296	652	392
UY3AW	*	138,820	295	220
URØEE	*	47,583	185	153
*UR4U	A	1,110,294	955	522
			(OP: UR4UDI)	
*UT4EK	*	699,712	740	416
*UT5UGS	*	490,106	642	382
*UY2UQ	*	418,834	604	362
*UR8QR	*	402,398	520	346
*UR5ETN	*	347,007	509	309
*UX7U	*	267,600	453	300
*UR5TW	*	175,724	311	223
*US4LS	*	164,964	323	236
*US5ISV	*	164,925	303	225
*UX2KA	*	131,399	260	197
*US7LM	*	121,824	267	216
*USØYW	*	107,445	246	195
*US8ICM	*	106,970	251	190
*UT4XU	*	90,090	241	182
*UW7M	*	89,362	252	182
			(OP: UR3MP)	
*UR5WDQ	*	85,928	254	184
*US6CQ	*	72,744	211	168
*UT8EL	*	69,208	212	164
*UT5UKY	*	65,637	194	153
*UT5UQN	*	65,565	177	155
*UR5WHT	*	65,081	199	151
*UR7EQ	*	58,144	190	158
*UT8IT	*	57,624	180	168
*UY5TE	*	57,514	193	149
*UR7R	*	54,901	203	161
			(OP: UX1RX)	
*UT2IO	*	49,096	184	152
*UR5XMM	*	39,552	131	103
*UYØIX	*	33,480	145	120
*UT5ERV	*	28,885	127	109
*UU2JG	*	27,846	107	91
*UU2JA	*	21,336	98	84
*USØSY	*	19,296	102	96
*UYØCA	*	14,705	97	85
*US9PA	*	10,833	79	69
*UY7C	*	9,916	70	67
*UY2RZ	*	9,685	69	65
*US6EX	*	7,360	56	46
*UR5KED	*	6,534	60	54
*UR7CT	*	5,814	54	51
*UU6JF	*	4,512	50	47
*UTØEZ	*	3,888	37	36
*UT2AB	*	1,272	24	24

*UTØEO	14	115,656	321	237
*UR2VA	*	97,600	269	200
*US7IA	*	96,849	273	211
*UT3RS	*	56,248	197	158
*USØMM	*	216	9	8
*UZ7M	7	1,301,869	797	529
			(OP: UT9MZ)	
*UR7TZ	*	460,250	537	350
*UT5KL	*	148,480	301	232
*UT3EK	*	73,476	179	157
*UZ5UA	*	46,080	144	128
*UU2CW	*	4,242	44	42
*UU5JFP	*	1,350	25	25
*UY4F	3.7	105,200	247	200
			(OP: UR5FEL)	
*UR3IJI	*	98,392	238	196
*UT1AB	*	25,086	125	111
*US6IPD	*	19,019	101	91

Wales

MWØZZK	A	188,190	331	255
GW4BLE	*	56,260	170	116
GW4OH	7	368,543	442	323
GW4BKG	*	100,998	221	186
*GW4EVX	A	105,534	279	198
*MW1MDH	*	83,904	256	192
*GW3YVC	*	3,818	48	46
*MWØCWJ	7	27,040	111	104
			(OP: MMØCWJ)	

OCEANIA

Australia

VK1MJ	A	132,060	234	155
VK2CA	A	138,061	311	163
*VK2KRM	A	31,457	150	83
*VK2HBG	*	7,335	88	45
*VK2LET	*	1,659	24	21
VK3NI	A	2,428,439	1120	509
VK3IO	*	366,639	362	221
VK3TZ	*	91,379	197	137
VK3AVV	*	32,476	123	92
VK3YXC	*	15,736	90	56
*VK3ALZ	A	19,462	88	74
*VK3ZGP	*	140	9	7
*VK3ZPF	14	1,809	32	27
*VK3VTH	*	738	22	18
VK4ZD	A	156,999	246	177
VK4HG	*	14,634	85	54
*VK4EJ	A	141,036	297	161
*VK4BL	*	65,744	195	112
*VK4XES	*	33,124	125	91
*VK4VDX	*	29,316	141	84
VK5HRT	A	48,312	167	99
*VK5NPR	A	26,544	110	79
*VK6FDX	A	5,520	53	40
VK7XX	A	128,860	306	170
VK7ZE	14	1,061,528	850	472
*VK8HPB	A	612	17	17

Brunei

*V8AQM	A	576,926	589	343

East Malaysia

9M8Z	A	6,046,416	2318	796
			(OP: 9M6DXX)	

Guam

KG6DX	A	1,691,999	1397	421
WH2X	*	1,080,891	1089	301
WH2D	*	79,800	234	120
			(OP: K3UOC)	

Hawaii

KH7XS	A	17,615,360	4520	983
NH7A	*	6,308,000	2634	664
KH6FI	*	2,569,894	1556	491
KH6RC	*	530,262	527	267
NH6P	21	448,256	587	272
*KH6CO	A	39,008	140	106
			(OP: KH6OO)	
*NH6WZ	*	4,176	33	29
*AH6RR	28	350	17	10

Indonesia

YB1AR	A	381,615	518	285
YB3ZCS	*	43,152	173	116
			(OP: YC3RPS)	
YC9MDX	21	597,025	695	325
YC1LA	*	247,260	370	260
YB1UUN	*	151,515	273	195
YB8FL	7	105,288	170	123
*YB1TJ	A	631,545	619	355
*YBØEIN	*	341,320	437	280
*YBØMJY	*	287,564	387	268
*YB3IZK	*	184,800	303	220
*YB1CYD	*	34,505	132	103
*YBØKYM	*	3,276	41	36
*YC2EUZ	*	2,600	34	26
*YB1AQD	*	1,281	21	21
*YC5OUB	21	156,420	278	198
*YB8EL	*	65,136	179	138
*YC2BBY	*	1,608	25	24
*YC1BRS	*	396	12	12
*YB1MBA	14	18,480	86	77
*YB1ALL	*	7,752	61	51
*YB5ZAA	*	3,104	37	32
			(OP: YC5BOY)	
*YC2FAJ	7	8,729	54	43
*YC1UGK	3.7	60	4	4

Mariana Islands

*WHØS	A	211,068	481	156

New Zealand

ZM1K	A	90,812	183	145
ZL1KMN	*	6,230	37	35
ZM2A	*	4,446	48	38
ZL3A	7	6,940,320	1605	760
			(OP: ZL3WW)	
*ZL1AAD	A	32,422	128	86
*ZL2MM	*	12,204	83	54
*ZL4JB	*	5,372	41	34
*ZL4CR	*	750	15	15
*ZL3DW	*	451	13	11

Philippines

DU1BP	A	2,135,989	1319	433
4H9RG	*	1,172,544	937	372
			(OP: DU9RG)	
4H1T	*	961,713	977	279
			(OP: DU1IVT)	
*DV1JM	A	489,072	547	276
*DU1EQ	*	63,546	200	119
*DU9/MØGHQ	*	36,450	127	90
*DV1EE	21	77,165	259	115
*DU1EG	*	25,986	128	71

SOUTH AMERICA

Antarctica

*R1ANC	14	26,666	136	67

Argentina

LT1F	A	5,288,631	2264	779
			(OP: LU1AEE)	
LU3MAM	*	1,360,476	973	494
LU7MCJ	*	1,294,452	953	492
LT5Y	*	175,501	296	223
			(OP: LU1YU)	
LU4FLJ	*	169,128	302	216
LW9ETQ	*	96,360	230	165
LU1HF	28	736,524	768	369
AY5F	21	5,689,620	2296	866
			(OP: LU5FC)	
LU1FDU	*	4,737,575	2113	775
LV5V	*	1,482,190	989	538
			(OP: LU5VV)	
LW3EWZ	7	53,297	140	117
LU9MDH	*	30,260	92	85
LU2DVI	3.7	1,044	18	18
*LT7H	A	2,196,156	1333	591
			(OP: LU1HLH)	
*LU2EE	*	1,032,700	864	449
			(OP: LU3DR)	
*LU8SAN	*	316,888	447	286
*LU5CAB	*	240,648	391	271
*LU4KC	*	75,088	252	152
			(OP: LU6KA)	
*LS2E	*	71,520	222	160
*LR1A	*	45,000	168	125
*LU1IBL	*	27,448	130	94
*L73DX	*	12,580	100	74
*LU7DSU	*	2,790	31	31
*LU7FWV	*	975	28	25
*LQ5H	28	240,170	406	235
			(OP: LU3HS)	
*LU2UE	*	218,550	372	235
*LU6FOV	*	70,213	221	143
*LTØD	*	56,160	174	130
			(OP: LU6DU)	
*LO7D	*	6,656	59	52
			(OP: LW1DRH)	
*LU4WG	21	336,217	423	301
*L20E	*	128,256	263	192
*LW1HR	*	103,170	242	181
*LU9FFZ	*	20,553	107	93
*LR1H	14	216,630	338	261
			(OP: LU2HOD)	
*LU5YF	*	1,848	33	28
*LT2F	*	147	7	7
			(OP: LU7FNI)	

Aruba

*P4ØA	A	14,106,670	3883	1010
			(OP: KK9A)	

Bolivia

CP1FF	14	10,496	65	64

Brazil

PY2YU	A	5,983,194	2252	866
PY3DX	*	2,676,168	1446	654
PY2ADR	*	2,597,705	1437	647
PY2EL	*	1,152,018	910	446
PY7ZZ	*	818,090	641	434
PP1CZ	*	555,269	599	353
PY1WS	*	294,560	383	280
ZW2B	*	140,936	280	223
			(OP: PY2FW)	
PY7XC	*	122,844	218	174
PY2WAS	*	122,460	261	156
PY2EX	*	121,986	283	162
PY2SF	*	83,694	214	174
PY2KP	*	48,240	155	120
PY6PRS	*	47,875	185	125
PP5JY	*	45,633	162	123
PY3CAL	*	7,524	69	57
PY5KA	*	3,440	43	40
PY3KIM	*	558	18	18
PP5WG	28	471,835	588	305
PY2HAM	*	1,260	28	28
ZX5J	21	9,930,600	3191	1080
			(OP: PP5JR)	
PP5TR	14	1,506,985	1003	551
PR7AR	*	790,218	660	429
PR5Z	*	197,263	323	227
			(OP: PY5ZHP)	
ZZ5Z	*	72	6	6
			(OP: PY5YA)	
PW2P	7	1,095,495	578	367
			(OP: PY2XAT)	
PR7AP	*	163,452	190	159
PY2BT	*	33,417	81	79
PV8AA	3.7	136,010	169	145
			(OP: PV8DX)	
PU3KNG	*	4	2	2
*PY2NY	A	2,426,318	1313	634
*ZX7A	*	1,091,415	851	435
			(OP: PS7TKS)	
*PY2SEX	*	477,125	464	347
*ZX7U	*	332,848	447	293
*PY2SRB	*	172,255	298	235
*PY1SX	*	141,693	282	219
*PY7VI	*	110,292	229	182
*PY2SEI	*	79,530	215	165
*PY1RY	*	41,540	169	124
*PV8DR	*	40,460	148	119
*PP5AIM	*	21,631	115	97
*PY5JO	*	20,672	93	76
*PY2ZR	*	20,615	112	95
*PY2DXX	*	18,040	95	88
*PP5KR	*	12,285	71	63
*PY5LF	*	10,582	86	74
*PY2BF	*	8,540	66	61
*PY3APY	*	7,564	75	61
*PU3LBA	*	2,340	41	36
*PY2RDZ	*	2,184	59	39
*PU8TEP	*	1,450	33	29
*PY2FDX	*	90	5	5
*PU2MTS	28	134,871	289	201
*ZV2C	*	127,264	284	194
*PU2LEP	*	61,200	186	144
*PU2UEO	*	20,680	108	88
*PU7XAF	*	9,880	106	65
*PU2KLM	*	6,102	64	54
*PU2WDX	*	3,638	45	34
*PU1SAT	*	2,400	43	40
*PU2UJG	*	1,140	34	30
*PU3LBS	*	660	22	22
*PU3LYB	*	476	18	17
*PY2MR	*	126	9	9
*PU2KXM	*	9	3	3
*ZV5E	21	1,284,215	911	505
			(OP: PP5KE)	
*PY2GH	*	397,328	479	304
*PY4DEL	*	221,859	347	249
*PY2DU	*	28,906	114	97
*PY4XX	*	15,470	90	85
*PP5JN	*	220	10	10
*PW2B	14	62,712	173	156
			(OP: PY2HL)	
*PY2ZA	*	10,854	77	67

Chile

*3G1C	A	771,680	787	371
			(OP: CE1KR)	
*CA6BMF	*	31,714	127	101
*XQ4CW	*	13,860	118	77
*XQ4EM	*	3,864	44	42
*CE2WZ	28	26,578	128	97
*CE4CT	21	700,422	752	321
*CA3OEV	7	1,512	21	21

Colombia

HK3Q	A	1,653	31	29
*HK3JJH	A	1,482,885	977	465
*HK6P	*	549,360	520	327

Ecuador

HC2A	A	87,630	220	138
HC2GF	21	620,620	753	308
HC2AQ	3.7	491,283	364	247
*HC5VF	A	47,190	148	121
*HC7AE	21	82,425	214	157
*HC1JQ	14	502,887	568	311

Falkland Islands

VP8KF	A	5,295,752	2147	818
			(OP: G3VPW)	

Fernando de Noronha

PYØFF	7	4,121,630	1149	643

Paraguay

ZP5CGL	A	548,915	575	353
*ZPØR	A	3,677,901	1706	723
			(OP: ZP5AZL)	
*ZP6DEM	*	346,275	493	285
*ZP8VAD	*	135,801	247	191

Peru

*OA4AI	A	118,370	244	178

Suriname

PZ5RA	A	992,864	763	437

Trinidad & Tobago

*9Y4D	1.8	2,616	26	24

Uruguay

CX2CC	28	305,184	461	264
CX1AV	21	1,292,576	946	496
*CX2ABP	A	25,116	125	92
*CX8ABF	*	2,574	45	39

Venezuela

YV5AMH	A	4,437,773	1759	647
YV5NWG	*	598,928	556	328
YV5MSG	*	470,041	392	247
YW4V	*	211,470	320	210
YY5CBK	*	23,868	71	68
*YV5EAH	A	600,600	634	308
*YV6BTF	*	462,384	527	338
*YY5ALO	*	22,620	115	87
*YV7QP	*	11,323	82	67
*YV1FM	21	446,368	556	296
*YV1JGT	14	17,802	92	86
*YY4CVI	7	13,770	53	51

QRP

TI5N	A	776,205	795	367
			(OP: NØKE)	
OK2BYW	*	595,265	694	395
F5BEG	*	552,690	629	414
OK7CM	*	524,372	629	389
RX1CQ	*	396,207	563	331
OM7DX	*	345,450	496	329
S59D	*	343,638	470	306
N2WN/4	*	331,441	447	319
NAØCW	*	325,995	549	309
			(OP: W8QZA)	
SP2DNI	*	219,760	398	268
DJ3HW	*	214,200	361	280
DL4VCG	*	189,224	348	248
VA3DF	*	173,723	279	187
HA7YS	*	165,120	307	240
HA6IAM	*	159,783	303	241
YPØA	*	156,065	312	245
RZ6MP	*	125,460	298	204
UT5UUV	*	125,457	299	213
WB4MSG	*	125,191	359	209
EA1GT	*	117,260	308	220
RW3AI	*	111,706	300	202
PE2KP	*	108,712	289	214
UXØZA	*	95,256	276	196
NN7SS	*	88,074	234	189
			(OP: K6UFO)	
4D1N	*	85,731	250	123
			(OP: DV1UWY)	
YO4AAC	*	72,738	215	162
US5IND	*	70,560	212	168
KT8K	*	66,980	211	170
WA8WV	*	64,548	198	163
YO4RST	*	63,296	196	172
RW3XS	*	58,984	193	146
UA3RC	*	54,984	219	158
HA5BA	*	53,576	184	148
CT1ELF	*	53,152	177	151
RW6FO	*	39,200	168	140
9M6YBG	*	31,941	135	91
LZ7H	*	30,326	141	118
9A2EY	*	25,308	135	111
EC5APA	*	24,544	148	118
PY2BN	*	22,638	120	98
G6CSY	*	21,000	101	100
M6KAH	*	20,402	113	101
M5AEF	*	19,610	124	106
VA3RKM	*	12,780	73	60
SP8LXE	*	11,627	91	77
RV3YR	*	9,982	70	62
VK4ATH	*	6,721	59	47
SP4DZT	*	6,500	54	52
RK3DCU	*	6,390	71	71
VU2PTT	*	5,152	56	46
W2JEK	*	4,860	57	45
M3PSK	*	4,508	50	46
WI1G	*	3,880	45	40
			(OP: W1IG)	
EA1EA	*	3,536	38	34
LA1TPA	*	2,814	45	42
WA5RML	*	2,408	51	43
PA9RZ	*	2,272	32	32
IZ3NVR	*	1,850	26	25
JM1KLO	*	1,824	36	24
AF9J	*	1,645	37	35
KB5DRJ	*	1,230	35	30
AO4C	*	840	28	24
K6MI	*	836	20	19
DL1JB	*	700	21	20
K9GY	*	364	13	13
MMØBQI	*	242	11	11
EA1GFY	*	44	4	4
EA8TX	28	23,120	103	80
LU7VCH	*	17,739	101	81
ISKAP	*	3,286	38	31
W6GMT/5	*	2,484	32	27
JA2MWV	*	319	15	11
HP1DFV	*	176	8	8
OK2ABU	*	1	1	1
JH7RTQ	21	37,296	161	111
SQ4HRN	*	12,544	75	64
7N4WPY	*	11,844	86	63
YCØCOX	*	10,920	70	65
WA6FGV	*	9,100	82	70
BD6QDR	*	8,085	69	55
SM5MEK	*	1,260	24	21
YT2B	*	1,144	22	22
JK1TCV	*	260	10	10
XX9LB	*	165	12	11
JA1KPF	*	133	7	7
RA3FO	14	264,067	576	347
IØUZF	*	107,778	268	213
LA9BM	*	90,055	287	217
CT/LZ3ND	*	63,867	218	183
TG9ANF	*	51,291	194	123
YT1CS	*	50,020	216	164
SP4GFG	*	48,100	187	148
UA1CEC	*	42,660	184	158
IZ1ANK	*	29,304	150	132
EG4M	*	23,712	125	114
			(OP: EA4EQD)	
UT5UPN	*	21,930	117	102
K3TW	*	21,660	101	95
7Z1SJ	*	19,344	87	78
LA8WG	*	18,870	130	111
EA3FF	*	13,932	87	86
DHØJAE	*	9,174	75	66
WB7OCV/2	*	8,976	73	68
RK4FB	*	6,969	75	69
IZ2FME	*	4,371	47	47
OK1DST	*	3,600	50	45
LY2LF	*	3,440	49	43
9A8MM	*	2,944	49	46
YO9CUF	*	2,592	38	36
IV3AOL	*	1,953	33	31
E77J	*	1,881	33	33
			(OP: YU2EA)	
HB9ENI	*	1,512	38	36
DL1DQY	*	1,357	24	23
KB1QEU	*	1,175	25	25
XX9ET	*	1,118	29	26
JK3AHS	*	403	14	13
BY4CYL	*	253	13	11
MØJBA	*	216	12	12
KZ2V/6	*	66	6	6
YO4AYE	*	28	4	4
JA1POS	*	24	4	4
SP6QKP	*	3	1	1
RA4FWA	7	93,790	196	166
N1TM	*	67,482	186	138
YU1LM	*	20,962	106	94
YR8V	*	19,140	98	87
			(OP: YO8CT)	
ES6KW	*	11,748	68	66
ON8NT	*	6,032	59	52
TG9ADQ	*	5,810	42	35
OK2NMA	*	3,440	47	43
RAØAY	*	360	10	10
OL4W	3.7	154,580	342	236
			(OP: OK1IF)	
SP9DTE	*	110,432	266	203
Z35X	*	100,746	248	193
SP2QOT	*	87,236	236	193
UT3L	*	71,214	199	166
			(OP: UR5LO)	
AJ3T	*	18,648	102	84
OK1AIJ	*	10,934	82	71
RZ9AR	*	4,368	31	28
DJ3GE	1.8	280	14	14

ASSISTED
NORTH AMERICA

United States

WU3A/1	A	6,701,832	2504	1026
			(OP: W3UA)	
WB9Z	*	5,104,008	2578	936
K7RI	*	4,193,814	2863	797
W5WMU	*	3,674,874	2651	826
W8MJ	*	3,498,908	2124	812
WE4M	*	2,531,778	1464	699
			(OP: N2QT)	
WG5J	*	2,191,133	2024	679
NG3R	*	1,937,562	1236	682
			(OP: N3DXX)	
WN9O	*	1,790,526	1233	653
			(OP: W9IU)	
A83CX/2	*	1,755,333	1286	639
K3WW	*	1,393,508	995	586
W3KL	*	1,300,000	865	520
W1BV	*	1,299,276	1004	561
N2BJ/9	*	1,263,675	1199	581
WA5ZUP	*	1,231,892	1670	526
AA3B	*	1,219,410	772	510
NM6G	*	1,215,506	1187	551
			(OP: W6CZ)	
N6QQ	*	1,084,492	1088	548
WM4RM	*	890,945	807	485
			(OP: W4NF)	
KG4W	*	870,738	763	474
NC4KW	*	834,110	836	478
			(OP: N1LN)	
W9JA	*	769,128	730	438
N6XT	*	746,200	1003	455
NQ7R	*	729,280	877	424
AA8LL	*	686,280	583	430
KØKX	*	660,111	540	417
WT8C	*	588,557	564	389
N2SQW	*	521,081	576	373
W2YC	*	412,456	427	344
AK6M	*	409,136	605	364
			(OP: K6MM)	
KJ6RA	*	401,508	590	342
NA1QP	*	386,570	497	310
			(OP: W1CTN)	
N2MUN	*	379,125	467	337
WØNO	*	328,662	444	279
NQ1W/4	*	328,042	450	341
			(OP: K1KO)	
AK4I	*	298,566	467	291
NZ5DX	*	297,540	452	270
			(OP: K5MR)	
WA1Z	*	275,925	424	283
N4ZZ	*	268,770	506	289
NM2O	*	259,888	487	296
AD6ZJ	*	257,450	518	271
K5NZ	*	248,880	496	305
KC4HW	*	239,493	497	291
N4GG	*	221,844	457	266
NS9I	*	216,790	322	266
NW6P	*	214,082	376	263
W2BZR/3	*	192,480	330	240
K5VIP/4	*	190,760	294	251
K7EG	*	186,368	319	256
K4JRA	*	182,595	322	235
KF9AF	*	181,790	351	245
W6SA/7	*	179,330	413	227
WB4MAK	*	178,816	296	254
N4DWK	*	173,508	298	228
N2KPB	*	171,225	315	225
W6XR/2	*	168,696	279	216
W8TE	*	152,736	255	222
NØODK	*	142,140	289	206
W4CU	*	133,342	282	209
W7CT	*	132,210	337	226
NØSXX	*	131,100	286	230
W2RZS	*	127,959	256	221
			(OP: WB2NVR)	
N4BCD	*	112,308	243	196
N1IBM/2	*	111,132	222	196
AJ3M	*	107,730	303	210
WØJPL	*	104,082	218	166
WF4W	*	103,415	326	185
AJ1M/8	*	103,408	265	184
N6WK	*	100,636	218	181
W9GIG	*	97,008	205	188
WI2E/3	*	88,200	280	175
N3KCJ/7	*	87,880	271	169
N2PKP	*	81,954	219	174
K9DUR	*	76,300	218	175
WA3OFC/4	*	76,293	176	173
N3UA/4	*	74,500	198	149
N4NM	*	74,250	206	165
NR4M	*	74,196	187	162
			(OP: K7SV)	
ND4V	*	73,950	194	174
KR4F	*	70,819	184	151
W5KI	*	68,572	249	158
AF6ME	*	65,155	211	157
KG7C	*	64,059	227	163
K7RSM	*	63,742	246	157
N1MGO	*	62,878	195	149
W3WC	*	59,200	167	148
W4RK/Ø	*	58,976	213	152
K4XD	*	58,362	168	137
N6VH	*	58,359	213	147
WA3G	*	58,290	157	145
KT7G	*	56,392	216	152
NJ1F/2	*	54,538	214	134
N4WW	*	53,795	211	145
K6TA	*	53,375	143	125
K5GKC	*	50,920	173	134
W4JAM	*	49,206	159	139
KV1J	*	48,772	186	137
WA9IVH	*	48,006	152	126
W9PL/7	*	47,696	141	88
W9KB/8	*	40,950	180	130
AJ4IM	*	38,700	116	100
KSØT	*	34,684	123	116
NA2M	*	32,376	129	114
WF2B	*	31,527	130	113
WA3AFS/2	*	31,188	94	92
W4CWA	*	30,360	138	110
K1ZW/4	*	30,048	98	96
W6UB/4	*	29,970	112	90
NK4I	*	28,518	125	97
KM9M	*	28,000	180	125
N4TL	*	27,904	122	109
KB9KEG	*	27,756	144	108
N8AGU	*	23,604	88	84
NN6C	*	21,112	103	91
			(OP: W6SC)	
WVØT	*	18,270	130	90
WU6CC	*	16,720	94	88
			(OP: WA6L)	
KF6I	*	16,008	101	87
K8MR	*	15,600	82	78
N2WKS	*	12,864	77	67
K6VVA	*	8,003	68	53
WBØGAG	*	7,744	81	64
N6ER	*	4,625	42	37
K8YC/4	*	3,978	40	39
W4VIC	*	3,762	40	38
KØFA	*	2,656	33	32
KF2O	*	2,352	24	24
N6ML	*	615	15	15
W7VS	*	385	12	11
NQ5K	21	86,190	212	170
			(OP: W5ASP)	

KI7M	14	994,449	1177	527
WR2G	*	391,124	484	353
W9NGA/7	*	384,748	765	364
KC1ME	*	376,302	552	354
			(OP: K1JB)	
KG9N	*	328,960	512	320
W2OSR	*	188,238	298	274
K6III	*	21,560	98	98
AC6DX	7	408,240	596	315
K2RET	*	139,698	312	199
KI9A	*	99,288	366	197
NA3M	*	84,800	190	160
KZ5OM/6	*	6,288	48	48
			(OP: K6III)	
W7WHY	*	247	13	13
KN6DV/2	3.7	336,740	568	298
			(OP: E78WW)	
WK4Y	*	113,750	333	175
N4QV	*	27,740	113	95
N8KOJ	*	18,540	145	90
K6GT	*	5,032	47	37
N2DW/4	*	918	20	18
W2MF	1.8	76,212	222	146
WZ8P	*	14,615	137	79
*NR1I	A	689,165	709	409
			(OP: W1NT)	
*W4KTR	*	525,470	582	374
*N4IG	*	483,035	547	373
*KE1V	*	318,008	489	313
*W4EE	*	284,100	399	300
*K2DSL	*	208,260	412	260
*K4NAU	*	203,404	311	241
*WN6K	*	190,212	504	262
*KØAD	*	187,854	446	262
*W1TO	*	153,652	254	214
*AB2IO	*	148,190	289	203
*N1DXF	*	140,015	281	205
*KCØDEB	*	138,229	342	217
*NØWK	*	123,768	298	216
*AI4ME	*	97,020	236	165
*K2ZC	*	92,904	236	168
*N4JOW	*	92,340	256	171
*K7VIT	*	90,654	253	174
*ND6S	*	77,700	258	175
*NF7T	*	74,866	227	166
*KØRC	*	74,360	209	169
*K6GEP	*	69,462	243	153
*N3ME	*	66,424	185	152
*K5WW	*	66,220	215	154
*N3BUO/5	*	62,216	204	154
*N7FLT	*	43,218	140	126
*ACØW	*	43,146	178	141
*WM6DX	*	42,672	161	127
			(OP: W6DPD)	
*KJ4IC	*	42,441	187	129
*K2PO/7	*	41,888	198	119
*WA1ZYX	*	38,142	133	117
*K5DO	*	34,128	143	108
*WB1EDI	*	33,176	134	104
*K3PG	*	29,268	129	108
*KD7YFG	*	24,200	151	100
*N9LF	*	22,048	135	104
*N7SCL	*	20,736	126	96
*NV7P	*	14,208	78	74
*KC2LST	*	14,118	89	78
*W4HIJ	*	9,920	90	64
*K2SX/4	*	6,441	67	57
*W9PDS	*	5,830	66	55
*KC9GGV	*	5,510	63	58
*WB2RIS	*	5,123	50	47
*W6ONV	*	4,050	58	50
*KI4MFX	*	3,654	46	42
*NJ5DX	*	3,034	40	37
			(OP: W5OV)	
*KB1OWT	*	2,775	38	37
*NE1F	*	2,336	33	32
*W5JAO	*	2,244	36	33
*KO4OL	*	638	23	22
*N2LQ	*	588	15	14
*NØBK	*	27	3	3
*W4LC	14	221,872	322	283
*KC9LNH	"	1,798	33	31
*W7SST	"	1,323	28	27
*K6BIR	"	1,288	35	28
*ACØE	"	525	21	21
*N7MAL	7	21,930	99	86
*W8EH	"	3,280	47	41
*W6HH/5	3.7	377	13	13

Alaska

AL9A	A	1,428,317	1197	451
*AL2F	A	193,844	360	196
*KL2R	14	25,568	117	94
			(OP: N1TX)	

Canada

VE3UTT	A	5,025,341	1754	821
VA3DX	*	2,225,402	1092	629
VE1DX	*	2,065,932	1481	594
VE7KS	*	536,580	485	330
VE2FXL	*	376,164	391	258
VE3ZZ	*	312,613	373	259
VE1OP	*	179,598	323	222
*VE1DHD	A	676,802	659	406
*VE6TN	*	653,496	646	373
*VE3XAT	*	187,360	287	176
*VA3PL	14	22,761	97	81
*VE3MGY	1.8	34,020	128	81

Mexico

XE2YBG	14	57,771	230	131

Turks & Caicos

VP5V	A	7,254,044	3343	898
			(OP: W5CW)	

Virgin Islands

*NP2KW	A	1,643,000	1490	500
*KP2BH	*	1,091,664	997	432

AFRICA

Canary Islands

EA8/DH6CS	21	5,084,580	2078	830
*EA8BQM	A	85,094	186	157
*EA8BZH	*	53,160	137	120

Madeira Islands

CS9L	A	14,356,552	3879	1048
			(OP: DF7ZS)	

South Africa

ZS4U	A	3,863,145	1779	715

ASIA

Asiatic Russia

RG9A	A	8,038,800	2346	900
			(OP: UA9AM)	
RU9CK	*	6,552,162	2145	822
RO9O	*	2,187,918	1141	558
			(OP: RZ9OO)	
RM9RZ	*	1,247,085	872	535
UAØSE	*	1,132,992	1036	448
UA9CDC	*	980,100	633	405
RV9WP	*	529,971	446	321
RW9WA	*	445,094	438	323
RW9TA	*	331,240	372	260
UA9HR	*	151,498	279	211
UAØNL	*	32,623	149	101
RAØAM	*	27,621	96	81
RXØAW	14	1,878,130	1138	641
UA9CAX	*	38,844	130	117
UA9TT	7	992,496	526	368
UA9MA	3.7	44,528	98	92
*RV9AZ	A	94,829	196	161
*RV9UP	*	63,342	169	138
*RV9YK	*	39,480	149	120
*RU9UG	*	23,715	96	85
*UA9SUX	*	11,139	49	47
*RX9WN	*	8,494	64	62
*RW9HAY	*	390	18	15
*RV9CX	*	374	12	11
*RV9JD	21	4,512	55	47
*RA9JR	14	187,739	290	241
*RWBAA	*	11,096	81	73

China

BA4SO	A	1,456	36	28
*BG4AHD	A	15,622	114	73
*BG7LKJ	21	37,076	191	124
*BD4QH	14	273,511	549	287
*BD4KUU	*	10,360	96	70

Georgia

*4L6OC	21	35,856	142	108

Hong Kong

VR2XLN	A	570,630	876	345
VR2YYW	14	532,032	695	408
*VR2PX	21	131,440	436	212

Israel

4XØA	21	184,245	322	213
			(OP: 4X1VF)	
*4Z5OZ	A	4,446	45	39

Japan

JQ1BVI	A	1,382,259	1100	501
JF9JTS	*	327,222	421	294
JO3DDD	*	311,472	466	252
JG2REJ	*	80,937	206	153
JE1FQV	*	75,509	180	161
JA7ZP	*	50,288	136	112
JF2QNM	*	43,173	170	117
JH7XVB	*	3,520	37	32
JA1IZZ	*	3,080	30	28
JA1EHV	14	157,296	317	226
JN3SAC	*	70,914	193	159
*JA1MZM	A	155,200	313	200
*JA1XPU	*	30,349	135	89
*JK2VOC	*	21,384	113	72
*JA3PYC	*	6,678	54	42
*JA2KPW	*	4,699	52	37
*JH3EQP	*	4,212	57	39
*JA1BJI	*	2,520	24	21
*JI3KXB	*	880	24	22
*JA1KEB	*	656	18	16
*JM1IMF	21	615	16	15
*JR4FLW	14	41,625	157	125
*JM1NKT	7	29,250	99	78

Kazakhstan

UP4L	14	2,452,359	1294	691
			(OP: UN7LZ)	
UN7MMM	*	1,211,250	860	510
*UN9PQ	14	30,456	116	108
*UN9FB	3.7	10,752	58	48

Kuwait

9K2HN	A	25,017	104	93

Kyrgyzstan

*EX7ML	21	47,762	185	143

Turkey

YM2W	21	130,140	259	180
			(OP: OK1MU)	
*TA3FB	A	29,040	98	88

EUROPE

Austria

OE2VEL	A	105,492	207	177
OE5UAL	*	26,864	100	92
OE3KAB	*	14,931	98	79
OE2S	14	3,537,990	1843	855
			(OP: OE9MON)	

Belarus

EW6GF	14	137,760	374	240
*EU4LY	A	65,902	203	166

Belgium

OO4B	A	935,077	827	503
			(OP: ON4BHQ)	
*ON6FC	A	176,085	346	273
*OO9O	*	22,155	115	105
*ON6NL	14	169,545	327	267

Bosnia-Herzegovina

E73M	A	7,750,990	2919	1090
*E71DX	A	18,445	88	85

Bulgaria

LZ2ZG	A	420	14	14

Croatia

9A4M	A	119,910	269	218
9A9M	*	2,975	37	35
9A2U	28	7,128	68	54
			(OP: 9A3ZA)	
9A3AG	7	3,165,372	1467	742
*9A3XV	A	18,972	97	93
*9A3TU	*	17,640	97	80
*9A5TO	*	96	8	8

Czech Republic

OL5T	A	2,436,177	1434	727
OK1TRA	*	33,630	131	114
OK2BPU	14	123,432	284	222
*OK1TC	A	276,544	423	298
*OK2KFK	*	145,848	320	236
			(OP: OK2PDE)	
*OK4DZ	*	70,716	210	166
*OK2BEN	*	24,388	105	91
*OK1UG	7	290,624	406	304

Denmark

OZØTE	A	279	10	9

England

MØRNR	A	107,996	262	203
*G4WGE	A	163,784	337	236
*M2W	*	5,720	65	52
			(OP: MØTZO)	

Estonia

ES5RW	14	2,377,620	1586	740
ES8TJM	7	112,404	251	204
ES5MG	*	60,501	132	129
*ES2MA	A	576	16	16
*ES5TF	14	89,452	235	209
*ES2BH	*	50,213	165	149

European Russia

RZ3AXX	A	8,262,288	3222	1086
			(OP: RA4HTX)	
UA6GP	*	4,074,543	2386	891
UA4WKW	*	3,831,044	2181	854
RK3DH	*	333,462	443	298
RK3FQ	*	214,272	307	248
RA4PD	*	90,932	240	179
RN1ON	*	36,894	148	129
RW4WZ	*	23,256	109	102
RX3MA	*	13,311	95	87
RA6HJR	*	4,480	46	40
RL3A	14	5,616,525	2785	1069
			(OP: UA3ASZ)	
UA6LUQ	*	359,476	634	403
RU3FN	*	221,654	403	307
RW6HJV/6	*	162,400	366	280
			(OP: RW6HJV/6)	
RA3THN	*	10,790	97	83
RU3OO	*	837	27	27
RT3T	7	1,419,100	972	575
			(OP: UA3TU)	
RK3QS	*	351	10	9
RU6FA	3.7	101,556	232	182
*RW3OU	A	1,158,906	1027	574
*UA1CUR	*	165,432	338	244
*UA4UT	*	146,082	319	251
*RA3ZOM	*	16,500	85	75
*RA6XR	*	12,351	78	69
*RV3MI	*	11,704	89	76
*UA3RW	*	9,018	66	54
*UA1OAM	*	5,029	47	47
*RX6AH	21	49,403	163	127
*RA3XEV	*	1,360	24	20
*RU3SD	14	485,780	616	454
*RA4FUT	1.8	6,288	59	48

Finland

OH4A	A	5,903,040	2472	960
			(OP: OH6KZP)	
OG6N	*	3,471,853	1985	847
OH4BNP	*	333,999	502	333
OH2XX	*	173,756	319	242
OH6RE	14	212,424	408	318
OH2BEN	*	16,200	95	90

France

TM7F	A	4,416,352	2141	928
			(OP: F6GLH)	
F5VNB	*	130,248	246	201
TM1C	*	80,800	189	160
F5UTN	14	2,045,585	1411	683
*F1IKD	A	348	12	12

Germany

DK5DQ	A	2,711,800	1484	745
DJ1AA	*	2,232,044	1376	683
DL8DAZ	*	1,410,475	1091	575
DJ3WE	*	1,341,912	1109	572
DHØGHU	*	1,023,244	870	521
DL5MEV	*	530,370	589	426
DL5KUT	*	494,199	552	387
DH1PS	*	466,700	529	359
DL7ON	*	444,675	542	385
DJ9MH	*	365,640	463	330
DR5A	*	348,606	455	321
			(OP: DL1ELY)	
DL1ECG	*	320,960	477	320
DG3FK	*	284,548	390	319
DL8UAT	*	244,591	361	277
DF5LR	*	240,188	406	298
DL9NCR	*	201,056	335	244
DL6EZ	*	188,045	339	263
DK2CX	*	184,508	315	239
DL8SCG	*	165,984	289	224
DL1DVE	*	121,660	272	220
DL1NEO	*	121,304	280	236
DL1PT	*	115,772	269	206
DM3VL	*	106,301	205	169
DK3GI	*	100,425	195	195
DL2RTL	*	91,136	241	178
DF2LH	*	76,812	208	173
DL6KAC	*	39,204	161	132
DF2MM	*	32,103	125	123
DL2HUC	*	23,688	95	94
DL9GTI	*	15,680	88	80
DR1F	*	15,600	87	78
			(OP: DG3FK)	
DF5RF	*	8,517	56	51
DL9NDV	*	8,008	65	56
DL1PF	*	3,696	52	44
DL2SWN	*	3,234	35	33
DLØEAM	*	418	13	11
			(OP: DG3FK)	
DR1H	*	403	15	13
			(OP: DG3FK)	
DLØJK	*	330	13	11
			(OP: DG3FK)	
DP9Z	21	48,160	171	140
			(OP: DF9ZP)	
DL7AOS	14	220,520	384	296
DL4CF	*	152,744	301	244
DMØY	1.8	298,144	547	308
			(OP: DL3BQA)	
*DK5MB	A	669,864	665	456
*DK3W	*	527,505	622	417
			(OP: DL6MHW)	
*DD5M	*	402,048	513	349
			(OP: DJØZY)	
*DK5TX	*	154,976	345	232
*DL1EHR	*	132,868	293	236
*DC6CX	*	120,612	265	228
*DK7ZH	*	82,080	245	180
*DR5X	*	74,148	197	167
			(OP: DL8LAS)	
*DO9ST	*	68,640	214	165
*DK4WF	*	48,657	179	147
*DK6AH	*	47,880	155	140
*DL9HD	*	45,298	156	142
*DL3DRN	*	33,306	136	122
*DL1DBR	*	29,750	146	119
*DL6RAI	*	29,440	131	115
*DF2AP	*	19,224	99	89
*DL1SBF	*	13,616	83	74
*DM3PKK	*	13,064	75	71
*DGØOM	*	10,519	74	67
*DO6SR	*	6,710	64	61
*DL4EAX	*	3,948	47	42
*DL9ECA	7	133,133	234	209
*DJ2MX	*	58,855	165	149
*DP4X	*	20,176	108	97
			(OP: DJ2MX)	
*DO4DXA	3.7	194,775	402	265
*DF1HF	*	32,760	151	126

Greece

SY2V	A	785,552	956	464
			(OP: SV2GJV)	
*SV1NK	A	138,458	294	214

Guernsey

*MUØFAL	14	35,893	159	143

Hungary

HGØXA	A	3,353,960	1820	754
HA6D	*	7,134	58	58
HA5PT	*	2,808	37	36
HG7T	14	1,027,847	952	529
HA6KVD	*	7,611	59	59
			(OP: HA6ZQ)	
*HA8CQ	A	62,088	197	156
*HA7VK	*	49,536	172	144

Iceland

TF3AO	A	26,400	153	132
*TF3DC	A	891	27	27

Ireland

EI9HX	14	2,120,930	1494	739
*EI4GXB	A	37,210	142	122

Isle of Man

MDØCCE	A	1,618,391	1156	617

Italy

IZ2FOS	A	2,483,292	1606	777
I2SVA	*	1,182,180	916	570
II5W	*	272,675	396	325
			(OP: IZ5DKG)	
IV3NVN	*	40,375	142	125
IK2GZU	*	9,900	62	60
IZ5ASZ	21	49,750	151	125
IR2C	14	4,309,476	2043	934
			(OP: IW2HAJ)	
IR2M	*	2,563,721	1567	809
			(OP: IZ2FDU)	
IWØHOU	*	1,320	22	22
IW2HAJ	3.7	1,868,370	1264	615
			(OP: HB9DUR)	
IC8C	*	253,134	427	287
			(OP: IC8JAH)	
*IW4EGX	A	209,754	389	258
*IK1DFH	*	200,709	384	261
*IZ6NCN	*	167,250	325	250
*IZ7FMM	*	86,064	210	176
*IR4E	*	72,380	167	154
			(OP: IK4ZHH)	
*IK4VET	*	7,296	62	57
*IZ1MKP	*	6,612	62	57
*IZØEYP/8	21	129,482	282	202
*IKØEIE	*	17,155	84	73
*IK2UTT	14	14,896	81	76
*IZ3KKE	7	110,856	220	186

Kaliningrad

RN2FA	A	27,976	115	104
RK2FWA	*	10,864	69	56
			(OP: RA2FA)	

Latvia

YL4U	A	4,252,797	2231	837
			(OP: YL1ZF)	
YL1ZM	*	65,010	193	165
			(OP: YL2KO)	
YL2TQ	*	1,428	25	21
YL7A	7	472,236	447	354
*YL2PP	A	37,471	127	101

Lithuania

LY6A	A	4,383,042	2221	886
LY2DX	*	858,888	850	474
LY1DØØCM	*	5,246	58	43
			(OP: LY1CM)	
LY1R	21	59,032	195	157
*LY1C	A	27,257	116	97
*LY2RD	*	17,484	103	94
*LY3JM	3.7	16,356	97	87

Macedonia

*Z35T	21	59,130	168	135

Netherlands

PE1MMZ	A	499,675	595	395
PAØLOU	*	120,801	245	201
PAØM	21	17,739	89	73
*PE4BAS	A	228,250	407	275
*PE1FTV	*	83,538	243	182
*PA2MI	*	58,680	205	163
*PA3DDP	*	36,456	148	124
*PA7RA	*	15,040	100	94

Poland

SO6I	A	1,595,990	1184	605
			(OP: SP6JIU)	
SP2LNW	*	541,600	645	400
SN3S	*	305,900	450	322
			(OP: SQ3LVO)	
HF8ØBEM	*	91,744	252	188
			(OP: SP9LAS)	
SQ9ANS	*	15,498	94	82
SP9TTT	*	9,936	73	69
SP6T	*	7,144	47	47
SQ8LSB	*	1,376	35	32
SQ4OLP	*	924	23	22
SQ9NKR	*	759	24	23
SP9WAN	*	162	9	9
SP1RKT	21	31,088	131	116
SP4JTJ	7	36,652	127	119
SO7O	*	1,026	19	19
			(OP: SP7DQR)	
SP2QG	*	720	18	18
SQ9HZM	3.7	476,905	605	377
SP1GZF	1.8	340,458	535	317
*SQ1K	A	3,486	46	42
*SP5BNB	*	1,176	24	24
*SP4PBI	14	67,298	202	161
*SQ7IL	*	900	21	20
*SN1I	7	74,424	214	168
*SN9Q	3.7	280,120	478	298
			(OP: SQ9NFI)	
*SQ8JMC	*	1,075	27	25

Portugal

CT4NH	14	2,186,880	1704	804
*CT2IVH	A	188,598	373	258
*CT1EBM	*	29,304	127	111

Romania

YR9P	A	4,443,585	2310	885
			(OP: YO9HP)	
YO3RU	*	299,493	494	321
YO8THG	*	42,364	138	119
YQ6A	14	178,851	354	263
			(OP: YO6BHN)	
YO8TYR	7	594	11	11
YO6TOH	*	54	3	3
YO88FB	3.7	646	19	17
*YO3FRI	A	212,598	355	279
*YO9DFQ	*	1,924	26	26
*YQ5Q	14	257,114	506	319
			(OP: YO5OHO)	
*YO3JW	7	122,008	248	202

Sardinia

*IS8/IT9VDQ	A	740	22	20

Scotland

GM4UYZ	A	55,277	192	167

Serbia

YT3M	A	4,089,055	2111	851
YU2MMA	*	16,562	102	91
YT5A	14	2,049,385	1527	769
YTØA	*	919,881	979	537
			(OP: YT2WW)	
YT5C	7	3,680,052	1664	786
			(OP: YT7AW)	
*YT7TA	A	2,048	34	32
*YT4A	3.7	305,602	416	319
*YT7AW	1.8	11,736	80	72

Sicily

IR9P	7	110,160	246	204
			(OP: IW9HMQ)	
*IT9IMJ	A	3,588	41	39

Slovakia

OM6A	14	90,479	262	173
			(OP: OM6NM)	
OM6NM	3.7	247,032	420	282
*OM5UM	A	63,360	200	165
*OM3TLE	*	41,470	164	130
*OM8HG	14	24,642	137	111

Slovenia

S53EA	A	1,283,130	1084	530
S54O	*	1,073,232	980	522
S51DX	*	124,644	295	221
S53DIJ	*	160	10	8
S56X	7	1,829,805	1049	613
S51CK	*	1,186,515	922	517
S51D	*	117,436	208	187
S57UN	3.7	2,195,202	1414	643
*S58WW	A	110,445	238	199

Spain

EE7E	A	3,874,044	1962	852
			(OP: EA7RU)	
EE5G	*	770,232	865	535
			(OP: EB5GG)	
EA5GTQ	*	26,190	102	90
EA1BLA	*	25,942	124	109
EA7ZY	21	201,124	437	308
EA1DR	*	117,008	257	206
EA1FDI	14	3,487,926	2113	922
EA5GS	*	1,531,134	1304	703
EA5KV	*	363,735	649	411
AN2A	7	129,744	246	204
			(OP: EA2AYD)	
AM1Q	3.7	34,485	134	121
			(OP: EA1QA)	
EA1GFW	1.8	55,125	194	147
EA1DVY	*	9,639	71	63
*EF1W	A	1,276,632	1016	596
			(OP: EA1WS)	
*EA2DK	*	45,156	182	159
*EA3GYK	*	22,264	112	92
			(OP: DK7TM)	
*EA5ET	14	44,688	162	147
*EA1GWM	*	14,400	97	96
*EA5KA	7	2,235,168	1091	624

Sweden

SI6R	A	190,976	343	256
*SM6MVE	A	9,694	82	74

Ukraine

UR6F	A	4,164,084	2214	927
			(OP: UXØFF)	
UU2JQ	*	172,928	297	224
UT8LN	*	2,366	31	25

UR6IJ	14	317,880	484	360
US7IVW	7	39,889	120	113
US6IKV	3.7	19,992	114	102
*UR5AS	A	898,700	829	473
*UR5IFB	"	589,720	684	460
*UX2MF	"	443,156	596	343
*UR5ZVJ	"	254,888	419	302
*UX7UN	"	190,816	374	268
*UR5RP	"	187,372	366	278
*UT3UZ	"	52,744	180	152
*UT5JCE	"	20,184	102	87
*UT3QD	14	14,418	96	81
*UX6F	"	11,340	95	84
			(OP: UR5FBK)	
*UR8IDX	7	42,780	135	124

Wales

MW9W	7	1,985,340	1272	509
			(OP: MW8JRX)	
MC0SHL	3.7	635,817	668	411
			(OP: G1VDP)	

OCEANIA

Australia

*VK2KDP	A	180	15	10

Indonesia

YB4IR	A	2,010,420	1157	540
YB0BCU	"	133,056	309	168
*YB0NFL	A	412,331	507	283
*YC0MWM	21	10,266	73	59
*YB2ECG	14	47,121	148	113

New Zealand

ZL4AS	A	565,783	575	293
ZL1BYZ	"	537,825	602	303
ZL1T	"	504,890	583	290

SOUTH AMERICA

Argentina

LU1VFP	7	6,116	46	44
*LU3JVO	28	5,170	57	47
*LU7YW	21	499,155	563	321

Brazil

ZX2B	A	7,805,700	2580	900
			(OP: PY2MNL)	
PY4OG	"	1,292,130	889	490
PS2T	"	329,460	409	289
			(OP: OH2MM)	
PY3PA	"	51,858	187	129
PY2RDS	"	24,816	113	94
PT9PA	21	314,685	395	315
ZZ6Z	14	1,924,505	1153	605
			(OP: PY6HD)	
PV2P	"	838,980	660	474
			(OP: PY2DY)	
PY2DJ	"	27,285	123	107
*PX2T	A	1,294,852	982	481
			(OP: PY2DN)	
*PY3OPP	"	166,540	310	220
*PY2VZ	"	72,210	210	166
*PY2GMR	"	36,480	148	114
			(OP: PY2OMT)	
*PY2IQ	"	27,371	131	101
*PY1KN	"	19,292	134	91
*PU4HUD	"	2,967	52	43
*PY3TIO	"	2,800	50	40
*PY2NFE	"	646	17	17
*PU9OSB	28	74,358	230	153
*PY7AHA	"	7,380	102	60
*PY2XC	"	7,259	71	61
*PY5TJ	"	2,176	38	34
*PY2ZY	21	776,385	706	405
*PS6T	"	504,754	546	359
			(OP: PY6KY)	
*PY4PW	14	2,730	44	39
*PY2BRZ	"	512	16	16

Chile

XR3P	A	537,684	610	346
			(OP: CE3PG)	

Peru

OA4AHW	A	32,944	163	116

Uruguay

CW7T	A	1,759,824	1040	606
CX5TR	"	550,800	587	360
CX4DX	28	1,200	31	25

Venezuela

YV6BXN	A	95,832	165	132
YW5T	1.8	18,939	61	59
			(OP: YV5JBI)	
*YV1RDX	A	8,450	97	65
*YY5LI	7	226,872	216	184

TRIBANDER/SINGLE ELEMENT

United States

N1WR/3	A	1,826,250	1368	625
K4FX	"	1,824,984	1302	639
WN2O	"	1,673,685	1277	585
			(OP: N2GC)	
W7ZR	"	1,616,598	1804	587
W6TK	"	1,605,176	1724	566
K4PV	"	1,496,082	1390	597
AA4NU	"	1,306,942	1219	559
AD4EB	"	1,256,564	1233	548
WX6V	"	1,003,458	929	474
ND1X	"	943,250	1076	490
N4WZ	"	848,072	1202	467
N3UM	"	811,200	830	480
KT6V/4	"	496,252	771	388
W1BYH	"	381,248	492	322
W1KQ	"	344,761	438	307
KU8E/4	"	339,300	481	300
WT7RC	"	279,310	476	310
			(OP: N7WR)	
K4IE	"	258,312	353	282
KS7T	"	233,905	430	287
KW3A	"	217,854	544	247
WG7X	"	189,484	538	254
K2PS	"	169,231	466	229
N6AJR	"	128,068	336	202
KX4D	"	126,126	304	198
WA0MHJ	"	117,162	236	207
WI3K	"	111,926	251	191
AE1T	"	108,225	236	195
AF8V	"	107,215	262	205
WK4P	"	97,280	262	190
NK6A	"	94,248	288	187
WM2Z	"	86,327	237	173
KI7Y	"	78,408	274	162
K7CS/4	"	76,319	224	167
N4DXI	"	70,370	207	155
WV6N	"	62,400	193	150
W2MC	"	47,376	148	126
KI4FIA	"	44,044	228	143
WR5G/7	"	41,168	153	124
N7FF/5	"	32,248	173	116
K1KNJ	"	27,265	103	95
KT4Q	"	26,228	88	83
KV7DX	"	16,968	95	84
			(OP: KN5H)	
K4XZ	"	12,450	93	83
KB1PXE	"	10,695	77	69
KA2VZX	"	4,366	37	37
KN5H/7	"	4,275	45	45
KC0VEU	"	2,144	33	32
K4MF	28	6,118	52	46
KJ3X/6	14	520,188	873	402
			(OP: K1DQV)	
AD1L	"	78,323	180	167
WB8O	"	66,744	178	162
W0PPF	"	40,044	162	141
KD7DCR	"	936	18	18
KX9DX	7	184,992	524	246
AA4D	"	20,007	83	81
WJ1R	"	8,064	53	48
W8JMF	"	1,350	15	15
W2UJ	3.7	94,355	223	167
KK9V	"	11,016	93	68
KA1CQR	"	9,381	75	59
*NX6T	A	1,290,096	1435	527
			(OP: K6AM)	
*WD5K	"	1,127,744	1077	526
*WB8TLI	"	723,600	677	432
*WZ8T	"	596,992	690	424
*KT4ZB	"	553,380	783	401
*WB4JFS	"	435,600	574	330
*KB3LIX	"	297,348	438	284
*KS4X	"	291,828	394	293
*NA4K	"	276,885	494	293
*WB0TSR	"	259,880	450	292
*AA6YX	"	251,394	509	293
*N6UWW	"	241,860	457	278
*N2FF	"	231,777	357	273
*KB0YH	"	228,897	429	261
*KS2G	"	220,865	377	271
*K9JE	"	173,430	334	246
*K7PRW	"	172,840	430	232
*NX8G	"	131,236	318	218
*N2ZN	"	127,312	298	218
*N7UR	"	124,898	321	197
*AA4UC	"	121,783	314	193
*N3ALN	"	112,996	333	212
*AI4GR	"	81,220	255	155
*K8WV	"	67,116	177	141
*K4OD	"	66,805	205	155
*N1ADY/4	"	57,256	175	136
*W4SKI	"	56,322	210	149
*W7RV	"	53,550	158	126
*N5DGK	"	52,182	152	117
*WB2L/9	"	51,652	219	148
*WB2KLD	"	50,697	152	131
*KK0SD	"	47,085	190	129
*WE6EZ/7	"	44,280	205	135
*KR1A	"	42,640	158	130
			(OP: KL7JT)	
*W7FYW	"	41,328	157	123
*WB8LZA	"	36,432	174	132
*W6FB	"	36,226	169	118
*K3TN	"	35,535	147	115
*WO1N	"	35,369	142	113
*W4NBS	"	33,228	131	117
*K4FTO	"	31,860	158	118
*WA4EMU	"	30,555	111	97
*KD4MZM	"	26,416	136	104
*N7CKJ	"	26,368	131	103
*AF8C	"	25,500	121	100
*KC9IRQ	"	24,786	147	102
*N3KUN	"	23,800	140	100
*AC6E	"	18,343	102	83
*AA6EE	"	16,150	104	85
*K7TR	"	14,235	95	73
*W0RO	"	13,575	94	75
*K6WSC	"	13,280	104	80
*N6ZE	"	8,040	76	60
*KC7H	"	7,605	79	65
*KB3EXB	"	6,298	51	47
*K6CSL	"	6,125	65	49
*K9JG/4	"	5,512	62	52
*KB3GQK/2	"	5,335	61	55
*WK5P	"	3,276	43	42
*WD9HDT	"	3,080	51	44
*N1IG/3	"	2,829	47	41
*K6TT	"	384	16	16
*N8QE	"	221	13	13
*W7UPF	21	36,270	136	117
*K7MY	"	31,570	121	110
*W9ELN/0	"	468	14	12
*NV8N	14	820,500	897	500
*K7ACZ	"	96,048	199	174
*AE6YB	"	67,032	240	171
*NZ5A	"	19,690	148	110
*N8WAV	"	6,466	60	53
*N9TF	7	73,260	277	165
*KT0P/4	1.8	9	3	3

DX

HG8R	A	6,321,780	2643	1018
			(OP: HA8JV)	
PY2ADR	"	2,597,705	1437	647
KH6FI	"	2,569,894	1556	491
EV1R	"	2,240,430	1515	690
VE3NE	"	2,181,250	1117	625
EU1AZ	"	1,703,208	1270	618
KG6DX	"	1,691,999	1397	421
YL7X	"	1,450,504	1143	583
			(OP: YL2LY)	
LU7MCJ	"	1,294,452	953	492
DB2B	"	1,210,758	1093	541
			(OP: DL8OBF)	
PY2EL	"	1,152,018	910	446
RL6YXX	"	1,124,010	1073	621
			(OP: RU6CQ)	
VE3RZ	"	1,098,499	801	397
VE1MC	"	1,035,468	706	441
DK1KC	"	968,156	946	497
EA3RR	"	927,276	873	498
OE6MDF	"	822,940	748	460
PY7ZZ	"	818,090	641	434
EI2JD	"	754,728	820	472
DL9GWD	"	749,480	777	457
DF0BV	"	730,620	673	451
			(OP: DL1MAJ)	
JA7COI	"	678,592	684	368
PF7M	"	590,480	676	440
DK8EY	"	559,248	606	382
F4DSK	"	479,560	587	380
HA5NB	"	425,712	582	362
EA4TG	"	410,589	694	411
YL9T	"	398,096	589	358
			(OP: YL2TW)	
EV2A	"	395,944	529	344
			(OP: EW2AA)	
DJ6OZ	"	390,848	432	394
YB1AR	"	381,615	518	285
VK3IO	"	366,639	362	221
PA0JNH	"	291,006	401	306
IK2SND	"	267,652	450	316
LA2AB	"	265,694	401	286
			(OP: SP2ASJ)	
LY2AE	"	237,510	412	273
IZ1OQB	"	219,224	409	268
F6KPQ	"	216,524	391	308
			(OP: F4FFZ)	
JE1LFX	"	206,712	351	216
SP5KCR	"	189,054	324	243
			(OP: SP5JTF)	
MW0ZZK	"	188,190	331	255
EI9FVB	"	186,400	334	233
VK4ZD	"	156,999	246	177
UA0DAM	"	148,824	296	216
LA1PHA	"	148,362	312	237
GI6DEY	"	147,264	299	236
VK2CA	A	138,061	311	163
VK1MJ	"	132,060	234	155
IW0GTA	"	127,832	260	232
PA3FMC	"	122,904	297	216
EA5ON	"	101,736	266	216
LW9ETQ	"	96,360	230	165
S55OO	"	92,926	251	194
VK3TZ	"	91,379	197	137
VA2WDQ	"	77,560	174	140
SE5T	"	47,775	162	147
VE7TUG	"	45,000	154	120
RK9KWI	"	30,736	121	113
IW0GYC	"	28,305	121	111
YY5CBK	"	23,868	71	68
RA6AR	"	23,760	118	110
OH9GIT	"	13,050	83	75
ZM2A	"	4,446	48	38
PY5KA	"	3,440	43	40
IW0BCF	21	73,350	198	150
JH7XMO	14	1,562,946	1071	561
VK7ZE	"	1,061,528	850	472
M0WLF	"	553,320	612	424
JN1NDY	"	434,444	522	347
OQ5M	"	159,372	318	233
			(OP: ON5ZO)	
SM5U	"	130,009	309	223
			(OP: SM5UGC)	
IW5EFX	"	65,736	203	166
TF8GX	"	14,238	121	113
SP9JZT	7	315,700	387	287
AM1C	"	223,130	353	265
LU9MDH	"	30,260	92	85
EA3ATM	3.7	749,023	679	457
IO3X	"	336,156	478	327
JI3BFC	"	3,680	36	32
SV1GRD	1.8	24,378	106	102
*CN2BC	A	4,208,064	1966	707
			(OP: DL7BC)	
*LT7H	"	2,196,156	1333	591
*EC8ADW	"	1,579,008	1007	512
*ON7CD	"	1,211,370	965	542
*YO7LFV	"	1,098,625	1000	517
*RV0SR	"	1,069,453	889	473
*RK3MWI	"	966,966	937	539
			(OP: UA3MSA)	
*V55X	"	932,024	710	452
			(OP: V51YJ)	
*RA9AAA	"	789,234	642	398
*VE3DZ	"	783,356	603	404
*LY2TS	"	782,768	779	482
*EE7R	"	667,371	724	447
*YB1TJ	"	631,545	619	355
*VE3KPP	"	612,125	605	295
*DB8NI	"	567,008	747	416
*HK6P	"	549,360	520	327
*DR4G	"	547,365	599	401
			(OP: DJ0GM)	
*CT3HF	"	522,389	495	343
*G3ZQH	"	520,740	665	396
*UA3ABJ	"	513,600	627	400
*EF7A	"	512,300	808	470
			(OP: EC7ABV)	
*SP3GXH	"	500,707	636	361
*MU0GSY	"	480,924	628	366
*F5LIW	"	452,580	558	380
*LX1ER	"	423,850	500	350
*EA1ET	"	408,250	513	355
*PA0MIR	"	394,710	543	354
*VE7UQ	"	364,770	447	270
*DC7NF	"	352,240	515	340
*EA8OM	"	321,720	373	280
			(OP: DJ1OJ)	
*LU8SAN	"	316,888	447	286
*OZ1ACB	"	303,050	474	319
*YO5OHY	"	302,400	490	300
*JH0NEC	"	293,454	412	274
*IK7NXU	"	290,780	417	310
*VE1ZA	"	274,833	314	261
*SV9COL	"	253,877	484	331
*ED4A	"	252,324	437	326
			(OP: EA4TV)	
*I5DOF	"	218,856	384	264
*OL2T	"	217,588	405	266
*VE7HA	"	202,215	345	221
*G4DFI	"	200,271	402	277
*IK2HLM	"	195,320	377	257
*DG5LAC	"	187,264	355	266
*WP3GW	"	186,093	304	207
*YR9F	"	182,961	334	261
			(OP: YO9FNP)	
*JA2PFO	"	179,333	341	187
*XE1GRR	"	170,046	392	201
*EI7CC	"	166,257	358	261
*OR6C	"	144,356	308	239
*JA6DIJ	"	132,990	317	186
*UA0SR	"	130,398	303	211
*VE3TW	"	126,195	222	179
*IW9FI	"	121,800	311	232
*LZ2SX	"	107,744	258	208
*HB9WDY	"	106,530	270	201
*BD4CZX	"	105,840	340	168
*GW4EVX	"	105,534	279	198
*RX6LD	"	102,150	274	227
*JE4MHL	"	102,050	259	157
*JL3MCM	"	97,300	281	140
*HS0ZCX	"	89,262	254	162
*OZ4NA	"	88,506	224	198
*BD4JUU	"	87,857	263	163
*G4NXG	"	83,328	215	168
*F1UJS	"	80,931	201	159
*2E0PLA	"	78,192	232	181
*RX3VF	"	75,620	212	190
*LU4KC	"	75,088	252	152
			(OP: LU6KA)	
*SE5S	"	69,600	194	174
*IZ5ILF	"	66,830	196	163
*IK2YSJ	"	66,411	201	157
*ON4PJA	"	66,300	210	156
*VK4BL	"	65,744	195	112
*UT5UKY	"	65,637	194	153
*G6UBM	"	64,476	196	162
*LY2SA	"	62,884	191	158
*BG4AHF	"	61,152	251	147
*G0MLY	"	60,897	196	159
*IZ4DIG	"	60,648	197	168
*EI4II	"	60,060	192	156
*DL1DTL	"	60,000	189	160
*OE3JTB	"	59,805	165	135
*VA3GML	"	51,584	147	128
*YO4GNJ	"	51,156	185	147
*PE2JMR	"	48,430	171	145
*RX9DJ	"	48,240	157	134
*LA7GNA	"	46,656	188	162
*JM1LRQ	"	46,529	209	119
*LA7TN	"	44,238	186	146
*VE3JI	"	43,834	130	101
*RZ9HA	"	43,810	152	130
*F4CUI	"	43,754	151	131
*EC8AFM	"	43,290	138	111
*JA8IJI	"	42,672	152	112
*RA3VE	"	42,059	168	137
*IT9YAO	"	41,720	166	149
*G3VAO	"	39,618	158	142
*DL8ZAJ	"	36,738	139	117
*DU9/M0GHQ	"	36,450	127	90
			(OP: M0GHQ)	
*PE1LTY	"	33,798	148	129
*VK4XES	"	33,124	125	91
*ZL1AAO	"	32,422	128	86
*PA3JD	"	32,375	140	125
*SA7J	"	31,008	153	136
			(OP: SM7XGG)	
*HB9WNA	"	29,700	122	110
*EW7LE	"	27,911	124	113
*LU1IBL	"	27,448	130	94
*RA9CIN	"	26,986	121	103
*ZS4JAN	"	23,760	121	88
*F2RO	"	22,568	111	104
*GI4SJQ	"	19,992	112	102
*RA9KM	"	18,000	91	80
*IK3XTY	"	17,575	133	95
*XE2RV	"	16,898	96	71
*PI4WLD	"	16,471	97	91
			(OP: PA0MIR)	
*DM6DL	"	15,488	95	88
*XQ4CW	"	13,860	118	77
*SE2A	"	12,201	101	83
*SP5APW	"	10,585	83	73
*UY7C	"	9,916	70	67
*BD4TQ	"	9,504	88	66
*BG4EXL	"	7,564	81	62
*YU1IV	"	7,353	61	57
*G0CMP	"	6,336	72	66
*JA4AQR	"	4,920	46	41
*OH3DP	"	4,752	48	48
*RL3FO	"	4,400	52	50
*EA3BIP	"	4,320	41	40
*NH6WZ	"	4,176	33	29
*IK2LFD	"	3,198	47	41
*EB5WC	"	3,154	38	38
*SP1II	"	2,816	33	32
*CX8ABF	"	2,574	45	39
*BG2AUE	"	1,550	37	31
*JO3RCK	"	1,026	26	19
*DG7RO	"	1,000	25	25
*M0PKZ	"	680	19	17
*EF5W	"	580	20	20
			(OP: EC5CWG)	
*IW3SRC	"	576	19	18
*JR3SZZ/3	"	473	16	11
*EA5PS	"	336	14	14
*JI1UDD	"	286	12	11
*VK3ZGP	"	140	9	7
*PU2KLM	28	6,102	64	54
*7N2UQC	"	779	23	19
*CE4CT	21	700,422	752	321
*EA8/DL3KVR	"	567,930	587	330
*C4Z	"	149,682	276	202
			(OP: 5B4AIZ)	
*JG1ALA	"	1,281	26	21
*RN3DY	14	604,572	786	498
*AO1B	"	330,064	563	392
			(OP: EA1YB)	
*UA4WCM	"	243,984	511	368
*RU3SE	"	135,708	332	258
*G1FON	"	80,892	257	214
*IT9LED	"	79,497	281	219
*IZ1DGG	"	77,644	247	188
*VU2HFR	"	52,080	178	140
*LY4OO	"	46,565	167	139
*JF3IYW	"	46,284	171	133
*DL4JYT	"	41,890	170	142
*EB1EVX	"	26,796	148	132
*JA3DAY	"	15,428	85	76
*DL1MHJ	"	3,535	36	35
*SQ3RX	"	3,486	47	42
*HS1JNB	"	1,856	33	29
*7M1MCT	"	1,518	23	23
*JG2CNS/3	"	780	22	20
*IZ0CEY	"	377	13	13
*DN1MSF	"	126	8	7
*I3YYY	"	9	3	3
*LY2MM	7	274,920	396	290
*IK1YED	"	92,000	229	184
*CT1EEK	"	47,616	134	124
*IW3SNR	"	20,792	99	92
*JR4URW	"	15,104	72	59
*JH1RDU	"	1,008	15	14
*JL3RDC	"	732	13	12
*RW3VZ	"	16	2	2
*G4BXT	3.7	238,260	372	285
*OH6JYH	"	3,486	46	42

ROOKIE

United States

N0QO	A	3,708,432	2490	849
AD1DX	"	297,470	502	302
K7DSL	"	138,516	319	204
W8DQ/4	"	22,746	122	102
KD0ACO	"	1,155	23	21
N6BY	14	456	19	19
*N6IEF	A	138,859	329	239
*KD8GOX	"	106,805	268	205
*AF6EV	"	75,036	239	156
*AJ4JD	"	57,232	214	146
*KI4TZU	"	51,054	183	134
*KJ8O	"	27,965	176	119
*KS6M	"	27,336	150	102
*KI6TXC	"	23,324	115	98
*KD8JDC	"	20,615	133	95
*KD8HHG	"	17,313	107	87
*KE7LOQ	"	16,104	99	88
*KI6QDH	"	15,456	121	84
*KJ4BIX	"	14,013	89	81
*KC0YJO	"	11,858	103	77
*AI4QR	"	7,874	83	62
*W3EDP	"	6,318	64	54
*KF7ADK	"	4,316	59	52
*W6VAR	"	4,230	60	45
*KI6LTC	"	3,408	62	48
*KC2UCJ	"	3,268	44	43
*KD0EPN	"	2,470	43	38
*KB3SCZ	"	1,914	39	33
*KJ4SAM	"	1,566	29	29
*K0ANS	"	1,364	34	31
*KI6GVI	"	1,125	27	25
*KJ4CNC	"	280	15	14
*NU3Q	"	270	15	15
*NS6T	"	200	12	10
*KC0YHU	"	132	11	11
*KD0DRQ	14	15,326	125	97
*KF1D	"	3,570	46	42
*KC2TYZ	"	3,225	47	43
*KE7VUX	"	2,530	51	46
*KD5RDR	"	20	5	4
*KG6FWT	"	1	1	1
*N4FFP	7	2	2	2
*KC2RKU	1.8	2,556	45	36

DX

IR1G	A	3,552,120	1833	828
			(OP: IZ1LBG)	
DJ5TD	"	189,222	363	282
DL7DS	"	126,218	291	223
BW6/XX9LT	"	107,160	345	188
			(OP: XX9LT)	
IZ2ODM	"	105,646	237	202
DJ6TB	"	48,764	169	146
VK5HRT	"	48,312	167	99
BD7MVZ	21	102,305	376	185
UA3QDS	"	9,856	78	56
IZ0PSC	14	237,140	406	334
BG3DLX	"	133,042	398	221
UY8LM	"	106,020	287	228
DL1LQL	"	2,223	39	39
DN1TB	"	240	10	10
PJ7MF	7	103,752	153	131
BG3DDB	"	53,192	167	122
PU3KNG	3.7	4	2	2
*F4FDA	A	465,792	580	384
*RN3DBA	"	461,131	603	407
*PF4T	"	369,408	530	384
*YT2AAA	"	324,995	498	311
*IZ2JPN	"	308,840	419	280
*RA3VLD	"	229,824	423	304
*PD1KSA	"	228,137	453	299
*IZ1JLF	"	220,150	372	259
*YU3MMM	"	217,854	398	266
*F4FFH	"	207,432	384	268
*UA9QCZ	"	196,212	294	197
*F4FEP	"	180,564	335	246
*YO7MGG	"	145,856	285	212
*EI4GNB	"	135,207	283	249
*PD7BZ	"	127,650	283	230
*IT9JDH	"	100,768	272	188
*SG0M	"	94,575	257	195
			(OP: SA0AQT)	
*IZ2NZZ	"	86,456	207	202
*RN3ARA	"	83,880	237	180
*OE6HLF	"	81,512	246	184
*PY2SEI	"	79,530	215	165
*F4F5V	"	70,269	207	177
*UA3DCU	"	69,459	201	169
*BD8ATI	"	67,971	269	163
*PD0HM	"	67,124	219	173
*SQ2TOM	"	64,548	181	163
*ES2IPA	"	58,050	190	154
*IZ1NBX	"	49,149	181	129
*RA3MAW	"	40,242	131	114
*UR5XMM	"	39,552	131	103
*EB7CIN	"	37,820	145	122
*YO2MIL	"	34,867	145	119
*BG5HSC	"	34,749	194	117
*BG6JNB	"	33,060	149	114
*DK1AUP	"	32,116	145	124
*VE7RSV	"	32,100	117	100
*CA6BMF	"	31,714	127	101
*RA3MAV	"	31,644	138	108
*VK2KRM	"	31,457	150	83
*EA4FJJ	"	29,875	137	125
*EA7HYL	"	29,493	126	113
*EA1GWL	"	27,270	147	135
*DK4KJ	"	27,251	130	119
*F4FHV	"	24,192	118	112
*DJ4PK	"	22,898	125	107
*BG7AWU	"	22,016	115	86
*EA4ETW	"	18,145	111	95
*VO1OR	"	17,252	83	76
*IN3SJG	"	13,416	95	86
*YO5CZZ	"	12,474	77	66
*BG6JEQ	"	10,626	98	77
*EA1PO	"	8,160	56	48
*EA3GNR	"	8,064	58	56
*LZ2NG	"	6,820	59	55
*IZ1MLS	"	6,324	55	51
*F4FBP	"	5,824	60	56
*IZ1DLY	"	5,456	67	62
*KP4RAY	"	5,289	47	41

*RW3QF	*	5,246	44	43
*BG4IKE	*	4,851	65	49
*UTØEZ	*	3,888	37	36
*DJØWB	*	2,622	40	38
***OH8FKU**	*	**2,592**	**38**	**36**
*EA3GUG	*	1,334	30	29
*BG5DNA	*	888	25	24
*BG4JWU	*	720	21	20
*BG4MLL	*	651	21	21
***ON4LWX**	*	**638**	**22**	**22**
*BD5HPC	*	442	17	13
*BG4MCG	*	420	22	21
*F4PWN	*	24	4	4
***IT9AUG**	28	**5,895**	**53**	**45**
***PU1SAT**	*	**2,400**	**43**	**40**
*IW9/KJ4DJL	*	765	18	17
*PU3LYB	*	476	18	17
***BA3AX**	*	**35**	**5**	**5**
***RA9UAD**	*	**4**	**2**	**2**
***DV1EE**	21	**77,165**	**259**	**115**
***EC6UD**	*	**2,460**	**31**	**30**
***VR2WHA**	*	**2,204**	**46**	**38**
***JF1VGZ**	*	**882**	**24**	**18**
***JR2AAN/2**	*	**800**	**24**	**20**
***BG4JZY**	*	**429**	**15**	**13**
***LR1H**	14	**216,630**	**338**	**261**
			(OP: LU2HOD)	
***EW1IP**	*	**99,750**	**272**	**210**
***BG3DCI**	*	**52,206**	**263**	**154**
***YT2ACA**	*	**20,292**	**147**	**114**
***IZ2JQP**	*	**16,456**	**109**	**88**
***VA3ARK**	*	**4,370**	**48**	**46**
*BG7NFM	*	3,408	69	48
*IZ8FSL	*	3,360	52	48
***VK3VTH**	*	**738**	**22**	**18**
***SQ5NPX**	*	**522**	**18**	**18**
***RK4HZM**	*	**483**	**23**	**23**
*BG4IOH	*	30	6	6
***4Z5UN**	7	**443,681**	**307**	**263**
			(OP: UU2JM)	
***BV4VR**	*	**15,128**	**68**	**60**
***EA7ILJ**	*	**4,928**	**47**	**44**
***UU2CW**	*	**4,242**	**44**	**42**
*UU5JFP	*	1,350	25	25
***BG7JYX**	*	**6**	**1**	**1**
***DG5SBK**	3.7	**12,720**	**88**	**80**
*DO1TGM	*	8,505	65	63

MULTI-OPERATOR
SINGLE TRANSMITTER

NORTH AMERICA

United States

K1LZ	**16,007,975**	**3854**	**1273**
NF4A	**11,313,432**	**3737**	**1224**
WR3Z	**7,894,528**	**3086**	**1088**
K3EST/4	7,533,517	2833	1031
NX5M	**6,920,938**	**3700**	**1037**
N7AT	**3,082,840**	**2221**	**740**
KD9ST	**2,968,144**	**2190**	**752**
NJ6N	**1,939,164**	**1715**	**636**
KT4PD	1,936,471	1726	647
K7ZS	1,369,914	1499	579
WX7P	1,312,716	1386	556
NQ4U	1,143,250	1146	538
NØMA	**1,071,918**	**975**	**527**
W7VJ	991,413	1303	503
KE9I	842,352	786	483
K8QK	557,190	872	410
NZ1U	529,968	541	366
AD4ES	341,316	615	342
NZ4DX	334,232	494	328
WX3SKY	292,616	389	316
WT4Q/2	**271,560**	**426**	**292**
NM1JY	216,821	551	253
WV2ZOW	216,225	371	225
KA1IOR	160,460	353	226
N8AJN/Ø	148,780	384	215
K4YHB	95,976	267	186
N4FR	88,638	215	187
WØMR	62,792	208	167
N3AFT	43,420	175	130
NV6C	13,202	105	82

Alaska

KL7FH	**3,690,389**	**1873**	**817**
KL7AIR	233,704	369	262

Canada

VE7GL	**5,727,504**	**2233**	**816**
VA2TG	**1,282,228**	**837**	**524**
VE9MY	**427,006**	**379**	**323**
VE8EV	**121,000**	**244**	**200**
VE7NA	96,819	232	177
VE7NSR	91,683	225	167

Costa Rica

TIØRC	**390,570**	**587**	**282**

Cuba

T48K	**3,620,700**	**1878**	**675**

Haiti

4V4JR	**3,145,900**	**2152**	**652**

Mexico

4B2S	**3,185,571**	**2027**	**617**

Puerto Rico

KP3VA	**268,649**	**333**	**233**

AFRICA

Canary Islands

EF8R	**32,273,965**	**5824**	**1429**
ED8R	14,450,560	3527	1072

Cape Verde

D4C	**32,202,182**	**6156**	**1399**

Madeira Islands

CQ3T	**19,639,404**	**4111**	**1228**
CS9A	70,195	167	139

Mozambique

C91TX	**2,401,841**	**1315**	**611**

ASIA

Asiatic Russia

RWØLT	**1,725,854**	**1220**	**533**
UAØSWA	1,538,988	1150	524
RK9CWW	**1,319,697**	**803**	**443**
UE9CAP	1,055,345	773	415
RZØSZZ	284,748	501	244
RK9WZZ	81,162	188	167
RKØCWT	21,588	102	84
RZ9UO	2,244	34	33

China

B4B	**836,225**	**976**	**403**
BY4SA	517,792	758	352
BY3MM	284,622	636	267
BY5CD	222,300	458	247
BY7KG	157,680	444	216
BY1CW	138,567	435	209
BY8AC	87,857	294	163
BY2UDL	64,532	264	146

Cyprus

P33W	**24,589,434**	**5331**	**1257**

Japan

JI2ZJS	**3,398,136**	**1673**	**678**
JI2ZEY	1,450,080	1048	477
JA3YKC	**562,024**	**639**	**326**
JH6JSR	**75,888**	**228**	**153**

Kazakhstan

UP9L	**3,183,170**	**1445**	**670**

Lebanon

OD5WPX	**284,380**	**318**	**236**

Qatar

A73A	**9,244,935**	**2810**	**945**
A71CT	2,009,460	1215	535

Thailand

HSØAC	**934,176**	**1114**	**444**

Turkey

TC7KA	**7,160,472**	**2486**	**792**
TC3EC	1,107,036	779	414

The antenna field at ZM3A, world high score for 40-meter single band. The 3-element Yagi can crank up to 24 meters above a very nice hilltop location.

EUROPE

Austria

OE9R	**3,252,576**	**1808**	**816**

Belarus

EV8DP	**153,340**	**314**	**220**

Belgium

OP4K	**2,379,829**	**1422**	**743**

Bosnia-Herzegovina

E7DX	**17,197,261**	**4704**	**1357**
E73ESP	1,248,426	1158	549

Croatia

9A8M	**4,878,537**	**2313**	**921**
9A3B	4,671,198	2279	917

Czech Republic

OL4A	**13,951,245**	**3836**	**1285**
OL1C	3,418,025	1669	845
OL7T	2,045,250	1377	675
OK2KOJ	672,495	723	419
OL2U	324,362	499	314

Denmark

5Q1A	**1,771,272**	**1328**	**657**
OZ5THY	11,700	91	78

England

G6PZ	**8,962,240**	**3137**	**1128**
MØXXT	4,857,354	2315	921
M4A	2,278,527	1427	731
G5O	2,084,112	1357	706
M4U	1,621,800	1251	636
G8DYT	874,152	782	456
G1T	594,440	692	386
G5FZ	460,976	609	376
G3YNN	60,102	183	159

Estonia

ES9C	**15,296,688**	**4905**	**1332**
ES1XQ	22,320	139	120

European Russia

RK3DZB	**5,738,040**	**2639**	**1012**
RK3K	5,006,880	2713	915
RC3W	2,967,905	1886	755
RM3Q	2,572,372	1787	748
RT4D	**1,387,602**	**1101**	**607**
RZ6HWA	**1,250,168**	**1149**	**568**
RK4HYT	549,402	731	381
RM3M	472,230	669	405
RK3SWS	354,172	558	364
RK3DXS	217,986	394	282
RK3DXZ	204,829	379	257
RZ3DZI	11,319	88	77

Finland

OH8T	**220,818**	**424**	**298**

France

TMØTAN	**1,084,178**	**1010**	**554**

Germany

DLØMB	**6,452,250**	**2598**	**1050**
DR2W	2,647,266	1720	718
DLØNZ	2,325,258	1425	741
DL3G	1,421,874	1029	603
DLØP	958,447	869	509
DM2C	621,810	701	423
DM5Z	522,029	654	383
DKØGYB	172,448	361	272
DLØTUM	140,771	319	239
DP4D	133,540	279	220
DLØLN	6,789	77	73
DN5KID	6,426	57	54
DKØIU	2,516	37	37

Greece

SZ3P	**2,144,272**	**1928**	**676**

Isle of Man

GD8K	**294,402**	**578**	**353**

Italy

IO5O	**11,728,454**	**3302**	**1214**
IQ4RN	4,077,486	2156	882
IR6T	1,782,150	1180	654
IZ1PKV	1,438,910	1049	635
IQ3TN	1,353,240	1202	540
IK2LTR	1,114,745	873	565
IQ2LS	99,066	249	209
IY5PIS	3,723	52	51

Jersey

MJ4K	**6,601,265**	**2814**	**1045**

Latvia

YL1XN	**181,790**	**368**	**245**

Lithuania

LY9Y	**9,300,648**	**3244**	**1162**
LY3V	1,177,761	1009	507

Montenegro

4O3A	**10,263,644**	**3443**	**1186**

Netherlands

PI4DX	**5,356,896**	**2306**	**984**
PI4TUE	734,580	738	462
PG2AA	366,414	511	353
PC25DIG	80,750	226	190

Norway

LN5O	**143,815**	**288**	**245**
LA2L	3,225	44	43

Poland

SO9S	**8,881,334**	**3136**	**1142**
SP9KDA	1,213,212	1052	546
SN5T	257,957	471	301
SP1KZE	66,992	216	158
SP3KPN	8,580	77	65
SN7T	7,695	58	57

Romania

YR1C	**1,670,445**	**1436**	**641**
YR8ØHCS	1,288,422	1155	558
YR8D	1,223,768	1052	533
YR5N	552,558	657	393

Scotland

GM7A	**1,091,500**	**946**	**590**
GM3W	798,186	728	453

Sicily

IR9Y	**9,132,656**	**3376**	**1196**
IF9A	3,111,592	1891	836

Slovakia

OM7M	**13,609,700**	**3825**	**1300**
OM8A	11,860,731	3487	1251
OM3KWZ	89,094	239	186

Slovenia

S51A	**4,854,384**	**2305**	**918**
S56P	4,505,674	2197	862
S54K	964,308	909	489

Spain

EE2W	**9,114,376**	**2967**	**1159**
EC1KV	**8,362,504**	**3051**	**1156**
EA1GA	2,395,120	1705	728
AO5A	**1,432,835**	**970**	**563**
AO2R	1,292,760	1178	630
EH5T	1,169,124	873	521
EE5J	696,376	783	488
AO2W	534,600	770	450
EA4RCT	**444,567**	**625**	**391**
EE2K	440,059	524	361
EH5J	354,000	606	400
EA1URO	117,831	233	181
EH2WE	94,923	248	199
AO5B	46,982	231	169
AD3F	**16,198**	**100**	**89**
EA5AER	14,060	78	74

Sweden

7S8X	**1,454,649**	**1243**	**613**
SK7OA	892,800	880	496
SK7AX	481,850	607	419
8SØC/5	418,093	526	377
SK6HD	150,930	336	234

Switzerland

HB9ODK	**291,600**	**423**	**300**

Ukraine

UR4Z	**3,334,472**	**2132**	**776**
UZ4E	2,935,842	1921	741
UR4PWC	47,880	168	140
UU5A	30,240	129	108

OCEANIA

Australia

VK6ANC	**4,247,266**	**1623**	**641**
VK6AHR	7,776	62	48

Indonesia

YEØX	**3,293,308**	**1737**	**646**
YE1ZAT	3,041,796	1552	618
YE1ZAL	28,365	122	93

New Zealand

ZM4A	**2,139,620**	**1188**	**493**

Papua New Guinea

P29NB	**620,118**	**793**	**282**

Philippines

4D1A	**419,356**	**563**	**238**

South Cook Islands

E51COF	**971,880**	**917**	**364**

SOUTH AMERICA

Argentina

LP1H	**13,213,101**	**3641**	**1101**
LR2F	11,124,295	3224	1063
LU6DK	411,180	546	330
LT5X	184,536	338	233
LQ4D	170,595	308	223

Brazil

PW2D	**11,266,866**	**3249**	**1082**
PR1T	9,919,818	2672	1017
PQ5B	6,449,194	2246	886
PT3T	3,426,543	1619	717
PP5VK	1,003,892	796	452
PW7A	812,448	718	416

Uruguay

CV5K	**1,704,243**	**1118**	**551**

Venezuela

4M5IR	**2,852,923**	**1536**	**593**

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NORTH AMERICA

KD4D/3	**13,300,413**	**4339**	**1211**
VE7SV	**12,433,314**	**3728**	**978**
KI1G	**11,934,690**	**4006**	**1230**
KZ9O	**7,773,885**	**3981**	**1035**
WC6H	**6,883,344**	**4012**	**936**
W1CU/6	6,114,584	3261	959
VE6FI	**4,872,751**	**2195**	**767**
VE3RM	**4,870,180**	**1933**	**809**
NG6S	1,675,298	1697	587
VE9ML	**454,811**	**457**	**301**
AC2AC/1	228,726	374	262

AFRICA

CT9M	**33,085,395**	**6033**	**1413**
ZT2V	**2,040,513**	**1158**	**593**

ASIA

C4I	**10,281,150**	**2896**	**930**
B7P	**3,699,024**	**2362**	**707**
BY1RX	1,610,670	1315	530
BNØN	**51,213**	**225**	**129**

EUROPE

9AØØVZ	**19,512,924**	**5557**	**1403**
OG8X	**17,523,730**	**5288**	**1390**
OLØW	**13,870,605**	**4404**	**1239**
DO8N	**11,949,176**	**4047**	**1238**
DR5N	10,211,225	3709	1165
UZ2I	**8,562,889**	**3870**	**1013**
OZ5E	**8,408,928**	**3483**	**1056**
DJ6KS	8,213,472	3181	1083
OL1X	6,608,415	2955	993
YU/HB9EDB	**6,190,594**	**3005**	**998**
G2YL	**3,334,856**	**1803**	**868**
DLØAT	2,678,515	1912	721
CT6P	**2,304,225**	**1634**	**735**
PI4COM	**2,130,090**	**1398**	**703**
IR3Y	**1,835,422**	**1383**	**629**
OMØA	**1,807,485**	**1409**	**615**
AM1A	**1,515,949**	**1215**	**613**
AM5A	**1,499,832**	**1417**	**666**
PI4RCK	1,392,963	1136	573
DP9I	1,105,380	1005	540
AO1K	752,464	869	524
LY5W	**536,580**	**727**	**396**

OCEANIA

AHØBT	**6,302,080**	**2823**	**640**
VK4KW	**5,435,613**	**2160**	**621**
WH2DX	**3,683,680**	**2304**	**460**
VK9LA	**1,398,250**	**1343**	**350**
DU1GE	**759,759**	**925**	**253**

SOUTH AMERICA

PJ2T	**26,165,040**	**6027**	**1166**
ZY7C	**20,751,356**	**4817**	**1238**
LS2D	**7,418,400**	**2860**	**880**
XR6T	**5,705,024**	**2422**	**832**
PR5D	1,837,580	1179	556
LV6D	1,061,928	902	441

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NORTH AMERICA

WE3C	**19,779,364**	**5008**	**1364**
NQ4I	**17,372,190**	**5997**	**1342**
WX3B	7,727,832	3524	1064
NE1C	**5,564,936**	**2808**	**949**
VE5PV	**3,143,028**	**1778**	**651**
NR6O	**569,114**	**678**	**413**
KBØHH/5	**420,792**	**615**	**356**
VE3MIS	**353,685**	**390**	**255**
WC8VOA	**277,005**	**530**	**295**

ASIA

BPØA	**514,080**	**1148**	**315**
JA1YGX	**1,290**	**32**	**30**

EUROPE

OT5A	**17,668,508**	**5394**	**1343**
LZ9W	**16,898,658**	**5494**	**1302**
UU7J	**16,465,872**	**5796**	**1328**
HG1S	**13,312,500**	**4267**	**1250**
LY7A	**7,763,692**	**3678**	**982**
SX5P	**5,027,256**	**2957**	**984**
EA3CCN	**2,693,905**	**1623**	**773**
SF6D	**2,240,453**	**1649**	**667**
DR2P	**607,166**	**790**	**434**
IZ1OMY	**383,825**	**478**	**325**
OK1KOB	**97,686**	**272**	**201**

OCEANIA

DX1DBT	**354,464**	**574**	**212**

SOUTH AMERICA

ZW5B	**21,733,005**	**5121**	**1315**
ZV5O	4,533,120	1946	787
XR1A	**2,335,000**	**1368**	**625**

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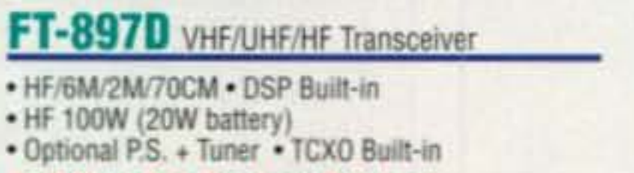

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