Changes Coming to CQ Award Program, p.79

http://www.cq-amateur-radio.com

$6.99

Amateur Radio

CQ

COMMUNICATIONS & TECHNOLOGY

JULY 2022

Dayton Returns!

pgs 8, 52

- **Results, 2022 CQ WPX RTTY Contest, p. 13**
- **Earthquake at the Equator, p. 19**
- **2022 CQ Hall of Fame Inductees, p. 30**

On the Cover: After a two-year pandemic pause, the Dayton Hamvention® was back in person in May, with commercial vendors, flea market sellers and bargain-hungry hamfesters making the most of it! See our coverage on pages 8 and 52.

VISIT…

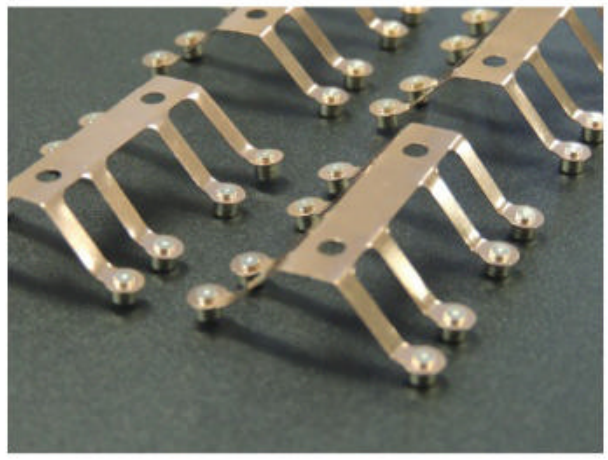
Raising the bar on performance and reliability!

RECENT STEPPIR INNOVATIONS

1

NEW BRUSH/CONTACT ASSEMBLY

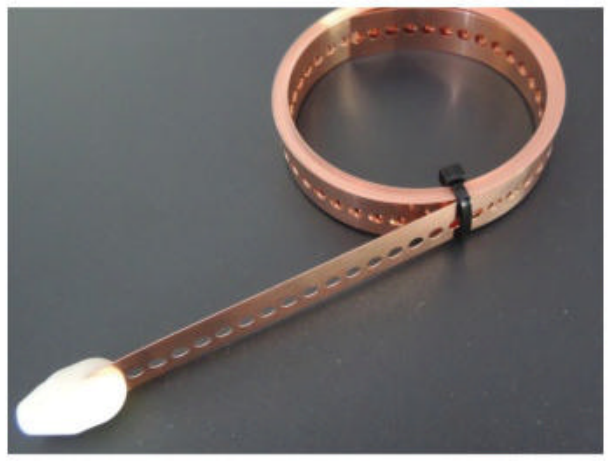
The new element housing unit (EHU) brush/contact assembly has greatly reduced friction buildup, with an average 36% friction reduction over the product life-cycle. The new assembly achieves this advantage without affecting product life expectations. The brush contact combination wears at a similar rate as our previous contacts. This new brush/contact not only has lower friction and the same longevity, it also greatly reduces RF noise during the tuning process due to the material properties of the contact.



2

NEW COPPER STRIP INDEXING

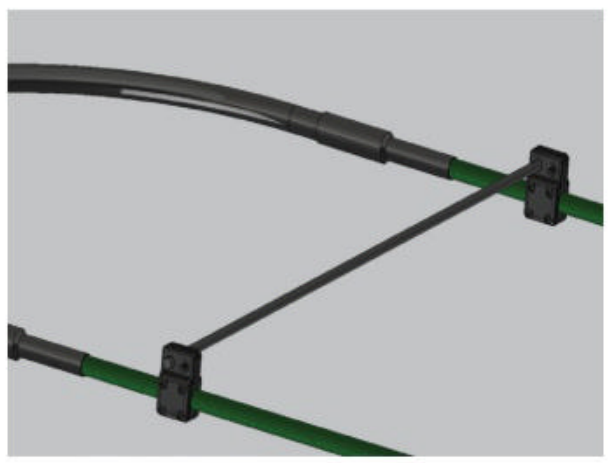
The engineering team at SteppIR has completely redesigned our copper strip indexing and crowning system – this has taken the better part of a year of extensive design and testing, along with a near total reconfiguration of the system. The resulting improvement in accuracy, pitch and repeatability is now producing the most consistent and reliable material we have ever had.



3

NEW 40/30 SWEEP ASSEMBLY

We always make it a point to listen closely to our customer base – we consider them to be an extension of our engineering department and are very thankful to have this resource. Thanks to a great initial idea we heard about from a few of our customers, we were able to leverage that knowledge into an all-new sweep system for our 40/30 loops. The new system will make the installation of antennas with loops, significantly easier and much more reliable. And, our new diverter system for the sweep return, will ensure that the copper conductor has a clear path through the sweep material at all times. This new design will eliminate the need for the sweep couplers.



steppIR COMMUNICATION SYSTEMS

20TH ANNIVERSARY steppIR

FOR PRODUCT DETAILS AND ORDERING:

www.steppir.com 425-453-1910

ham radio news

Dayton Roars Back … With an Asterisk

The world's largest hamfest was back in-person in May for the first time since 2019. The Dayton Hamvention® drew an official attendance of 31,367 people to the Greene County Fairgrounds in Xenia, Ohio, after being cancelled in 2020 and 2021 due to the Covid pandemic. According to Hamvention officials, that's about 1,000 fewer people than attended in 2019, but General Chairman Rick Allnut, WS8G, said he considered that "not bad for a pandemic recovery year."

Unfortunately, the pandemic is not completely behind us and *CQ* has heard reports from multiple sources of many attendees returning home and testing positive for Covid. We wish them all a full and speedy recovery.

Also in Ohio … YOTA Camp 2022

The second annual Youth on the Air (YOTA) Americas summer camp was underway as this was written, based once again at the National Voice of America Museum of Broadcasting in southwestern Ohio. Tweets from the group reported that the rooftop antennas on their hotel were damaged by a heavy thunderstorm, but that special event station W8Y managed to quickly get back on the air. They also launched and recovered a high-altitude balloon, among many other activities. We'll have more details in upcoming issues.

FCC Proposes Huge Fine for Firefighter QRM

The FCC has proposed fining an Idaho ham $34,000 for what it called willful and repeated transmissions on fire control frequencies during a wildfire operation in the state in 2021. According to the *ARRL Letter,* the FCC says Jason Frawley, WA7CQ, of Lewiston, repeatedly interfered with U.S. Forest Service and Idaho Department of Land firefighting personnel by transmitting on government frequencies on which he was not licensed to operate. Frawley reportedly told the FCC he was trying to help, not interfere, by passing along information about the area in which the fire was burning, with which he said he was very familiar.

The Commission didn't buy Frawley's argument, noting that this was the largest fine it had ever imposed for this type of interference. The case even drew the attention of FCC Chairwoman Jessica Rosenworcel, who said the transmissions, "put fire suppression and public safety itself at risk," noting, "You can't interfere with public safety communications. Full stop."

AMSAT Launches Youth Initiative, with QCWA Support

AMSAT, the Radio Amateur Satellite Corporation, introduced a new youth initiative program during its Hamvention® forum in May. According to the AMSAT News Service, the program has been in the planning stage for two years and, "takes a radically different approach to introducing youth to amateur radio and satellites." AMSAT Development VP Frank Karnauskas, N1UW, noted that satellite use is pervasive in virtually everything we do today, from tracking climate change and forecasting the weather to broadcasting and military operations. "Our message to youth," says Karnauskas, "is 'Satellites in Space Help Us Live Better Lives Here on Earth,'" adding that once young people's interest is engaged, the program can involve them in, "experiences and exercises that then use amateur satellites and amateur radio as their 'laboratory' or 'classroom.'"

The initiative is community-based and will work directly with young people, their parents and youth organizations, relying on two websites — KidzSat.com for kids in grades 5-7 and BuzzSat.com for teens in grades 8-12 — which will provide age-appropriate activities and exercises. Participants will also have access to a network of online software-defined radios (SDRs) that will let them receive images and telemetry from active satellites as they pass overhead.

The Quarter Century Wireless Association (QCWA) is supporting the program through a $4,000 grant to help pay the costs of developing the online lessons and network of SDR ground stations.

Second Interoperable Radio System for ARISS Contacts Installed on Space Station

Astronauts participating in the Amateur Radio on the International Space Station program (ARISS) will soon have a second interoperable amateur station available for making contacts with schools and other groups. According to the AMSAT News Service, a new Kenwood TM-D710GA transceiver — delivered to the space station back in February — was installed in the station's Russian segment in late May by Cosmonaut Oleg Artemyev, providing a second platform from which crew members may conduct ARISS contacts.

RBN Launches New Website

The Reverse Beacon Network has launched a revamped website at <reversebeacon.net>. RBN stations actively monitor the bands and report the stations they hear to the network. Those spots are then posted on the website, along with information such as band and signal strength. The new site brings back a live map on which spots are posted, along with color-coded lines between the transmitting and receiving stations that indicate the band in use. The map updates frequently, with the most recent spots shown. Many other new features are included. For information, visit <reversebeacon.net>, click on "about" and then "Guide to the new site (beta)."

Milestones: SEA-PAC Turns 40

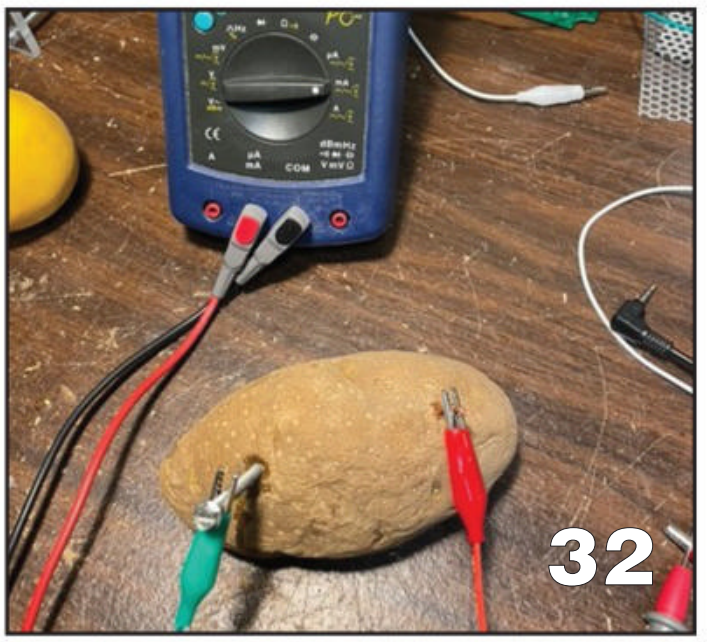
SEA-PAC, the largest hamfest in the northwest, celebrated its 40th anniversary in early June. The ARRL reports that the convention drew some 15,000 people to the Seaside Convention Center in Seaside, Oregon.

More News Elsewhere in This Issue

K9CT and KM3T were inducted into the CQ Contest Hall of Fame, along with six new members of the *CQ Amateur Radio* Hall of Fame. The complete announcement is on page 32. In addition, CQ award certificates are beginning a transition to high-definition PDF files that will be delivered immediately after an award application is approved, eventually eliminating long waits for hand-lettered paper certificates. Details are in our Awards column on page 79.

contents

JULY 2022 • VOLUME 78 NUMBER 07

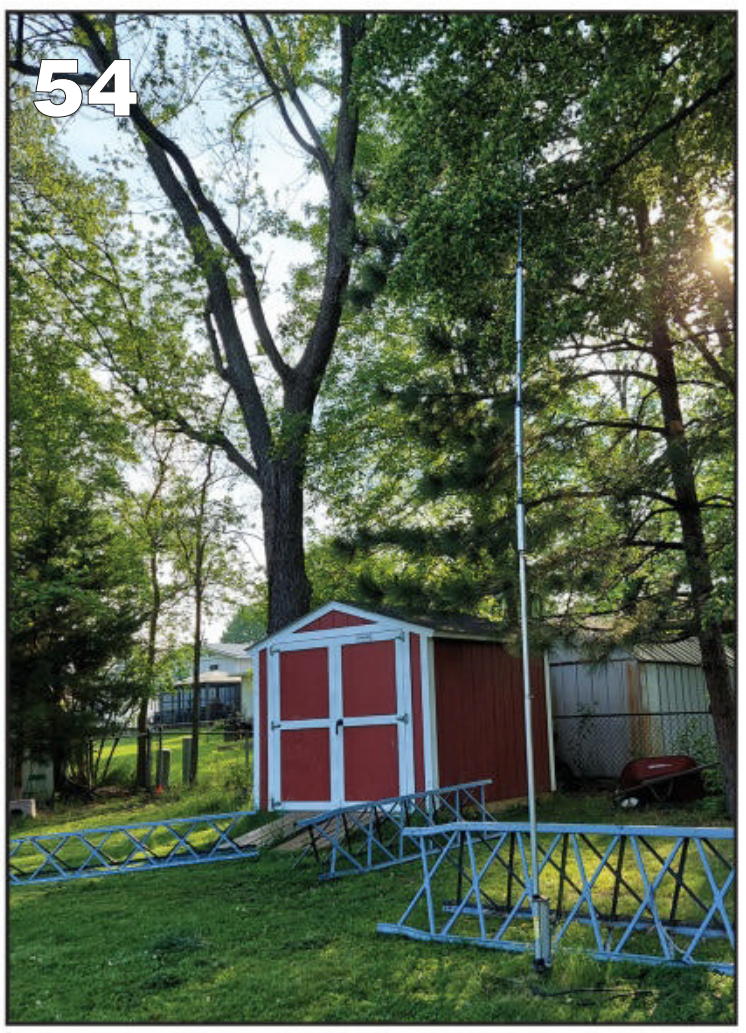


features

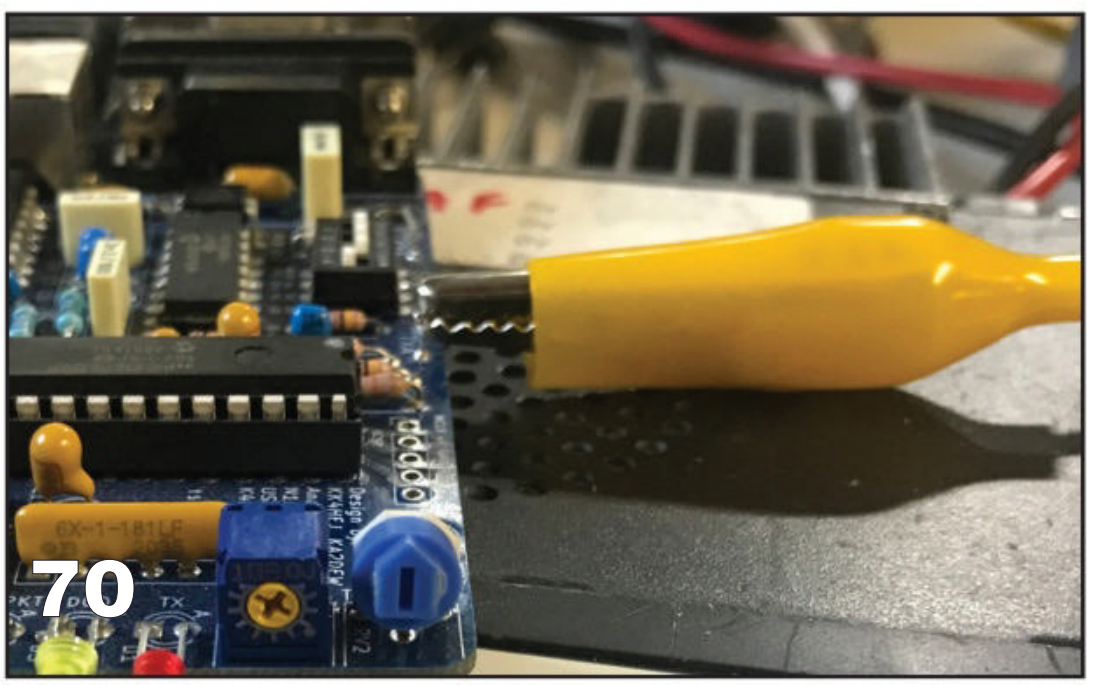
FOCUS ON: The return to in-person events could not have come soon enough and we were thrilled that the Dayton Hamvention was back in full swing. Joe Eisenberg, K0NEB, has all the sights on page 8, while Eric Nichols, KL7AJ, gives his rundown on page 52. Meanwhile, we have the full results of the CQWW WPX RTTY contest on pages 13 & 94 and the rules of the CQWW DX RTTY contest on page 30. Plus Gordo and Ron Ochu discuss antenna traps on pages 54 and 57.

columns

departments



miscellaneous



A publication of

CQ Communications
45 Dolphin Lane
Northport, NY, 11768 USA.

CQ Amateur Radio (ISSN 0007-893X) Volume 78, No. 7, Published monthly by CQ Communications, Inc., 45 Dolphin Lane, Northport, NY, 11768, Telephone 516-681-2922. E-mail: cq@cq-amateur-radio.com. Fax 516-681-2926. Web site: www.cq-amateur-radio.com. Periodicals Postage Paid at Northport, NY 11768 and at additional mailing offices. Subscription prices (all in U.S. dollars): Domestic-one year $42.95, two years $77.95, three years $111.95; Canada/Mexico-one year $57.95, two years $107.95, three years $156.95: Foreign Air Post-one year $72.95, two years $137.95, three years $201.95. Single copy $6.99. U.S. Government Agencies: Subscriptions to CQ are available to agencies of the United States government including military services, only on a cash with order basis. Requests for quotations, bids, contracts., etc. will be refused and will not be returned or processed. Entire contents copyrighted 2022 by CQ Communications, Inc. CQ does not assume responsibility for unsolicited manuscripts. Allow six weeks for change of address.

Printed in the U.S.A.
POSTMASTER: Send address changes to:
CQ Amateur Radio, P.O. Box 1206, Sayville, NY, 11782

announcements

JULY

HARRISBURG, PENNSYLVANIA — The Harrisburg Radio Amateurs' Club will hold its 51st Annual Firecracker Electronics Expo and Hamfest and 2022 ARRL Pennsylvania State Convention beginning 8 a.m., Saturday, July 2 at the Harrisburg Postal Employees Picnic Grounds, 1500 Roberts Valley Road. Contact: Terry Snyder, WB3BKN, (717) 896-0256. Email: <wb3bkn1@gmail.com>. Website: <www.w3uu.org>. Talk-in 147.075 (PL 123). DXCC / WAS/ VUCC card checking.

PLAINS, PENNSYVANIA — The Murgas Amateur Radio Club will hold the 43rd Annual Wilkes-Barre Hamfest and Computerfest beginning 8 a.m., Sunday, July 3 at the Polish American Veterans, 2 South Oak Street. Contact: Herb, K2LNS, (570) 829-2695. Email: <murgasarc@gmail.com>. Website: <http://hamfest.murgasarc.org>. Talk-in 146.610- (PL 82.5). VE exams

CAMILLUS, NEW YORK — The Radio Amateurs of Greater Syracuse will hold Roger's RAGS Hamfest 2022 from 7:30 a.m. to 12:30 p.m., Saturday, July 9 at the Camillus Elks Lodge #2367, 6117 Newport Road. Contact: Jerry Wright, NK2C, <wrightjk@gmail.com>. Website: <www.ragsclub.org>. Talk-in 146.91- (PL 103.5). VE exams.

OAK CREEK, WISCONSIN — The South Milwaukee Amateur Radio Club will hold the South Milwaukee Swapfest 2022 from 7 a.m. to 3:30 p.m., Saturday, July 9 at the American Legion Post 434, 9327 S. Sheppard Avenue. Contact: Karen, KC9WQJ, (414) 578-0492. Email: <kc9wqj@gmail.com>. Website: <http://southmilwaukeearc.org>. Talk-in 146.910- (PL 127.3).

ROSEVILLE, MINNESOTA — The MAGIC Repeater Club will hold the MAGIC TAILGATER from 8 a.m. to noon, Saturday, July 9 at the Galilee Lutheran Church, 145 N. McCarrons Boulevard. Contact: Leon Dill, WØCOE, (651) 688-9964. Email: <w0coe@arrl.net>. Website: <www.magicrepeater.net>. Talk-in 145.170 (PL 100). VE exams.

SMITHTOWN, NEW YORK — The Suffolk County VHF/UHF Association will hold its Hamfest 2022 beginning 8 a.m., Saturday, July 9 at The Elks Lodge Field, 120 Edgewood Avenue. Contact: Scott Miller, NQ2F, (516) 658-5120. Email: <nq2f@optonline.net>. Website: <http://hamradioexamsny.yolasite.com>. VE exams, DXCC card checking.

TEXAS CITY, TEXAS — The Tidelands Amateur Radio Society will hold the Texas City Tidelands Hamfest 2022 from 8 a.m. to 2 p.m., Saturday, July 9 at the Charles T. Doyle Convention Center, 2010 5th Avenue North. Email: <info@tidelands.org>. Website: <www.tidelands.org>. Talk-in 147.14 (PL 167.9) or 442.025 (PL 103.5). VE exams, T-hunt.

FERNDALE, MICHIGAN — The Flying Beers International will hold the Flying Beers International Swap Meet III from 9 a.m. to 2 p.m., Sunday, July 10 at the Ferndale FOP, 2233 Burdette Street. Website: <www.facebook.com/flyingbeersinternational>. Talk-in 442.600+ (PL 123). VE exams,

SOMERSET, PENNSYLVANIA — The Somerset County Amateur Radio Club will hold the Somerset County PA Hamfest from 8 a.m. to 1 p.m., Sunday, July 10 at the Somerset County Technical Center, 281 Technology Drive. Contact: Stew, AK3J, (814) 444-0637. Email: <ak3j@arrl.net>. Website: <http://k3smt.org/hamfest>. Talk-in 147.195+ (PL 123) or 443.250+ (PL 123). VE exams.

ALEXANDER, NEW YORK — The Lancaster Amateur Radio Club will hold the Batavia Hamfest beginning 6 a.m., Saturday, July 16 at the Alexander Firemen Grounds, 10708 Alexander Road (Rt. 88). Contact: Luke, M2GDU, <luke48@gmail.com>. Website: <www.w2so.org>. Talk-in 147.285 (PL 141.3).

ATHENS, TENNESSEE — The McMinn County Amateur Radio Club will hold its 18th Annual MCARC Hamfest beginning 7 a.m., Saturday, July 16 at the McMinn County Expo Center, Athens Regional Park on Decatur Pike. Phone: (423) 368-1473. Email: <kc4jiy@yahoo.com>. Website: <www.mcminnarc.com>. Talk-in 146.060- (PL 141.3) VE exams.

CARY, NORTH CAROLINA — The Cary Amateur Radio Club will hold its 49th Annual Swapfest from 8 a.m. to 1 p.m., Saturday, July 16 at the Harold Ritter Park, 301 West Lochmere Drive. Email: <wa4gir@arrl.net>. Website: <https://caryarc.org>.

ELYRIA, OHIO — The Northern Ohio Amateur Radio Society will hold NOARSfest 2022 from 9 a.m. to noon, Saturday, July 16 at the Lorain County Community College-John A. Spitzer Conference Center, 1005 N. Abbe Road. Contact: Carl Rimmer, W8KRF, (216) 256-9624 (before 9 p.m.). Email: <noarsfest@noars.net>. Website: <www.noars.net>. Talk-in 146.70- (PL 110.9). VE exams.

KANAI, ALASKA — The Moosehorn Amateur Radio Club will hold the 14th Annual Kennai Peninsula Hamfest from 10 a.m. to 4 p.m., Saturday, July 16 at the Kenai American Legion Hall, 902 Cook Avenue. Contact Ed Cole, KL7UW, (907) 776-5829. Email: <kl7uw@acsalaska.net>. Website: <www.kl7uw.com>. Talk-in 146.88-.

MONUMENT, COLORADO — The Pikes Peak Radio Amateur Association will hold the PPRAA Ham Radio Megafest from 8 a.m. to 1 p.m., Saturday July 16 at the Lewis-Palmer High School, 1300 Higby Road. Email: <megafest@ppraa.org>. Website: <https://ppraa.org>. Talk-in 146.235+. VE exams.

NORTH BEND, NEBRASKA — The Pioneer Amateur Radio Club will hold its 24th Annual Flea Market from 8 a.m. to 12:30 p.m., Saturday, July 16 at the North Bend City Auditorium, 741 North Main Street. Contact: Rich Mehaffey, KBØARZ, (402) 652-3410. Email: <4randjme@futuretk.com>. Talk-in 146.67- or 443.900+. VE exams, DXCC card checking.

WARRENSBURG, MISSOURI — The Warrensburg Area Amateur Radio Club will hold the Warrensburg Hamfest 2022 from 8 a.m. to noon, Saturday, July 16 at the Johnson County Fairgrounds, 144 NW 361st Street. Contact: Kristl Thompson, KR1STL, <kr1stl.cq@gmail.com>. Website: <www.waarci.org>. Talk-in 146.88- (PL 107.2).

AUGUSTA, NEW JERSEY — The Sussex County Amateur Radio Club will hold the 43rd Annual SCARC Hamfest beginning at 8 a.m., Sunday, July 17 at the Sussex County Farm & Horse Show Fairgrounds, 37 Plains Road. Contact: Brian Brunsch, KC2YON, (973) 862-8197. Email: <hamfest@scarcnj.org>. Website: <www.scarcnj.org>. Talk-in 147.30+ (PL 151.4). VE exams.

PEOTONE, ILLINOIS — The Kankakee Area Radio Society will hold KARSFEST 2022 beginning 8 a.m., Sunday, July 17 at the Will County Fairgrounds, 710 S. West Street. Contact: Art Reis, K9XI, (815) 348-7752. Email: <karsfest@gmail.com>. Website: <www.w9az.com>. VE exams, card checking.

WASHINGTON, MISSOURI — The Zero Beaters Amateur Radio Club will hold the 60th Annual ZBARC Hamfest from 7 a.m. to noon, Sunday, July 17 at the KC Hall, 1121 Columbus Lane. Email: <briceserbus@abcglobal.net>. Website: <www.zerobeaters.org>. Talk-in 147.24+ VE exams.

LA CROSSE, WISCONSIN — The Central States VHF Society will hold the 54th Annual CSVHFS Conference from Friday, July 22 and Saturday, July 23 at the Raddison Hotel La Crosse, 200 Harbor View Plaza. Email: <registration@csvhfs.org>. Website: <http://2022.csvhfs.org>.

WAYNESVILLE, NORTH CAROLINA — The Western Carolina Amateur Radio Society will hold its Hamfest beginning 8 a.m., Saturday, July 23 at the Smoky Mountain Event Center, 758 Crabtree Road. Website: <www.wcars-club.org>. Talk-in 146.910- (PL 91.5 or 147.390+ (PL 94.8). VE exams.

CHAMBERSBURG, PENNSYLVANIA — The Cumberland Valley Amateur Radio Club will hold the CVARC Hamfest 2022 from 8 a.m. to noon, Saturday, July 30 at the Cumberland Valley Engine & Machinery Association Show Grounds, 1501 Criders Church Road. Email: <hamfest@w3ach.org>. Website: <www.w3ach.org>. Talk-in 147.120+ (PL 100). VE exams.

SUTTON, WEST VIRGINIA — The West Virginia State Amateur Radio Council will hold the 64th Annual ARRL West Virginia State Amateur Radio Convention on Saturday, July 30 at the Days Inn and Conference Center, 350 Days Drive. Contact: Ed Messenger, N8OYY, (304) 517-9715. Email: <n8oyy@arrl.net>. Website: <www.qsl.net/wvarc>. Talk-in 145.29 (PL 91.5). VE exams, Wouff-Hong.

LEBANON, TENNESSEE — The Wilson Amateur Radio Club will hold the Greater Nashville HamQuest from 8 a.m. to 3 p.m., Saturday, July 30 at the James E. Ward Agricultural Center, 935 E. Baddour Parkway. Contact: Bill Uthoff, KK4WU, (615) 210-5581. Email: <info@midtnhamquest.com>. Website: <www.midtnhamquest.com>. Talk-in 147.105+ (PL 156.7). VE exams.

WINCHESTER, INDIANA — The East Central Indiana Hamfest 2022 will be held from 8 a.m. to 3:30 p.m., Saturday, July 30 at the Randolph County 4-H Fairgrounds, 1885 U.S. Highway 27. Phone: (765) 400-0232. Email: <INhamfest@gmail.com>. Website: <http://INhamfest.com>. Talk-in 147.300+ (PL 110.9). VE exams.

AUGUST

CENTRAL CITY, IOWA — The Cedar Valley Amateur Radio Club will hold the Fifth Annual Midwest Techfest and 2022 ARRL Iowa State Convention from 8 a.m. to 3 p.m., Saturday, August 6 and from 8 a.m. to 3 p.m., Sunday, August 7 at the Linn County Fairgrounds, 201 Central City Road. Contact: David Cripe <nm0s@arrl.net>. Website: <http://w0gq.org/hamfest>. Talk-in 146.745- (PL 192.8). VE exams,

ELKHART, INDIANA — The 2022 Elkhart East Hamfest will be held from 8 a.m. to 2 p.m., Saturday, August 6 at the Northern Indiana Event Center, 21565 Executive Parkway. Email: <info@elkharteasthamfest.com>. Website: <www.elkharteasthamfest.com>. Talk-in 145.430 (PL 141.3). VE exams.

GROVE CITY, OHIO — The Aladdin Shrine Audio Unit will hold the 2022 Columbus Hamfest from 8 a.m. to 1 p.m., Saturday, August 6 at the Aladdin Shrine Center, 1801 Gateway Circle. Website: <www.columbushamfest.com>. Talk-in 146.760 (PL 123).

ROANOKE, VIRGINIA — The Roanoke Valley Amateur Radio Club will hold its Hamfest from 8 a.m. to 1 p.m., Saturday, August 6 at the Colonia Avenue Baptist Church, 4165 Colonial Avenue. Contact: John, W4AZT, <darrell@ki4lla.us> or Darrell, KI4LLA <johnbougeois_19@yahoo.com>. Website: <https://roanolehamfest.info>. Talk-in 146.985- (PL 107.2). VE exams.

TRUMANSBURG, NEW YORK — The Tompkins County Amateur Radio Association will hold the Ithaca Hamfest from 7 a.m. to noon, Saturday, August 6 at the Trumansburg Fairgrounds on NYS 96. Email: <ne2t@arrl.net>. Website: <http://tcara-ny.org/hamfest>.

BERRYVILLE, VIRGINIA — The Shenendoah Valley Amateur Radio Club will hold the 71st Annual Berryville Hamfest beginning 8 a.m., Sunday, August 7 at the Clarke County Ruritan Fairgrounds, 890 W. Main Street. Contact: Mick W8BE, <vendor-coordinator@berryvillehamfest.com>. Website: <www.berryvillehamfest.com>. VE exams.

PEOTONE, ILLINOIS — The Hamfesters Radio Club will hold its 87th Annual Hamfest beginning 8 a.m., Sunday, August 7 at the Will County Fairgrounds, 710 S. West Street. Contact: Don Pointer, KC9EQQ, (773) 426-1936. Email: <dpointer65@aol.com>. Website: <http://hamfesters.org>. Talk-in 442.450+ (PL 114.8). VE exams.

EVANSVILLE, INDIANA — The Tri-State Amateur Radio Society will air special station W9OG/75 from 1400 UTC, Friday, August 12 through 2359 UTC, Sunday, August 14 to honor its 75th Anniversary. Frequencies include 7.262, 7.045, 14,250 MHz and the FT8 band on the 20- and 40-meter band. QSL a SASE to WA2USA, 5577 Victoria Court, Newburgh, IN 47630. Contact: Dennis Martin, WA2USA, (812) 598-8333. Email: <wa2usa.ham@gmail.com>.

AUBURN, INDIANA — The Northeastern Indiana Amateur Radio Association will hold the Auburn Hamfest from 9 a.m. to 2 p.m., Saturday, August 13 at the Auburn Cord Duesenberg Museum, 1600 S. Wayne Street. Email: <w9ou@arrl.net>. Website: <http://w9ou.org>. Talk-in 147.015 (PL 141.3)

CARLINVILLE, ILLINOIS — The West Central Illinois Hamfest will be held from 7 a.m. to noon, Saturday, August 13 at the Macoupin County Fairgrounds, 21149 IL Route 4. Contact: Jim Pitchford, N9LQF, (217) 670-5777. Email: <information@wcilhamfest.com> or <n9lqf@arrl.net>. Website: <http://wcilhamfest.com>. Talk-in 444.250 (PL 103.5). VE exams, card checking.

FAYETTEVILLE, NORTH CAROLINA — The Cape Fear Amateur Radio Society will hold its 23rd Annual Ole Fashioned SwapFest from 8 a.m. to noon, Saturday, August 13 at the Cumberland County Shrine Club, 7040 Ramsey Street. Contact: David, KI4W, (910) 624-1394. Email: <kr4oe@nc.rr.com>. Website: <www.cfarsnc.com>. Talk-in 146.910- (PL 100). VE exams.

FORT PIERCE, FLORIDA — The Fort Pierce Amateur Radio Club will hold the Fort Pierce Hamfest from 8 a.m. to 1 p.m., Saturday, August 13 at the Treasure Coast Public Safety Training Complex 4600 Kirby Loop Road. Website: <www.fparc.org>. Talk-in 147.345 (PL 107.2). VE exams, DXCC card checking.

OWENSVILLE, OHIO — The Cincinnati Hamfest will be held from 8 a.m. to 2 p.m., Saturday, August 13 at the Clermont County Fairgrounds, 1000 Locust Street. Email: <info@cincinnatihamfest.org>. Website: <www.cincinnatihamfest.org>. Talk-in 147.345+ (PL 123). VE exams,

RACINE, WISCONSIN — The Racine Mega Cycle Club will hold its Free Fest 2022 from 6 a.m. to 1 p.m., Saturday, August 13 at the Greater Racine Kennel Club, 6320 Six Mile Road. Contact: Dan Miller <ka9oil@yahoo.com>. Website: <www.w9udu.org>. Talk-in 147.270+ (PL 127.3).

O'FALLON, MISSOURI — The St. Charles Amateur Radio Club will hold its Hamfest from 7 a.m. to noon, Sunday, August 14 at the Elks Lodge, 1163 Tom Ginnever Avenue. Contact: Doug Wheeler, KØHKK, (314) 660-0674. Email: <scarc.hamfest@gmail.com>. Website: <www.wb0hsi.org>. Talk-in 146.670 or 145.330.

PHOENIXVILLE, PENNSYLVANIA — The Mid-Atlantic Amateur Radio Club will hold the Valley Forge Hamfest beginning 8 a.m., Sunday, August 14 at the Kimberton Fire Company Fairgrounds, 762 Pike Spring Road (Rt. 113). Contact Bob Palin, N3JIZ, (610) 420-1535. Email: <hamfest@marc-radio.org>. Website: <www.marc-radio.org>. Talk-in 145.30- (PL 131.8) or 147.060+ (PL 131.8). VE exams, DXCC / WAS card checking.

HUNTSVILLE, ALABAMA — The Huntsville Hamfest and the 2022 ARRL Southeast Division Convention will be held from 9 a.m. to 4:30 p.m., Saturday, August 20 and from 9 a.m. to 3 p.m., Sunday, August 21 at the Von Braun Center South Hall, 700 Monroe Street SW. Website: <www.hamfest.org>. Talk-in 146.94 (PL 100). VE exams, DXCC card checking,

ADAMS, MASSACHUSSETS — The Northern Berkshire Amateur Radio Club will hold its Hamfest beginning 7 a.m., Sunday, August 21 at Bowe Field (Adams Agricultural Fair Grounds on Route 8. Contact Eric (413) 743-9975. Website: <www.nobarc.org>. Talk-in 146.91 IPL 162.2). VE exams

MARLBOROUGH, MASSACHUSSETS — FEMARA Inc. will hold The Northeast HamXposition 2022 and the 2022 ARRL New England & Hudson Divisions Convention will be held from Friday, August 26 through Sunday August 28 at the Best Western Royal Plaza Hotel & Trade Center, 181 Boston Post Road W. Website: <www.hamxposition.org>. Talk-in 147.270+ (PL 146.2), 223.940- (PL 103.5), or 449.925- (PL 88.5). VE exams, special event station, DXCC card checking, fox hunt.

BARABOO, WISCONSIN — The Yellow Thunder Amateur Radio Club will hold the Circus City Swapfest from 8 a.m. to noon, Saturday, August 27 at the Badger Steam & Gas Engine show grounds, E3347 Sand Road. Contact: Tom Harrison, N9PQJ, (608) 963-0762. Email: <n9pqj@yellowthunder.org>. Website: <www.yellowthunder.org>. VE exams

DAVENPORT, IOWA — The Davenport Radio Amateur Club will hold the 51st Annual WØBXR Hamfest / Computer Show beginning 8 a.m., Saturday, August 27 at the Iowa Army National Guard, 5300 West Kimberly Road. Contact Kelly Lovely, W1HAM, (563) 321-7559. Email: <w1ham@arrl.net>. Website: <www.arcsupport.com>. Talk-in 146.28+ (PL 77) or 146.10+ (PL 77).

LEBANON, TENNESSEE — The Short Mountain Repeater Club will hold the 2022 SMRC Cedars of Lebanon Hamfest beginning 8 a.m., Saturday, August 27 at the Cedars of Lebanon State Park, 5070 Murfreesboro Road. Website: <http://smrclub.com>. Talk-in 146.910-.

MACEDON, NEW YORK — The Roc City Net will hold its 4th Annual Roc City Net Hamfest beginning 7 a.m., Saturday, August 27 at the Log Cabin Restaurant, 2445 W. Walworth Road. Website: <roccitynethamfest.com>. Talk-in 145.11 (PL 110.9).

NAPERVILLE, ILLINOIS — The Society of Midwest Contesters will hold the SMC Fest 2022 Saturday, August 27 at the Chicago Marriott Naperville, 1801 North Naper Boulevard. Website: <http://w9smc.com>. Friday, August 26th Banquet.

BRIGHTON, COLORADO — The Denver Radio Club will hold its Hamfest from 9 a.m. to 1 p.m., Sunday, August 28 at the Adams County Fairgrounds, 9755 Henderson Road. Contact Cathy Villhauer <drcfest@w0tx.org>. Website: <www.w0tx.org>. Talk-in 145.490 (PL 100) or 448.625 (PL 100). VE exams.

CHIPPEWA FALLS, WISCONSIN — The Chippewa Valley Amateur Radio Club will hold its 2022 Hamfest from 9 a.m. to 2 p.m., Sunday, August 28 at the Northern Wisconsin State Fairgrounds, 225 Edward Street. Email: <hamfest@w9cva.org>. Website: <http://w9cva.org>. Talk-in 147.375+ (PL 110.9). VE exams.

SEPTEMBER

SHELBY, NORTH CAROLINA — The Shelby Amateur Radio Club will hold the Shelby 2022 Hamfest and the 2022 ARRL North Carolina Section Convention from 9 a.m. to 5 p.m., Friday, September 2, 8 a.m. to 5 p.m., and 8 a.m. to 1 p.m., Sunday, September 3 at the Cleveland County Fairgrounds, 1751 E. Marion Street. Phone: (980) 295-5151. Email: <chairman@shelbyhamfest.org>. Website: <www.shelbyhamfest.com>. Talk-in 146.880-. VE exams.

FINDLAY, OHIO — The Findlay Radio Club will hold its 80th Annual Hamfest from 8 a.m. to 2 p.m., Sunday, September 11 at the Hancock County Fairgrounds, 1017 East Sandusky Street. Email: <hamfest@FindlayRadioClub.org>. Website <www.FindlayRadioClub.org/hamfest>. Talk-in: 147.150+ (PL 88.5).

LOCKPORT, NEW YORK — The Lancaster Amateur Radio Club will hold the Lancaster Hamfest beginning 7 a.m., Saturday, September 10 at the Transit Drive In, 6655 S. Transit Road. Website: <www.w2so.org>. Talk-in 147.255 (PL 107.2).

our readers say...

More Feedback on CQ's Contest Policy Regarding Russia and Ukraine

Editor, *CQ*:

I wanted to say how much I appreciate your article in *CQ* April 2022. I generally stick with the rules of "no religion" and "no politics" on ham radio; however, being a student of history and especially WWII geopolitical & military tactics, I, too, must step up and support the Ukrainian people and condemn Russian political / warfare tactics in use. I believe if the world had stood against this exact type of behavior Germany was using against neighboring countries, perhaps the magnitude of war might have been avoided. Please help keep us informed.

Thank you most sincerely,

– Will Allen Peden, Jr., KE5OYL

Plus, the Return of Print...

Editor, *CQ*:

What a joy to receive at last a copy of my favorite, *CQ*.

What an even greater joy to read your well-thought-out policy on the war in Ukraine! These are difficult times and it is encouraging to know there are people who are doing what they can.

– 73, David Haines, KC1DNY

Editor, *CQ*:

Ahhhhhh, it's great to be able to turn a paper page again to read a good magazine!

Good decision to limit our Russian "friends'" contest scoring. When the Ukrainian hams can enter contests again maybe it will be time to let the Russians have a go at it.

– 73, R.L. Davidson, W4IA

And Professor Heisseluft Snags Another Reader...

Editor, *CQ*:

Regarding the article — "Slow Website Speeds Cause Spectrum Rage" — April 2022:

I found your two-page article on Spectrum Rage a bit simplistic and bordering on nonsensical.

The current problem of foul mouth rage alcoholics on the radio can be traced to a simple source: The FCC. Since there seems to be little to no enforcement of civility on the bands by the FCC, the problems will just grow worse and worse. The constant and same operators that cuss, scream, operate drunk, and a variety of venting other foul language are ever present on the same frequencies day after day, and they fear no punishment. All at 1,500 watts, or more.

With the technology available today, finding these people would be rather simple. Until the FCC knocks on their doors, seizes their equipment, and fines them dollar amounts in the six-digit range, it will not stop. The FCC has all but stopped enforcement of the rules we all should live by. An occasional fine for an operator that has repeatedly caused interference will do nothing to discourage the problem. I am afraid the HF bands are quickly heading toward what became of the CB radios. Soon, they will be unusable by decent people.

Only expensive seizures of equipment, followed up by very high fines, will the problem slow down. Repeated violators that get back on the air should then be jailed.

It has gotten to the point that I would not want my children on any on the HAM bands. Any parent that wanted to encourage their child to get into ham radio will no longer try due to the foul language that is on the air night after night.

People like this only understand one kind of punishment. EXPENSIVE. Total seizure of all their equipment and high fines are possible under current rules. The FCC is just not interested in pursuing it.

– T. Andrew McCluskey, N4MCC

zero bias: a cq editorial

BY RICH MOSESON,* W2VU

Make This a Summer of DX Discovery

Several of our columns this month focus on HF "newbies," hams who are just getting started on the shortwave bands. Prime among them is N2OO's DX column, a "DX Chasing Guide for Novice and Technician Licensees." (Yes, believe it or not, there are still Novices out there!) Following the same theme, "Learning Curve" editor KOØZ writes about the basics of trap antennas, which are frequently the first "commercial" antenna many hams try, after a dipole; and WB6NOA dissects a trap and shares an innovative mounting method for a multiband vertical in his "Gordo's Short Circuits" column.

I thought about calling this month's issue an "HF Newbie Mini-Special," but then I realized it ain't just newbies. Solar Cycle 25 is rising at a delightfully fast rate, so far following a course predicted by a "maverick" solar physicist who thinks we're in for a really super cycle. And Cycle 24 was so weak that anyone who has come into ham radio in the past decade (that would be roughly 300,000 of you) has never had the opportunity to enjoy a really good sunspot cycle. So articles on the basics of DX and DXing aren't just for the newcomer to HF. They're useful for nearly half our population.

If you have a General or Extra Class license, you have fantastic opportunities for DXing on all of our HF bands. But N2OO is reminding those of us with a Tech or Novice license that you don't need to upgrade in order to reap the benefits of a hot solar cycle. All hams have voice privileges on the 10-meter DXing segment between 28300 and 28500 kHz. You can increase your DXing potential by learning Morse code and using the CW subbands — again open to all hams — on 80, 40, and 15 meters. And 6 meters is expected to be super this summer. So, even if you've been a ham for a decade but your shortwave success has been limited or nonexistent, now is the time to start a summer of DX discovery on HF. And we've got the help to get you started, right in this issue.

All hams have voice privileges on the 10-meter DXing segment between 28300 and 28500 kHz. You can increase your DXing potential by learning Morse code and using the CW subbands — again open to all hams — on 80, 40, and 15 meters.

Ham Eclectic

If DXing isn't high on your priority list, don't worry. The rest of this issue is an illustration of the incredible breadth and variety of amateur radio. We take you to Ohio for the in-person return of the Dayton Hamvention® and to Ecuador for a look at ham radio's response to a massive earthquake there a few years back (as yet another big quake shook the region as we were preparing this issue). We look at really "green" power by using fruits and vegetables to power up a very low power (QRPp) transceiver. (Yes, this really is a "thing." A few years back, I was sharing a table at a mini-Maker Faire with a display of power-producing produce!) And our columnists delve into the return of high-speed packet, getting more hams onto the microwave bands and more. There really is no end to the different aspects of our hobby, which offers something for anyone with virtually any technical or communication interest.

Not so coincidentally, that is also the theme of KL7AJ's new book, *Playing with Meteors.* No, it isn't a guide to meteor scatter communications (although that wouldn't be a bad idea); it's about all the varied technical paths you can follow in ham radio, and vice versa — how ham radio can help you follow any number of technical career paths. The title is borrowed from my son, Dan, KC2OOM, who once explained to a skeptic asking why young people today would possibly be interested in amateur radio that no other hobby "lets you play with meteors." So if you know someone who loves technology, but doesn't yet know that he or she needs to be a ham, get this book as a gift!

Award Changes

CQ's award program is taking another step into the 21st century while addressing some significant issues at the same time. As detailed in this month's "Awards" column on page 79, as of September 1st, we will begin phasing out hand-lettered parchment certificates as the "standard" certificate for CQ awards. They will continue to be available, but as an added-cost option.

Going forward, the "standard" CQ award certificate will be a high-resolution PDF file — suitable for printing and framing — emailed to the recipient at the same time as the award letter (already done for WPX recipients; coming soon for WAZ, with CQ DX and USA-CA to follow later). This will eliminate the wait times that have been so frustrating for many award recipients (Thankfully, we are making great progress on eliminating the backlog). With ongoing supply-chain issues affecting the availability of parchment paper and flat cardboard mailers, along with constantly escalating costs, this is our only option at this point. Certificates already "in the pipeline" as of September 1st will be processed without imposing the added fee. Again, please see the Awards column on page 79 for details.

Improved DX conditions will help make it easier to earn these awards in the first place, so if you're new to ham radio, new to HF, or new to Cycle 25 (that would be just about all of us), take advantage of the best "solar weather" we've had since the early '00s — with great promise to get even better — get yourself on the air and make this a summer of DX discovery! May the sunspots be with you…

– 73, Rich, W2VU

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

news bytes

Thinking of Buying an EV? Watch Out for QRM

If high gas prices and/or environmental concerns have you considering the purchase of an electric vehicle (EV), here's one more consideration to include in your decision-making: Will you be able to operate a mobile HF ham rig without debilitating interference from the car itself? *Radio World* magazine reports that the subject of electromagnetic interference (EMI) from EVs was a forum topic at June's conference of the Audio Engineering Society.

RW reports that interference to analog AM signals is so bad in some vehicles that the manufacturers are not including AM radios with their cars, opting only for FM and digital, both of which are more resistant to electrical noise. Such noise would likely be broadbanded enough to seriously degrade analog SSB and CW signals on the HF bands as well. VHF/UHF FM is less likely to be affected.

Apparently, not all EVs are created equal in this regard. One of the AES forum speakers on the subject was Xperi Corp. communications system engineer Pooja Nair, who wrote in a previous RW commentary <https://tinyurl.com/yckay4fk> that "EMI can be suppressed in EVs using well-known mitigation techniques such as shielding cables and electric motors, installing filters and carefully locating electrical components within the vehicle. Within receivers, EMI can be limited by isolating and shielding antenna and RF sections, filtering connections and carefully grounding and placing receiver components." Some manufacturers, Nair writes, do work hard to mitigate EMI while others take the easier path of leaving out the AM radio.

Takeaway for hams who operate HF mobile and are considering an EV purchase: Do your homework. Find out the steps taken by the manufacturer of each vehicle you're considering to control EMI within the vehicle. Step 1: Does the car include an AM radio?

Are EVs sources of rolling RFI? It all depends on the manufacturer, says one expert. (Photo by Mariordo, via Wikimedia Commons)

After two cancellations due to Covid-19, the Dayton Hamvention® was finally back in person this year. While CQ decided to wait another year before braving the unmasked crowds at an indoor booth, Kit-Building Editor Joe Eisenberg, KØNEB, was one of several CQ columnists, contest directors, and award managers who "waved the flag" for us at the show. Joe shares his observations — and a bunch of photos — with us here.

Hamvention 2022 "The Reunion"

PHOTO ESSAY BY JOE EISENBERG,* KØNEB

I made it! My first time driving to Hamvention since 2009. Surprisingly, the plug-in hybrid Prius Prime did not have a significant noise problem on HF, compared to my previous Prius hybrid cars which had 20 over 9 noise levels from the high-voltage power inverters.

Putting in my time as Net Control at W8BI on Thursday for the talk-in without my signature hat. (The headphones wouldn't let it stay in place!)

After a long three years since the last Hamvention® was held, it was great to see everyone there. It was wonderful to wander the largest ham radio flea market and convention in the world once again. Lots of planning by the hard-working Dayton Amateur Radio Association (DARA) Hamvention committees and volunteers made for another successful show. I even volunteered to put in my first-ever, four-hour shift as Net Control and alternating as assistant NCS of the talk-in on the W8BI 146.34/.94 repeater under the watchful eye of the talk-in chair, Elizabeth Klinc, KE8FMJ. With a laptop full of resources nearby, it was easy to guide those on their way as well as answer questions, such as where to go to get inside exhibitor credentials and get flea market vendors to the correct entrance. The question remains, will I get invited to help the talk-in again?

** Contributing Editor, CQ*
Email: <k0neb@cq-amateur-radio.com>

As Always … The Weather!

Heavy to moderate rain persisted from late Thursday night until just about gate opening time at 9 a.m. on Friday, giving way to near-record heat approaching 90° once the clouds cleared. The heat persisted until later on Saturday afternoon, around 4 p.m., when dark clouds once again gathered and lightning and thunder permeated the Greene County Fairgrounds. The amazing thing was that, despite the heavy rains just before opening and late on Saturday, the grass parking areas remained usable although wet, and no tow trucks were needed to pull out vehicles stuck in mud. Many attendees chose to take advantage of the paved parking at the three remote parking sites along with their free shuttle buses.

The flea market also benefitted from improvements made after the muddy first year, including drainage improvements and the use of ground asphalt recovered from local street improvements packed down and rolled to form the aisles that make up the flea market. The food was great again, and the lines for food were shorter than in the past. With fewer inside exhibitors this year, there were also no tents set up to accom-

The flea market was not flooded this year, despite the rains that came the week before, including on Thursday night and early Friday morning, as well as Saturday afternoon and night.

Tables full of flea market bargains awaited shoppers who rushed the gates at 9 a.m. on Friday.

A full Collins KWM-2A setup beckons flea market browsers.

It was wonderful to wander the largest ham radio flea market and convention in the world once again.

Tower Electronics returned to Hamvention, both indoors and outdoors, with plenty of connectors and antennas and other things needed by hams.

Need a microphone?

A sample of the T41 SDR project was on display during the Four Days in May QRP seminars. This radio may become a future kit. (See "What's New" in the June 2022 issue. –ed.)

The best homebrew award at FDIM went to Gary Auchard, WØMNA, with his incredible tube-type World War II replica Paraset radio.

Yaesu was there showing off its new mobiles, such as the FTM-200, as well as the FT-5DR HT. But the star of their show was the FTDX-101MP.

Icom also displayed a prototype of its new SHF Project radio. 5 GHz!

Icom's new IC-PW2 1-kilowatt, solid-state amplifier was on display. This amp will output 500 watts at 120-volts AC and 1 kilowatt at 220-volts AC power input. The amplifier does not have to take up any desktop space, being completely controlled either via your network or the removable touch-screen control panel. SO2R capability is also built in.

modate vendors, with all inside exhibitors fitting inside the five buildings allocated to inside exhibits. There were several exhibitors missing for various reasons, including supply chain issues or businesses sold / merged with others. That former tent space was filled with emergency communications vehicles and VHF/UHF rovers.

The Envelope, Please …

The awards banquet was held at the Holiday Inn at Beavercreek, and I was honored to represent CQ as well as act as the official photographer for the Dayton Amateur Radio Association. There were award recipients present not only for 2022, but also for the years of 2020 and 2021 as well.

It was great to see everyone and it was a different year for me as well as I drove instead of flying as I usually do. Driving 800 miles each way was affordable as I got between 57 and 62 MPG in my Prius Prime on each fill up.

The Mississippi Valley Amateur Radio Association (MVRA) had its well-outfitted communications bus on display.

There were award recipients present not only for 2022, but also for the years of 2020 and 2021 as well.

It was great to see everyone and it was a different year for me as well as I drove instead of flying as I usually do.

The MVRA bus is equipped with three operating positions that feature Yaesu FTDX101D radios, as well as other operating positions.

Jack Gerbs, WB8SCT, as president of DARA presents the Amateur of The Year award for 2022 to Jim Simpson, KF8J.

Hamvention Chairman Rick Allnutt, WS8G, presents the 2022 Club of The Year award to the Highland Amateur Radio Association of southwest Ohio.

DARA Vice President Ron Cramer, KD8ENJ, presents the 2022 Technical Achievement Award to Adam Farson, VA7OJ/AB4OJ.

Results of the 2022 CQWW WPX RTTY Contest

BY CHRIS TATE*, N6WM & ED MUNS, WØYK**

The CQWW WPX RTTY contest is a wonderful event that spurs participation around the world, and with its use of prefixes for multiples, encourages activity more than focused-multiplier cousins, leading to amazing activity and fun for all. The 2022 running of the event presented us with propagation conditions that featured an acceleration of Solar Cycle 25, a predicted CME event, and some of the good and not so good that can come with it.

* Email: <n6wm@largeradio.org>
** Email: <ed@wØyk.com>

"10 meters rocks!" —Alan AD6E/KH6TU

"Great openings on 10 and 15 meters, particularly to Japan and Europe." —Luis, XE2B

"80 meters was a bit of a bust, 40 meters on the first night not up to par, but as the weekend wore on, things got continually better!" —Kevin, K7ZS

Comments from operators were mixed, with some welcoming the presence of the 10-meter band and a blazing hot

2022 WPX RTTY TOP WORLD SCORES

SINGLE OPERATOR

HIGH POWER ALL BAND

LZ5R (LZ5DB)	12,465,658
UW1M	9,435,568
OK7W	9,124,070
SN7Q (SP7GIQ)	8,695,360
EA8AH (OH4KA)	7,922,330
AA3B	7,598,899
R2AA	7,001,316
K3MM	6,701,282
S53X	4,473,797
UTØU (UT5UDX)	4,441,728

28 MHz

PX2A (PY2XV)	1,722,595
LU1DX	981,768
V55Y (V51WH)	979,160
LU7HN	578,683
LU6ETB	532,560

21 MHz

CR6T (CT1ESV)	2,284,272
9A5Y (9A7DX)	2,191,840
CV7S (CX7SS)	1,940,400
HG3DX (HA1DAE)	1,530,664
Z35T	1,472,445

14 MHz

IQ1RY (IZ1LBG)	2,916,377
YT3X	2,810,052
OM2VL	2,218,041
LX7I (DF7EE)	2,119,975
9A5D (9A7Z)	2,011,283

7 MHz

YT3D	3,745,504
DP4M (DJ4MH)	3,526,430
S51CK	2,730,242
LY1FW	2,516,692
SP4TKR	2,460,028

3.5 MHz

OL7R	2,679,528
S52X	2,322,086
HA1TJ	2,224,690
SN2M	1,572,900
IT9RBW	1,307,964

LOW POWER ALL BAND

TM3Z (F4DSK)	7,375,214
IQ6AN (IK6VXO)	6,121,180
IZ4BOY (IT9RGY)	4,905,648
EE4Y (EA4GOY)	4,144,700
KK9A	3,780,388
AK1W (K5ZD)	3,187,866
UT4LW	2,926,236
UW6E (UR6EA)	2,852,208
EF7N (EA7KHB)	2,743,104
TM7Y	2,684,982

28 MHz

4M1W	313,496
PT4T (PY4XX)	278,631
LU4HK	253,008
PU1JSV	142,350
4F3BZ	119,790

21 MHz

EA8DED (OH2BP)	1,038,345
EC7R	922,041
EA5DF	639,105
PY2QT	537,474
RZ9AD	506,726

14 MHz

UR7GO	1,463,683
UY5VA	814,078
LY5W	800,100
HZ7C (7Z1SJ)	728,875
LZ5ØYE (LZ1YE)	704,868

7 MHz

G8X (G4FJK)	2,082,144
OK2RU	1,252,710
II2V (IW2MXY)	1,176,480
I3PXN	1,068,450
G4N (G4ZVB)	1,065,064

3.5 MHz

OK6T (OK1WCF)	1,434,640
UX2X (UT2XQ)	1,347,460
UZ2HZ	804,518
S51W	751,410
HA8WY	610,364

QRP

ALL BAND

RM5F	1,176,602
IZ8JFL	955,239
YU1A (YU1LM)	682,803
KV2U (K2YG)	516,975
EA3F	394,670
HG6C (HA6IAM)	357,984
DK8R (DL8LR)	321,440
LZ3RR	312,734
LZ7K (LZ3GW)	309,960
SN3ØWOSP (SP2UUU)	235,940

28 MHz

TIØRC (TI2YO)	198,848
WE6EZ	23,800
7S2A (SA2SAA)	10,251
DV9IHK	4,200
W2NTN	3,450

21 MHz

UA3QJJ	276,120
HG3IPA (HA3JB)	143,594
YC1LJT	87,363
7N4WPY	63,106
UY5QQ	60,098

14 MHz

OQ4B (ON4BHQ)	87,840
HAØGK	44,485
DJ3HW	34,181
DF8AN	28,305
JG1LFR	15,400

7 MHz

4X6HX	452,804
SP9KAG (SP9CXN)	159,048
R7KO	124,780
DF2BR	37,600
9A6TT	21,000

3.5 MHz

ON3DI	216,070
SP3EMA	87,870
G5Q (G3SVL)	41,208
UD2F	37,632
CO2JD	7,920

MULTI-OPERATOR

SINGLE TRANSMITTER (HIGH)

J42L	7,509,124
SZ1A	7,285,500
YU5R	6,736,620
F6KNB	6,166,611
DKØ5ØBN	6,049,110
DR5N	6,048,240
OG66X	5,391,934
DP6A	5,156,672
AA5AU	4,981,536
F8KCF	4,775,760

MULTI-OPERATOR

SINGLE TRANSMITTER (LOW)

IT9MBZ	6,644,810
WP3C	5,777,270
EC7MA	3,118,878
Z66BCC	2,758,896
DQ4W	2,592,990
LY2J	2,550,925
ND3D	2,501,324
NY6DX	2,092,678
RN4SW	1,849,637
OL1Z	1,644,577

MULTI-OPERATOR

TWO TRANSMITTER

CR3DX	25,331,940
ED1R	14,812,860
K9CT	9,309,960
WV4P	9,112,950
UW5Y	8,004,036
C37N	6,233,720
C4I	4,646,016
NCØDX	4,019,157
KT7E	3,897,560
EI1E	3,437,440

MULTI-OPERATOR

MULTI-TRANSMITTER

9A1A	21,386,341
LN8W	10,456,536
NW8S	4,382,904
N1RR	2,777,934
LO5D	1,699,965
W3GH	804,300

MULTI-OPERATOR

MULTI-DISTRIBUTED

SX2I	11,902,215
IQ3ME	7,758,630
EH2VE	5,054,981
VX2X	4,900,245
NA5NN	3,824,434
IQ4RN	3,190,261
KZ1W	2,853,136
IQ1NO	2,317,014

ROOKIE

HIGH POWER

EA2ESB	1,514,625
DL3SWR	1,136,640
KN6MYI	700,977
DK5PH	359,682
W6DMW	150,920
KD2UBH	150,234
AA3R	60,000
SM6M	25,116
IV3IPA	7,943

LOW POWER

EU1VA	661,430
KI2D	496,184
S51I	330,820
R7RBE	236,848
KC3RPO	223,260
LB6VI	222,976
EA4HKF	187,306
W3FR	144,144
YD1EQX	138,690
MØLKW	133,320

CLASSIC

HIGH POWER

EA8DO	4,235,958
I5MXX	3,697,155
KP4/K6DTT (K6DTT)	2,504,977
KU2M	2,397,915
IC8SQS	2,372,860
S52X	2,322,086
KU1CW	1,895,234
K2XA	1,893,712
UA6CE	1,876,997
VE3KI	1,810,230

LOW POWER

RG4A	1,439,478
OE2E (OE2GEN)	1,430,620
SP2EWQ	1,238,094
LT6M (LU8MHL)	1,123,584
LZ3QE	1,122,735
Z36W	1,121,076
I3PXN	1,068,450
LC7N (LA5LJA)	1,041,798
IW1PNJ	975,000
EC7R	922,041

TRIBANDER / WIRES HIGH POWER

N3QE	3,631,232
DP8M (DL6NDW)	3,345,590
DK8ZZ	3,174,138
NF3R	2,870,072
YO4NF	2,642,850
VE3EY	2,399,085
DL1NEO	2,392,407
UZ1WW	2,304,562
KO7SS	2,191,131
DFØKU (DJ3NG)	2,035,764

LOW POWER

UT4LW	2,926,236
EF7N (EA7KHB)	2,743,104
TM7Y	2,684,982
CR5O (CT7AJL)	2,356,466
TA7I	2,324,426
UX1VT	2,132,043
OK4GP	1,646,204
ON5GQ	1,561,958
UT5EPP	1,531,930
V31MA	1,437,648

YOUTH

HIGH POWER

SO9I (SQ9ORQ)	3,532,232
DM7XX	3,208,205
YTØC	1,885,970
RA9Y (R9YCY)	1,234,791
9A2ZI	872,364

LOW POWER

SP3KX	545,616
OE9SEV	519,560
9A3LET	408,778
EI8KW	148,782
SP8BRT	97,280
YC1LJT	87,363
DJ4MX	36,960
TC7YOTA (TA7MNA)	12,480
JQ7AXT	9,800
YD2UWF	9,396

15-meter band, but others noted challenges on the 40- and 80-meter bands. Let's take a look at some of the notable races on the bands.

World

Single Operators

Top honors in the Single Operator All Band High Power (SOAB/HP) category world go to LZ5R (Milen, LZ5DB operating). Milen had a solid margin of over 3 million points above second-place finisher Victor, UW1M's, solid performance.

In the Single Operator All Band Low Power (SOAB/LP) category, a bit of a tighter race as TM3Z (with Dimitri, F4DSK, operating) edged out IQ6AN (Andrea, IK6VXO, operating) by just over a 1 million points.

How do you make over a million points operating QRP? Look no further than RM3F (Andrey, UA3DPX operating) narrowly pulling ahead of Fabio, IZ8JFL.

One of the great advantages of CQ-sponsored contests is the various subcategories: Rookie, Classic, Triband Wires, Youth etc. that allow for a wide range of competitions. All categories have notable performances and I encourage you to browse these categories in the line scores.

Multi-Operators

A battle for the Multi-Single (M/S) category took place in Greece, netting two stations the top two spots. Team J42L took a narrow win in the M/S High Power category over the large SZ1A team. Localized shootouts like this are a great way to enjoy contesting. In this case it netted a station the top spot in the world, but sometimes just the local win is enough to have fun with your peers.

Better times in Ukraine ... Slava, US2YW, shared this picture of operators in the 2022 CQWW WPX RTTY contest just before conflict bore down on the region.

2022 WPX RTTY TOP EUROPE SCORES

SINGLE OPERATOR
HIGH POWER
ALL BAND
LZ5R (LZ5DB) 12,465,658
UW1M 9,435,568
OK7W 9,124,070
SN7Q (SP7GIQ) 8,695,360
R2AA 7,001,316
S53X 4,473,797
UTØU (UT5UDX) 4,441,728
OH1F (OH1TM) 4,221,712
EMØI (UT2IZ) 4,181,856
YO9HP 4,063,692

28 MHz
HA8FK 103,788
DH8AF 98,324
YT1X 49,500
YT8A (YU1EA) 36,288
F5NBX 32,118

21 MHz
CR6T (CT1ESV) 2,284,272
9A5Y (9A7DX) 2,191,840
HG3DX (HA1DAE) 1,530,664
Z35T 1,472,445
OL4C (OK1NP) 1,160,916

14 MHz
IQ1RY (IZ1LBG) 2,916,377
YT3X 2,810,052
OM2VL 2,218,041
LX7I (DF7EE) 2,119,975
9A5D (9A7Z) 2,011,283

7 MHz
YT3D 3,745,504
DP4M (DJ4MH) 3,526,430
S51CK 2,730,242
LY1FW 2,516,692
SP4TKR 2,460,028

3.5 MHz
OL7R 2,679,528
S52X 2,322,086
HA1TJ 2,224,690
SN2M 1,572,900
IT9RBW 1,307,964

LOW POWER
ALL BAND
TM3Z (F4DSK) 7,375,214
IQ6AN (IK6VXO) 6,121,180
IZ4BOY (IT9RGY) 4,905,648
EE4Y (EA4GOY) 4,144,700
UT4LW 2,926,236
UW6E (UR6EA) 2,852,208
EF7N (EA7KHB) 2,743,104
TM7Y 2,684,982
CR5O (CT7AJL) 2,356,466
UX1VT 2,132,043

28 MHz
RU7A 101,460
EE3Z (EA3NO) 39,672
UX3IW 26,030
9A8A 22,088
SQ9V 12,416

21 MHz
EC7R 922,041
EA5DF 639,105
IQ8XS (IZ8GNR) 438,948
R2AL 365,085
GI5NI (MIØSAI) 354,892

14 MHz
UR7GO 1,463,683
UY5VA 814,078
LY5W 800,100
LZ5ØYE (LZ1YE) 704,868
IK5AMB 696,532

7 MHz
G8X (G4FJK) 2,082,144
OK2RU 1,252,710
II2V (IW2MXY) 1,176,480
I3PXN 1,068,450
G4N (G4ZVB) 1,065,064

3.5 MHz
OK6T (OK1WCF) 1,434,640
UX2X (UT2XQ) 1,347,460
UZ2HZ 804,518
S51W 751,410
HA8WY 610,364

QRP
ALL BAND
RM5F 1,176,602
IZ8JFL 955,239
YU1A (YU1LM) 682,803
EA3F 394,670
HG6C (HA6IAM) 357,984
DK8R (DL8LR) 321,440
LZ3RR 312,734
LZ7K (LZ3GW) 309,960
SN3ØWOSP (SP2UUU) 235,940
EA1GT (EA1GT/QRP) 222,984

28 MHz
7S2A (SA2SAA) 10,251

21 MHz
UA3QJJ 276,120
HG3IPA (HA3JB) 143,594
UY5QQ 60,098
YO3DAC 57,810
SP4NKJ 34,980

14 MHz
OQ4B (ON4BHQ) 87,840
HAØGK 44,485
DJ3HW 34,181
DF8AN 28,305
R3IBT 11,023
LY2LF 11,020

7 MHz
SP9KAG (SP9CXN) 159,048
R7KO 124,780
DF2BR 37,600
9A6TT 21,000
OG4T (OH4MFA) 10,976

3.5 MHz
ON3DI 216,070
SP3EMA 87,870
G5Q (G3SVL) 41,208
UD2F 37,632
EA5FQS 6,132

MULTI-OPERATOR
SINGLE TRANSMITTER (HIGH)
J42L 7,509,124
SZ1A 7,285,500
YU5R 6,736,620
F6KNB 6,166,611
DKØ5ØBN 6,049,110
DR5N 6,048,240
OG66X 5,391,934
DP6A 5,156,672
F8KCF 4,775,760
OK1KSL 3,924,346

MULTI-OPERATOR
SINGLE TRANSMITTER (LOW)
IT9MBZ 6,644,810
EC7MA 3,118,878
Z66BCC 2,758,896
DQ4W 2,592,990
LY2J 2,550,925
RN4SW 1,849,637
OL1Z 1,644,577
SN8Z 1,620,057
S57ZT 1,504,568
ED3D 1,333,956

MULTI-OPERATOR
TWO TRANSMITTER
ED1R 14,812,860
UW5Y 8,004,036
C37N 6,233,720
EI1E 3,437,440
DM5B 3,062,698
ES5G 2,770,005

MULTI-OPERATOR
MULTI-TRANSMITTER
9A1A 21,386,341
LN8W 10,456,536

MULTI-OPERATOR
MULTI-DISTRIBUTED
SX2I 11,902,215
IQ3ME 7,758,630
EH2VE 5,054,981
IQ4RN 3,190,261
IQ1NO 2,317,014

ROOKIE
HIGH POWER
EA2ESB 1,514,625
DL3SWR 1,136,640
DK5PH 359,682
SM6M 25,116
IV3IPA 7,943

LOW POWER
EU1VA 661,430
S51I 330,820
R7RBE 236,848
LB6VI 222,976
EA4HKF 187,306
MØLKW 133,320
S57ZM 93,170
SY9DOK 69,915
YU3ABC 35,612
MØYWA 33,152

CLASSIC
HIGH POWER
I5MXX 3,697,155
IC8SQS 2,372,860
S52X 2,322,086
UA6CE 1,876,997
DAØBCC (DL6MHW) 1,720,020
OZ11A 1,620,038
IZ2FOS 1,424,800
DF8QB 1,314,402
LZ1ZJ 1,237,613
IZ2BVC 1,164,834

LOW POWER
RG4A 1,439,478
OE2E (OE2GEN) 1,430,620
SP2EWQ 1,238,094
LZ3QE 1,122,735
Z36W 1,121,076
I3PXN 1,068,450
LC7N (LA5LJA) 1,041,798
IW1PNJ 975,000
EC7R 922,041
DM3M (DM3XRF) 913,230

TRIBANDER / WIRES
HIGH POWER
DP8M (DL6NDW) 3,345,590
DK8ZZ 3,174,138
YO4NF 2,642,850
DL1NEO 2,392,407
UZ1WW 2,304,562
DFØKU (DJ3NG) 2,035,764
IX1CLD 1,929,368
F4AIF 1,657,656
Z35T 1,472,445
G1N (GØURR) 1,384,944

LOW POWER
UT4LW 2,926,236
EF7N (EA7KHB) 2,743,104
TM7Y 2,684,982
CR5O (CT7AJL) 2,356,466
UX1VT 2,132,043
OK4GP 1,646,204
ON5GQ 1,561,958
UT5EPP 1,531,930
EW7B 1,422,520
R7MM 1,418,844

YOUTH
HIGH POWER
SO9I (SQ9ORQ) 3,532,232
DM7XX 3,208,205
YTØC 1,885,970
9A2ZI 872,364

LOW POWER
SP3KX 545,616
OE9SEV 519,560
9A3LET 408,778
EI8KW 148,782
SP8BRT 97,280
DJ4MX 36,960

2022 WPX RTTY TOP UNITED STATES SCORES

SINGLE OPERATOR

HIGH POWER

ALL BAND

AA3B 7,598,899
K3MM 6,701,282
WK1Q (K1MK @K1TTT) 4,404,699
N3QE.....3,631,232
W9SN 3,406,790
ACØC 3,397,686
WV1K (N1IXF).....3,232,311
N6AR.....3,030,795
NB3R.....2,984,100
NF3R 2,870,072

28 MHz

NR6O (N6RO) 290,652
K4WI.....163,506
W5PR 104,448
WZ7ZR (W7ZR).....71,154
AI3Q 20,424

21 MHz

WV6I (N6WM) 817,236
W9ILY.....762,375
NØXR (@NØNI) 618,018
N3UA.....244,510
N2NF 178,563

14 MHz

NA3M 851,904
K8YE 415,276
K6SEA (KA6BIM) 20,944
W2YK 20,874
W2QQ 20,196

7 MHz

K9OM 1,610,840
NB2P 1,030,200
WX5S (@N6RO) 765,992
WJ2D.....426,736
K7WP 191,350

3.5 MHz

NØNI 547,288
KW7MM.....376,376
W3LL 293,056
W6DMW 150,920
KY2N (N2ZN) 94,864

LOW POWER

ALL BAND

KK9A 3,780,388
AK1W (K5ZD).....3,187,866
KQ1F (K1XM).....1,808,884
NG1R (W1QK) 967,146
AA2EQ 850,560
N8CWU 848,400
AD8IG.....844,886
ND9G 794,880
K5EK 789,012
WB2JVO (K2AL) 704,946

28 MHz

WM6Y.....12,728
K6KM.....4,224
KE3ZT 1,938
KB9RUG.....1,914
K7ULS 1,288

21 MHz

WA1FCN 260,429
AB1J.....236,504
K5QR.....203,225
NY1E 42,624
WAØMHJ 23,544

14 MHz

KA4RRU.....584,309
W4LC 190,680
WAØEJX 25,000
N3RC.....8,736
NE3R.....3,478

7 MHz

W2VTV 256,486
W7QDM.....89,308
W9AKS.....63,732
K4MIL 63,248
KJ6MBW 42,292

3.5 MHz

K9CS 75,184
K2TW 54,784
W8WTS 6,256
WZ6ZZ 2,904

QRP

ALL BAND

KV2U (K2YG) 516,975
WW2G.....158,461
W6QU (W8QZA) 109,848
N4IJ 84,072
W1IG 68,637
WAØMN (NØUR) 38,608
W4ER 24,503
KK7A 13,260
K3FHP.....12,859
K8ZT.....8,866

28 MHz

WE6EZ 23,800
W2NTN.....3,450

21 MHz

NK5G.....21,922
KKØU 17,424
K3EO.....1,767

14 MHz

N8URE 8,216

MULTI-OPERATOR

SINGLE TRANSMITTER (HIGH)

AA5AU.....4,981,536
NK5P 3,152,349
KC7V 2,911,006
KS9R 2,824,260
NC1CC 1,179,500
WW7E 1,150,552
AK9D 249,378
NW6P 241,109

MULTI-OPERATOR

SINGLE TRANSMITTER (LOW)

ND3D.....2,501,324
NY6DX 2,092,678
AGØMN.....208,800
KK9V 76,304
W9JWC 37,450

MULTI-OPERATOR

TWO TRANSMITTER

K9CT 9,309,960
WV4P 9,112,950
NCØDX 4,019,157
KT7E 3,897,560
WT3K 3,111,098
WN7M 2,447,290
KE1S 2,445,870
K3CCR 1,319,432
AA1SE.....1,068,032
WU5K.....225,680

MULTI-OPERATOR

MULTI-TRANSMITTER

NW8S 4,382,904
N1RR.....2,777,934
W3GH.....804,300

MULTI-OPERATOR

MULTI-DISTRIBUTED

NA5NN 3,824,434
KZ1W 2,853,136

ROOKIE

HIGH POWER

KN6MYI 700,977
W6DMW 150,920
KD2UBH.....150,234
AA3R 60,000

LOW POWER

KI2D 496,184
KC3RPO.....223,260
W3FR 144,144
KO4ENU.....61,072
N5JGE.....40,656
KO4NIK 30,847
KD2SGM 27,864
N3AML 23,987
W3MAM.....22,659
KD9PLD 10,354

CLASSIC

HIGH POWER

KU2M 2,397,915
KU1CW 1,895,234
K2XA 1,893,712
KI6DY 1,593,394
NG1M 1,530,650
N4ZZ 1,467,432
N7WY 1,286,256
AJ6V.....1,045,170
NY2DX (W4CU) 818,840
K5WE 728,112

LOW POWER

WDØT 565,211
WA8MCD 484,692
AC4G.....451,906
WA3LXD.....411,939
AA8OY 374,035
WQ5L 366,582
KB9YOJ.....365,371
WB8JUI 344,784
K3JT 332,920
KTØR (KEØL) 290,160

TRIBANDER / WIRES

HIGH POWER

N3QE.....3,631,232
NF3R 2,870,072
KO7SS 2,191,131
AE1P 1,854,657
K9OM 1,610,840
KE2D 1,445,940
AD5XD 1,426,852
W4GE.....1,406,224
NR4O 1,297,789
W1AJT.....1,202,698

LOW POWER

AD8IG.....844,886
ND9G 794,880
WB2JVO (K2AL) 704,946
W2NO.....544,440
KC2WUF 486,239
KW2O (KA2D) 476,790
K9CW 447,888
K4GM 427,347
KZØUS (W7RY) 412,347
N9UA.....401,436

2022 WPX RTTY PLAQUE DONORS AND WINNERS

SINGLE-OPERATOR HIGH POWER

World: Jeff Blaine, ACØC. Won by: LZ5R (op. Milen Dimov, LZ5DB) – New Europe Record
North America (Excludes U.S. and Canada): Marty Sullaway, NN1C. Won by: Alan Fields, KP4/K6DTT
USA: Abroham Neal Software by K3NC. Won by: Bud Trench, AA3B
USA 7th Call Area: Hank Lonberg, KR7X in memory of Bob Wruble, W7GG. Won by: Jeff Stai, WK6I/7
Europe: FlexRadio Systems. Won by: Victor Yarovoy, UW1M
Africa: Vlado Karamitrov, N3CZ. Won by: Pekka Kolehmainen, EA8AH
Asia: Mike Trowbridge, KA4RRU in memory of Steve Veader, N4DXS. Won by: Valery Vinakov, RT9A

SINGLE-OPERATOR LOW POWER

World: Gerry Treas, K8GT. Won by: TM3Z (op. Dimitri Cosson, F4DSK) – New Europe Record
North America (Excludes U.S. and Canada): Wray Dudley, AB4SF. Won by: Marc Missalla, V31MA
USA: Gerry Treas, K8GT. Won by: John Bayne, KK9A
Europe: FlexRadio Systems. Won by: IQ6AN (op. Andrea Tonci, IK6VXO)
Oceania: Doug Faunt, N6TQS. Won by: Kent Carlson, KH6CJJ – New Oceania LP TB-Wires Record

SINGLE-OPERATOR QRP

World: Vlado Karamitrov, N3CZ. Won by: Vitaly Filonenko, RM5F
North America (Excludes U.S. and Canada): FlexRadio Systems. Won by: TIØRC (op. Minor Barrantes, TI2YO) – New North America Record

SINGLE-OPERATOR SINGLE BAND

World 14 MHz: Steve “Sid” Caesar, NH7C. Won by: IQ1RY (op. Filippo Vairo, IZ1LBG)
World 14 MHz Low Power: Kenny Young, AB4GG. Won by: Alexander Nudel, UR7GO
North America 21 MHz (Excludes U.S. and Canada): Doug Faunt, N6TQS. Won By: Alexei Joaquin Morejon Cohen, CO2XK
World 28 MHz: Steve Booklout, NR4M, and the “Goat Farm Gang”. Won by: PX2A (op. Julio Tarraco, PY2XV)

MULTI-OPERATOR, SINGLE-TRANSMITTER HIGH POWER

World: Rich Cady, N1IXF. Won by: J42L (ops. SV2KF, SV2BXA, SV2CLJ, SV2DCD, SV2SNS)
USA: John Lockhart, WØDC. Won by: AA5AU (ops. W4RN, AA5AU, K2GO, W3UL, KU1CW)
Europe: Billy, GM6DX. Won by: SZ1A (ops. SV8PMM, SV1CIB, SV1DPI, SV1DPJ)

MULTI-OPERATOR, SINGLE-TRANSMITTER LOW POWER

World: Ed Muns, WØYK. Won by: IT9MBZ (ops. IT9BLB, IT9MBZ, IT9CDU, IT9VDQ, IT9ZMX)
USA: FlexRadio Systems. Won by: ND3D (ops. K3AJ, WT3K, ND3D, KB3IKC, N8IVN, K3WA, W3MAM)

MULTI-OPERTATOR, MULTI-TWO

World: Steve Bookout, NR4M, and the “Goat Farm Gang”. Won by: CR3DX (ops. CT3DZ, CT3EN, CT3KY, OK1HRA, OM2KW) – New World Record
USA: CTRI Contest Group in memory of Chris, KA1GEU (SK). Won by: K9CT (ops. AI9T, K9NR, K9CT, KT9L, N9CK, K9WX)
Europe: FlexRadio Systems. Won by: ED1R (ops. EA1P, EA1TL, EC1KR, EA4AOC)

MULTI-OPERATOR, MULTI-TRANSMITTER

World: Steve Bookout, NR4M, and the “Goat Farm Gang”. Won by: 9A1A (ops. 9A5W, 9A9A, 9A6A, 9A7R, 9A7C, 9A7EU, 9A7AS, 9A7QQ, 9A3SMS)
USA: BeLoud.US. Won by: NW8S (ops. KB8O, AB8M, NQ8O, KM8V)

MULTI-OPERATOR, MULTI-DISTRIBUTED

Canada: FlexRadio Systems. Won by: VX2X (ops. VE2EBK, VA2RC, VE2FK, VE2PI, VE2CSM, VE2FXL)

CLUB COMPETITION

World: Potomac Valley Radio Club. Won by: Bavarian Contest Club
USA: Northern California Contest Club: Won by: Potomac Valley Radio Club

In the M/S Low Power category, the five-operator IT9MBZ team based in Palermo edged out Alfredo, WP3C, and his team. Alfredo was struggling with some damaged rotor equipment. So, a second place showing on the world stage is not so bad.

CR3DX posted an impressive Multi-Two All Band score, double that of ED1R in the second position. CR3DX was a six-person team, and leveraged the optimal location of Madeira Island to pull way ahead of all others.

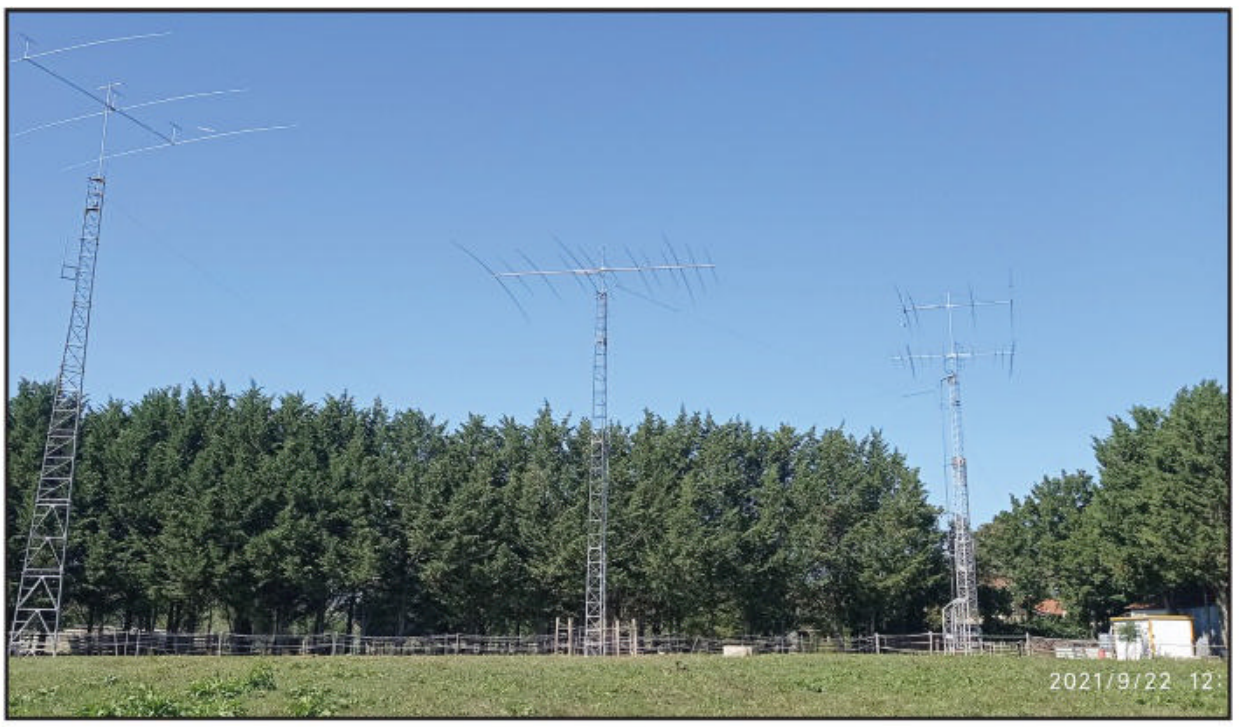
Similarly to CR3DX in its category, 9A1A had over double the score of its closest competition in the Multi-Multi category. This was a nine-person team, which was able to get back in-house after a long absence during the pandemic. 9A1A always features a young team and this year carried out that tradition with half of them age 20-25. Well done team.

With mention of the pandemic, once again another category opportunity emerged, which is the Multi-Op Distributed category. There are still folks taking advantage of this, either to avoid close exposure or to lessen the inconvenience of travel.

"We decided to try the new distributed category this time around to bring in ops in the club unable to travel to the NA5NN Lumberton QTH. Technically all worked well using the Hamachi VPN along with N1MM+. From the N1MM perspective you wouldn't know that all ops weren't sitting right there in the same room. Pretty cool," said team member Randy, W5UE.

The winner in this category was SX2I, a six-station distributed team. They were on top of the 10-station team under the call IQ3ME.

There were numerous great single-band performances. To be honest, some of the usual multi-ops broke up and did single banders this go-round. I encourage you to browse the line scores to see how you and your competitors performed.



A view of the TM3Z antenna farm used in the 2022 CQWW WPX RTTY contest for their Low Power win from France.

United States

Single Operators

Prolific contester Bud, AA3B, took the top U.S. position in the SOAB/HP with K3MM sliding into second place. Rich N1IXF, (a member of the contest management team) who operated this category as WV1K, was enjoying upper band propagation said, "great 15-meter open-

2022 CQWW RTTY WPX BAND-BY-BAND BREAKDOWN — TOP ALL BAND SCORES

Number groups indicate: QSOs / Prefixes on each band

WORLD SINGLE OPERATOR ALL BAND

Station	80	40	20	15	10
LZ5R	626/241	1151/387	749/161	721/219	123/46
UW1M	477/183	1071/342	842/203	798/183	78/21
OK7W	700/278	920/340	693/239	347/98	0/0
SN7Q	583/270	679/259	944/257	536/149	2/2
EA8AH	237/127	562/288	317/90	1004/209	534/104

USA TOP SINGLE OPERATOR ALL BAND

Station	80	40	20	15	10
AA3B	458/173	737/303	665/247	683/153	107/37
K3MM	446/133	787/361	399/145	604/216	105/34
WK1Q	325/177	472/211	375/162	489/221	44/30
*KK9A	245/87	530/233	535/200	557/160	117/29
N3QE	312/97	672/313	429/158	310/124	19/12

WORLD MULTI-OPERATOR SINGLE TRANSMITTER

J42L	280/97	1008/387	541/236	468/186	52/26
SZ1A	233/114	1066/392	597/183	505/197	18/14
YU5R	409/205	718/276	526/191	403/159	93/54
*IT9MBZ	207/157	563/239	621/277	550/237	146/75
F6KNB	287/156	637/305	525/184	483/211	113/35

USA MULTI-OPERATOR SINGLE TRANSMITTER

AA5AU	377/144	628/280	589/144	538/204	50/12
NK5P	144/35	831/359	257/58	653/207	57/22
KC7V	100/16	711/252	525/92	667/220	152/37
KS9R	323/118	571/240	497/112	339/110	79/38
*ND3D	249/90	556/280	296/125	212/105	50/28

WORLD MULTI-OPERATOR TWO TRANSMITTER

CR3DX	505/118	1491/428	1469/308	1520/200	801/86
ED1R	518/171	1266/352	1340/284	904/246	156/31
K9CT	593/118	965/295	1181/371	742/170	174/36
WV4P	529/125	1009/385	844/186	988/255	155/39
UW5Y	553/259	668/196	949/300	545/171	35/13

USA MULTI-OPERATOR TWO TRANSMITTER

K9CT	593/118	965/295	1181/371	742/170	174/36
WV4P	529/125	1009/385	844/186	988/255	155/39
NCØDX	302/72	727/246	793/192	563/175	235/38
KT7E	220/51	711/168	727/271	640/164	355/47
WT3K	355/145	454/230	449/183	261/114	131/50

WORLD MULTI-OPERATOR MULTI-TRANSMITTER

9A1A	1135/324	1422/358	1191/236	1040/230	242/69
LN8W	639/224	1064/334	953/291	442/126	76/22
NW8S	445/126	723/285	619/160	470/160	49/13
N1RR	73/27	526/229	510/150	450/204	59/32
LO5D	0/0	0/0	0/0	591/303	526/252

USA MULTI-OPERATOR MULTI-TRANSMITTER

NW8S	445/126	723/285	619/160	470/160	49/13
N1RR	73/27	526/229	510/150	450/204	59/32
W3GH	218/85	346/158	251/131	81/38	15/8

ing to Europe on Saturday. Best I remember in a long time ... come on Cycle 25."

In the SOAB/LP category, John, KK9A, edged into the top spot, with Randy, K5ZD, operating as AK1W taking second position.

In the U.S. SOAB QRP category, KV2U (Hugh, K2YG, operating) took the lead with a large margin over the second place challenger.

Once again there were many great performances in the Single-Operators' subcategories, including high and low

TOP SCORES IN VERY ACTIVE ZONES

Zone 3

KK6P (W7IV)	2,812,231
WK6I/7	2,636,552
KO7SS	2,191,131
KYØW (WØYK)	2,118,272
KZ7X (K6LL)	2,049,248

Zone 4

W9SN	3,406,790
ACØC	3,397,686
VA3DF	2,911,090
VE3EY	2,399,085
N5HC	1,865,864

Zone 5

AA3B	7,598,899
K3MM	6,701,282
WK1Q (K1MK @K1TTT)	4,404,699
*KK9A	3,780,388
N3QE	3,631,232

Zone 14

*TM3Z (F4DSK)	7,375,214
*EE4Y (EA4GOY)	4,144,700
MD7C (M5RIC)	3,557,175
DP4M (DJ4MH)	3,526,430
DP8M (DL6NDW)	3,345,590

Zone 15

OK7W	9,124,070
SN7Q (SP7GIQ)	8,695,360
*IQ6AN (IK6VXO)	6,121,180
*IZ4BOY (IT9RGY)	4,905,648
S53X	4,473,797

Zone 16

UW1M	9,435,568
R2AA	7,001,316
UTØU (UT5UDX)	4,441,728
EMØI (UT2IZ)	4,181,856
*UT4LW	2,926,236

Zone 20

LZ5R (LZ5DB)	12,465,658
YO9HP	4,063,692
YO4NF	2,642,850
*TA7I	2,324,426
LZ6K (LZ2PL)	1,858,272

Zone 25

JR4OZR	3,610,645
JA1CSN	1,692,469
JM1XCW	1,628,145
JH7QXJ	789,120
JA8KSF	783,900

*Low Power

EUROPE TOP SINGLE OPERATOR ALL BAND

Station	80	40	20	15	10
LZ5R	626/241	1151/387	749/161	721/219	123/46
UW1M	477/183	1071/342	842/203	798/183	78/21
OK7W	700/278	920/340	693/239	347/98	0/0
SN7Q	583/270	679/259	944/257	536/149	2/2
*TM3Z	486/225	1051/401	260/147	226/110	46/30

EUROPE MULTI-OPERATOR SINGLE TRANSMITTER

J42L	280/97	1008/387	541/236	468/186	52/26
SZ1A	233/114	1066/392	597/183	505/197	18/14
YU5R	409/205	718/276	526/191	403/159	93/54
*IT9MBZ	207/157	563/239	621/277	550/237	146/75
F6KNB	287/156	637/305	525/184	483/211	113/35

EUROPE MULTI-OPERATOR TWO TRANSMITTER

ED1R	518/171	1266/352	1340/284	904/246	156/31
UW5Y	553/259	668/196	949/300	545/171	35/13
C37N	225/84	900/370	743/227	475/122	16/5
EI1E	301/208	444/134	692/214	270/98	4/2
DM5B	477/213	511/212	363/140	117/50	44/26

EUROPE MULTI-OPERATOR MULTI-TRANSMITTER

9A1A	1135/324	1422/358	1191/236	1040/230	242/69
LN8W	639/224	1064/334	953/291	442/126	76/22

2022 WPX RTTY CLUB SCORES

United States

Club	# Entrants	Score
POTOMAC VALLEY RADIO CLUB	66	38,451,424
FRANKFORD RADIO CLUB	47	34,697,851
YANKEE CLIPPER CONTEST CLUB	28	25,739,301
SOCIETY OF MIDWEST CONTESTERS	49	25,191,003
NORTHERN CALIFORNIA CONTEST CLUB	44	18,047,225
ARIZONA OUTLAWS CONTEST CLUB	20	12,714,358
WILLAMETTE VALLEY DX CLUB	17	9,482,894
FLORIDA CONTEST GROUP	17	8,105,668
WESTERN WASHINGTON DX CLUB	11	6,995,894
KANSAS CITY CONTEST CLUB	6	6,261,534
MINNESOTA WIRELESS ASSN	26	5,842,051
CENTRAL TEXAS DX AND CONTEST CLUB	7	5,334,894
DFW CONTEST GROUP	14	5,226,327
TENNESSEE CONTEST GROUP	15	4,704,749
NE MARYLAND AMATEUR RADIO CONTEST SOCIETY	13	4,631,387
HUDSON VALLEY CONTESTERS AND DXERS	5	4,225,605
CAROLINA DX ASSOCIATION	9	4,188,894
CTRI CONTEST GROUP	5	4,180,643
SOUTHERN CALIFORNIA CONTEST CLUB	12	3,888,089
SPOKANE DX ASSOCIATION	9	2,705,093
NIAGARA FRONTIER RADIOSPORT	10	2,611,015
ORDER OF BOILED OWLS OF NEW YORK	7	2,596,539
GRAND MESA CONTESTERS OF COLORADO	6	2,549,773
KENTUCKY CONTEST GROUP	8	2,459,204
SOUTH EAST CONTEST CLUB	7	2,442,246
SWAMP FOX CONTEST GROUP	10	1,663,991
BRISTOL (TN/VA) ARC	4	1,294,357
ALABAMA CONTEST GROUP	6	928,220
NORTH COAST CONTESTERS	5	843,671
SHENANDOAH VALLEY WIRELESS	4	599,322
ROCHESTER (NY) DX ASSN	5	554,482
MAD RIVER RADIO CLUB	4	260,157
PHIL-MONT MOBILE RADIO CLUB	4	65,375

DX

BAVARIAN CONTEST CLUB	116	93,247,408
ITALIAN CONTEST CLUB	99	57,280,886
UKRAINIAN CONTEST CLUB	54	50,478,292
EA CONTEST CLUB	25	41,988,426
INTEREST GROUP RTTY	28	33,656,949
CROATIAN CONTEST CLUB	8	26,465,899
CONTEST CLUB ONTARIO	27	18,529,146
RHEIN RUHR DX ASSOCIATION	43	17,452,168
RUSSIAN CONTEST CLUB	13	12,903,103
CONTEST CLUB FINLAND	9	11,161,251
SLOVENIA CONTEST CLUB	6	10,398,890
BELARUS CONTEST CLUB	10	8,680,972
RADIO AMATEUR ASSN. OF WESTERN GREECE	4	8,298,824
RIO DX GROUP	21	7,547,693
ARAUCARIA DX GROUP	13	7,061,282
CONTEST CLUB SERBIA	10	6,977,684
WORLD WIDE YOUNG CONTESTERS	4	6,672,325
CONTEST GROUP DU QUEBEC	8	5,806,084
CLIPPERTON DX CLUB	5	5,577,966
VYTAUTAS MAGNUS UNIVERSITY RADIO CLUB	7	5,188,747
5NNDXCC	18	5,081,796
THRACIAN ROSE CLUB	6	3,804,999
SP DX CLUB	16	3,755,382
CHILTERN DX CLUB	8	3,717,593
RADIOCLUBUL RADU BRATU	4	3,681,648
CZECH CONTEST CLUB	4	3,625,127
BALTIC CONTEST CLUB	6	3,574,112
KAUNAS UNIVERSITY OF TECHNOLOGY RADIO CLUB	4	3,224,376
LU CONTEST GROUP	12	2,953,759
SOUTH URAL CONTEST CLUB	4	2,824,618
RUSSIAN DIGITAL RADIO CLUB	19	2,468,474
RTTY CONTESTERS OF JAPAN	12	2,260,223
LATVIAN CONTEST CLUB	5	2,118,196
CONTEST CLUB BELGIUM	7	2,087,307
ORCA DX AND CONTEST CLUB	7	2,064,549
YB-LAND DXING PASSION IS	46	1,836,209
VK CONTEST CLUB	7	1,771,496
RIIHIMAEN KOLMOSET	4	1,627,946
ARCK	7	1,616,080
YB LAND DX CLUB	14	1,246,001
RUSSIAN CW CLUB	4	968,294
599 CONTEST CLUB	5	942,481
GMDX GROUP	5	803,023
SIAM DX GROUP	5	689,959
7A DX-CONTEST CLUB	8	492,736
YB6 DXC	7	444,912
GRUPO DXXE	5	386,177
CABREUVADX	10	338,551
ARABIAN GULF DX GROUP	4	321,650
YBDXC	5	270,092
ORARI LOKAL BOGOR	7	212,601
CDR GROUP	6	88,532
KEYMEN'S CLUB OF JAPAN	4	38,860

Club scores with 4 or more entries.

power rookie categories, the ever popular classic and Triband / Wires categories at both power levels. Check the line scores to see the results.

Multi Operators

RTTY contester and Elmer to the RTTY community, Don, AA5AU, led a winning team performance in the M/S High Power category. They were a five-person team and operators all connected to W4RN remotely from their QTH.

A thrilling shootout occurred in the U.S., pitting the veteran Multi-Two station and operating team led by Craig, K9CT, against the newer team led by station builder and challenger Ron, WV4P. Team K9CT emerged on top but with a very narrow margin.

There were a greatly reduced number of Multi-Multi (M/M) stations this year, more on that below. Top honors go to NW8S who edged out the six-person N1RR team.

A number of regular M/M teams took the opportunity to either hit the single-band categories, or sponsor several single banders from their competitive stations. The N6RO station in California, for instance, sponsored four single banders, producing two top U.S. scores, one of which was accomplished by CQ Contest Hall of famer Ken, N6RO, himself on 10 meters. That being said, there is a wide variety of competitions in these single-band categories. Check out the line scores to see the fun.

Summary

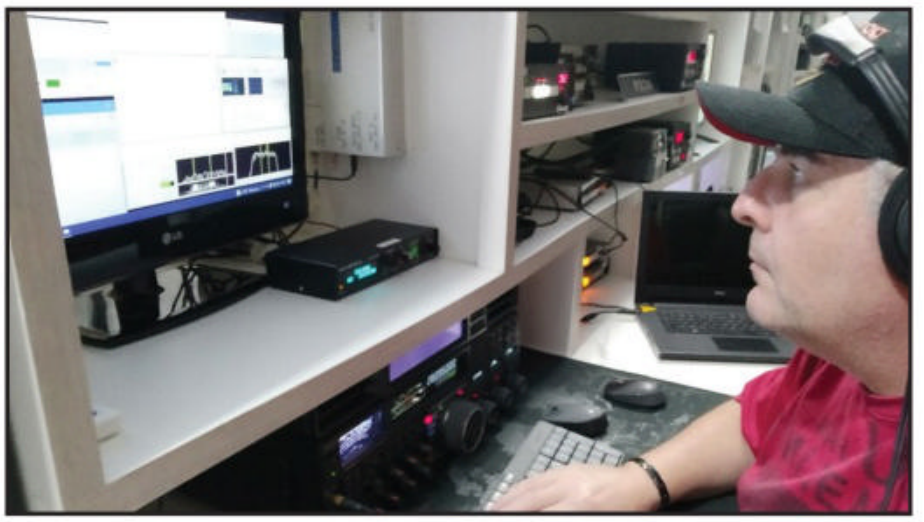
Cycle 25 is upon us, and with it, the conditions will likely continue to improve as we approach the peak over the next several years. In 2022 we saw solid signs of this on 10 meters, which came roaring back. It's great to see folks having a good time and enjoying the fun of operating prefixes on RTTY.

A couple notes from the CQ World Wide RTTY management team:

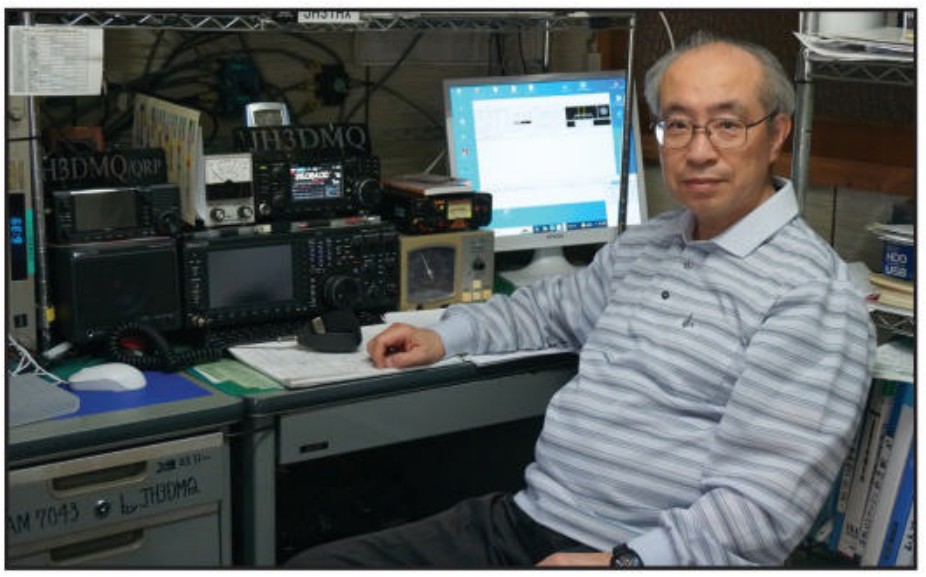
1. Winning a plaque in a CQWW contest is a great achievement, and often times are some of the most coveted awards that one can hang on their shack wall. The opportunity to sponsor plaques is available, and can be a great way to establish regional excellence, or recognize a particular annual competition. We would like to encourage you to review the plaques awarded in this competition and reach out to the management team if you would like to sponsor one or more in the future.

2. Also, we need photos of your efforts. A picture speaks a thousand words, and really enhance our coverage of this major worldwide RTTY WPX competition. Please keep that in mind as your roll into these contests. Pictures of operators or teams of operators are the best. Send us yours for a chance to get it published in *CQ* magazine!

(Scores on page 94)



Julio, PY2XV, as PX2A, turned in a command performance in the 10-meter, single band high power category, besting challengers from around the world on the newly revived band.



Munehiro san, JH3DMQ, took advantage of the improved 10-meter band conditions to work the band QRP with a decent showing.

The K9CT WPX team hard at work. Craig and team had a full challenge on their hands from WV4P, but they managed to stay on top.

Who is behind the ZM4T WPX RTTY team? Holger, ZL3IO, and his daughter Xenia, ZL4YL, a real ham radio contesting family. Xenia is starting her third year at the University of Aukland. It's always great to work them. (Photo by Birgit, ZL2YL)

As we were beginning work on this issue, a magnitude 7.2 earthquake struck southern Peru, Ecuador's neighbor to the south. So while the incident described here occurred six years ago, it continues to be relevant today.

Earthquake at the Equator

The Guayaquil Radio Club Remembers Six Years Later the 670 Dead in the Biggest Earthquake in Ecuador's Recent History

BY MARTIN BUTERA,* PY2ZDX/LU9EFO

On April 16, 2016, Ecuador experienced one of the most destructive earthquakes in its recent history, magnitude 7.8, which unfortunately left 670 people dead and thousands affected, as well as millions of dollars in material losses (*Photo A*).

This earthquake hit the provinces of Esmeraldas (border with Colombia) and its neighbor Manabí, both located on the coast of the Andean country, nearly on the Equator, but it also affected other areas and was even felt strongly in Ecuador's capital, Quito.

The Guayaquil Radio Club (HC2GRC), founded in 1923, is the dean of the radio clubs in Ecuador and Latin America, and participated in the relief efforts following one of the worst emergencies that the country has faced.

In this article, we will learn the story of Victor Perez, HC2DR (*Photo B*), one of the Emergency Coordinators of the Guayaquil Radio Club, who, along with other radio amateurs, selflessly collaborated with their society when they needed it most.

***CQ:** Six years have passed since the Guayaquil Radio Club acted in the earthquake. What are your memories of those first hours?*

Victor Perez, HC2DR: I remember that we first felt a slight tremor of magnitude 4.8 and according to reports from the Military Geophysical Institute of Ecuador (IGM), this took place in the sea off the coast of the Cojimies sector,

Photo A. Buildings destroyed by the magnitude 7.8 earthquake in Ecuador (Courtesy of the Ecuadorian Red Cross)

Photo B. Our interviewee, Victor Perez, HC2DR, member of the Guayaquil Radio Club and an emergency coordinator during the 2016 earthquake response.

** Contributing Editor, CQ*
Email: <martin_butera@yahoo.com.ar>

Photo C. A worker with the Ecuadorian Red Cross walks through the desolate streets of Manta, a city where the earthquake was very intense. (Courtesy of the Ecuadorian Red Cross)

around 6:48 p.m. local time. Ten minutes later, the Pedernales earthquake of magnitude 7 occurs.

I remember it felt very strong in the city of Guayaquil where I was. I immediately went to the radio station in my house asking for news reports on the VHF repeaters and on the HF band in which the HC chain control was just beginning, which takes place every day for more than 41 years without interruption.

In the first reports from radio amateurs who were in the affected area of the province of Manabi, it was that in every block there are houses and buildings collapsed and that they did not have basic services; plus many dead and injured. It was total chaos.

CQ: What were the actions that the Guayaquil Radio Club carried out in the earthquake?

HC2DR: We organized ourselves to travel the next day with radio equipment, antennas, batteries, solar panels, etc. with the aim of establishing two communication points from the affected areas of Pedernales and Tarqui.

Let me mention the colleagues who worked in the Pedernales and Jama areas: Gunther Chaange, HC2G, and Juan Jose Chaange, HC2TKA, with a stay of four days. And I, together with my son Ahmed, HC2AP, were in the area of Portoviejo, Manta (*Photo C*) and Tarqui, also staying for four days.

We helped 174 affected people to transmit messages to their relatives in other sectors of the country, either to communicate that they were well or had injured or deceased relatives.

Likewise, we re-established the operation of the repeaters in the sector and programmed teams of rescuers on our frequencies to integrate them with the different response agencies that attended the affected sectors.

CQ: At that time, you received an important donation from other amateurs. What can you tell me about that?

HC2DR: We received a very large amount of help, about 400 pounds of ham radio equipment, valued at more than $7,500, that was sent from the ARRL to Ecuador.

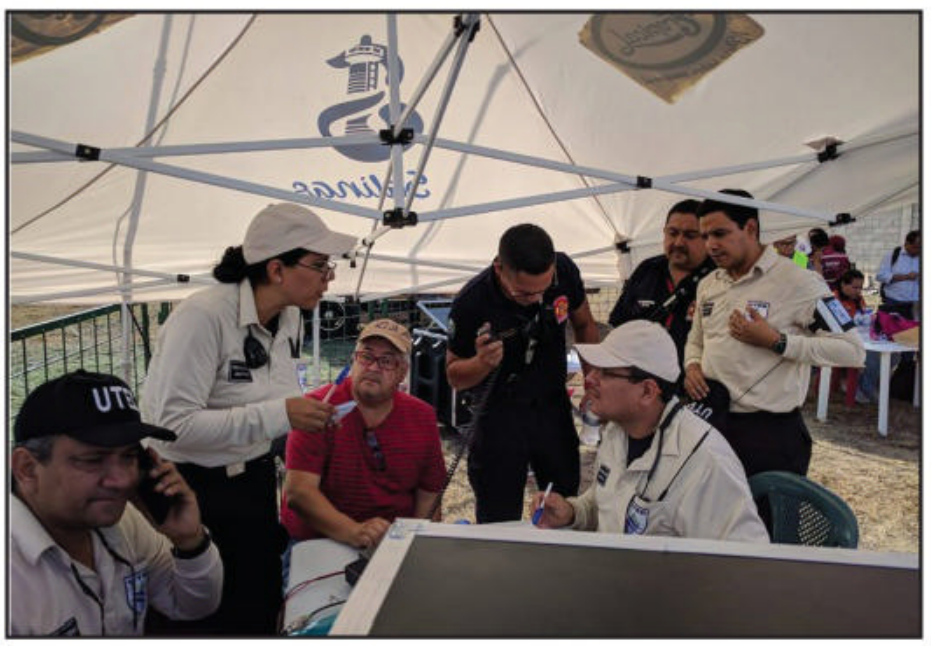
I remember at the time that everything was coordinated by the ARRL Emergency Preparedness Manager, Mike Corey, KI1U, along with other colleagues such as: Ken Bailey, K1FUG; Sean Kutzko, KX9X; Tom Gallagher, NY2RF; Jeff Beals, WA4AW, and Kenny Hollenbeck, KD4ZFW. Of course, this would not have happened without the collaboration here in Ecuador of our colleague Gunter Chaange, HC2CG, together with our president of the Guayaquil Radio Club, Lorenzo Lertora, HC2BP.

Due to those radio teams, together with the Ecuadorian radio amateur volunteers, we were able to help a Venezuelan Air Force plane carrying search and rescue personnel and equipment to land safely at an airport that had lost all power and communication. We will always be very grateful to our North American colleagues for their selfless collaboration.

Of course, I apologize in advance if I forgot to mention a colleague who participated in the aid and negotiations for that aid to reach Ecuador, in this interview.

CQ: Coincidentally, on the morning of Monday, April 4, 2022, the Geophysical Institute of Ecuador reported an earthquake with an intensity of 4.1 on the Richter scale, recorded in the Guayaquil area. How is it to live with the ghost of the 2016 earthquake?

HC2DR: It is not easy, but we adapt. A lot of work has been done to inform and train the population about what to do in these cases; every year earthquake and tsunami drills are



Photos D-G. Photographs of the National Tsunami Drill, with the participation of radio amateurs from the Telecommunications Unit for Emergencies and Disasters (UTED) together with radio amateurs from all over Ecuador and from the following institutions: Guayaquil Radio Club, Manabí Radio Club, Azuay Radio Club, Durán Fire Department, Salinas Fire Department, Ecuadorian Navy, Ecuadorian Air Force, Risk Management Secretariat, Ecuadorian Red Cross, Decentralized Autonomous Governments, and SIS ECU911.

Photoa H-K. Another important training exercise developed by the Guayaquil Radio Club is the National Communications Exercise — Mar Bravo.

Photo L. Victor Perez, HC2DR (left), with one of his radio amateur sons, Ahmed Perez, HC2AP.

carried out along the coastal profile; an early warning system and evacuation signs and meeting points have also been implemented. Likewise, in the main cities, a citizen security ordinance has been created by the municipalities so that companies can implement contingency plans in these cases.

CQ: *Since what happened in the earthquake, the Guayaquil Radio Club (HC2GRC), has been carrying out different practice drills, what can you tell me about that?*

HC2DR: We participate every year in drills that take place in Guayaquil (*Photos D-G* and *Photos H-K*) and we test our response capacities. We have signed cooperation, advice and training agreements with the Secretariat of Risk Management, the Ecuadorian Red Cross, Fire Department, and others with the aim of forming an inter-institutional emergency telecommunications network.

CQ: *Tell us a little about your relationship with the Guayaquil Radio Club. Do I understand that your family participates in the club and that you also held different positions within the institution?*

HC2DR: I joined the Guayaquil Radio Club (HC2GRC), on June 5, 1988, invited by some members of that time, as a technician in the telecommunications area, shortly after I collaborated in the area of the technical commission and formation of new members, over the years I have been occupying positions in the directory and I am currently the treasurer, my two eldest sons are also radio amateurs and collaborate with me in the activities of the club.

CQ: *Next year, the Guayaquil Radio Club will be 100 years old. How do you see the future of the club and radio in general?*

HC2DR: As a club, we will continue to work offering educational courses for radio amateurs and aspirants to this hobby; we will continue to hold contests and competitions with other clubs in our country; we will also continue to train emergency and disaster communicators and, above all, we will continue to collaborate with society in the technical preparation of new young people, with the idea that they relieve us and have the same mystique of service.

We thank the Ecuadorian Red Cross for the images, as well as the Guayaquil Radio Club, and we send a special greeting to club President Lorenzo Lertora, HC2BP, with much appreciation from *CQ* magazine.

The Pacific Belt or Ring of Fire

Ecuador is located in the Pacific Ring of Fire, which concentrates some of the most important subduction zones (sinking of tectonic plates) in the world and is the scene of strong seismic activity.

In addition to Ecuador, the Belt (another name for the Ring of Fire), which is shaped like a horseshoe, includes a large number of countries such as Chile, Argentina, Bolivia, Peru, Colombia, Panama, Costa Rica, Nicaragua, El Salvador, Honduras, Guatemala, Mexico, the United States, and Canada.

As noted at the very beginning of this article, a magnitude 7.2 earthquake struck southern Peru on May 26th of this year.

Collaborators of the Ecuadorian Red Cross walking through the destroyed streets of Manta, a city where the 2016 earthquake was very intense. (Courtesy of the Ecuadorian Red Cross)

Announcing:

The 2022 CQ World-Wide RTTY DX Contest

September 24-25
Starts 00:00:00 UTC Saturday Ends 23:59:59 UTC Sunday
Additional categories for 2022: Youth Overlay and Explorer

I. OBJECTIVE

For amateurs around the world to contact as many other amateurs in as many CQ zones, countries, and W/VE QTHs as possible, using only Baudot RTTY (see Rule IX.,10).

II. BANDS

Five bands only: The 3.5-, 7-, 14-, 21- and 28-MHz bands. Observance of established band plans is strongly encouraged.

III. CONTEST EXCHANGE

RST report plus CQ Zone (e.g., 599 05). Stations in the continental USA and Canada also send QTH (e.g., 599 05 MA). See IV.C.3. below.

IV. SCORING:

A. Score: The final score is the result of the total QSO points multiplied by the sum of zone, country, and QTH multipliers. Example: 1,000 QSO points * (30 Zones + 70 Countries + 35 W/VE QTHs) = 135,000 (final score).

B. QSO Points: Stations may be contacted once on each band. QSO points are based on the location of the station worked.

1. Contacts between stations on different continents count three (3) points.

2. Contacts between stations on the same continent but in different countries count two (2) points.

3. Contacts between stations in the same country count one (1) point.

C. Multiplier: There are three (3) types of multipliers.

1. **Zone:** A multiplier of one (1) for each different CQ Zone contacted on each band. The CQ Worked All Zones rules are the standard.

2. **Country:** A multiplier of one (1) for each different country contacted on each band. The DXCC entity list, Worked All Europe (WAE) multiplier list plus IG9/IH9, and continental boundaries are the standards for defining country multipliers. Maritime mobile stations count only for a zone multiplier.

3. **W/VE QTH:** A multiplier of one (1) for each continental U.S. state (48), The District of Columbia and each Canadian call area (14) contacted on each band. Please use only U.S. Postal Service abbreviations to identify U.S. states (e.g., Michigan = MI, Massachusetts = MA, Ohio = OH, The District of Columbia = DC). Note: Alaska (KL7) and Hawaii (KH6) are counted as country multipliers only and not as state multipliers. Canadian call areas (14 total) are as follows: NB (VE9), NS (VE1), QC (VE2), ON (VE3), MB (VE4), SK (VE5), AB (VE6), BC (VE7), NWT (VE8), NF (VO1), LB (VO2), NU (VYØ), YT (VY1), PEI (VY2).

V. ENTRY CATEGORIES:

A. Single Operator Categories: One person (the operator) performs all operating and logging functions. There is no limit on operating time or band changes. Only one transmitted signal is permitted at any time.

1. **Single Operator:** QSO finding assistance of any kind is prohibited (see VIII.2).

a. **High Power (All Band or Single Band):** Total output power must not exceed **1,500 watts**.

b. **Low Power (All Band or Single Band):** Total output power must not exceed **100 watts**.

c. **QRP (All Band or Single Band):** Total output power must not exceed **5 watts**.

2. **Single Operator Assisted:** Entrants in this category may use QSO finding assistance (see VIII.2).

a. **High Power Assisted (All Band or Single Band):** Total output power must not exceed **1,500 watts**.

b. **Low Power Assisted (All Band or Single Band):** Total output power must not exceed **100 watts**.

c. **QRP Assisted (All Band or Single Band):** Total output power must not exceed **5 watts**.

B. Single Operator Overlay Categories: Any Single Operator entrant who meets the requirements may ALSO enter one of the categories shown below by adding the appropriate CATEGORY-OVERLAY line in the Cabrillo log file header. Overlay category entries will be listed separately in the results; scored as All Bands; and grouped by High Power and Low Power (includes QRP).

1. **Classic Operator (CLASSIC):** The entrant will use only one radio, no QSO finding assistance, and may operate up to 24 of the 48 hours — **off times are a minimum of 60 minutes during which no QSO is logged**. If the log shows more than 24 hours of operation, only the first 24 hours will be counted for the overlay score. Receiving while transmitting is prohibited. Single Operator Assisted entries are not eligible for this category.

2. **Rookie (ROOKIE):** The operator was first licensed as a radio amateur less than three (3) years before the date of the contest. Indicate the date first licensed in the SOAPBOX field. Previous Rookie winners are ineligible for plaques in this category.

3. **Youth (YOUTH):** The operator was 25 years old or younger at the start of the contest. Indicate the birth year in the SOAPBOX field.

C. Multi-Operator Categories (all-band operation only): Any number of operators is allowed. QSO finding assistance is allowed. Only one transmitted signal per band is permitted at any time.

1. **Multi-Single:** Only one transmitted signal on one band permitted at any time (run station / signal). Exception: One — and only one — other transmitted signal (multiplier station / signal) may be used, if — and only if — it is on a different band from the run transmitted signal and the station worked is a new multiplier. The run and multiplier transmitted signals may each make a maximum of 8 band changes per clock hour (00 through 59 minutes). The log must indicate which transmitted signal (run or multiplier) made each QSO. The multiplier transmitted signal may not call CQ (solicit contacts).

a. **High Power:** Total output power must not exceed **1,500 watts** on any band at any time.

b. **Low Power:** Total output power must not exceed **100 watts** on any band at any time.

2. **Multi-Two:** A maximum of two transmitted signals may be used at any time, and they must be on two different bands. The log must indicate which station / signal made each QSO. Each station / signal may make a maximum of 8 band changes in any clock hour (00 through 59 minutes). Total output power must not exceed **1,500** watts on any band at any time.

3. **Multi-Multi:** The five contest bands may be activated simultaneously. Only one transmitted signal per band is permitted at any time. Total output power must not exceed **1,500 watts** on any band at any time.

D. Explorer: The Explorer category allows amateurs to participate in the CQWW contest while encouraging innovation in operating strategies, station design, and technology adaptation. For full Explorer rules, go to <cqww.com/explorer.htm>.

E. Checklog: Entry submitted to assist with the log checking. The entry will not have a score in the results and the log will not be made public.

VI. AWARDS:

A single-band log will be eligible for a single-band award only. A log containing more than one band will be judged as an all-band entry unless specified as a single-band entry.

A. Certificates: Electronic certificates will be made available for download for everyone that submits an entry by the log deadline.

B. Plaques: Plaques are awarded for top performance in a number of categories. View the current list of plaques and sponsors at <cqwwrtty.com/plaques.htm>. Only one plaque will be awarded per entry. A station winning a plaque will not be considered for a sub-area award; the plaque will be awarded to the runner-up in that area.

VII. CLUB COMPETITION:

The club score is the total aggregate score from logs submitted by members. There are two separate club competition categories.

A. USA Clubs: Participation is limited to club members residing within a 250-mile radius circle from the center of club area.

B. DX Clubs: Participation is limited to club members residing within EITHER the DXCC country where the club is located OR within a 400-kilometer radius circle from the center of club.

C. General club rules:

1. National organizations (e.g., JARL, REF or DARC) are not eligible for the club competition.

2. Single-operator entries may only contribute to one club. Multi-operator scores may be allocated to multiple clubs as a percentage of the number of club members participating in the operation. The log entry must spell out the full club name (and club allocations if multi-op).

3. A minimum of four logs must be received for a club to be listed in the results. Checklog entries are not counted for the club score.

4. The word “reside” shall be defined as: To dwell permanently or continuously or to occupy a place as a person’s fixed, permanent, and principal home for legal purposes.

VIII. DEFINITIONS OF TERMS:

1. Station location: The area in which all the transmitters, receivers, and antennas are located. All transmitters, receivers, and amplifiers must be within a single 500-meter diameter circle. Antennas must be physically connected by RF transmission lines to the transmitters and receivers.

2. QSO finding assistance: The use of any technology or other source that provides callsign or multiplier identification of a signal to the operator, other than a single-channel RTTY decoder. This includes, but is not limited to, use of a multi-channel RTTY decoder, DX cluster, DX spotting websites (e.g., DX Summit), local or remote callsign and frequency decoding technology (e.g., RTTY Skimmer or Reverse Beacon Network), or operating arrangements involving other individuals.

IX. GENERAL RULES FOR ALL ENTRANTS:

1. Entrants must operate within the limits of their chosen category when performing any activity that could impact their submitted score.

2. A different callsign must be used for each entry. Only the entrant’s callsign may be used to aid the entrant’s score.

3. Do not exceed the total output power limitation of the chosen entry category on any band. Total output power on any band at any time is measured at the output of the active amplifier(s).

4. Self-spotting or asking to be spotted is not permitted.

5. Remote operation is permitted if the physical location of all transmitters, receivers, and antennas are at one station location. A remotely operated station must obey all station license, operator license, and category limitations. The callsign used must be one issued or permitted by the Regulatory Authority of the station location.

6. Remote receivers outside of the station location are not permitted.

7. Only one signal on a band is allowed at any time. When two or more transmitters are present on the same band, a hardware device MUST be used to prevent more than one signal at any one time. Alternating CQs on two or more frequencies on a band is not permitted.

8. All requests for contacts, responses to calls, and copying of callsigns and contest exchanges must be accomplished during the contest period using the mode and frequencies of the contest.

9. Correction of logged callsigns and exchanges after the contest, by use of any database, recordings, email, or other methods, is not allowed.

10. Only 45.45-Baud, 170-Hz shift ITA2 mode is permitted.

X. LOG INSTRUCTIONS:

Electronic submission of logs is **required** for all entrants.

1. The log MUST show the following for each contact: Correct date and time in UTC, frequency (or band), callsign of the station worked, exchange sent, and exchange received. A log without all required information may be reclassified to Checklog. Contacts should be logged at the time they are completed. Stations competing for World and Continent awards must provide actual frequencies for all contacts in the log.

2. Single band entrants are required to include all contacts made during the contest period, even if on other bands. Only contacts made on the band specified in the Cabrillo header will be considered for scoring purposes. Logs with contacts only on one band will be classified as single-band entries.

3. The CABRILLO file format is the standard for logs. See <cqwwrtty.com/cabrillo.htm> for detailed instructions on filling out the CABRILLO file header. Failure to fill out the header correctly may result in the entry being placed in the wrong category or reclassified as a Checklog. Note: U.S. and Canada stations must indicate the station location in the CABRILLO header (e.g., LOCATION: OH); other stations indicate “DX” (e.g., LOCATION: DX).

4. Web upload is the only method of log submission. Web upload of logs is available at <cqwwrtty.com/logcheck>.

5. Instructions for NON-CABRILLO electronic logs: If you are not able to submit a CABRILLO format log, please contact the Contest Director for assistance with submitting another format.

6. Entry Confirmation: All logs received will be confirmed via email. A listing of logs received can be found at <cqwwrtty.com/logs_received.htm>.

7. Log withdrawal: An entrant may withdraw the submitted log for any reason within 30 days of the log deadline. Contact the Contest Director for instructions.

XI. LOG DEADLINE:

1. All entries must be sent **WITHIN FIVE (5) DAYS** after the end of the contest: no later than **2359 UTC September 30, 2022**. Resubmitting an entry after the deadline will result in it being considered as a late log.

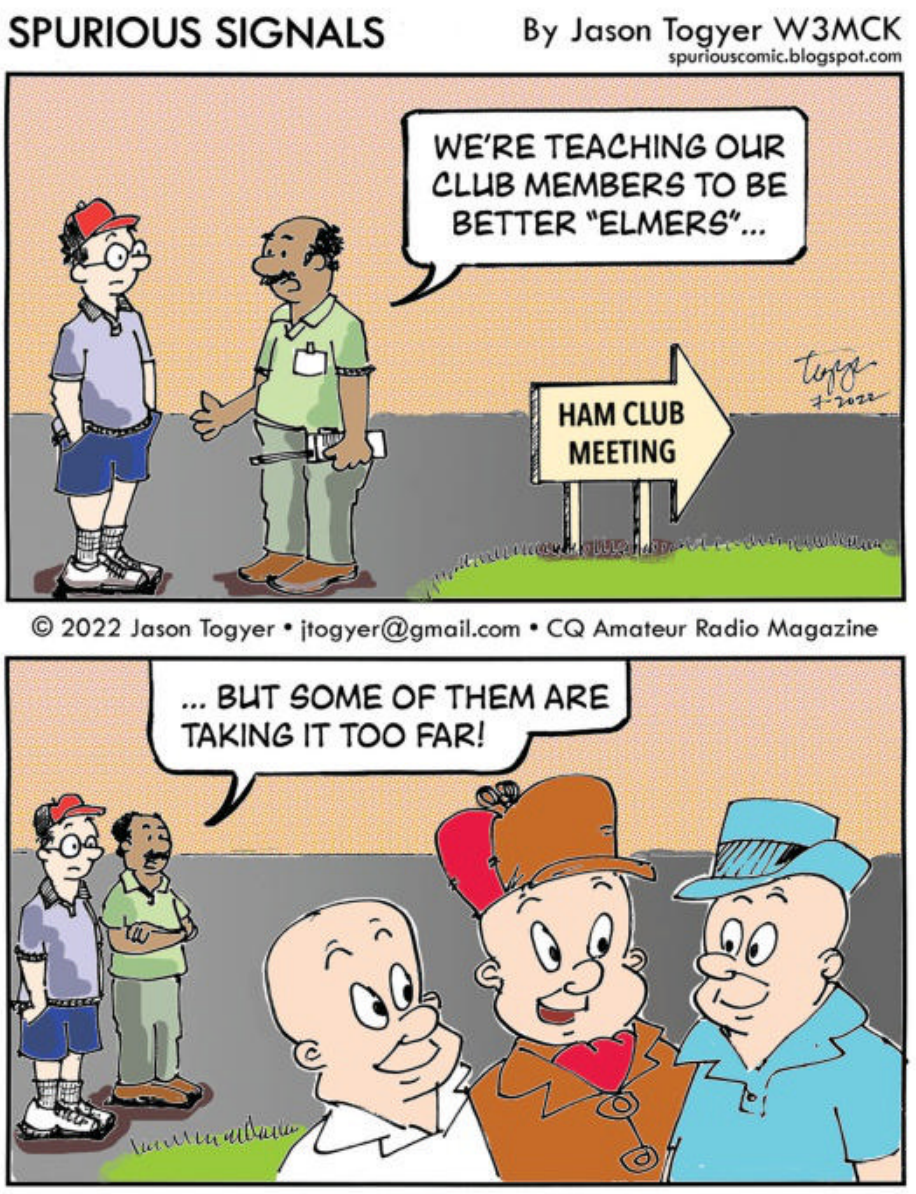
2. An extension may be requested at <cqwwrtty.com/contact>. The request must state a legitimate reason and must be received before the log deadline. Extensions are granted only upon confirmation by the Contest Director.

3. Logs submitted after the deadline may be listed in the results, but are not eligible for awards.

XII. JUDGING:

The CQWW RTTY DX Contest Committee is responsible for checking and adjudicating the contest entries. Entrants are expected to follow the rules and best amateur radio practices. Violation of the rules of the contest or unsportsmanlike conduct may lead to disciplinary action by the Committee.

A. Unsportsmanlike Conduct: Examples of unsportsmanlike conduct include, but are not limited to:



1. Arranging or confirming any contacts during or after the contest by use of ANY non-amateur radio means such as telephones, internet, instant messaging, chat rooms, VoIP, email, social media, or websites.

2. Transmissions by the entrant on frequencies outside of license limitations.

3. Changing times in the log to meet band change or off time rules.

4. Taking credit for excessive unverifiable QSOs or unverifiable multipliers.

5. Signals with excessive bandwidth (e.g., splatter, clicks) or harmonics on other bands.

6. Running stations making more than three consecutive contacts without sending their callsign.

B. Audio Recordings: Any single operator entrant (see V.A.1) competing for a top five finish at the (a) World, (b) Continent, or (c) USA levels, including Classic Overlay, must record the transmitted and received audio as heard by the operator for the duration of the contest operation. The recording must be in a common format (e.g., mp3) and should include the audio to each ear as a separate channel. The recording must be a continuous recording (not a recording of individual QSOs). Time "off the air" (when not transmitting or receiving) does not have to recorded. The recording may be requested by the Committee within 90 days after the log deadline to help adjudicate the log. The recording files must be provided by the entrant within 5 days of the request. **Failure to submit a requested audio recording may result in the reclassification of a log entry or disqualification.**

C. Disciplinary Actions: In the event of a violation, the entrant is subject to disqualification at the discretion of the Committee.

1. Disqualified entries will be listed at the end of the published results and are not eligible for an award.

2. Notification of Committee actions will be sent by email to the address provided with the log submission. The entrant has five days to appeal the decision to the Contest Director. After that time, the decision is final.

3. The Committee reserves the right to change the category of any entry based on its examination of the log or other information.

D. Log Checking: All logs are checked using custom software and humanjudgment.

1. Duplicate contacts are removed with no additional penalty.

2. Contacts with an incorrectly received exchange are removed with no additional penalty.

3. Callsign errors (bust) or callsigns not in the other log (NIL) are removed and receive a penalty of two times the QSO point value for that contact.

XIII. DECLARATION:

By submitting a CQWW RTTY DX Contest log, and in consideration of the efforts of the CQWW RTTY DX Contest Committee to review and evaluate that log, an entrant unconditionally and irrevocably agrees that he/she has: 1) read and understood the rules of the contest and agrees to be bound by them, 2) operated according to all rules and regulations that pertain to amateur radio for the station location, 3) agreed the log entry may be made open to the public, and 4) accepted that the issuing of disqualifications and other decisions of the Committee are official and final. If an entrant is unwilling or unable to agree to all of the foregoing, the entrant should not submit the entry or submit the entry as a Checklog only.

Questions pertaining to the CQWW RTTY DX Contest rules may be submitted through at <cqwwrtty.com/contact.htm>. Answers for many frequently asked questions can be found at <https://cqwwrtty.com/rules.htm>.

CQ CLASSIC:

The Birth of HF Voice Privileges for Novices and Technicians

Several articles in this issue are focused on newcomers to the HF bands, and our DX column looks at the great DXing opportunities offered by the (admittedly limited) HF voice and digital privileges for hams holding Technician and Novice Class licenses. So, we thought we'd go back to the birth of those privileges for this month's *CQ Classic*, in a look at what came to be known as the FCC's "Novice Enhancement" rulemaking 36 years ago. Here's a redux of W5YI's "Ticket Talk" column from the August 1986 issue (which just happened to feature the boss — K2MGA — on the cover.

Ticket Talk

a monthly feature by
FREDERICK O. MAIA, W5YI

INFO ON AMATEUR RADIO LICENSING

FCC Proposes Voice Privileges For Novices

"One of the fundamental purposes of amateur radio is to maintain a pool of operators, technicians, and electronics experts. In light of the apparent downward trends in Novice operators, we are concerned that a valuable national resource is being diminished. Accordingly, we will propose rulemaking in the hope that an enhanced Novice license will benefit the service and reverse the trends."
from FCC Rule Making, April 18, 1986.

	Fiscal Year 1983	Fiscal Year 1984	Fiscal Year 1985	3 Year Totals	
New Novices	18,744	17,392	15,913	52,049	
Dropped Out	9,129	14,883	9,615	33,627	(64.6%)
Novices/Year End	86,781	80,461	76,337	-10,444	

Table I- Statistics show the high attrition rate at the Novice level. (Source: Federal Communications Commission, Personal Radio Branch, Washington, D.C.)

Most newcomers to the hobby are disappointed at being restricted to Morse code operation when they enter the amateur ranks at the Novice level. The greater majority of new amateur radio operators feel the code requirement is antiquated and unnecessary in view of today's technology and their main interest—voice or computer operation. The five word per minute code requirement remains the necessary prerequisite evil to grading up to telephony privileges. The attrition rate at the Novice level is high! (See Table I.) Sad to say, a staggering two thirds of all Novices eventually drop out of ham radio without ever obtaining the voice privileges they dearly desire.

Even more of a problem to the future of amateur radio is the declining numbers of new Novices entereing amateur radio. It is becoming an old man's pursuit. The average amateur's age is well up in years, when in reality it should be in the teens and twenties!

The FCC statistics published in Table I tell the story! There are more than 10,000 *less* Novice operators than just two years ago! New blood is needed if amateur radio is to continue as we know it. Many commercial groups say they need more spectrum and point to the declining numbers of new Novices and the stagnated Amateur Radio Service in general. They want the frequencies we have. Once lost, you can bet that they will never be regained. They will be gone forever.

The FCC views a growing Amateur Radio Service as a healthy service. While some blame the decline in new amateurs on the bottom of sunspot cycle and its accompanying poorer band conditions, the fact is that the Amateur Radio Service is anything but healthy! Just ask amateur radio equipment manufacturers. Reliable VHF and higher frequency communications for the most part aren't affected by propagation.

Current Novice activity is pretty much limited to a small sliver of the 40 and 80 meter bands, which suffer from Canadian amateur phone operation and international broadcast activity. Stated simply, Novices are disillusioned with amateur radio —but the situation is about to change for the better!

The code-bound Novice is about to gain voice privileges—and soon! The long expected **Novice Enhancement** proceeding was released by the FCC on April 30th. Voice privileges for Novices won't be precedent setting, however. They had 2 meter (145-147 MHz) telephony privileges back in the sixties when VHF was considered "experimental" and repeaters were unheard of. The technology just wasn't there. A lot has changed since then! What was once a Morse code and AM phone hobby now

basically is FM/SSB telephony and digital operation. Clearly the Novice should be allowed to participate. To deny them is to deny amateur radio and everyone loses. A new generation must be attracted to the Amateur Radio Service.

History of Novice Enhancement

While most important, the American Radio Relay League was far from the first to petition the FCC for expanded Novice privileges. The FCC-supported "no-code" class of amateur ticket was defeated by intense League lobbying a couple of years ago. Enhancing Novice privileges is thought by many to be a second-best alternative to "no code." Technician class amateurs will also reap the benefits of any additional Novice privileges, since they automatically receive all privileges available to the Novice operator.

Larry W. Garens, KC5OQ, of the smallwest Texas community of Brady, deserves the credit as being the initial author of Novice Enhancement. He filed four petitions for it with the FCC before the ARRL filed their petition. Garens proposed to expand the operating privileges for Novice operators by allowing telegraphy, RTTY, and voice privileges in the 10 meter band and code and voice between 220-225 MHz. Garens filed a fifth petition after the League jumped on the bandwagon suggesting the addition of the 902-928 MHz band to the Novice class. While not given much publicity, the League's petition for Novice enhancement is basically the same as that envisioned many months earlier in the Garens' proposal.

What Did The ARRL Propose?

On June 6,1985 the ARRL proposed to provide greater motivation for amateurs-to-be to obtain their first license, without reducing the incentive to upgrade by attaching too many privileges to what is, and should continue to be, an elementary license. The League suggested Novice voice and data privileges sufficient to permit communication with other local amateurs and to provide an occasional opportunity for long-distance communications. The essential elements of the ARRL petition were:

1. Authorize Novice control operators digital communication privileges in the 10 meter band on frequencies 28.1 to 28.3 MHz, 200 watt output PEP;

2. Authorize Novice control operators emission J3E (sideband telephony) privileges in the 10 meter band on frequencies 28.3-28.5 MHz;

3. Authorize Novice control operators frequency privileges in the entire 1.25 meter band (220-225 MHz) with all emission privileges authorized for that band and with a transmitter power limit of 25 watts.

4. Stations in 220-225 MHz repeater operation could retransmit the signals of Novice stations, but no Novice licensee could be the control operator of a station in repeater operation;

5. Authorize Novice control operators frequency privileges in the 0.23 meter band on frequencies 1246-1260 MHz with a transmitter power of 5 watts similar to the conditions proposed for the 1.25 meter band.

To eliminate a loss of privileges, the League suggested that the power level be authorized at full amateur level (i.e., 1500 watts output PEP) when a General through Extra class amateur operated in the 28.1-28.2 MHz Novice segment. (The FCC is reviewing comments from the public— particularly Novices— on the feasibility of this.)

New Novice Test Outline Suggested

The League suggested that the Novice written examination (Element 2) be expanded to include topics about digital communications and telephony techniques. The ARRL said this was necessary so that the examination would be commensurate with the Novice privileges granted. The League also asked that the written test be expanded to 30 questions and the question pool (P.R. Bulletin 1035A) from which these questions are selected be increased to 300 questions.

To preserve the integrity of the Novice examination the ARRL said that each examination for the Novice class operator license should be administered by two volunteer examiners holding General class licenses or above, rather than the presently required one examiner.

FCC Issues NPRM

The Commission issued the Notice of Proposed Rulemaking just in time for FCC announcement at the 1986 Dayton Hamvention. It was very well received by those in attendance. The FCC's NPRM provides for basically the same features as proposed by the League.

The FCC did caution the amateur community, however, regarding the 220-225 MHz band. They said that it must be recognized that there are three petitions seeking spectrum from this amateur band—two seeking narrow-band land mobile operation and another from a "reading for the blind" organization. In view of this, the FCC said that they will not be finalizing the matter of permitting Novice operators in the 220-225 MHz band until these petitions are resolved. Any Novice operation authorized must necessarily be on an interim basis pending resolvement of the 220 MHz issue.

The FCC did publish new tentative rules, however, authorizing Novice and Technician access to:

28100—28500 kHz, Morse Code, Digital Information, 200 watts PEP output
28300-28500 kHz, Single Sideband Voice (J3E), 200 watts PEP output
220-225 MHz, All current amateur modes, 25 watts PEP output
1246-1260 MHz, All current amateur modes, 5 watts PEP output

Novice class operators may not be the control operator of an amateur radio station in repeater, auxiliary, or beacon operations.

It must be emphasized that these rules are FCC *proposed*. They will become permanent if the FCC adopts their proposal. The general feeling is, however, that we will indeed see some firm enactment of enhanced Novice privileges by year end. The effect on the Amateur Radio Service could be dramatic! And not everyone is in favor of a large expansion of the ham ranks.

The FCC did not go along with the ARRL's suggestion that two examiners administer Novice examinations and invited comments on this issue. "Integrity of the license is important, but we are not convinced that two examiners is the right safeguard to employ." The FCC did feel that "Including Novices in the Volunteer Examination System has merit, but we are reluctant to disturb the present procedure under which aspirants to amateur radio receive licenses quickly and free of charge." The FCC also said that they were unsure of the capacity of the VE system to handle a large volume of applicants.

Public comment period on the Notice of Proposed Rulemaking closed on July 16th. A novel approach was also suggested by the FCC in the NPRM, that being to split the present Technician class examination into two sections—separate MF/HF and VHF/UHF questions. "It would be a simple matter," the FCC said, "to rearrange the topics into two syllabi: Element 3(A) for VHF and UHF; Element 3(B) for MF and HF. Element 3(A) would be a written test requirement for a Technician-and-above license. Element 3(B) would be

License Class	Morse Code Examinations	Written Examinations	Passing Mark
Novice	Element 1 A—5 wpm	Element 2—20 questions	15 correct
Technician		Element 3—50 questions	37 correct
General	Element 1B—13 wpm		
Advanced		Element 4A—50 questions	37 correct
Extra Class	Element 1C—20 wpm	Element 4B—40 questions	30 correct

Table II- Requirements of amateur radio license classes.

a written test requirement for a General-and-above license." The present Element 3 covers both VHF/UHF and high-frequency operation. Basically, what the FCC's alternative proposal suggests is a simpler examination for Technician class than is now the case.

From The Mailbag

Must the amateur radio examinations be taken in order? Can't I just take the General class and skip the Novice and Technician classes? There are seven different amateur radio operator examinations—three for the Morse code and four written tests. The requirements are shown in Table II.

You can't be a General class amateur without first passing the Novice and Technician class requirements. The written examinations must be taken in order of ascending difficulty starting with Element 2. The code tests may be taken in any order. Thus, if you can pass the Extra class requirement of 20 words per minute, you need not take Element 1A or 1B. Passing mark is 74% on a written test.

The passing mark on the code test depends on how it is administered, which is up to the VE team. Seven out of ten fill-in-the-blank, true/false, or multiple-choice questions answered correctly or one minute solid copy passes the code test. It is up to the VE team whether or not a sending test is required. Most VE teams don't administer one, since Morse receiving ability is considered evidence that you can send at that speed.

There is no longer an FCC requirement for a waiting period before retaking failed examinations. Some VECs do, however, have their own requirements dependent upon their testing capabilities. Even though a VEC may require a specified period before you retake an examination, you can always be immediately retested at another VEC's program. In our own VEC case, we allow candidates to retake failed examinations the following day, but never on the same day administered by the same VE team.

I'm thinking of becoming a volunteer examiner. Just what am I getting into? Being a volunteer examiner for other applicants is the highest calling in amateur radio. It is the key to the future of the hobby. It is very easy to do. Some VEC's have programs that are more difficult to administer than others. We go to great lengths to cut through all of the red tape, unnecessary forms, procedures, and "paper." One of our guiding policies is that is should be no harder to administer a Technician through Extra class license than one at the Novice level. There are differences, however.

It takes three Extra class level VE's to hold a test session at the Technician or higher level, and an advance public notice must be made of the upcoming test session. You can immediately be accredited as a VE if you are an Extra class amateur by simply signing a statement regarding your status and submitting a copy of your amateur radio operator license. (Send for a free application if you are interested.)

Once you have lined up the necessary three accredited VE's, you can hold an examination session by advising us of the date and test site city. You will be mailed a package containing all of the necessary instructions, tests, and forms. Once you have held a test session or two, you can qualify for our ADP (Automatic Distribution Plan) program where we automatically forward you many test versions for administration by your team as needed. You don't even have to request a test session once you are on the ADP program. Just use the testing materials that we have sent you. The Part 97 rules require that you keep all tests secure against disclosure. You automatically get many new test versions and answer sheets whenever the FCC revises a question pool.

The idea is to make amateur radio operator testing as simple as possible while still maintaining the credibility of the VE system. We feel that it is one of the VEC's responsibilities to make it easy for VE's to quickly hold a hassle-free exam session if there are applicants to be tested and accredited volunteer examiners willing to administer those examinations. Our program is unique in that we also share test fees with our VE teams, since they too have expenses which must be paid.

Announcing:

2022 Inductees to the CQ Amateur Radio and Contesting Halls of Fame

CQ magazine is pleased to announce its 2022 Hall of Fame inductees, including two new members of the CQ Contest Hall of Fame and six[1] inductees to the CQ Amateur Radio Hall of Fame. The Contest Hall of Fame induction took place in person at the Dayton Contest Dinner for the first time in three years; honorees from 2020 and 2021 were also recognized.

The CQ Amateur Radio Hall of Fame honors those individuals, whether licensed hams or not, who have made significant contributions to amateur radio; *and* those amateurs who have made significant contributions either to amateur radio, to their professional careers or to some other aspect of life on our planet. This year, we are inducting six new members, bringing to 345 the total number of members inducted since the hall's establishment in 2001.

The 2022 inductees (listed alphabetically) are:

Franklin P. Antonio, N6NKF (SK), co-founder of Qualcomm, whose chips underlie much of our modern technology. Antonio was particularly involved in the company's satellite work and was a philanthropist as well, donating $30 million to the University of California at San Diego as seed money for a new engineering building.

Wolf Harranth, OE1WHC / OE3WHC (SK), journalist and broadcaster on Radio Austria International; founder of Austria's radio documentary archive (DokuFunk), now the world's largest archive on the history of radio, including the YASME / Colvin collection; literary translator and 2017 recipient of the IARU Region 1 Roy Stevens memorial award for his work on DokuFunk.

Les Kramer, WA3SGZ, inventor of lower-limb prosthetic devices used by some 3,000 people worldwide, including two survivors of the Boston Marathon bombing; as well as multiple other inventions in the fields of electric power generation, IED detection, optical coatings for industrial processes, and more.

Peter Marks, AB3XC, physician and FDA scientist behind "Operation Warp Speed." Dr. Marks leads the team at FDA that reviewed and approved all of the available vaccines for COVID-19 as well as all intravenous therapeutics such as Convalescent Plasma, Monoclonal antibodies, and diagnostic testing.

Bob Ringwald, K6YBV (SK), well-known blind jazz musician in Sacramento; co-founder of the Sacramento Jazz Festival; known locally as "the emperor of jazz" and, last but not least, father of actress and singer Molly Ringwald.

R. Scott Wright, KØMD, physician and leader of Mayo Clinic team developing the use of convalescent plasma as one of the first treatments for Covid-19; DXer, contester, former editor of the *National Contest Journal*.

The 2022 inductees to the **CQ Contest Hall of Fame** are:

David Pascoe, KM3T, a highly accomplished multi-op and single-op contester with many championships and record scores to his credit, and he is also responsible for much of the "back room" infrastructure behind the administration of many major contests. He is the infrastructure and IT security "departments" for all of the contests supported by the World Wide Radio Operators Foundation (WWROF), including all CQ contests, several ARRL contests, and others. He also maintains the email lists on the contesting.com system,

CQ World Wide DX Contest Director and Dayton Contest Dinner Emcee John Dorr, K1AR, presents 2022 CQ Contest Hall of Fame Plaque to Craig Thompson, K9CT, at the Contest Dinner in Dayton, Ohio. (Photos by and courtesy of Bob Wilson, N6TV)

K1AR presents 2022 CQ Contest Hall of Fame Plaque to David Pascoe, KM3T, at the Contest Dinner in Dayton, Ohio, on May 21st.

2020 CQ Contest Hall of Fame honoree Geoffrey Howard, WØCG/PJ2X. Due to Covid, there were no in-person inductions in 2020 or 2021.

2021 CQ Contest Hall of Fame honoree Robert Wolbert, K6XX, at the 2022 Dayton Contest Dinner.

including CQ-Contest, 3830, and more. He is also a pioneer in live contest audio streaming, and is a volunteer pilot for two organizations that provide free medical-related air travel.

Craig Thompson, K9CT, a world-class contester and promoter of youth in contesting. He developed the North American Collegiate Championship (NACC) program, in which college amateur radio clubs compete against each other in the context of the larger competition of the North American QSO Party. Craig also worked closely with Tim Duffy, K3LR, to develop a version of the Contest University (CTU) program specifically designed to integrate with each year's W9DXCC Convention. He is also involved in several amateur radio organizations, serving as treasurer of CWops, a board member of the Northern California DX Foundation (NCDXF), past president of the Society of Midwest Contesters, and is currently chairman of the ARRL Contest Advisory Committee.

The CQ Contest Hall of Fame was established in 1986 to recognize those amateurs who have made major contributions to the art of radio contesting.

CQ DX Hall of Fame

There were no inductees to the CQ DX Hall of Fame for 2022, as the judging committee determined that none of the nominees met the high standard required for selection.

Note:

1. The original Hall of Fame announcement incorrectly included seven inductees to the Amateur Radio Hall of Fame. The seventh person listed, EZNEC developer Roy Lewallen, W7EL, was already inducted in 2007 and remains a member in good standing!

Just about everything these days operates on batteries, from the computer in your pocket to electric vehicles. But disposing of all those batteries creates a big environmental problem. AH6CY offers a "green" approach to powering a very low-power transceiver … using fruits and vegetables to generate electricity. (And no, this is not an April fool article; that's why we waited until now to publish it!)

"Green" Power for QRPp

Explore the World of QRPp Radios With Biodegradable Batteries

BY HIROKI KATO,* AH6CY

No, the lowercase "p" in QRPp doesn't stand for potato, it indicates the extreme lower region of QRP in which transmitters typically radiate 1 watt or less. QRPp transmitters are measured in milliwatts.

The experiment I recount here started as a joke. Members of our QRP club were comparing the various batteries for our outdoor portable operations. One OM mentioned, tongue in cheek, that he powered his radio with a potato battery. He really doesn't, but he has the largest collection of batteries in our group. Many of us fondly remember playing with potatoes or lemons to make a battery in our elementary school days. I decided to re-live that fun and at the same time to take a serious look at how much electric energy potatoes, lemons and other fruits and vegetables can generate. Like

* *Email: <ah6cy@arrl.net>*

Note: A shorter version of this article appeared in the April 2022 issue of QST.

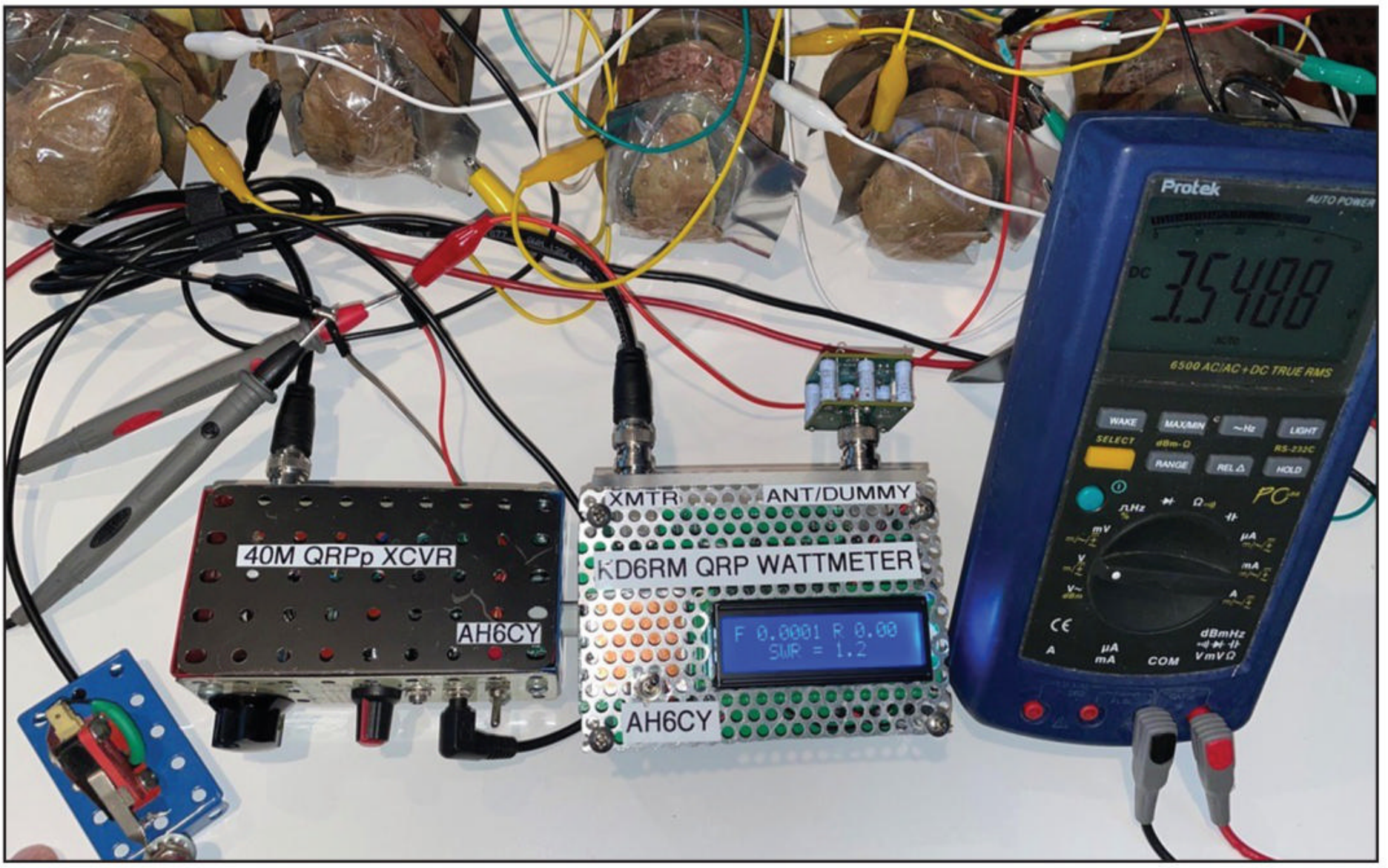


Photo A. AH6CY's naturally-powered QRPp transceiver. The "batteries" are renewable, biodegradable and … edible! (All photos by the author)

Photo B. In the initial experiment, a copper penny and a zinc-plated nail were used as the electrodes in a single raw potato. I could only get 0.084 mA of current.

any self-respecting ham, I also wanted to find out if it was possible to use a vegetable to power a QRP rig (*Photo A*).

Battery Power

From testing many different kinds of vegetables and fruits, I learned that they generate anywhere between 0.5 and 1 volt of electricity. When it comes specifically to potatoes, I found out:

1. The voltage you can get from a single potato is somewhere between 0.5-0.9 volts. The size of the potato does not make any difference in voltage, and neither does the distance between the two electrodes.
2. However, increasing the contact surface area of the electrodes increases current output while the voltage does not change. The current you can obtain from a single potato or a lemon is so small that my multimeter registers much lower than a single milliamp. It takes as many as three potatoes to light an LED.
3. Potatoes retain their battery chemistry and can produce an output as long as a month even after they become moldy or rotten.

It was immediately apparent that I would need to connect many potatoes in parallel and in series to make a useful battery if I was going to power a QRP rig. In theory, I could produce a 12-volt, 1- to 2-amp potato battery by connecting many potatoes to power a common 1-5-watt QRP transceiver. But if it takes hundreds of potatoes to power a radio, it wouldn't be a practical battery, either in terms of cost (even though the potato is one of the least expensive vegetables; about a dollar per pound in my neighborhood) and the physical space required. I concluded that I would need a radio that could operate with a much lower voltage power supply, say 3-5 volts at 5-15 mA, i.e., a QRPp radio.

While experimenting with various fruits and vegetables, my internet research uncovered a scientific paper that blew me away. In 2010, Prof. Haim Rabinowitch of Hebrew University wrote a paper in which he claimed that cooked potatoes can generate up to 10 times greater output than raw potatoes.[1] Encouraged by the article, I cooked a batch of potatoes in a microwave oven and experimented with various ways to construct a practical multi-cell battery. I inserted a copper plate (99% purity) for the anode and a zinc plate (99% purity) for the cathode in each cell. To increase the surface contact area of the electrodes I bent each of the plates into a "U" shape.

Here are some of the results of my experiments:

With a copper penny and a zinc-plated nail as the electrodes (*Photo B*), I could only get 0.084 mA of current from a single potato, not enough even to turn on an LED light. When I replaced the copper penny and the zinc-plated nail with a flat copper plate and a flat zinc plate, thus increasing the electrodes' surface contact area, the output increased from 0.084 mA to 0.436 mA. When the same potato was cooked in the microwave, the output increased dramatically from 0.436 mA to 2.165 mA. When I squeezed the same cooked potato to concentrate more of the potato mass into contact with the surface of the electrodes, the output further increased to 5.406 mA. I then packaged cooked potatoes by tightly wrapping them with a plastic tape (*Photo C*). The copper plates and zinc plates were bent into a "U" shape to increase contact surface.

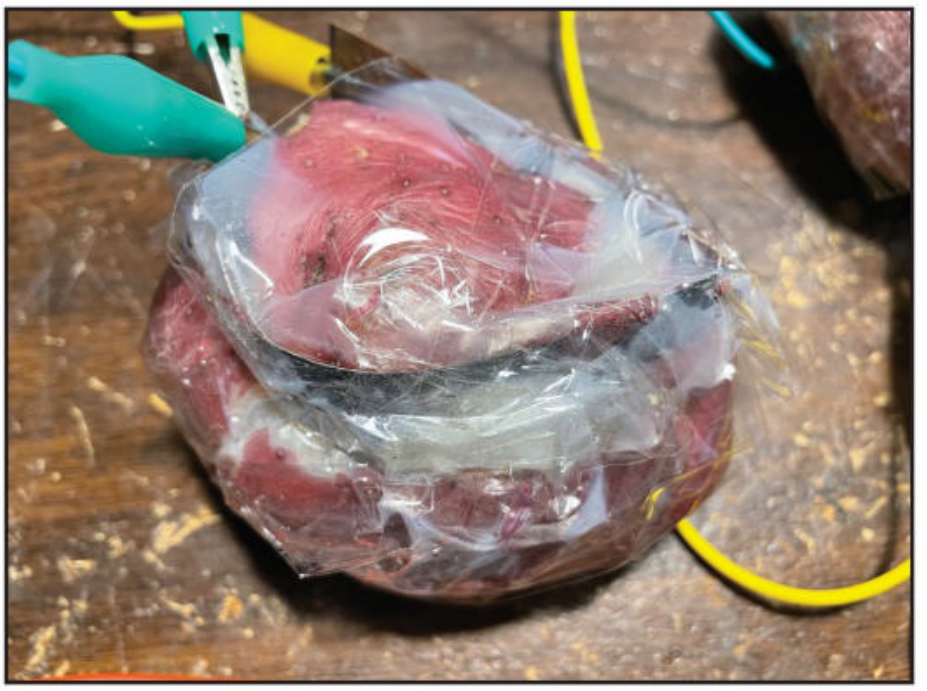


Photo C. The potato batteries were wrapped tightly in plastic tape, with the electrodes curved around them for maximum contact area.

I powered a QRPp transceiver with a bank of 8 cooked potatoes (*Photo D*). The result was a current drain of 7.729 mA that produced 1mW of RF power output from the transmitter (more on the transmitter below).

I then constructed a more "sophisticated" packaging for the potato battery. I prepared mashed potatoes and built a 6-cell battery in a 6-section plastic case. This made it easier to transport and use for portable operation. This particular arrangement generated about 5 volts and a current greater than 30 mA.

The battery in *Photo E* was made of shredded and microwaved lemons (rind and all). It generated 6 volts and over 40 mA of current (It smelled good, too!)

Transceiver

My first QRPp transmitter powered by the potato battery is actually a 14,318-kHz computer clock oscillator (SG-531P) that I found on eBay. It was designed to oscillate at 5 volts, but it generates its signal at as low as at 1.5 volts. I added a 20-meter bandpass filter and a Morse key (in the form of a micro switch), all built in a repurposed small hearing aid battery case (*Photo A*; circuit in *Figure 1*). At 4 volts, it produced a power output of 1 milliwatt and consumed 26.5 mA of current, not a very efficient radio. But it works fine with a potato battery, if you don't mind some chirp in your signal. When you key down, the potato battery voltage drops

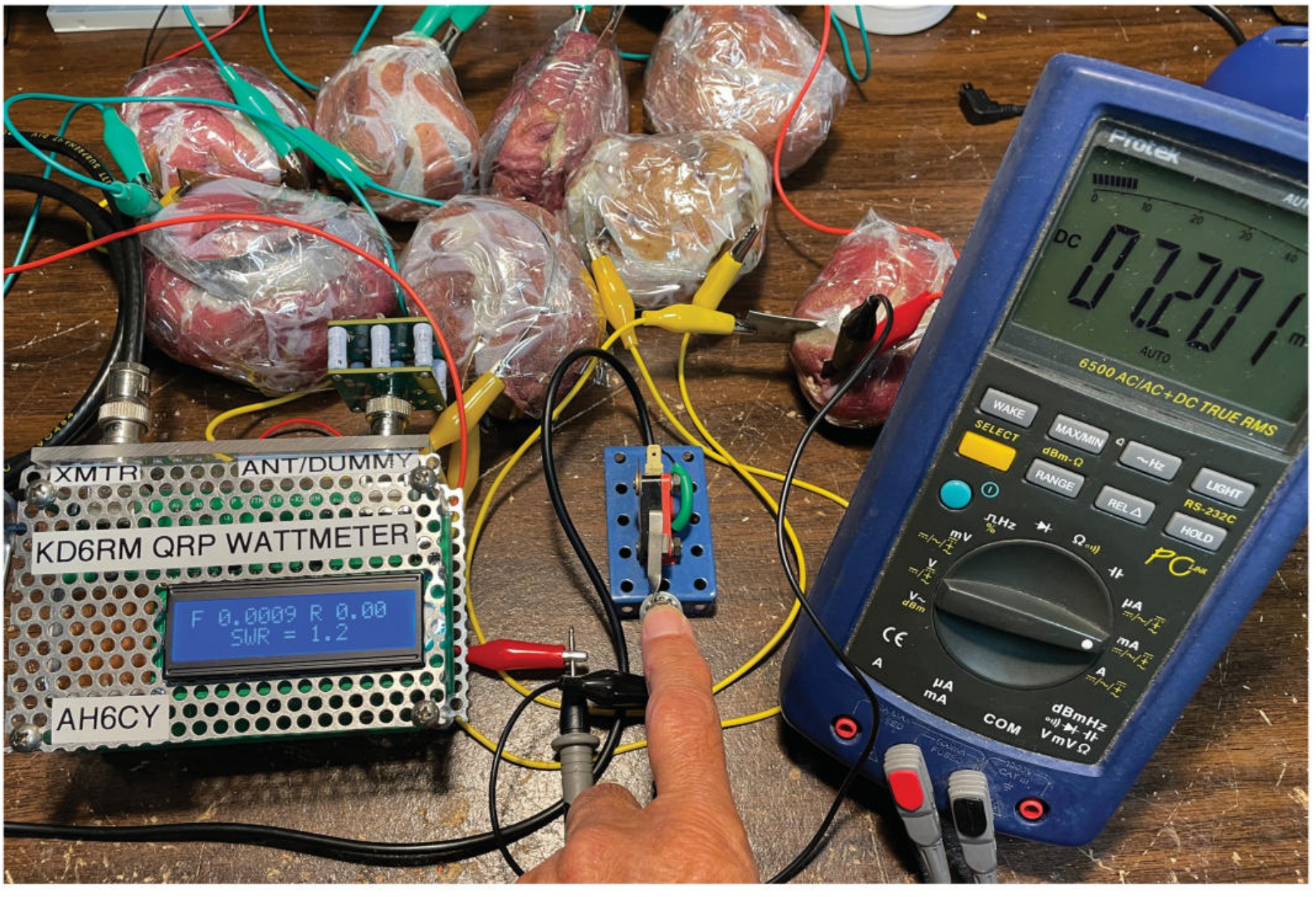


Photo D. A bank of eight potatoes was able to produce enough current to power a 1-milliwatt QRPp transmitter.

significantly and RF output power is reduced to a few hundred microwatts.

I mated the same "computer clock" transmitter with a two-transistor regenerative receiver, the circuit diagram of which I found on the internet at <https://tinyurl.com/42ce53u4> (*Photo G* and *Figure 2*).

How well does it work? I took the potato battery and the QRPp transceiver to my QRP club's Friday gathering in a public park in Palo Alto, California in June 2021. My antenna was the MP-1 portable vertical mounted on my SUV. My signal chirped but I successfully completed a 2-mile distance two-way QSO with members of the club. If I had used a better antenna, I probably could have reached a much greater distance. The receiver, like most regenerative receivers, is not very stable, though it is fairly sensitive. It requires a steady hand to tune.

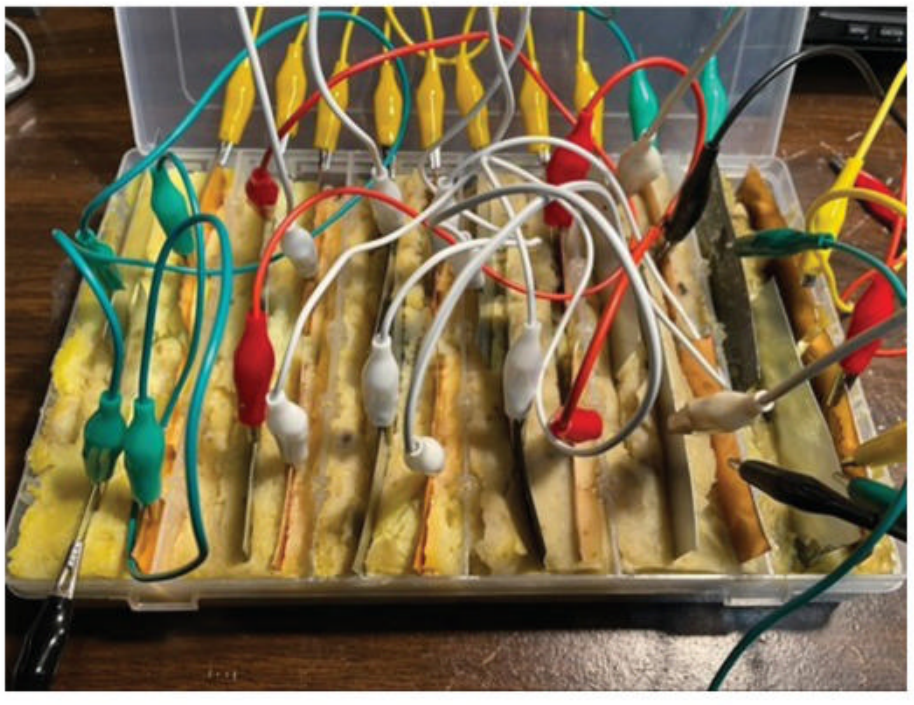


Photo E. This battery was made of shredded and microwaved lemons. It generated 6 volts and over 40 mA of current.

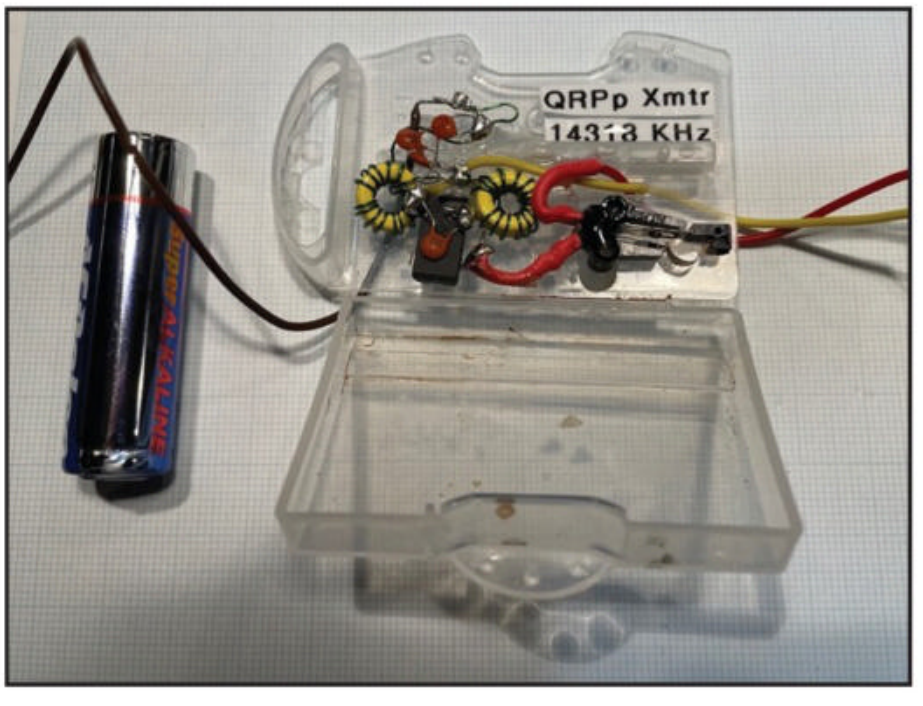


Photo F. A green-powered QRPp transceiver built around a 14-MHz computer clock oscillator. See schematic in Figure 1.

The second QRPp transceiver I built specifically for the potato battery is a modified Pixie 40-meter transceiver[2] with a direct conversion receiving circuit. It has a built-in automatic T/R switching with keying. At 3 volts, the transmitter produces 2.1 milliwatts of RF output, drawing 7.3 mA. On receive, the current drain is 2.2 mA. It requires a high-impedance earphone, though it does work with common headphones albeit at much lower volume. It is crystal-controlled and can change frequencies among eight installed crystals by a rotary switch. The entire transceiver was housed in a metal case made of old Erector set pieces (courtesy of my grandkids, HI; *Photo H* and *Figure 3*).

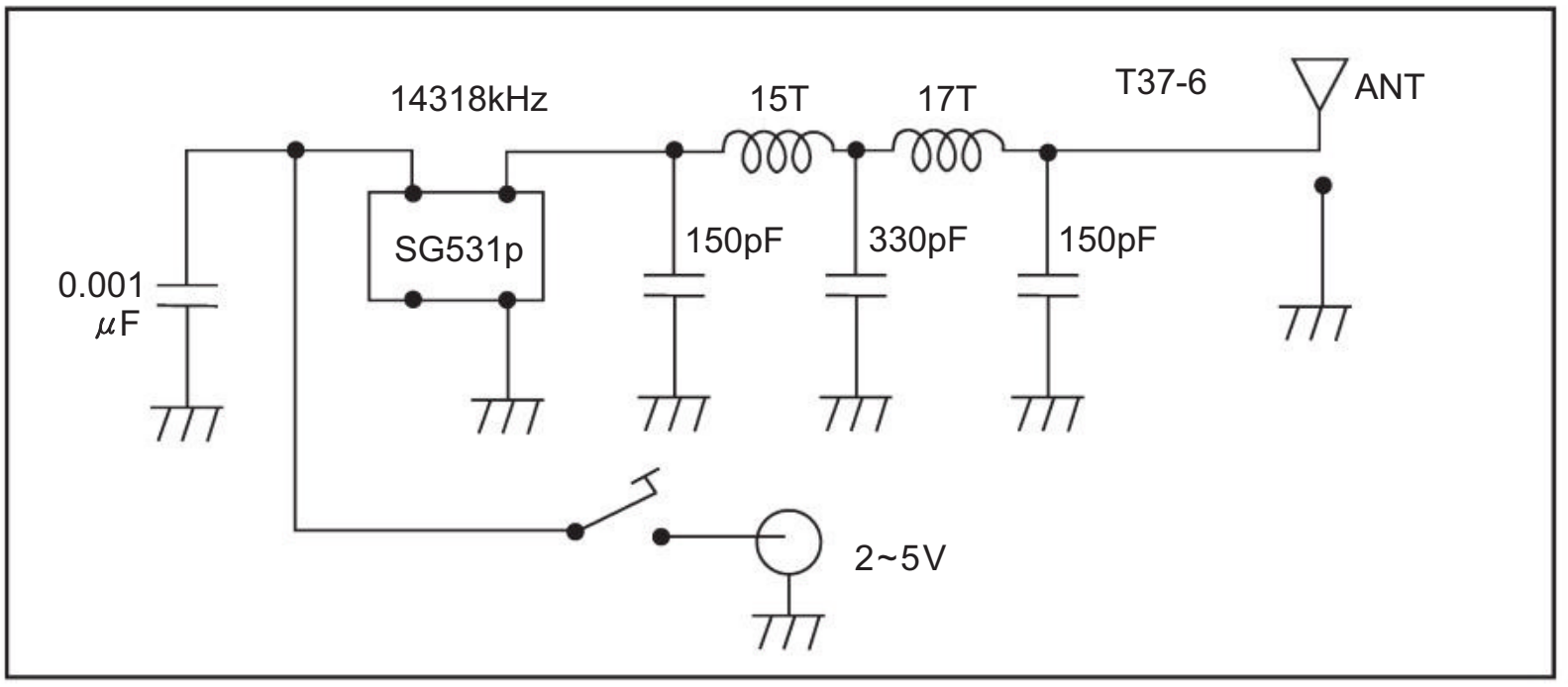


Figure 1. Schematic of the computer clock oscillator-based QRPp transmitter. (Drawing by Emily Leary)

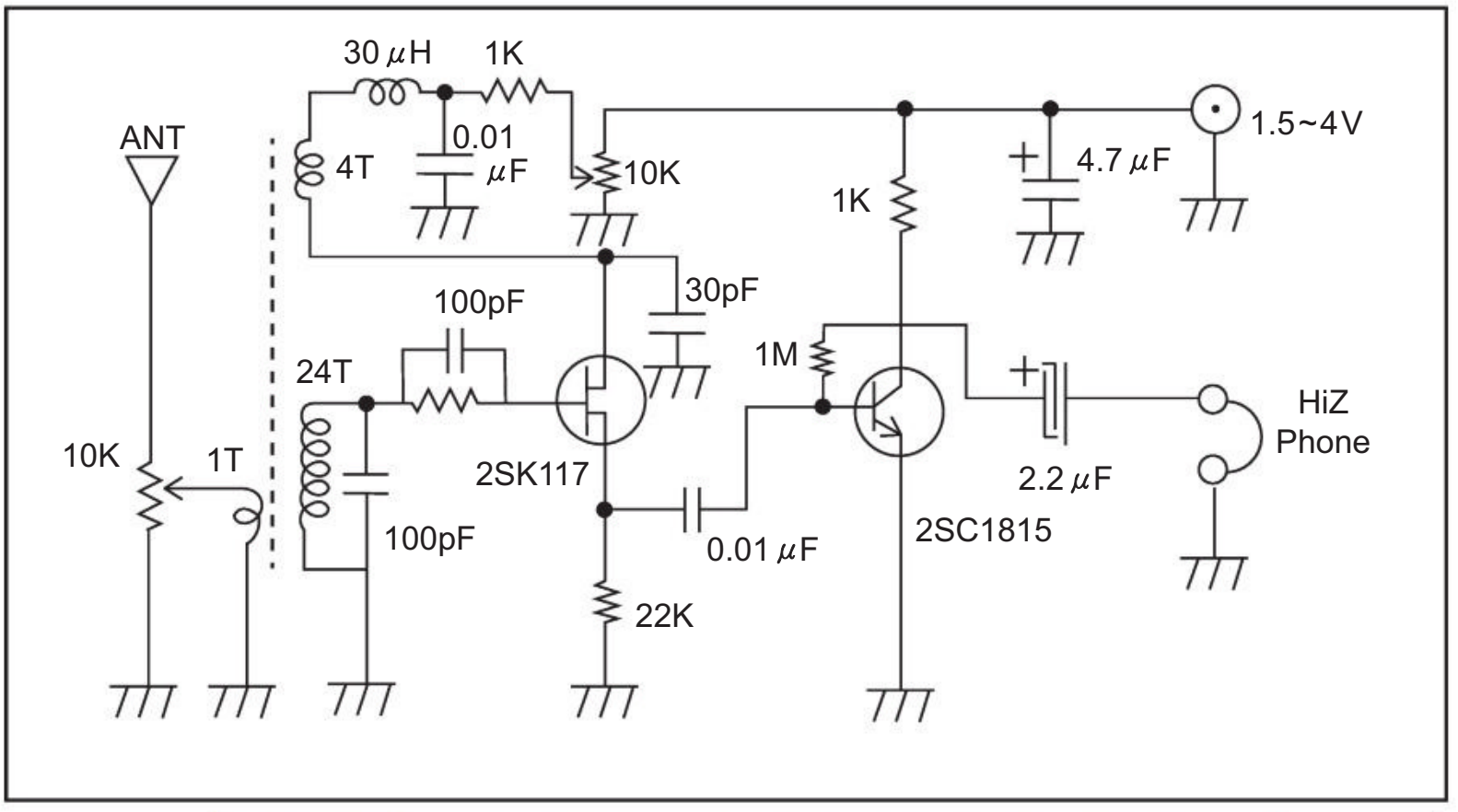


Figure 2. Schematic of the regenerative receiver the author built to work with his initial QRPp transmitter. (Drawing by Emily Leary)

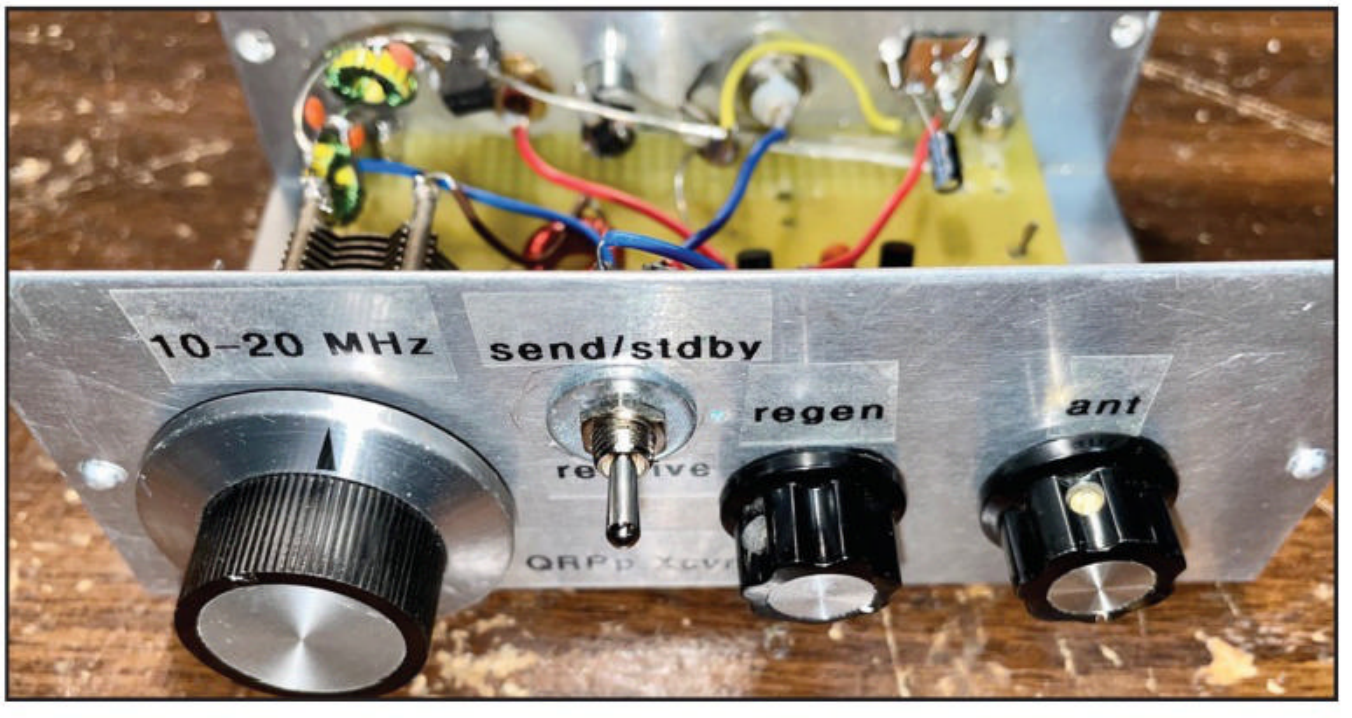


Photo G. A regenerative receiver circuit found on the internet provided the receive side of the author's original plant-powered station.

18+

WHAT IS AVAXHOME?

AVAXHOME-

the biggest Internet portal, providing you various content: brand new books, trending movies, fresh magazines, hot games, recent software, latest music releases.

Unlimited satisfaction one low price
Cheap constant access to piping hot media
Protect your downloadings from Big brother
Safer, than torrent-trackers

18 years of seamless operation and our users' satisfaction

All languages
Brand new content
One site

AVXLIVE.ICU

AvaxHome - Your End Place

We have everything for all of your needs. Just open https://avxlive.icu

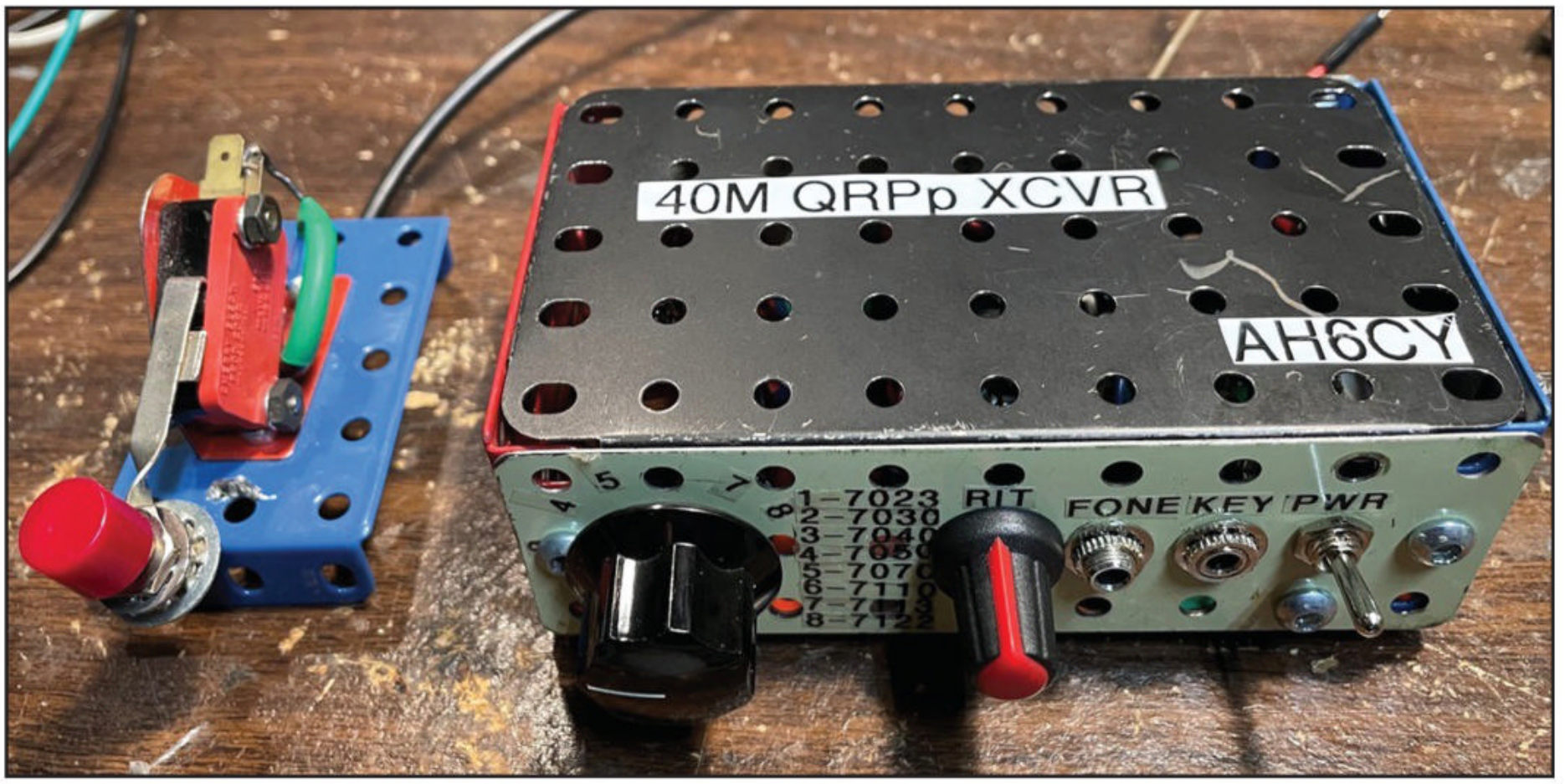


Photo H. This potato-powered transceiver is a modified Pixie circuit. It is crystal-controlled with up to eight frequencies available, and used pieces of an old Erector set for its case. See circuit in Figure 3.

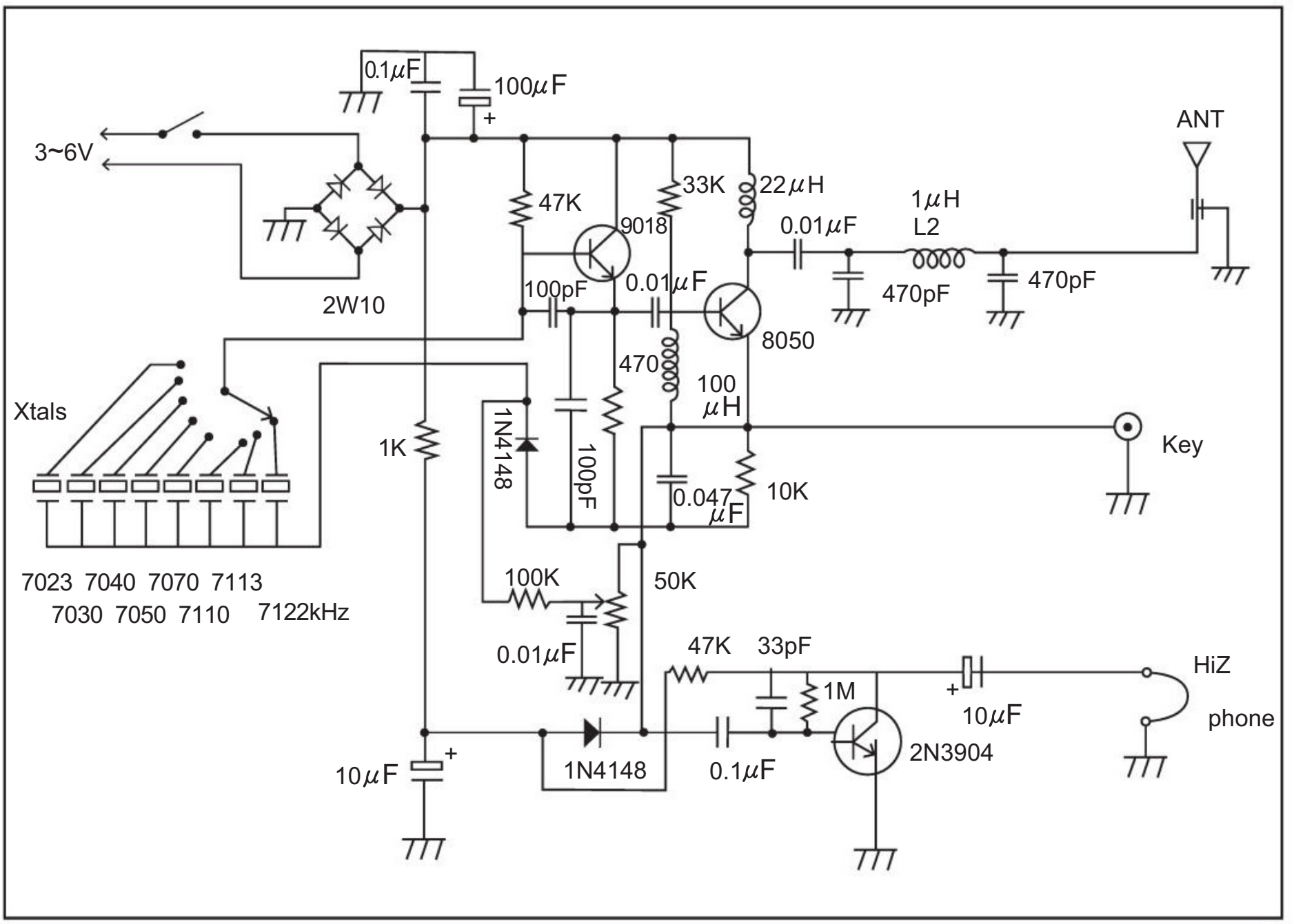


Figure 3. Schematic of the Pixie-based QRPp transceiver. (Drawing by Emily Leary)

The Morse key you see in the photo was also built with a couple of Erector set parts and a repurposed microswitch.

Final Thoughts

So, what can you do with a 1-2-milliwatt QRPp transceiver? Some of us who have discovered the joy of QRP find it a fun challenge to pursue DX with lower and lower power. You may have heard that some QRPers try to reach a goal of million-miles-per-watt (with 1 mW, the corresponding distance is 1,000 miles). In 1990 Bob Moody, K7IRK, achieved Worked All States, along with some DX, using a 2-milliwatt computer clock transmitter on 10 mters.[3] Admittedly, his feat was accomplished during the high sunspot cycle period of the 1990s. As Cycle 25 is now upon us, perhaps in the very near future we can hope to have some great propagation again, even with flea (well, potato) power.

A potato-powered QRPp transceiver can potentially be used as a practical emergency communication device. During the recent Hurricane Ida disaster, several communities were completely isolated without any electric power or cell signals. Some residents had no way of letting the outside world know their desperate need for immediate help. A radio that allows you to communicate reliably even a few miles could be the difference between life and death. A totally self-contained inexpensive small system, such as a potato-powered radio, that does not depend on any infrastructure, can be distributed in many disaster-prone locations.

Another potentially beneficial use of a potato (or any fruit or vegetable)-powered radio would be to very poor remote communities. There still are isolated villages on the African continent where there is no electricity or stores, let alone cell phone service. Some of these people live on less than $1/day. In such places, fruit and vegetable batteries could power LED lights for reading or for inter-village radio communication.

I believe that QRPp ham radio, especially when powered by biodegradable battery such as potatoes and lemons, is an environmentally desirable radio. It could not only be a more sustainable and accessible approach to ham radio but it could also be lots of fun, as there is much to explore at low cost. Given the increasingly difficult environmental condition our planet is facing today, the small footprint minimalist radio may be a way for us to go.

Notes:

1. "Zn/Cu-Vegetable Batteries, Bioelectrical Characterizations, and Primary Cost Analysis," *Journal of Renewable and Sustainable Energy* 2, 1 (2010)

2. The Pixie has a long and illustrious history in the annals of the QRP world. It is a minimalist QRP radio originally developed in the 1990s by a group of hams of the NorCal QRP club in northern California led by Doug Hendricks, KI6DS, and his friends, and has been modified and refined by many hams over the years. The most popular version today is an inexpensive kit ($3-10) available online from several Chinese vendors. The Chinese version is designed to operate at 9-13.8 volts, with most of its current drain occurring in the audio amplifier stage that utilizes the LM386 IC chip. I replaced the LM386 with a single 2N3094 transistor amp and removed the piezo sidetone generator and an LED light to conserve power. This modification allows the transceiver to operate at 3-5 volts, drawing much lower current.

3. "Working the World with 2 Milliwatts," *73 Amateur Radio Today*, November 1990

Special note: The RF wattmeter you see in some photos here was designed by Phil Sittner, KD6RM. It is capable of measuring down to 1/10 of a milliwatt accurately. Most commercially available wattmeters do not read the milliwatt level.

math's notes

BY IRWIN MATH,* WA2NDM

A Dummy Load, Spare Power, and a Voltage Detector

In keeping with our goal to provide interesting low-cost ideas that may hopefully convince you to get out the "old soldering iron," here are three more.

A Non-Inductive Dummy Load

In January, we described how to make a simple dummy load for testing your transmitter with a bunch of 2-watt carbon resistors and some simple copper sheet metal parts. Well, for those of you who do not want to start cutting copper and drilling a bunch of holes (not to mention soldering with a really large solder iron or gun), there is an even easier way. This is by the use of non-inductive resistors that have actually been on the market for years. These devices are manufactured by the Caddock Corporation and come packaged in TO-style power transistor type housings which can be easily mounted with a single machine screw. *Figure 1* shows the MP930 30-watt and the MP9100 100-watt devices. You can see full specifications as well as the wide range of resistance values at <www.caddock.com>, but for our purposes, the 50-ohm devices will be what you need. These are also stocked by many electronic distributors such as Mouser Electronics and Digi-Key and cost is approximately $10.

These resistors come in individual sizes of 15, 16, 25, 30, or 100 watts and can be connected in parallel for even higher wattages. For a single load use a 50-ohm device. For higher power simply parallel devices but adjust values accordingly. A 200-watt load, for example, could be made of two 100-ohm, 100-watt resistors in parallel but you get the idea. Since the package is a common TO-type package, mounting to a heat sink is very easy with a simple screw and nut. The resistor is also insulated from the housing (up to 1,000 volts) so no special mounting kits are needed. Don't forget that you do need to heat sink these, however, and the use of silicon grease or other heat conducting paste between the resistor and whatever heat sink version you choose is also a good idea, especially for higher power levels. Remember, if you are dissipating any significant amount of power at all, the heat has to go somewhere. You can use any conductive metal surface, heat sink material or even a chassis but take care that whatever you do use can safely dissipate the power. Also, when you wire resistors in parallel as well as to appropriate connectors remember you are still dealing with RF so use as short a connecting lead as practical between the resistor and your coaxial connector. I did not try to use these immersed in oil, such as the older dummy loads were, but you can always try.

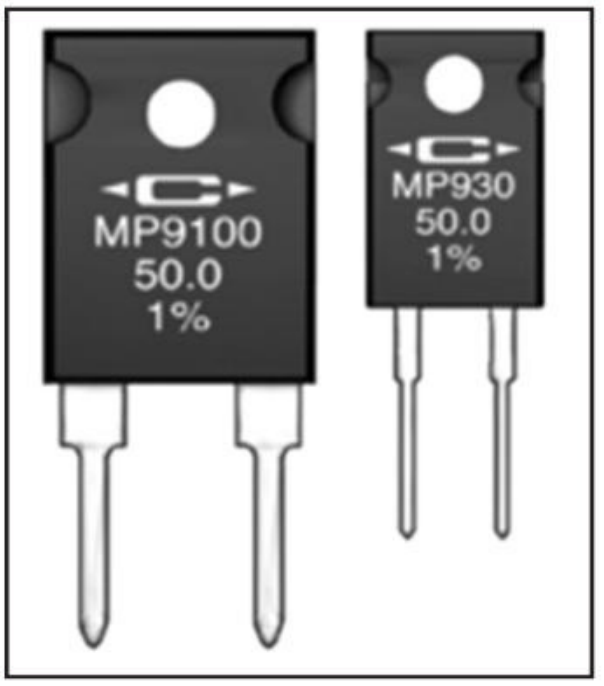


Figure 1. Thirty- and 100-watt non-inductive power resistors

Spare Power

Figure 2 is a method to either add a rechargeable battery backup to equipment lacking it or to add an external power supply to battery-powered equipment (such as a handie-talkie [HT]) that would benefit from this feature. In the circuit, two silicon diodes are arranged as an OR gate and allow whatever power supply voltage is higher to pass on to the equipment. In configuring such a circuit, the battery voltage should be what is normally recommended for the equipment to be powered and the external supply, which can be a wall type plug-in, should have a somewhat higher voltage rating but not necessarily with the same current rating, unless you wish it to also power the load when the battery is discharged. If so, then it should have a current rating that can handle the load. In any event, be sure to choose diodes that can carry the full current that will flow through the load-in operation and be aware that although the forward voltage drop of the diodes will only be 0.7 volts or so for common silicon devices, they may still dissipate significant power. If your load were to draw 5 amperes, for example, the diodes would dissipate 3.5 watts. The added resistor, by the way, is used to "trickle"-charge the battery when the external power is connected. It should be chosen so that the current flowing into the battery is about 5% or so of the recommended charging current of the units used. Remember we are not trying to charge the batteries instantly, we are only attempting to keep them "topped off" but when they are depleted they will then charge. Such a scheme switches instantly and you can go between external and internal power as quickly as you can change connectors.

Low-Cost Voltage Detector

Figure 3 is a way to detect the output from an HT (or cell phone if that is your

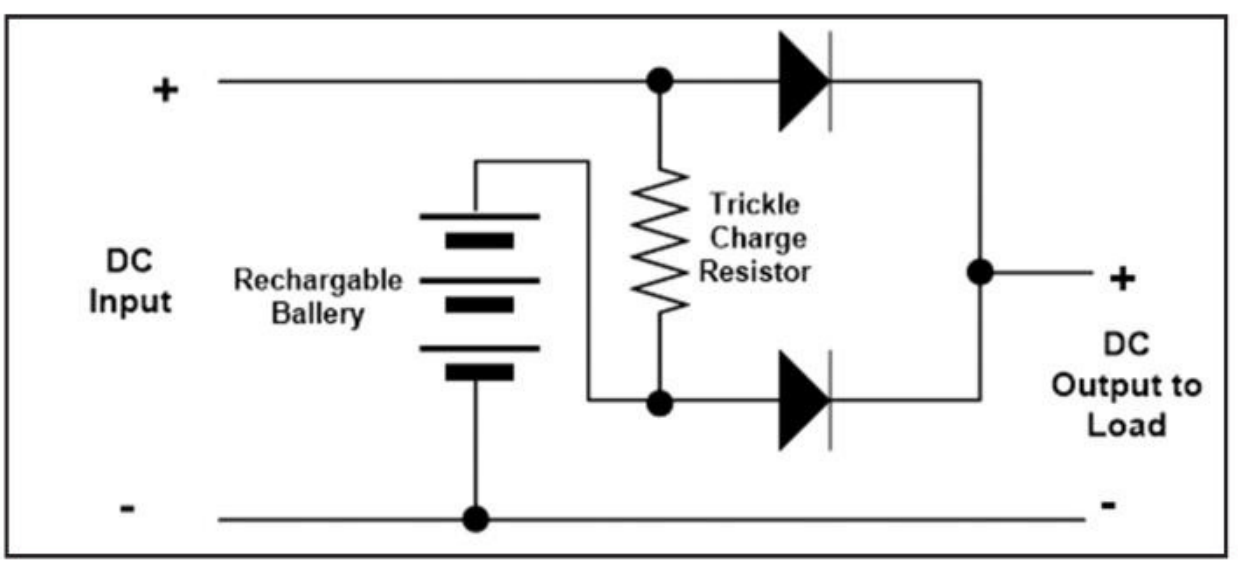


Figure 2. Simple battery scheme described in text

*c/o CQ magazine

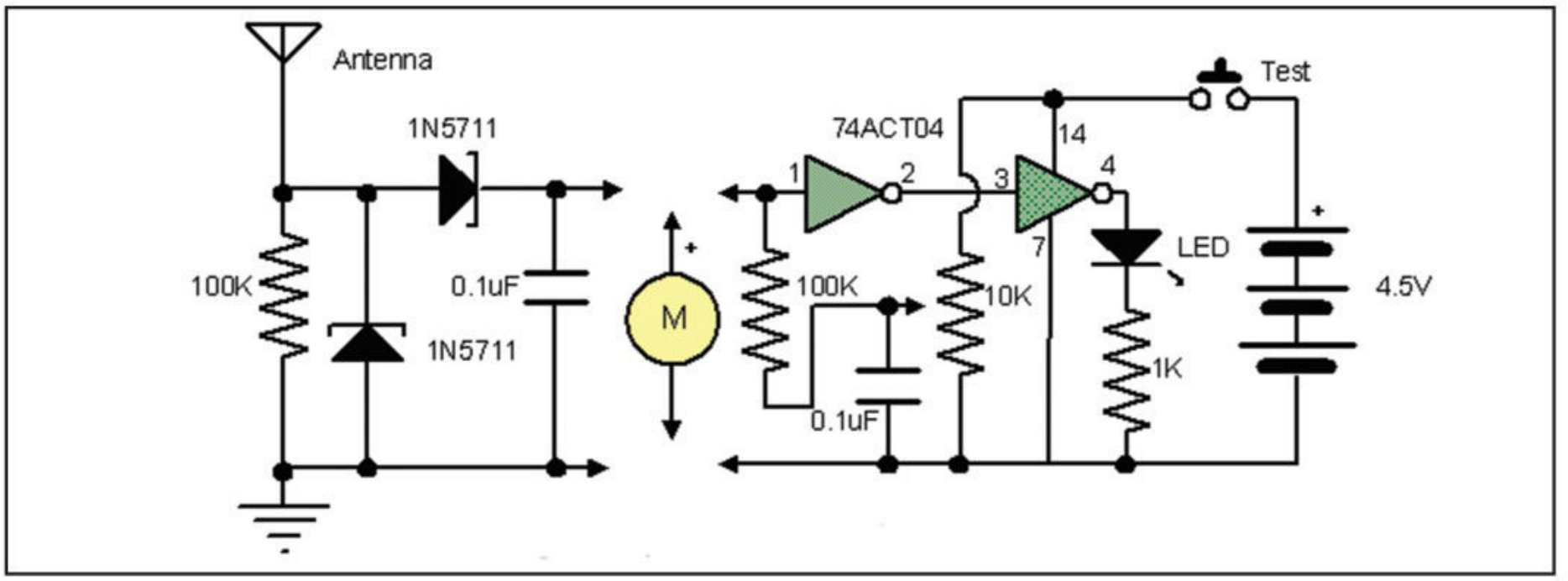


Figure 3. Simple RF voltage detector

preference) to see if it is actually working. Since both devices produce RF, all that is needed is a simple untuned diode detector. The schematic shows a simple version in which you only need a sensitive surplus panel meter (50 µA to 1 mA full scale), depending on how sensitive you want the detector to be. Such meters are available on the internet for little cost and in many forms. The schematic also shows a somewhat more elaborate version if you prefer an LED indicator instead of a meter. This will require a 7404-hex inverter, three AAA penlight batteries, and some associated components.

For the simple version, the panel meter simply indicates the relative strength of the RF signal. For the more complex version, the circuitry lights an indicator LED when RF is present. The 10K pot here is a sensitivity adjustment which is used to set the point where the LED turns on when the power is at a desired level. To adjust it, just turn on the device you wish to test and set the pot to the point where the LED just turns off. Then move it a slight distance toward the point where the LED just turns on.

In both versions the 1N5711 Schottky diodes are arranged in a voltage-doubler circuit to detect the RF. The resulting DC voltage is then filtered by the 0.1-µF capacitor and applied to either the panel meter or to the input of a 74ACT04 hex inverter. This inverter is then used to trigger the indicator LED. In this version, the 10K pot is adjusted just below the trigger point of the circuit and the push button is used to prevent battery drain when the unit is not being used. Any RF that is then "received" by the antenna is amplified and turns on the LED. Connections for either version are shown in the diagram. This circuit should work well into the VHF region if built carefully and its overall sensitivity will be determined by the length of the sensing antenna as well as its distance from the RF source. For HT work, 6 to 12 inches should be adequate.

I sincerely hope the above basic projects serve to spark your interest to the extent that you are actually motivated to try something. They are simple enough and may be just what you need to update and complete that project of yours.

– 73, Irwin, WA2NDM

the listening post

BY GERRY DEXTER

Mystery (Not) Colombian Station Remains a Mystery

~ That L.A. station on 4940 kHz is not from Colombia, it seems, but is simply relaying programs from LV du Conciencia, the HJ formerly on 6010 kHz, and its neighbor, Radio Alcaravan, on 5910 kHz. Thus, the confusion and the 4940-kHz mystery station remain unsolved. I heard all of this from the former QSL manager at Conciencia. The Conciencia station is not shown in the 2022 *World Radio TV Handbook* (WRTH), because my eyes aren't what they were, and there's all that small print too!

~ Every now and then we are faced with a news situation in which events move so quickly it is impossible for a print magazine to keep up. Such is the case with Russia's invasion of Ukraine. With the first month and a half in the book, things are still fluctuating. So, whatever I write now will be history by the time you read it. Thus, I've decided not to play that game. I'll just go with what information I've got at my deadline and hope for the best.

~ Right now, WTWW in Lebanon (Tennessee) is carrying a freedom program and several other broadcasters are beginning to get with it, including the Voice of America (VOA) which has added several hours to its coverage in Russian. No changes yet for Radio Free Europe, the most logical candidate for modifying their lineup.

~ Radio Vanuatu's third harmonic is again being heard on 11835 kHz in the very late evening / early morning.

~ The BBC is celebrating its 90th anniversary this year. That's a big deal but not quite the top of the line. KDKA (1020) in Pittsburgh has already passed 100 years and so has WHA (970) in Madison, Wisconsin. The two AM rivals can't seem to agree on who was first.

Listener Logs

Your shortwave broadcast station logs are always welcome. But please be sure to double or triple the space between the logs, list each log according to the station's home country and include your last name and state abbreviation after each. Also needed are spare QSLs (copies), station schedules, brochures, pennants, station or shack photos, and anything else you think might be of interest. The same holds for you amateur radio operators who also listen to shortwave (SW)

**c/o CQ magazine*

Ukraine, which I think most hams and shortwave listeners could easily find on a map. Not sure about the rest.

Vatican Radio has also added broadcasts during the Ukraine war.

broadcasts. I know you're out there! You, too, are most welcome to contribute!!

Here are this month's logs. All times are in UTC. If no language is indicated, then English is assumed.

ALASKA—KNLS via Anchor Point on 7355 at 1255 with station ID, frequencies and website. (Brossell, WI) On 9580 with program lineup at 1402 and then into a pop number. (Sellers, BC)

ALGERIA—Radio Algerienne on 9585 via Issoudun at 2147-2200* with several men speaking in Arabic, carrier off at the top of the hour. (D'Angelo, PA)

ASCENSION ISLAND—BBC-North Atlantic Relay on 12095 at 2109 on Russian war crimes; on 11810 at 2127. (Taylor, WI) On 15400 with news at 1802. (Brossell, WI)

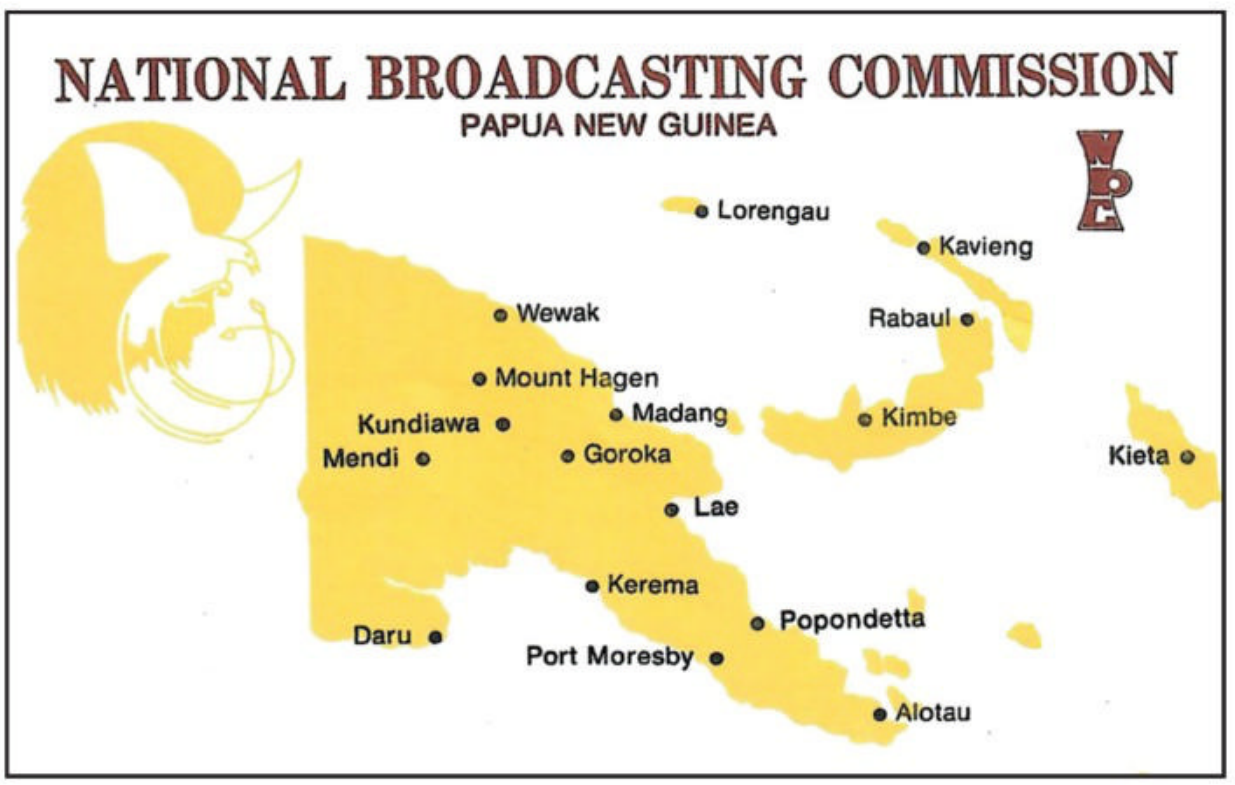
AUSTRIA—Adventist World Radio on 6155 via Moosbrunn with woman reading the news in German at 0509, followed by a man speaking, then classical music from 0530. (D'Angelo, PA) On 11955 in Turkish at 1523. (Brossell, WI)

AUSTRALIA—Reach Beyond on 9610 via Kununurra in Hindi at 1238 with a South Asian song, possibly Christian, last verse was "Hallelujah;" on 11905 at 1127 in English station IDs then into Rohinga; on 12010 in Tsngla at 1110 with IS, English station ID, Southeast Asian music, and woman speaking from 1130. (Taylor, WI) At 1313 on 9610 in Tamil with closing announcements, addresses, English station ID, email address and a Bible message; on 9720 in English at 1438. (*English is scheduled Monday, Wednesday, Friday, Saturday, and Sunday at 1315-1330 –GLD*) (Sellers, BC) On 11900 in Kurdish at 1248. (Brossell, WI)

BOLIVIA—Mosoj Chaski via Cochabamba on 3310 at 0123 in Spanish with woman and man speaking Spanish but suffering from periodic radar blasts. (Taylor, WI)

BOTSWANA—Voice of America (VOA)-Mopeng Hill Relay on 15580 at 1833 with a brief discussion on the Milwaukee Bucks. (Brossell, WI)

BRAZIL—Radio Brazil Central via



PNG's NBC used to have outlets in most of these sites, today not so much ... barely a handful.

Goiania on11815 at 2235 with a man and woman speaking Portuguese and Brazilian pop music. (Taylor, WI)

CANADA—Bible Voice on 11790 via Nauen in Amharic at 1719. (Brossell, WI)

CHINA—China Radio International on 11675 via Urumqi in Hindi at 1311. (Brossell, WI)

CNR-2 on 6090 via Ge'ermu in Mandarin at 1278 with fanfare, station ID, and announcements. (Taylor, WI)

PBS Sichuan on 7225 via Chengdu at 1119 with woman and man speaking in Tibetan. (Taylor, WI)

PBS Nei Menggu on 7420 via Hohhot in Mandarin at 1046 with woman talking. (Taylor, WI)

PBS Xinjiang on 7275 via (possibly) Urumqi at 1054 with man and woman speaking Uighur in short sections. (Taylor, WI)

PBS on 11630 via Lingshi in Kazakh at 1243. (Brossell, WI)

Biebu Bay Radio on 9820 via Nanning with man and woman alternately talking in Zhuang at 1212. (Taylor, WI)

EGYPT—Radio Cairo on 9440 via Abis at 2233 with man and woman speaking in English and the usual poor modulation plus an annoying whine; on 9809.7 with a man talking over Middle Eastern music. (Taylor, WI) On 9885 via Abis at 2330 with time pips, man speaking in Arabic, occasional vocals and five more pips at the top of the hour. (D'Angelo, PA) On 9900 at 2215 with news and terrible modulation. (Brossell, WI)

ENGLAND—BBC on 11805 via the Oman Relay with English interview ending program, off before 1400. (Sellers, BC)

ESWATINI—Trans World Radio on 15105 via Mpangela Ranch in Lingala at 2002. (Brossell, WI)

FRANCE—Radio France Intl. on 11700 via Issoudun with man speaking in Hausa, music, man and woman talking, and closed at 2359. (D'Angelo, PA)

GERMANY—Deutsche Welle on 15275 via France at 1618 with interview in Amharic. (Brossell, WI)

GUAM—Adventist World Radio on 12080 via Agat at 1600 with sign-on and program opening into unidentified language not shown in the lists, website lists language as Telugu. (Sellers, BC)

INDIA—All India Radio on 11560 via Bengaluru at 1342 in Dari. (Brossell, WI) At 1357 in Pashto with Southeast Asian music and male announcer. (Taylor, WI)

TWR India via Armenia at 1451 with woman speaking in English and a Christian message. (Sellers, BC)

IRAN—VOIRI on 11630 via Sirjan in Hausa at 2308 with male announcer for over 20 minutes. (Taylor, WI)

JAPAN—Radio Japan on 11815 via Yamata with English sign on at 1400, time pip, and news. (Sellers, BC)

MADAGSCAR—African Pathways Radio on 11695 via Mahajanga at 2045 with "Doxology" program. (Brossell, WI)

MALAYSIA—Wai FM on 11665 via Kajang at 1115 in Malay, man hosting program with contemporary music. (Taylor, WI)

MALI—RTV Mali on 5995 via Bamako at 0601 in Bambara with xylophone-like instrumental music, then a man talking at length. (Taylor, WI)

NEW ZEALAND—RNZI on 5980 on Mahalia Jackson at 1338. (Sellers, BC) On 9700 via Rangitaiki at 1246 carrying ABC Wantok (PNG) with an interview in Tok Pisin. (Taylor, WI)

NORTH KOREA—Voice of Korea on 9435 via Kujang in English at 1309 with news; on 11710 it was inaudible. (Sellers, BC)

OPPOSITION—Dimtse Woyane (via France to Eritrea) on 15160 at 1513 in Tigrinya. (Brossell, WI)

Radiyouni Dieree Shaggar (via France to Eritrea) on 15415 at 2605 with man talking under dominating pulse jammer, likely from Ethiopia. (Taylor, WI)

Manara Radio Intl. (via France to Nigeria) on 15285 in Hausa at 1608. (Brossell, WI) At 1611 before quickly fading. (D'Angelo, PA)

Nippon No Kaze (via Taiwan to North Korea) on 9940 in Korean at 1304 with woman, then man with deliberate speaking styles, rumbling hum on frequency was possible DPRK jamming. (Taylor, WI) Also heard at 1307. (Brossell, WI)

Echo of Hope (South Korea to North) on 4885 at 1115 with man and calm talk. (Taylor, WI) On 6335 at 1241 with woman speaking in English and Taiwan headlines, news program from EBS-FM in Taiwan. (Sellers, BC)

Furusato No Kaze (Taiwan to North Korea) on 9685 in Japanese at 1458 with woman singing traditional Japanese vocals. (Taylor, WI)

Radio Dabanga (via Vatican to Sudan) in Sudanese Arabic at 1608. (Brossell, WI)

Denge Welat (via Moldova to Turkey) on 11530 at 1237 in Kurdish. (Brossell, WI)

Republic of Yemen Radio (Saudi Arabia to Yemen) on 11860 with man speaking in Arabic occasionally through telephone-like tones, never noted the tone effect before. (Taylor, WI)

PERU—Radio Tarma via Tarma on 4775 at 1049 with contemporary OA music, station ID bumper, into bass-voiced man and more music, CODAR was a problem. (Taylor, WI)

Radio Logos possibly via Chazuta on 4810 with man singing a slow ballad, maybe station ID at 1029, more ballads and flutes. (Taylor, WI)

PHILIPPINES—Far East Broadcasting on 12095 via Bocaue in Black Tai at 1300, IS, woman giving probable station ID, long talks by man and woman; on 12120 via Bocaue at 1245 in Chin-Daai, poor, with man talking. (Taylor, WI)

PIRATES—Piss Ant Radio on 6935 upper sideband (u) mostly guitars at 0134, some slow-scan TV (SSTV), the last one showing a QSL. **Radio Cidades** on 10230 at 2346 in Portuguese with weak music, station ID from HF Underground. **WJCS** on 6880u at 0106 music (in order) from Jesus Christ Superstar, off at 0203. **Angry Cow Radio** on 6932u at 0141 with chaotic selections, cow moos, rap, station ID, speech loop, Eddie Arnold number, ZZ Top, and off in mid song. **WHIZ** on 6935 at 0027 with light vocals, man giving possible station ID, and gone by 0135. (Taylor, WI)

Egypt has fascinating museums, but Radio Cairo couldn't even modulate the Great Barrier Reef!

CHIL on 9500u with instrumental music, woman giving station ID at 2329; at 2339, the woman read another station ID followed by more soft music. **Fubar Radio** on 6903u at 0219 mentioning "this is live radio," AC hum and buzz. **WDDR** on 6915/6900u at 0105. **The Coconut Radio** on 6950u at 2232 noisy under QRN. (Hassig, IL)

Previously Reported: **Yeah Man**, **Damn Skippy**, **WDOG**, **XFM**, **Radios Ballsmacker**, **Two Dog**, **Outhouse**, **Wolverine**, **WTF Worldwide**, **Clever Name**, **Captain Morgan**.

ROMANIA—RRI on 9740 via Galbeni at 2038 on global warming. (Brossell, WI)

SAO TOME—VOA Relay on 11900 via Pinheira in French at 2001. (Brossell, WI)

SINGAPORE—BBC-Far East Relay on 12025 at 1537 with interview of a Ukrainian escapee. (Sellers, BC)

SOUTH KOREA—KBS World Radio on 9570 via Kimjae at 1321 with man and woman talking and reading the news. (Sellers, BC)

SWEDEN—IBRA Radio on 9840 via Tashkent (Uzbekistan) at 0004 in Bengali with South Asian song, radio play, woman reading the closing announcements and off at 0030. (Taylor, WI)

TAIWAN—Radio Taiwan on 9400 via Tamsui at 1601 welcoming listeners, plus program preview. (Sellers, BC) On 9900 at 2247 with woman speaking in Chinese; on 9555 via Paochung in Mandarin at 1227. (Brossell, WI)

UNITED STATES—Voice of America via Vatican at 0354 to 0359*. (D'Angelo, PA) On 7480 via the Thailand Relay in Mandarin at 1319. (Brossell, WI)

Radio Mashaal/VOA on 15365 via the Thailand relay in Pashto at 1257. (Taylor, WI)

Radio Liberty on 11790 via the Kuwait relay in Uzbek at 1429; on 17880 via the Thailand relay in Dari at 1230. (Taylor, WI)

Radio Free Asia, on 9355 via the Northern Marianas relay, English station ID at 1430 and into Khmer. (Sellers, BC) On 9370 via Tajikistan at 1236 in Burmese. (Taylor, WI) On 11855 via the Northern Marianas relay in Tibetan at 1348. (Brossell, WI)

Radio Ashna on 7285 via the Lampertheim relay at 0030 with woman speaking in Pashto, IS, announcements, and into Afghan music. (Taylor, WI)

Adventist World Radio on 11790 via Nauen with woman giving a long talk in Yoruba, then closed at 2059. (D'Angelo, PA) On 11985 via Madagascar at 2111 with religious program for Nigeria; on 15430 via Sri Lanka in Meithei at 1257. (Brossell, WI)

WRNO via New Orleans on 7505 at 0339 with man speaking in Hindi followed by a woman giving English station ID, email addresses, and prayer requests. (D'Angelo, PA)

WTWW via Lebanon, Tennessee on 9940 at 2031 welcoming to "Voice of Freedom" program, later announcements mentioned it was a temporary program and appealed for donations to continue. (Taylor, WI)

VATICAN—Vatican Radio on 7320 via Philippines at 1443 in Hindi; on 11620 via SM Galeria at 1512 with unscheduled English broadcast of two men discussing the Christian faith, saying thanks for tuning in, website, into schedule at 1530. (Sellers, BC) On 9610 via SM Galeria in Russian at 1237. (Brossell, WI)

VIETNAM—Voice of Vietnam on 7435 at 1057 in Vietnamese with man and woman reading announcements over music; on 7285 via Sontay at 1136 in Lao with man and woman talking and music; on 11885 in Russian at 1653. (Taylor, WI) On 9840 via Sontay at 1330 with woman reading the news in English; on 12020 & 11885 at 1603, again with woman reading the news in English. (Sellers, BC)

Quien Sabe

~ Mark Taylor reports an unknown on 5980 kHz at 0810 UTC with a bass-voiced man giving a sermon or a political talk through the bottom of the hour in an unidentified language and a second bass-voiced man occasionally in QRN-dominant weak signal. No clues in HFCC, AOKI, or EIBI lists. Mark had to call it quits by 0835 UTC.

Bill Whitacre, now retired from the frequency division at the Voice of America, poses at one of the several VOA road signs.

QSL Quests

The mail person ignored us again this month.

Back in the Day

~ Radio Bertoua via Bertoua, Cameroon on 4750 at 2150 with a domestic service in French on September 11, 1979.

Just Sayin'

As I said at the outset, the Ukrainian situation is moving so fast it's becoming a Road Runner rival. But, so far, USAGM is proving to be very slow in reacting. A few changes at the VOA and one or two by the private voices. But where is a "Radio Free Ukraine" or a similar government vehicle? The obvious participants (Radio Free Europe?) seem to be asleep!

Thanks for Your Logs

Thanks to the good guys who provided their reports, which included: Mark Taylor, Madison, WI; William Hassig, Mt. Pleasant, IL; Harold Sellers, Vernon, BC; Bob Brossell, Pewaukee, WI; and Rich D'Angelo, Wyomissing, PA ... and please remember to **CELEBRATE SHORTWAVE!**

emergency communications

BY JOHN FERGUSON,* K3PFW

It's a Disaster! What Am I Going to Do?

Since this column is about emergency communication, let's attempt to define and differentiate, *emergency* and *disaster*. Disasters by their nature are large in scope. Emergencies, on the other hand, tend to be smaller. Unless, that is, it happens to you; then it's humongous! So, what is the definition of an emergency? In last month's column, we said, "it is any occurrence that presents an immediate risk to life or property, interrupting the normal activities or processes." In other words, you've got to take care of it right now; time is of essence. Disasters seem to evolve over time, and can be defined as an expanding number of individual, interrelated, emergencies. Yes, to the family that just lost their house to a fire, it's a disaster of great magnitude to them. This is where perception comes in. Also in disasters, as multiple individual emergencies occur, there will often be a shift in priorities by the authority managing the response and the recovery. This will occur because of changes in what's occurring at the moment. Needless to say, change will frequently create additional confusion in an already stressful situation.

The professional managers who have the statutory authority to direct the response and recovery are the ones from whom we take our direction. We are communicators, not emergency managers. They tell us what their needs and priorities are. We should not attempt to tell them what we should be doing. And, as priorities and directives change, we should smile and say, "on it," when redirected to another task. You, as a communicator, need to clearly understand your position and role in the local emergency management hierarchy, and "stay in your lane." The Incident Command System (ICS) now places communication assets wherever they are needed in the command structure for the incident, so be flexible.

Disaster Categories

We can categorize disasters into two groups; those that will naturally occur (thank you, Mother Nature) and those caused by man and his actions. There is some overlap, particularly with disasters involving fire. Fires are a frequent cause of disasters from the home of a single family, as above, to huge multiple-square-mile monsters, destroying everything in their path. Somewhere in between is the industrial / manufacturing complex, burning out of control, with explosions and hazardous chemical agents spreading through adjacent neighborhoods.

For the year 2020, there were 1,338,500 fires in the United States, causing 3,500 deaths, 15,200 injuries and $21.9 billion in property damage (NFPA report 2021). Chances are that sometime in your role as an emergency communicator, you will be dealing with a fire. That is not an "if," it's a "when." Your best resource for fire-related and electrical hazard issues is the National Fire Protection Association (NFPA).

** 20116 Donovans Rd.*
Georgetown, DE 19947
Email: <K3PFW@cq-amateur-radio.com>

We can categorize disasters into two groups; those that will naturally occur (thank you, Mother Nature) and those caused by man and his actions.

The NFPA is an international nonprofit organization devoted to reducing deaths, injuries, property and economic losses, due to fire, electrical, and related hazards.

Natural disasters seem to occur somewhere almost daily. The more you know about natural disasters, the better you will be able to perform in your role as a communicator when it really counts. There are floods, hurricanes, thunderstorms with hail, lightning, and tornadoes. These can all come at the same time in the same area with a major hurricane. Then there are extremes of heat and cold with blizzards, avalanches, heat waves, and droughts. From the geological side we get volcanoes, earthquakes, landslides, tidal waves, and tsunamis (yes, they're different). We've already mentioned fire as a crossover with wildfires and structure fires. Some of these disaster types are unique to particular geographic areas, here and around the world. Some come as a "double whammy," such as the earthquake, volcanic eruption, or major landslide that creates a tsunami. Multiple fires often accompany earthquakes in urban areas. Earthquakes are a force of nature, yet the issue of "fracking" raised the yearly number of earthquakes in Oklahoma. This is a crossover from man and his technology, exacerbating what is a naturally occurring type of disaster.

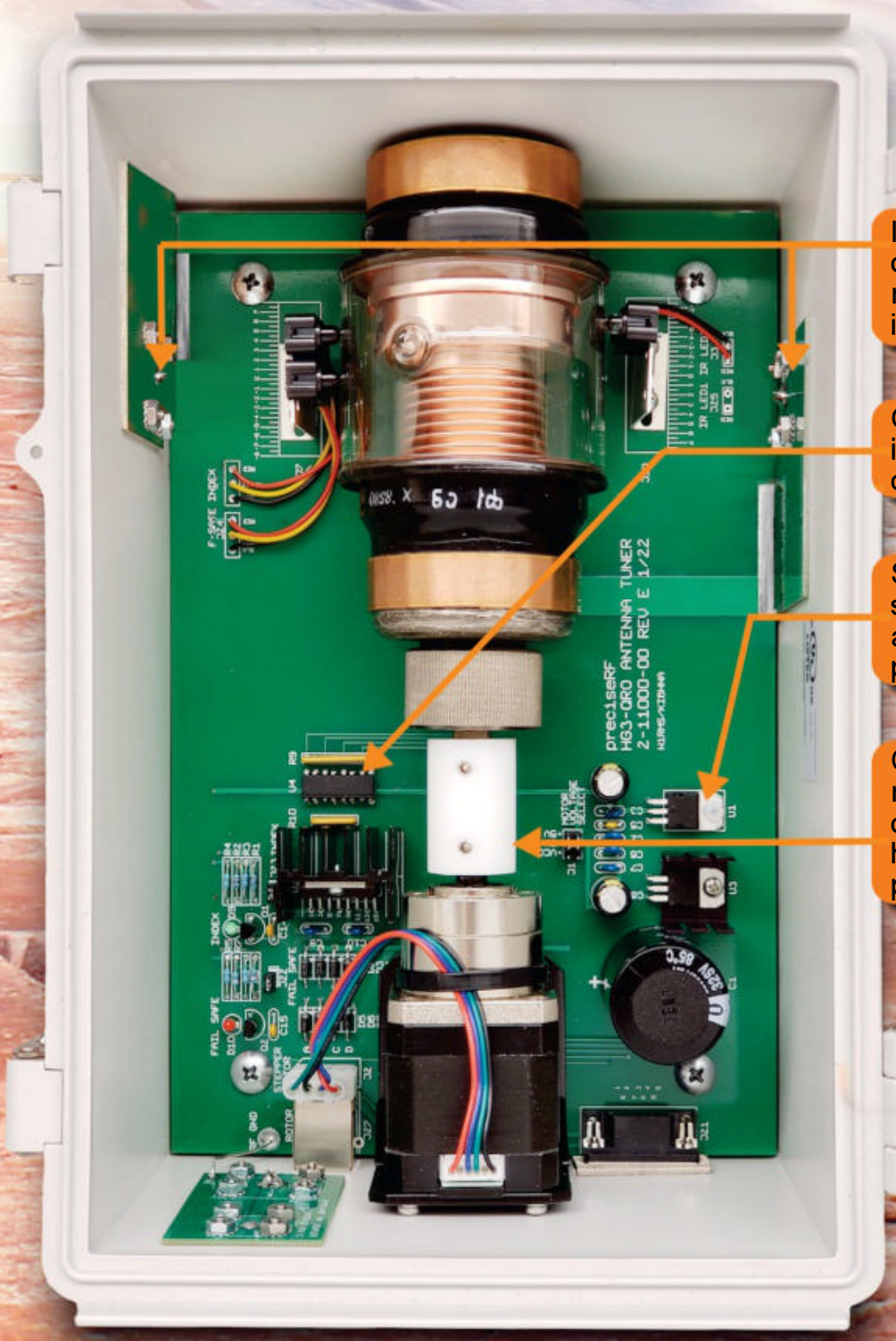
Then we have those disasters caused by man and his actions. We can list transportation incidents with multiple complications of fire, hazardous material, and explosions. We are regularly seeing multiple vehicle pileups on interstates due to weather. Let's not forget terrorism, both foreign and domestic, spanning a range of possible disaster-like consequences. Nobody can forget 9/11. The newcomer to the disaster list, cyber-attack, could be considered one of the threats of terrorism. There are also production and manufacturing-related incidents with release of hazardous substances, fires, and explosions. It seems that oil refineries, chemical plants, and fertilizer factories / storage facilities like to blow up in the middle of the night, often leading to evacuation of local neighborhoods. Nuclear power-related incidents — thankfully rare — but with devastating consequences when they do occur.

A common issue with most disasters affecting public safety is the consequential need for an evacuation. It's just a matter of scale. A house fire in a development might require one as well as a coastal hurricane. Then the evacuation on its own merits can create a disaster within the disaster when "gridlock" occurs on the evacuation routes as the number of vehicles overwhelms the transportation infrastructure. And, then we had the gas stations running out of gas, as we saw in Florida several years ago. The issue is very real here on the Delmarva Peninsula, rated by the Federal Emergency Management Agency (FEMA) as the third-most

COMPROMISE WAS NOT AN OPTION FOR THE NEW HG3 QRO-A!

No Compromises Mag Loop
The new HG3 QRO-A raised the bar again for Magnetic Loop Antennas (MLA). MLAs are well known for their superior performance. The remotely tuned HG3 QRO-A MLA covers 80*-10 meters with stepper motor precision and resolution. The high Q vacuum capacitor allows for 1.5 KW PEP*. The 45,000-step resolution delivers an unprecedented 511 Hz resolution bandwidth allowing you to set your band preferences spot on. Rapid-Tune automatically scans each band for the lowest SWR and works with most HF radios.

It Pays to Pay Attention
How do you make a great product even better? You listen to your customers.The heart of an MLA is the tuner. We made so many improvements to it that we now call it the HG3 QRO-A. The HG3 Plus Controller also received new firmware and an improved SWR function. *Some limitations may apply or are optional.



HG3 QRO-A Improvements:

- Integrated capacitor to radiator connections with six times more copper surface area for improved efficiency
- Optical isolated driver interface allows for a longer control cable and RFI rejection
- Separate logic circuit and stepper motor power supplies allow for smoother and more precise tuning
- Custom high voltage Delrin motor to capacitor shaft coupler provides for greater high power and high voltage protection

Check Preciserf.com for all our high performance Magnetic Loop Antennas

preciseRf
PRECISERF.COM ™

13690 Wisteria Dr. NE Aurora, OR 97002
• ph: 503-915-2490 • preciserf.com •

difficult place in the “lower 48” to evacuate. It has been a topic of discussion at the Sussex County (DE) EOC as each June marks the start of hurricane season. Two of the three major evacuation routes run through the county. The Delmarva (containing all of Delaware and portions of Maryland and Virginia) is called a peninsula, but it is in reality an island. A sea-level canal, the Chesapeake and Delaware, isolates the southern three fourths of the peninsula from the mainland. There are seven bridges that will close to traffic when sustained target wind speeds from 40 to 55 miles per hour are reached, effectively trapping the remaining populace. Evacuation planning deficiencies in Hurricanes Katrina and Rita, and the subsequent large number of fatalities, lead to FEMA-mandated changes in emergency management response plans for evacuations.

As communicators, our role is to support the response and recovery operations associated with emergencies and disasters and is directed by the “authority having jurisdiction,” or the “AHJ.” Titles, departments, and governmental agencies may differ from country to country, state to state and municipality to municipality. We can best perform our role if we are prepared with knowledge, skills, and experience applicable to the tasks we may be assigned to. And make sure you have at least the minimum required Incident Command System (ICS) training. It will help you understand the actions of emergency management. The more you know about the types of disasters you may be involved in, the better you will perform in your role as an emergency communicator.

Most weather-related disasters come with some warning. That could be days if we are talking hurricanes, minutes for tornados. Use the time wisely! Figure about three days before landfall for a reasonably good forecast of what to expect from a hurricane (tropical cyclone). For those of you on the west coast, a hurricane making landfall is a rare occurrence. On the other hand, for those of us on the eastern seaboard and Gulf Coast, they are not rare at all. Typhoons are the tropical cyclones of the Pacific basin. This yearly run through the alphabet we’ve been experiencing during hurricane season is really getting old. Hurricanes bring wind, rain, thunderstorms, and even tornados. These often occur in the right front quadrant, embedded in the thunderstorms, making them difficult to spot. The newer series of NWS Doppler radar, however, does an excellent job of picking them out. Thunderstorms also bring lightning, which can start fires and knock out power. The storm surge from a hurricane is deadly. It is the factor responsible for most of the fatalities during landfall. Tidal flooding can have far-reaching effects in the coastal interiors. Coming ashore, hurricanes usually start to downgrade quickly to tropical storm status with rainfall causing flooding that can affect areas not in the storm’s path. A close relative of the tropical cyclone, the nor’easter, has typically caused more damage on the Delmarva Peninsula than hurricanes. Nor’easters are common from the Mid Atlantic to New England. You can think of them as “cold weather hurricanes.”

Severe thunderstorms are dangerous in their own right, bringing damaging wind gusts, lightning, hail, and tornados.

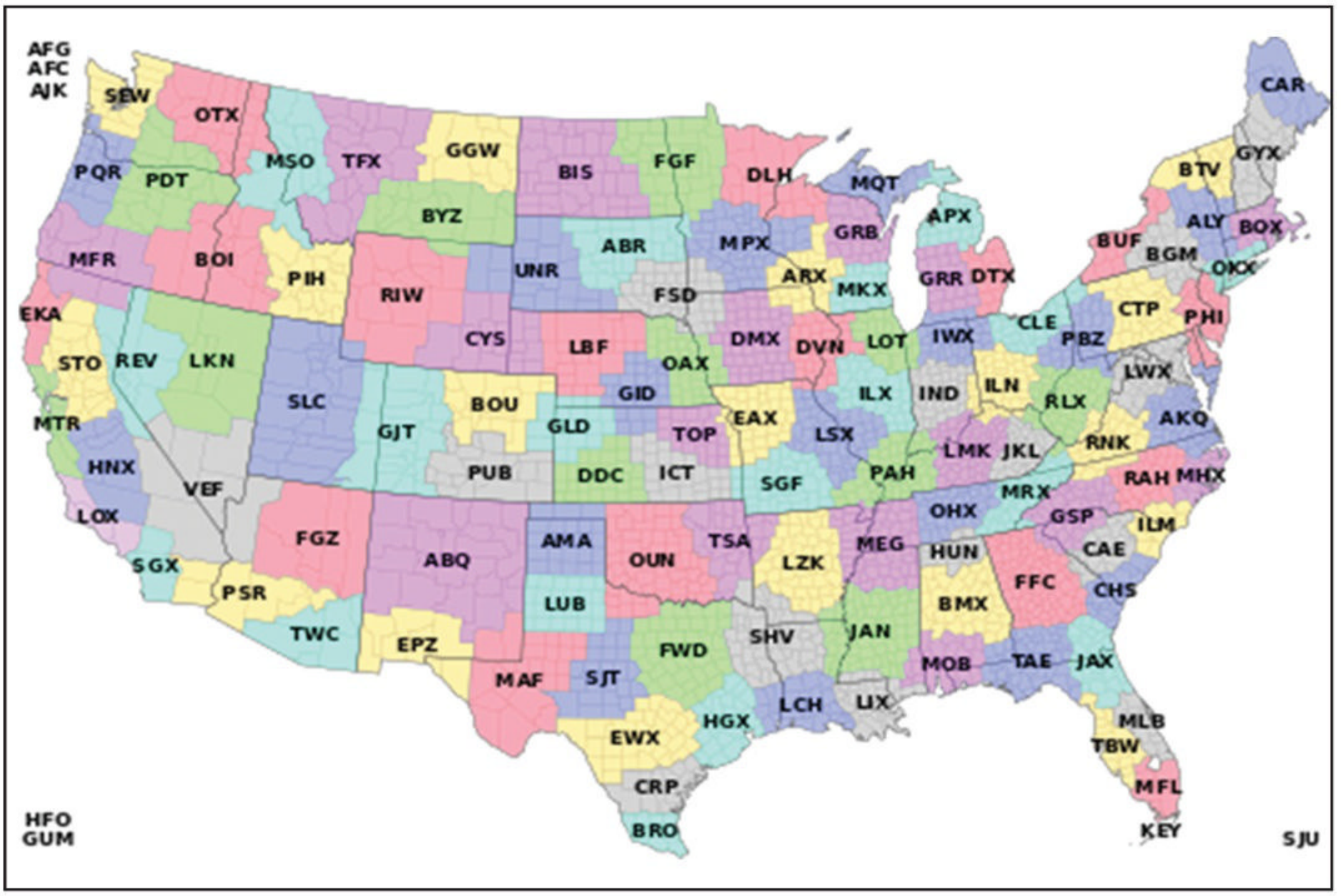


Figure 1. Map of National Weather Service local weather forecast offices (WFOs) with their three-letter designators. Use the web address in the main text, substituting the designator of your choice for the “XXX” to access local information for that area. (Courtesy National Weather Service)

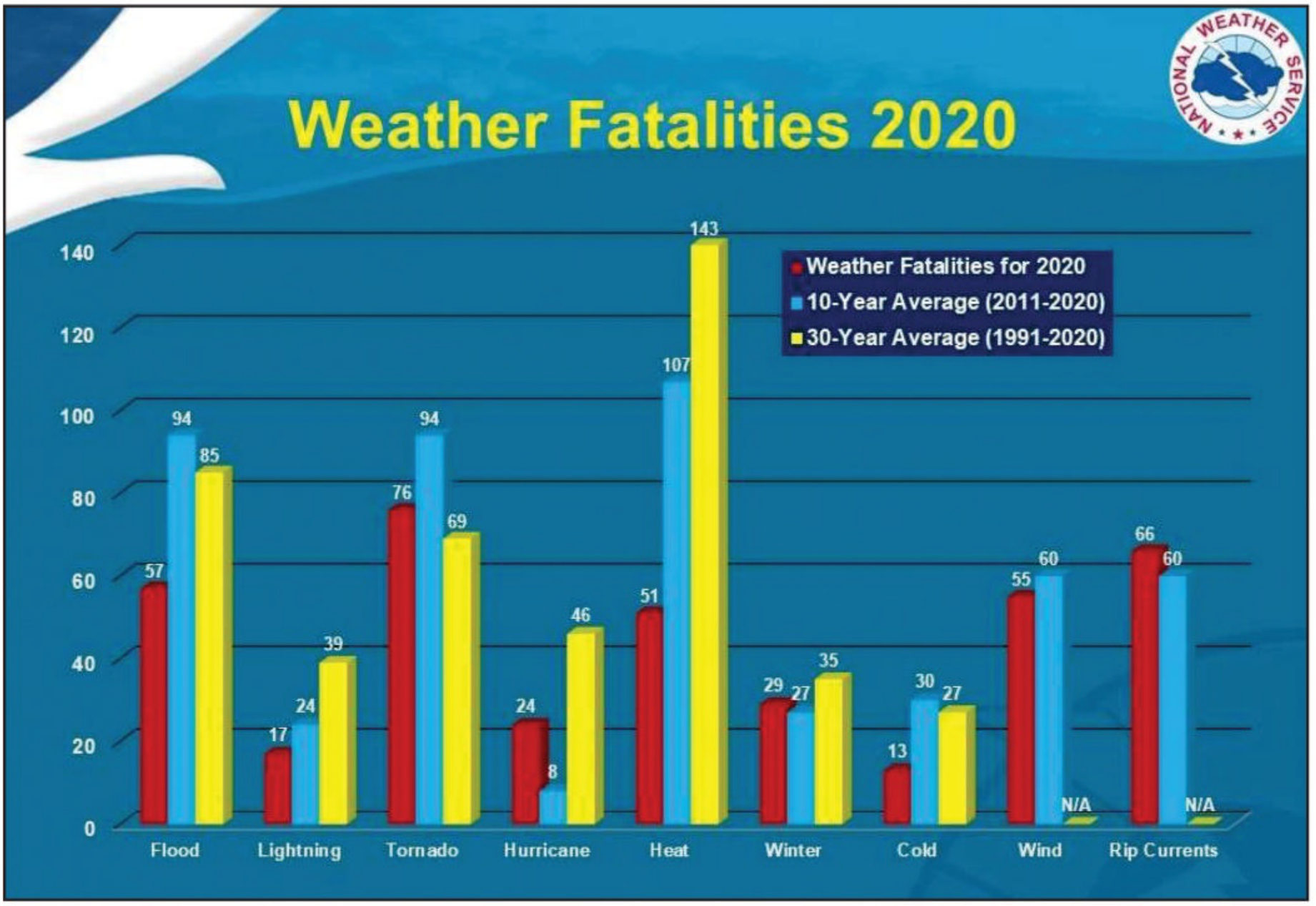


Figure 2. NWS graph of weather-related fatalities for 2020 (the most recent year available), along with 10- and 30-year averages, broken down by type of weather event. (Courtesy National Weather Service)

With the "unsettled" (we're not supposed to call it "disturbed") weather patterns of the last few years there are now frequently tornados occurring outside of the traditional "Tornado Alley." Tornados are a product of severe thunderstorms, causing minor to major damage and deaths. Occurring primarily in the central part of United States, they can occur anywhere if the weather conditions are favorable.

Timely warnings of impending weather-related incidents come from the National Weather Service, with its 122 Weather Forecast Offices (WFOs) providing daily forecast services across the United States and its possessions. These offices are a great resource for information about all types of weather and related issues. The NOAA Storm Prediction Center (SPC) in Norman, Oklahoma, predicts and tracks severe weather occurrences across the United States. It is probably best known for its tornado and severe thunderstorm warnings. The National Hurricane Center (NHC) in Miami, Florida, provides hurricane tracking and prediction products internationally. These are the resources you should be familiar with, and use, on a regular basis. Quick access to a range of information from the NWS Forecast Office in your area, referred to as its County Warning Area (CWA), can be had by the link, <www.weather.gov/xxx>, where "XXX" is the three-letter designator for your local office. *Figure 1* is a map of the local WFOs with their three-letter designators. For example, I'm in Sussex County, Delaware, which is in the NWS Philadelphia Office County Warning Area, so that would be <www.weather.gov/phi>. Using this link, with the appropriate three-letter designator, can give you quick access to weather conditions anywhere in the country. You will notice that some of the county warning areas cross state lines, and in some cases, adjacent counties in the same state will be part of different CWAs. This can create confusion, and has historically, when the emergency managers on opposite sides of the lines have different ideas about their response plan for the developing situation. Bad things have happened in the past. There are now federally mandated cooperative agreement stipulations in place, particularly when evacuations are called for. Weather-related fatalities are not as high as fire fatalities. The chart in *Figure 2* presents the 388 weather-related deaths for 2020. However, what is interesting are the 10-year and 30-year averages, the majority well above the featured year. Education of the populace, better warning systems, and a robust emergency management presence, have been effective in reducing fatalities. We cannot become complacent. Mother Nature is relentless and unforgiving of poor judgement and bad planning.

The Weather Channel is also a great source for weather information 24 hours a day. It is presented in a very visual format.

The Weather Channel is also a great source for weather information 24 hours a day. It is presented in a very visual format. Our EOC uses four weather forecasting sources when the center is activated; a contract service that gives us

The technology of ham radio and the scope of disaster management are continually evolving. New ideas and techniques are presented frequently.

almost immediate access to a forecaster, two National Weather Service offices and the Weather Channel. Sussex County (DE) is in the Philadelphia Office CWA, the adjacent counties to the south are in the Wakefield, Virginia CWA. Weather does not recognize political boundaries, and since most of our major storms come from the south, we like to get a preview of what to expect. By law, management decisions must be made on the basis of the NWS forecast. During a hurricane activation the National Hurricane Center is added to the list.

Geological disasters such as damaging earthquakes and major volcanic eruptions are relatively rare today in the United States. They usually occur with little, if any, advance warning; although ongoing research is making some headway in the science of warnings. Major earthquakes, when they occur, are catastrophic. There are minor earthquakes going on all the time around the world hardly noticed by most of the populations. The damage from an earthquake, particularly in a developed area, will present a multi-hazard response problem for emergency management. Improved building codes for earthquake-prone areas have reduced the number of fatalities and additional consequential damage issues. Volcanic eruptions are accompanied by large clouds of ash, airborne debris, and lava flows. Toxic gases are also present around the crater. Evacuation orders are usually mandatory.

Tsunamis and tidal waves are a threat to coastal areas around the world. They are caused primarily by seismic activity. However, landslides and volcanic activity can also cause them. A tsunami wave is barely detectable over deep water, but builds in height as it approaches the shallow shoreline. There is usually a reasonable degree of warning if the epicenter of the cause was at some distance from the shore. Damage and loss of life is right up there with the related storm surge of a hurricane. Five countries, Australia, Chile, India, Japan, and the United States, have sophisticated tsunami warning systems in place, and share data internationally. There was an excellent article on a tsunami communication exercise in the May issue of *CQ*. Historically, before warning systems were developed, loss of life was tremendous.

Transportation and Manufacturing Incidents

Incidents involving transportation and manufacturing activities are usually multiple-hazard in nature. Transportation accidents involving spills of hazardous and/or flammable material quickly escalate the response to the incident, as multiple agencies respond. The manufacturing, processing, and storage of all the "stuff" that society needs and consumes provides a ripe venue for an incident with multiple hazards and multiple agency response. Almost always, agencies with environmental protection jurisdiction will be part of the response, and frequently in the recovery phase as well. Information on local concerns for industrial and manufacturing-related sites that could be a source of concern is collected by your Local Emergency Planning Committee (LEPC). Under the Emergency Planning and Community Right-to-Know Act (EPCRA), Local Emergency Planning Committees (LEPCs) must develop an emergency response plan, review the plan at least annually, and provide information about chemicals in the community to citizens. Plans are developed by LEPCs with local authority, business, and citizen participation. There is one LEPC for each of the more than 3,000 designated local emergency planning districts (Source: Wikipedia). To find your local LEPC, type in "LEPC" to your favorite search engine and it should bring up your local committee information.

From Response to Recovery

A famous quote from Yogi Berra, catcher for the New York Yankees, "it ain't over 'til it's over," can be applied to any accident, disaster, or incident that you might run into. Response issues to a developing incident are matched by the problems of recovery. The log may be closed on the response, but the recovery is what will, hopefully, restore things to a degree of normalcy, and eventually pass into barely remembered history. Recovery almost always involves multiple agencies.

During the initial and developing phases of a disaster, the agencies involved were the first responders. These are the "get there, get it done, and return to barn for the next one," organizations. Recovery will now have the politicians, social services, environmental protection agencies, contractors, and private companies involved. The list will be long and the progress slow. There will be legal issues, lawsuits, and court hearings. The response will be judged by those who often have no experience or understanding of the issues involved. Recovery can and will take time. Usually more than the initial estimate. The greater the disaster, the longer the recovery. There will be those disasters from which affected areas never completely recover. Scars will remain. The physical, emotional, and psychological issues of the victims can remain for a lifetime. The memory of the "bad ones" can remain with the responders, sometimes for their lifetime. PTSD is real.

Ham Radio's Contribution

So, what can you do, the foregoing notwithstanding, if you are still interested in using this great hobby of ours to serve your community? If so, I'll say, "welcome aboard!" The journey will sometimes be difficult, but I can assure you it won't be boring. However, let me state that in emergency and disaster communications, there are two possibilities. One, you are part of the solution by being trained and prepared, both you and your family. The second possibility, that without preparation and training, you will become part of the problem. That would not be good.

Opportunities abound for you to get the training that you will need. There are online courses and there are local opportunities for training with emergency communication groups in your area. Start with the local ham clubs if you are not already a member of one. Consider becoming a member of the national amateur radio association in your country, if you aren't one already. All of the national organizations have organized programs for emergency communication response and sponsor local groups, hopefully in your area. That is the first step.

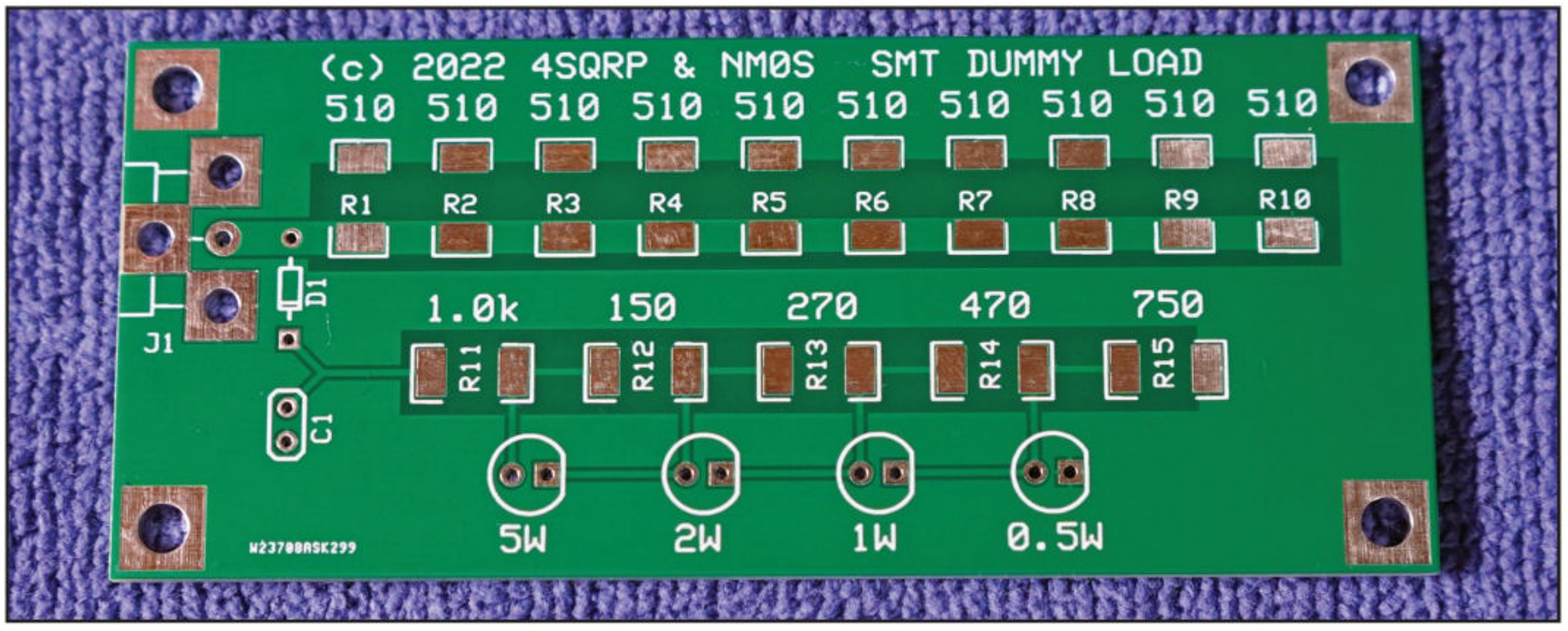
The second step is a critical one. You and your family must be prepared to safely ride out any disaster that would affect your local area. You must be comfortable with the situation you would leave your family in, if you are going off to support the communication emergency. Get the whole family involved in the planning. There are many free programs available to help you determine how they, and you, will weather the storm. In this endeavor, you will never stop learning. We will explore this in next month's column. The technology of ham radio and the scope of disaster management are continually evolving. New ideas and techniques are presented frequently. Again, welcome aboard, it will be one heck of a ride.– *73, de K3PFW*

kit building

BY JOE EISENBERG,* K0NEB

Scratching the Surface (Mount)

Four State QRP Group SMT Dummy Load Kit



The Four State QRP Group's SMT Dummy Load kit PC board.

With a cluster of hamfests recently, I have delayed completing the SW40+ kit for a couple of weeks. That doesn't mean there aren't kits to bring to you here and the Four State QRP Group has a great one that will be very useful for a kit builder.

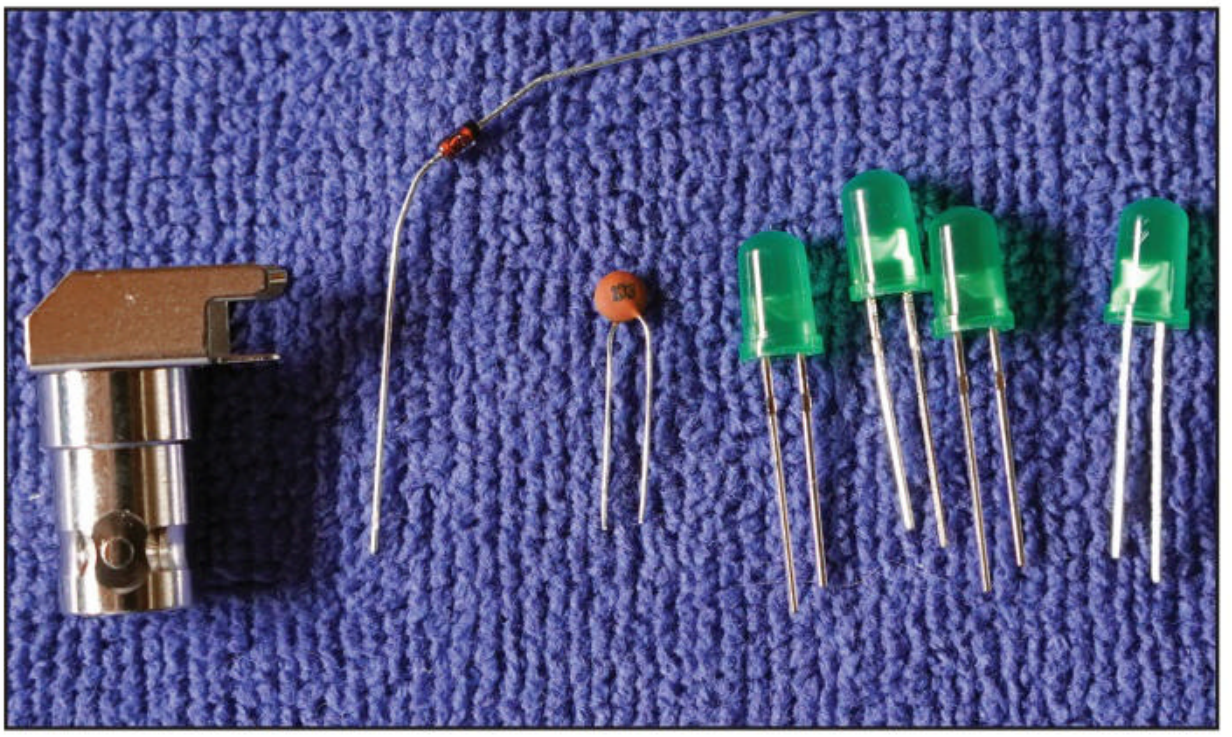
I often mention in my seminars the importance of having a proper dummy load available when testing QRP transmitters like the SW40+. I also have suggested learning techniques for working with surface-mount components. The newest kit put out by the Four State QRP Group — the SMT Dummy Load — presses both of those buttons and then some. There are four LEDs which give an indication of the power output, ideal for optimizing your RF output tuning.

The SMT Dummy Load kit uses 15 larger surface-mount resistors, four LEDs, one capacitor, one diode and a BNC connector, making it a very easy kit to assemble and great practice for surface-mount assembly. The 15 surface-mount resistors are about 1/4-inch across, making them about as big as a regular resistor. The resistor values are marked as a number, which is referenced in the manual.

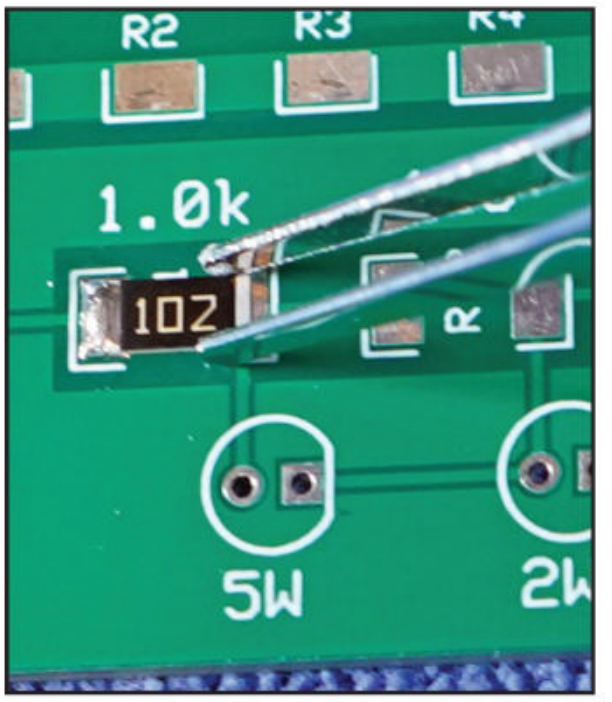
There are two methods I use to mount them, both equally effective. The first method is to place a small dab of solder on one of the two pads. Then lay the resistor next to that pad and while reheating the solder, move the resistor using tweezers until it is aligned correctly on the pad. Remove the soldering tip and let the pad cool before releasing the tweezers. Using 63/37 solder lessens the cooling time. Now you can solder the other side and return to the first connection to touch up the solder connection on the first pad.

*7133 Yosemite Drive, Lincoln, NE 68507
email: <k0neb@cq-amateur-radio.com>
Hamfest Hotline #5855

The surface-mount resistors that make up the SMT Dummy Load kit.

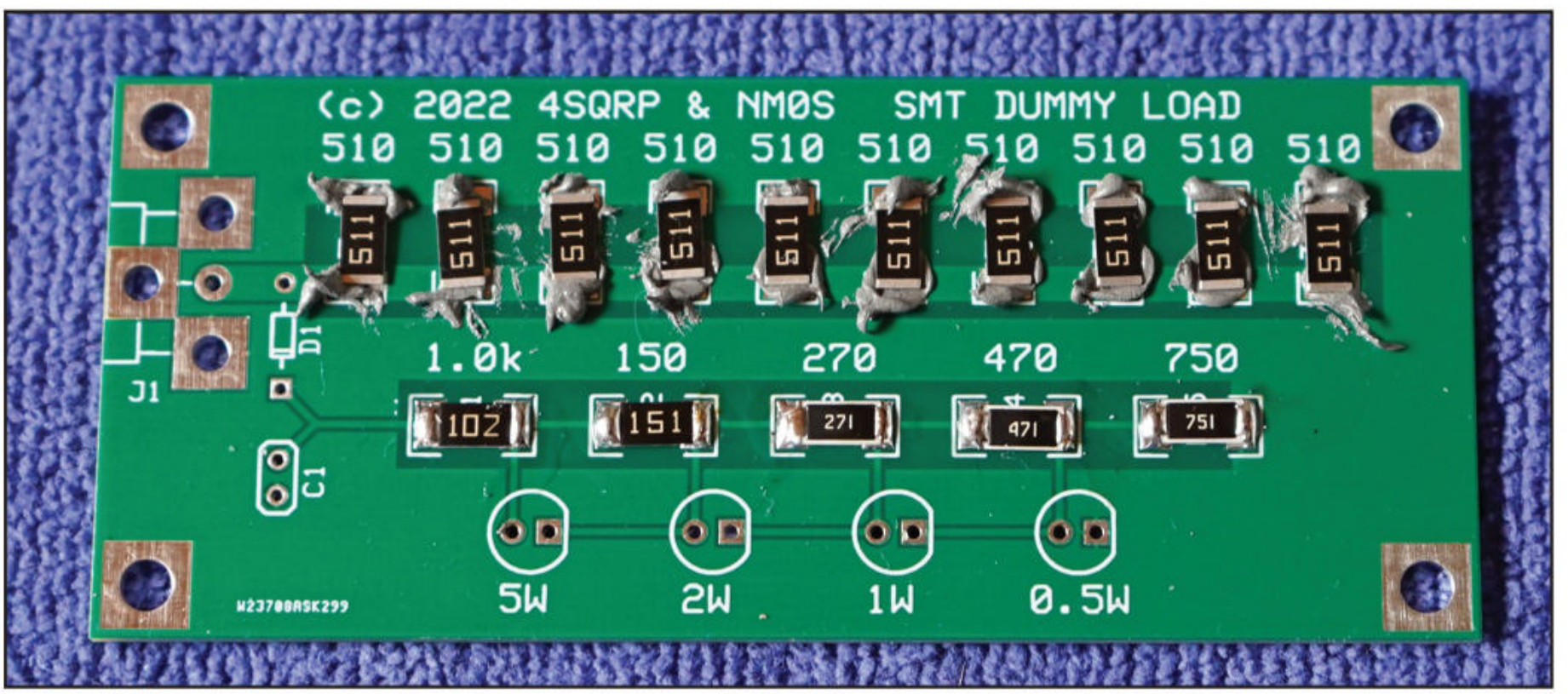


The through-hole components to complete the SMT Dummy Load.

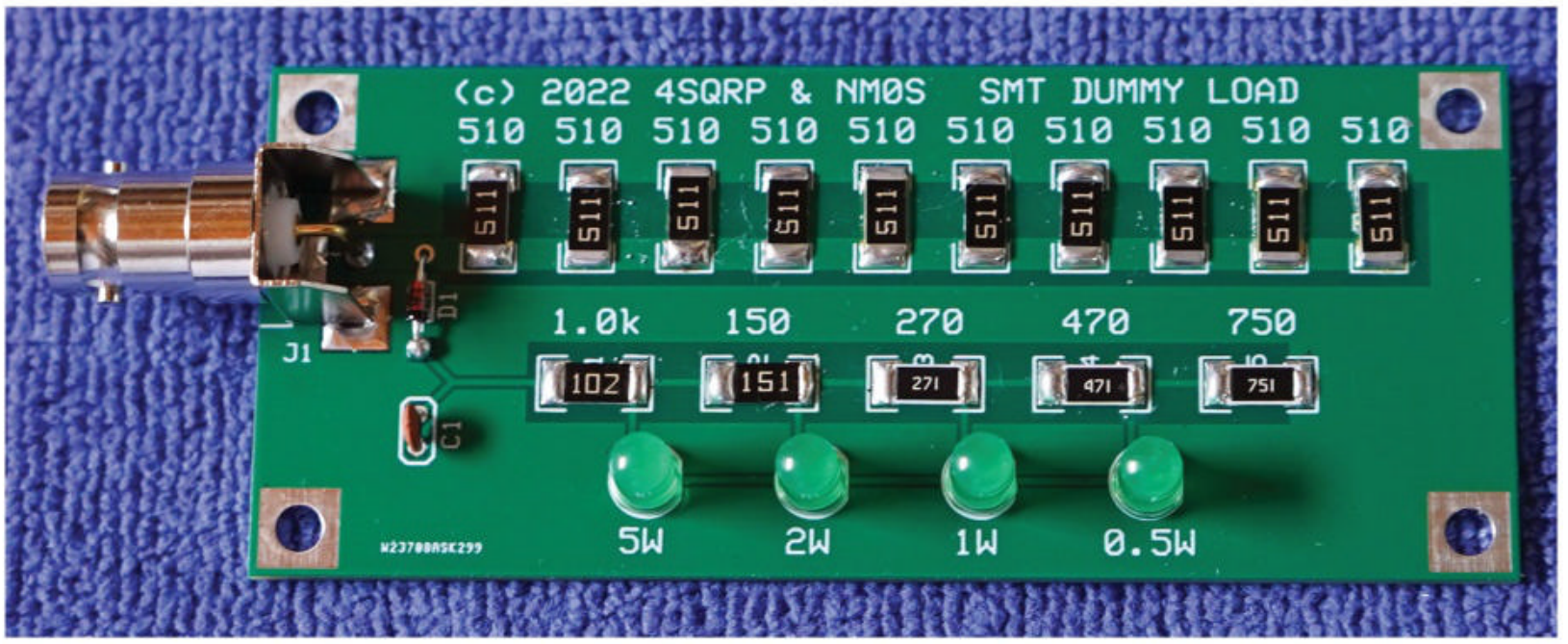


Holding an SMT resistor in place to be soldered.

Solder paste in a syringe can be purchased from MG Chemicals or ChipQuik online. Also check at MicroCenter stores online or locally for these products.



The top row of resistors placed on the pasted pads ready to be heated.



The finished SMT Dummy Load is ready to go!

The other method I use involves using solder paste, which is most often a grey looking paste mixture of solder and flux. This paste is often packaged in a syringe for application to the board. Begin by placing a dab of paste on each pad. Don't worry about it not being nice and neat as the magic will happen later. Once you have applied the paste to each pad, use tweezers to place each resistor on each set of pads. It might look a bit sloppy, and carefully removing some excess paste can help. I use a low airflow heat tool, often sold as an embossing heat tool at craft stores such as Hobby Lobby or Michael's. Heat guns, like those sold at hardware stores for paint stripping, have much higher airflow and will blow surface-mount parts off of the board. Holding the tool about 2 inches or so above the pads to be heated will take a few seconds to begin the magic.

At the beginning of the heat process, the grey paste will become shiny as the flux begins to melt, cleaning the pads and preparing for the solder flow. A few seconds later, the solder will melt and become the silvery substance we are familiar with. Once the pads are both silvery, you might see the part position itself a little straighter. This is due to the surface tension of the melted solder and flux and serves to straighten the parts like magic. The flux and solder that seemingly spread beyond the pads magically contracts and the solder occupies the pads due to a substance called "resist" on the PC board. Once the parts are soldered, you can move the heat tool to the next set of pads until all are done. Be sure to let the board cool thoroughly and stay still before handling it, as it will be very hot! Use 91% alcohol, found commonly in drug stores to clean the excess flux from the board and use a regular soldering iron tip to clean up any excess solder if needed. After all the surface-mount parts are done, you can mount the LEDs and other parts according to the manual.

Using a double male BNC adapter or a short BNC jumper cable to connect the dummy load to the RF output of your QRP transmitter will let you not only provide a correct impedance load for testing your QRP radios, but measure its output as well.

You can order the SMT Dummy Load Kit at <www.4sqrp.com>. As with all the other Four State QRP kits, the proceeds from the sales will help defray the costs of putting on the annual Ozarkcon QRP convention in Branson, Missouri. Be sure to check out <www.ozarkcon.com> for information about the 2023 Ozarkcon. See you there!

Hans Summers, GØUPL, shows his third version of the QDX 4-band digital modes transceiver kit at Four Days in May during Hamvention 2022.

FDIM

It was great to not only see everyone at Ozarkcon this year, it was wonderful to see Hamvention returning as well. There was a great crowd at Four Days In May (FDIM), the annual QRP gathering held in conjunction with Hamvention. Some great kits were even available for purchase at FDIM. In addition to Four State QRP Group kits by David Cripe, NMØS, there were kits from QRP Labs. Hans Summers, GØUPL made it to FDIM and had a number of his kits for sale including some of the new third version of his QDX 4-band digital modes QRP kits. I am truly looking forward to assembling my QDX and bringing it to you here soon. At FDIM, there were a few SDR kits and projects on display that show the future of kits can include SDR technology. Some of these new SDR projects will become kits and many utilize 3-D printed cases. More details on these possible kits will come in the near future.

Going to Ozarkcon and the Dayton Hamvention as well as FDIM made me feel good about the future of kit-building in amateur radio. To see the marvels of new very small SDRs and other innovative new kits using DDS technology, as well as simple kits that make great entry-level projects, gives me hope for even better kits in the future. I'll be showing some of these new kits in the future in these pages as well.

Be sure to look for me at the hamfest in Cedar Rapids, Iowa as well as the Huntsville Hamfest in Alabama and the Northeastern HamXposition near Boston all in August.

– Until next time, 73 de KØNEB

analog adventures

BY ERIC P. NICHOLS,* KL7AJ

Dayton Debrief

Photo A. The Dayton flea market was back, bigger than ever, and packed with hams, including a lot of young hams. (Photo courtesy Joe Eisenberg, KØNEB)

I just got back to North Pole from Dayton last night, and have had just enough time to organize some related thoughts that have been sloshing around the brainium in the cranium, before they completely evaporate.

Because of some flight cancellations, my XYL and I ended up staying in Dayton another day after Hamvention, so we took the time to see the Wright-Patterson Air Museum (the SECOND most important thing to see in Dayton) the way it should be seen … taking an entire day. I've seen the museum in hurried bits and pieces over the past several Hamvention pilgrimages, but never had time to do it right, until this time.

I am struck by the similarities between early flight and early radio ... in fact, they both started at nearly the same time. Marconi's first transatlantic test in 1901 was just two years before the Wright Brothers' first successful powered flight.

The Wright brothers were not encumbered by any preconceived notions of what an airplane should look like. In like manner, early practitioners of wireless weren't even sure what to call the thing. The term "radio" didn't come into general usage until actual broadcasting was established. Radio amateurs were way ahead of the curve in the adoption of the term. Nevertheless, it did take a few years for radio amateurs to figure out what radio should "look like." The Wright brothers at least had some natural models of flight to draw from ... although the original Wright Flyer was very un-bird-like in its physical configuration.

By contrast, there was nothing in nature that looked quite like radio for its pioneers to draw upon for inspiration. And, collectively speaking, we still aren't sure exactly what amateur radio should look like. It certainly doesn't look like what it did when I first got my Novice ticket in 1972, "only" 50 years ago, come next September. I do have a shack full of boat anchors that look unmistakably like radios, but I also have quite a few items that even the geekiest of us radio geeks back then wouldn't have recognized as radios, such as my thumb-drive-sized SDR general coverage receiver. But beyond the mere evolution of ham hardware over the past 50 years, the freshly-minted ham himself or herself in 2022 doesn't look anything like their 1972 counterpart from a social, educational, or attitudinal standpoint.

**3763 Lyle Avenue*
North Pole, AK 99705
email: <kl7aj@cq-amateur-radio.com>

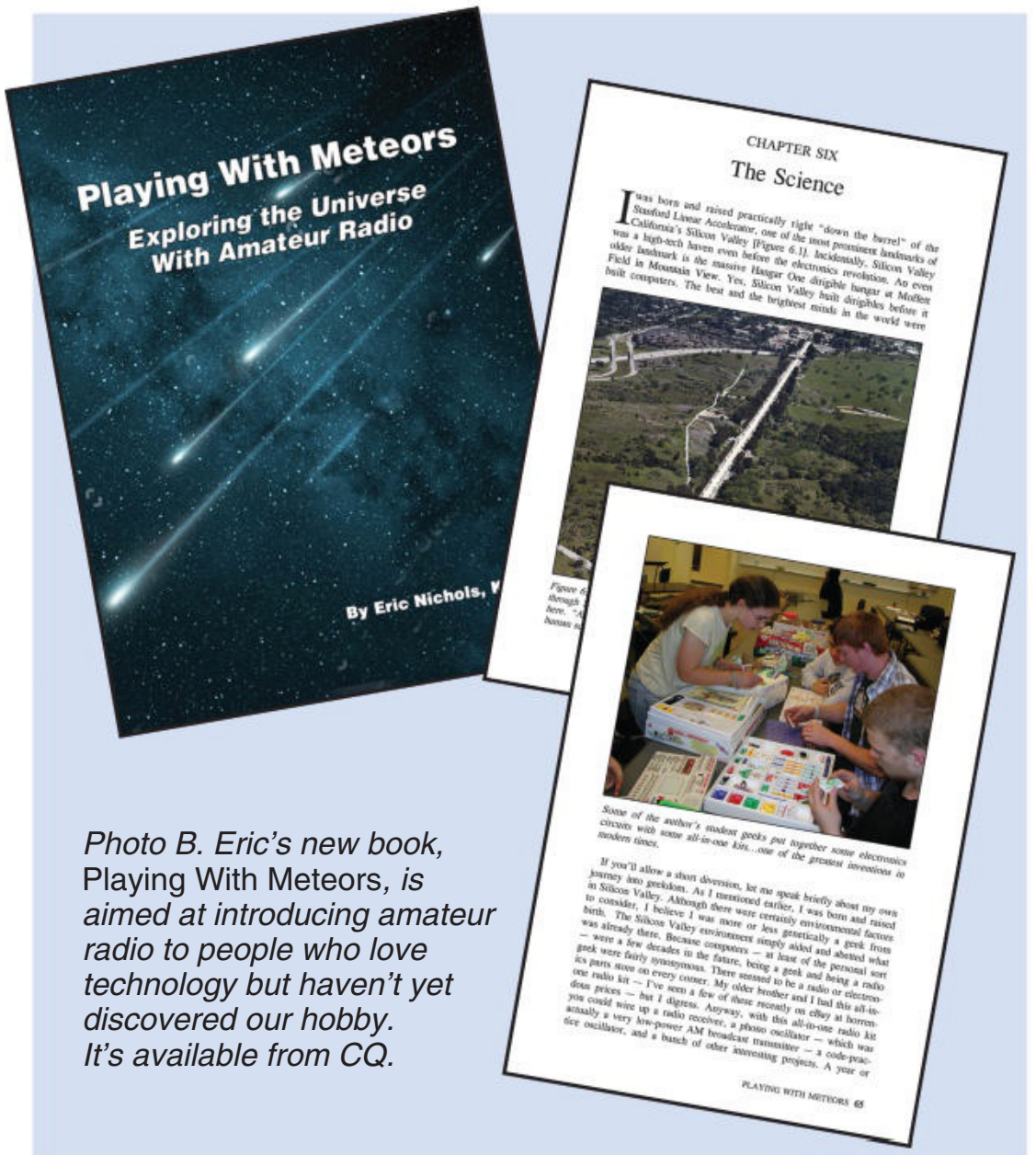


Photo B. Eric's new book, Playing With Meteors*, is aimed at introducing amateur radio to people who love technology but haven't yet discovered our hobby. It's available from CQ.*

That being said, I was really encouraged by the large numbers of young people at Hamvention ... more than I've seen in a long time. And, surprisingly enough, a lot of them were hanging around the flea market (which was HUGE, by the way — see *Photo A*), and thoroughly enjoying spinning the dials of the countless boat anchors and rummaging around the immense displays of variable capacitors and roller inductors.

I was naturally a little disappointed that *CQ* wasn't at Hamvention this year; as I was entertaining notions of signing some copies of my new book *Playing with Meteors* (*Photo B* — forgive my shameless commercial plug), which had just gone to the printer mere *days* before the event. In any case, I believe *Playing with Meteors* is a timely and entertaining book, and I believe it will sell well. I'll figure out some way of getting autographed copies to some of our loyal readers, perhaps even before *next* Hamvention, when *CQ* will surely be back in full swing.

On Sunday morning, I gave a dual talk on both LF Techniques and Using Digisonde Ionogram Data, which was very well received. (And yes, these two topics are indeed related). I plan on exploring both these topics in future Analog Adventures columns.

Well, that pretty well covers it for this month. Next issue, I'll try to get back on track and present the Octopus universal component testing widget.

– 73, Eric, KL7AJ

learning curve

BY RON OCHU, KOØZ*

Antenna Traps

In my 47 years of operating amateur radio, I have yet to find a ham radio operator who isn't interested in antennas. Recently at a doctor's a-p pointment, a health worker overheard me talking about ham radio and after introducing himself, he immediately told me about his antenna farm. It was great meeting him and hearing about his sky-hooks (antennas). It seems antennas are always THE go-to subject amongst hams. If you haven't noticed, hams love to chat about antennas. Sometimes, antennas can even spark, lively, fun-filled debates.

I'm here to tell you national politics isn't the only polarizing issue. Antenna design can be polarized (direction of electrical flow). Antennas can be horizontally or vertically polarized. Most polarized antennas are directional (signal concentrated in one direction) by design, but many are omnidirectional (radiate in all directions). There are other polarizations, but we'll save that topic for a later date. Instead, I'd like to focus on another "hot" antenna topic; namely, multi-band antennas and the use of traps (*Photo A*).

Photo A. A multi-band Yagi antenna. Note the traps in each element of the Yagi. (Courtesy of Wikimedia Commons)

Traps

Most multi-band antennas use traps. Traps are found in multiband wire antennas, dipoles, verticals, and Yagis. Traps allow a single antenna to operate over several different bands; thereby reducing the need to install multiple single-band antennas. From a radio operator's budgetary viewpoint, a multi-band trap antenna needs only one run of coax from the rig to the antenna. It also means switching bands is automatic. There is no fooling around with tapped wire RF (radio frequency) transformers. Like most things in life, there are pros but there are also cons associated with a trap.

But first things first; just what is a trap antenna? SOTAbeams defines a trap as, "a parallel tuned circuit (a capacitor in parallel with an inductor). Parallel tuned circuits (PTC) are used in all sorts of radio applications as they are selective: in this context a PTC has a resonant frequency at which it has a high impedance. At frequencies below the resonant frequency the reactance of the PTC will be inductive; above the resonant frequency the reactance will be capacitive." You can find the full article by SOTABeams at <https://tinyurl.com/yckz9p9r>.

Wow, that is a great, technical definition, but it is a lot to digest on the first bite. Let's break it down into more bite-sized pieces.

Breaking Down the Trap

Looking at *Figure 1,* we observe a simple dual-band antenna. For our purposes, this antenna is a dipole for 20 and 40 meters. Instead of two separate full-size dipoles with two separate coax runs, we now have just one antenna with a single coax run. Notice the identical traps in each dipole leg. Electrically, the trap is nothing more than a capacitor (C) and an inductor (L) connected in parallel. *Photo B* depicts a well-worn trap from a discarded antenna. Examine the antenna element and ignore the "rat's nest" of black wire underneath the antenna element with the trap. The trap appears to be a can with two black end caps. Now, let's remove the end caps and the metal sleeve. An RF (radio frequency) coil wound on an insulator attached to each end of the antenna element is revealed (*Photo C*). This coil is the "L" or inductor. Inductors store magnetic energy, and this electrical quality is called *inductance*.

Okay, we have the "L" side of the trap, but where is the "C" side of it? Good question! Remember, the metal can with the black end caps that fits over the coil? The metal can serves as the "C" or capacitor. Capacitors store electrical energy, and this quality is called *capacitance*. The wire windings also offer some distributed capacitance. Combined, L and C form a parallel res-

*Email: <ko0z@cq-amateur-radio.com>

onant circuit and that is where the "RF multi-band magic happens!"

How Do Traps Work?

Simply put, LC circuits react to AC (alternating current) frequency. RF is AC and as frequency decreases, inductance decreases and capacitance increases. Inversely, as frequency increases, inductance increases and capacitance decreases. Ah great, but what does that mean to me? To make more sense of this LC phenomenon, let's look at our 20/40-meter, dual-band dipole in *Figure 1*.

The dipole extends from segments A to B. In between A and B is our trap. Line segment A is the 20-meter section of the antenna. In effect the 20-meter dipole ends at the beginning of each trap. Astute readers will note the trap is mechanically and electrically connected to the 20-meter section. So why does the 20-meter signal "stop" at the trap?

The trap electrically appears to be an open circuit to a 20-meter signal. It's as if the antenna ends at the trap. However, at a lower RF frequency such as 40 meters, the LC trap no longer appears to be electrically open, and the 40-meter RF signal continues on its merry way along wire segments B. Isn't that cool?

In effect, the use of trap in each antenna element leg allows us to combine two different bands into one just one, dipole antenna.

Getting Deeper into the Weeds

I've found that getting into the weeds by experimenting is an excellent way to learn. Keeping an experimenter's notebook to record each experimental attempt is essential. After a few dozen attempts, unrecorded data becomes jumbled and messy if left to memory. As I get older, or "more experienced," I depend on my notes more and more. Fortunately, there are a lot of online calculators that make theoretical experimentation a breeze. I recommend Jotrin's Antenna Trap Caluclator <https://tinyurl.com/2p84jd4x>. For visual learners, may I recommend Dave Casler, KEØOG's YouTube video on trap antennas at <https://tinyurl.com/3ztdu56b>.

Photo B. A trap element appears to be nothing more than a can inserted between two aluminum poles. (Photos B-E by KOØZ)

The ARRL offers an excellent bevy of articles in PDF on trap antennas <www.arrl.org/hf-trap-antennas>.

Pros and Cons of Trap Antennas

Life is full of compromises and the same goes for antennas. Multi-band trap antennas (*Photo D*) offer many pros. For one, just one coaxial run is needed to just a single antenna that will operate on multiple bands, whereas each single-band antenna will need its own coax. Trap antennas tend to be shorter in length as compared to a single-band antenna. On the other hand, single-band antennas are more efficient RF radiators because they are less lossy than trap antennas. Traps offer some resistance and some of the RF energy is converted into heat. Single-band antennas offer more bandwidth with lower SWR (standing wave ratio) as compared to a trap antenna.

Throughout most of my ham career I've used a trapped multi-band Yagi with excellent results. It is good, but not as

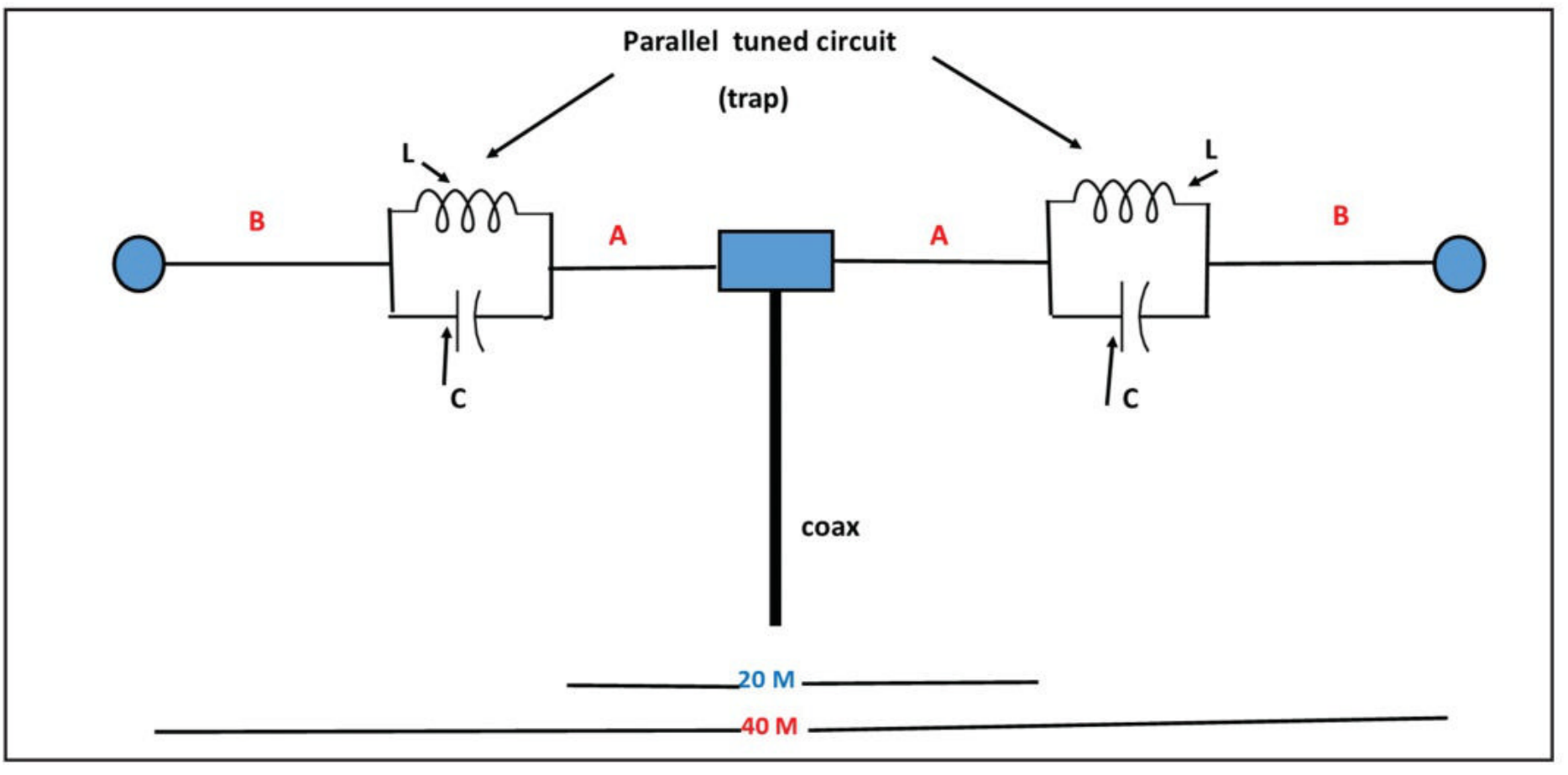


Figure 1. Example of a dual-band, trapped dipole antenna. (Image by KOØZ)

Photo C. Upon closer inspection by removing the outer metal housing (trap capacitor), an RF coil is wound on an insulator that is connected to each aluminum element.

good as a single-band Yagi with the same number of elements. Single-band, directional antennas open and close the band longer than a multi-band trap dipole. By that I mean, a single-band Yagi will hear signals earlier in the morning than my multi-band Yagi and it will hear signals longer into the evening than my multi-band. In radiosport (contesting), that can give a station a competitive edge. That's why serious, competitive contest stations use many single-band Yagis.

Lower out-of-pocket costs are associated with a multi-band antenna as compared to the additional expense of multiple single-band antennas, feedlines, etc. It all boils down to available real estate, finances, and ham radio expectations. As I am in the process of rebuilding my tower, I am on the HF bands with a Hy-Gain 14 AVQ vertical trap antenna. I work DX (long distance) on an almost daily basis and it performs well enough for my needs (*Photo D*).

Look Up

Look around and be observant, especially when traveling. You never know when you will unexpectedly come across a ham operator's awe-inspiring antenna farm. Such was my case as I was traveling westbound on Interstate 80 in Pennsylvania, just about to cross over into Ohio when I discovered Tim Duffy, K3LR's, contest superstation. It was so inspiring that I turned around at the nearest offramp to retrace my path just to get a closer look. Tim uses single-band antennas for contesting instead of multi-band antennas for the extra gain and bandwidth, and his station shows the sheer amount of engineering it takes to build a competitive HF contest station. K7AGE has a very entertaining video of K3LR's station at <https://tinyurl.com/3w3kez5c>. Other than contest stations, for the most part, you will see multi-band, trap antennas in your travels. My wife Debbie, KC9ULA, wonders how I can get the layout of a city so quickly. I quip, "I establish visual landmarks such as radio antennas and eating establishments."

Don't Underestimate Trap Antennas

It's been my experience not to sell trap antennas short. Trap antennas offer a lot of advantages for radio amateurs (*Photo E*). Sure, they are not as efficient as a "big gun" multiple, single-band Yagis at a contest station, but they do work well and offer a great deal of excitement. Currently, I am in the process of working on my 40-foot tower, but in the meantime, I am back on HF (high frequency) with my Hy-Gain 14 AVQ trap vertical for 10-40 meters. I only have three radials lying on the ground and I make regular DX QSOs. If you're pressed for antenna space and in need of a decent antenna, you may just want to delve a bit deeper into trap antennas.

– Thank you for reading CQ *and until next month, 73 de Ron, KOØZ*

Photo D. Hy-Gain's 14 AVQ, 10-40 meters is a low maintenance, relatively low profile, efficient HF antenna.

Photo E. A close up of a 14 AVQ (10-40 meter) vertical antenna trap.

gordo's short circuits

BY GORDON WEST, * WB6NOA

Antenna Dilemma: Wobbly Anchor, No Holes Allowed!

Many hams upgrading from Technician Class to General Class (no FCC $35 administrative fee for an upgrade!) may want to start antenna "small," with a multi-band HF vertical. While there are over 10 models of multi-band verticals, with all sorts of appendages going up the mast, the Hustler series of 4-, 5-, and 6-band verticals are stout and sleek in appearance.

Also, many seasoned General class hams, ready to go with a three-element, multi-band beam, will literally give away their trusty vertical, as we will read below.

Father and son new ham operators Malachi and Escher Clark, KN6SUZ and KN6TMP, were given a slightly-used Hustler 5-band trap vertical (*Photo A*). The plan was to mount it on a convenient cast-iron roof vent pipe. The ground system counterpoise would use the iron vent pipe, and its

Photo A. Challenge: Roof-mount a gently used Hustler 5BTV HF vertical without drilling holes … complicated by the discovery that a cast iron vent pipe originally planned as an anchor and ground was actually made of fiberglass! (Photos A-D and Figures 1-2 courtesy KN6SUZ)

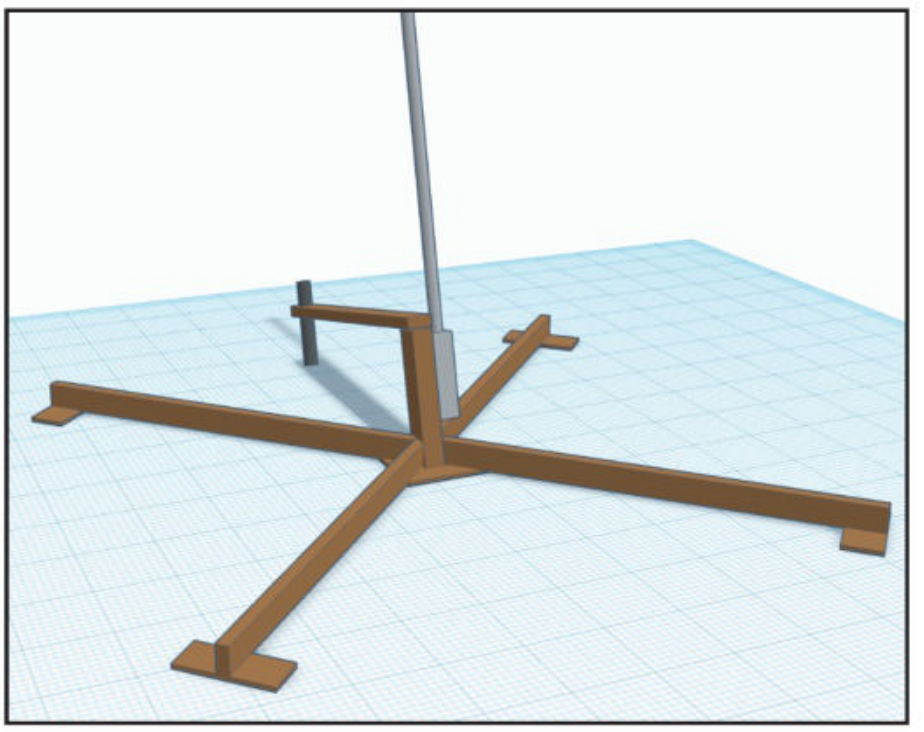


Figure 1. Computer-aided design program solves the problem of roof-mounting an HF vertical without drilling holes.

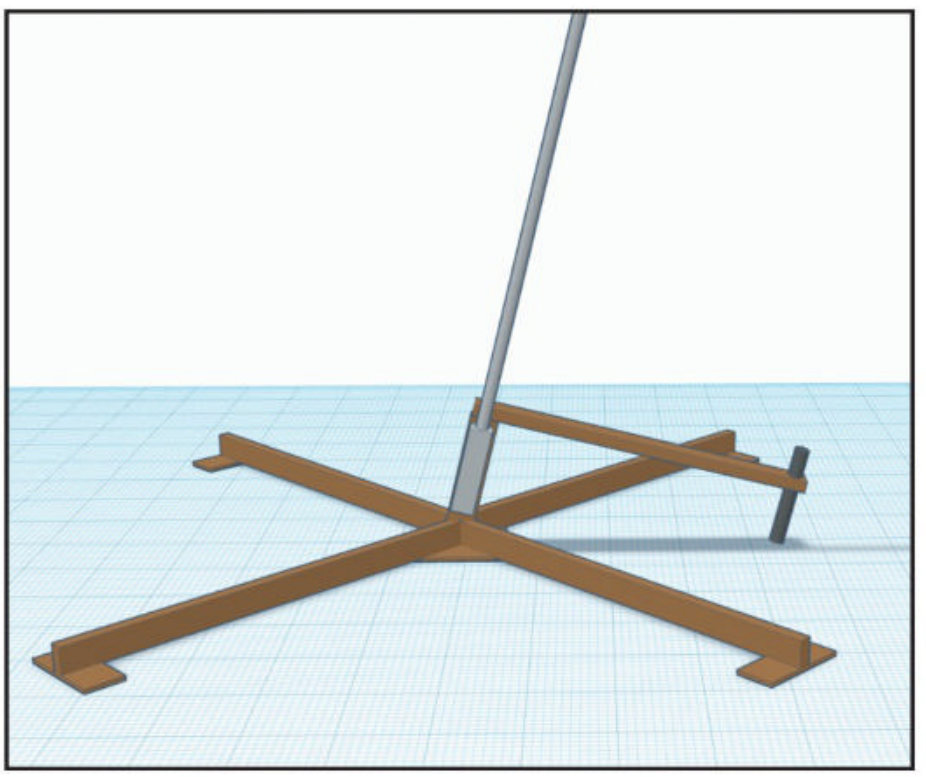


Figure 2. The CAD program also took into account the pitch of the roof and produced a design that assured that the vertical would indeed be vertical.

*CQ Contributing Editor
2414 College Dr., Costa Mesa, CA 92626
email: <wb6noa@cq-amateur-radio.com

Photo B. The PVC vent pipe anchors the homebrew antenna base to the roof, avoiding the need to drill holes or drive nails through the roof.

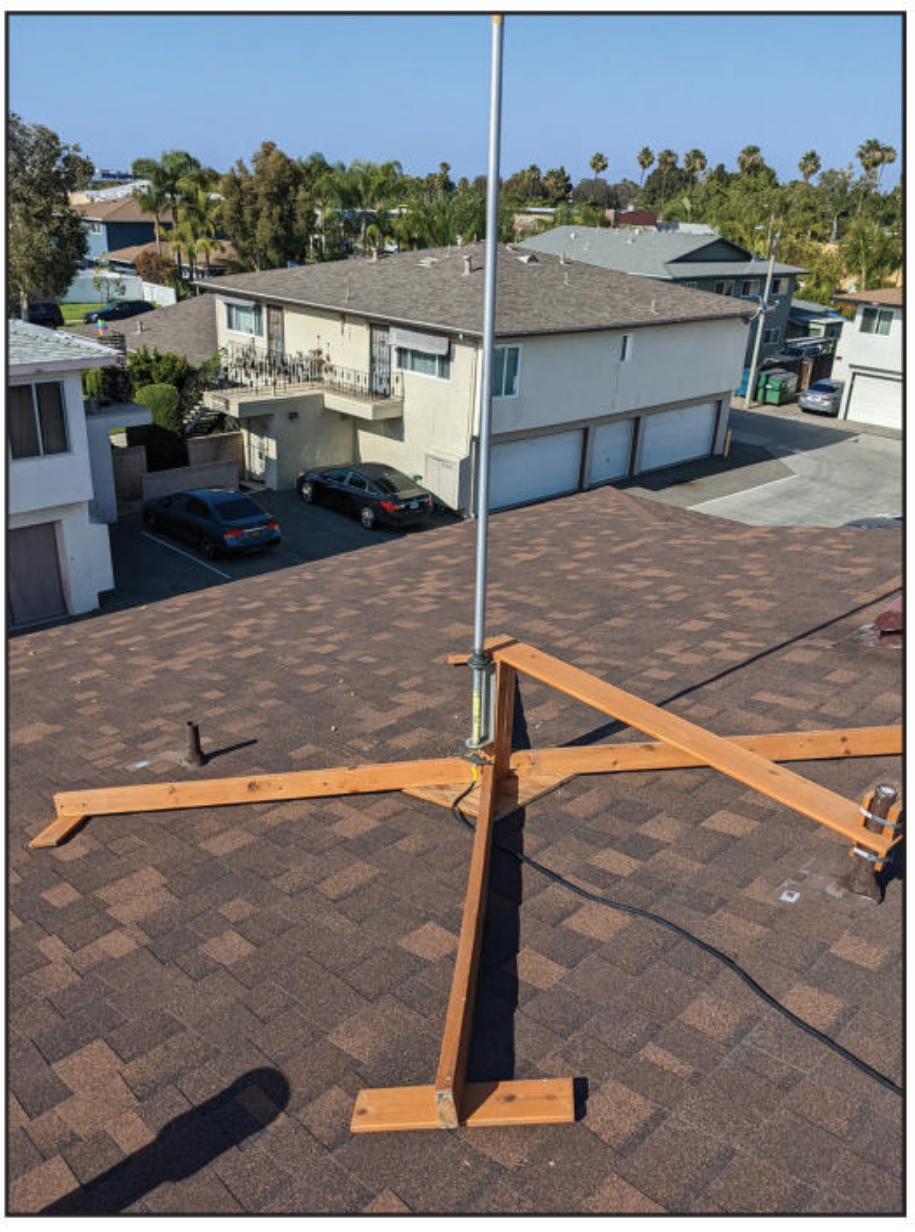


Photo C. The vent-pipe anchor also helps keep the antenna vertical on a sloped roof.

Photo D. If you look very carefully, just to the right of the satellite TV dish, you can see the tip of the Clarks' 18-foot VHF/UHF collinear peeking through the top of the tree.

attached plumbing, plus two each 1/4-wavelength radials per band. The vent would still have plenty of "breathing room," as the antenna base would mount to the side of the vent pipe, not occluding it.

No holes in the roof allowed, nor needed.

But then Malachi and Escher made the big discovery — what looked like cast iron vent pipes were all loosey-goosey non-conductive, non-rigid, PVC vent pipes. OK, the multiple 1/4-wavelength ground radial counterpoise wires will work, but how are father and son going to mount the 19-foot 5-BTV HF vertical to a wobbly vent pipe?

Malachi brings up his CAD computer program, and works up the plan — use the wobbly vent pipe to anchor his fabricated wood antenna mast support (*Figure 1*). No holes, and ultra sturdy, with no wobble.

The feet are positioned for maximum anti-sway, and the plastic vent pipe anchors the system from sliding off the roof. The coax acts as a fail-safe lifeline, along with another counterpoise cable. The CAD program shows the exact angle to mount the base, so the antenna is absolutely vertical, compensating for the pitch of the roof! (*Figure 2* and *Photos B/C*)

Mission accomplished, with the antenna standing tall and firmly in place.

Photo E. The exhibit halls were full as the Dayton Hamvention returned in-person for the first time in three years.

Malachi and Escher also have a three-section, 18-foot VHF/UHF collinear fiberglass antenna. They decided it would be too obvious on the roof, beside the 5 BTV. No problem, now it's in the tree alongside the dwelling (*Photo D*). There was less than 0.5-dB attenuation with the antenna spaced 2 feet away from the tree trunk, supported and hidden in the branches.

Both antenna systems are fed with LMR 400 coax for minimum loss. Success! The 5 BTV loads with good SWR dips near or on each band (with some help from an LDG 100A autotuner on 75), and the VHF/UHF collinear is working simplex out 60 miles away.

Hamvention Success, New Tech Book, Remote Testing

The Dayton Hamvention™ in Xenia, Ohio, was on a 2-year pandemic pause, and now back with a welcome success, with capacity crowds inside the Greene County Fairground's five permanent buildings (*Photo E*). Forums were brim full, the outside two swap meet grassy-grounds were vehicle parking-groomed, vehicles and tables stocked with gear, with the weather cooperating for the outside swappers, except for a couple short bursts of an Ohio downpour.

At the inside W5YI booths, the new 2022-2026 Gordo Technician Class book (*Photo F*) was hot off the press, and I had the pleasure to also meet and present my forum to registered ins tructors, all about the new Technician Class digital questions in the new book, and a presentation on the nationwide Zoom free Technician and General classes from Gary Johnson, West End Amateur Radio Group (AA6GJ@arrl.net). We also discussed the W5YI VEC Remote Zoom testing, available throughout the country, for applicants who don't have a ham club nearby offering classes or testing <https://hamstudy.org/sessions/w5yi>.

Alan Batteiger, WB5QNG, working with the W5YI VEC, also announced that new license applicants needing to pay the $35 FCC administration fee do not need to wait for the FCC's "pay up" email. They can login into the FCC CORES site at <https://tinyurl.com/bdh6tmcr> to pay their fee, ahead of the FCC's email.

But, Allan cautions, MAKE NO CHANGES to a pending application. If

Photo E. Gordo's new Technician Class license manual, updated for the new question pool that kicks in this month, is now available from W5YI.com.

the home address or email has changed needing an update, wait until the grant arrives, and then get together with the VEC for these no-cost updates.

More Dayton News

The AMSAT and ARISS multiple booth layouts were immense, and Rosalie White, W1STO, said the International Space Station cross-band repeater has really "turned on" a lot of old, new, and seasoned hams to work through the orbiting repeater station, especially with kids around, to show them a new aspect of ham radio operating.

To pull off RECEIVING a successful "pass" of the ISS on FM crossband, first dial to 437.800 MHz FM for the ISS downlink, for *receiving*, with hams uplinking to the ISS repeater input on 145.990 MHz FM with a tone of 67 Hz CTCSS.

Spend a few weeks LISTENING, before you try and get a word in edgewise on the uplink.

As the ISS is coming up toward you, "AOS" or "acquisition of signal," you MUST dial up on UHF an added 10 kHz, to compensate for Doppler shift — so begin *receiving* the ISS pass at 437.810 MHz. Then, as it gets higher in the sky, dial 437.805, then 437.800 when it is near overhead, and then dial *down* 5 kHz to 437.795 MHz, then 437.790 as it disappears over the horizon ("LOS" or "loss of signal"). To see when the next local pass of the ISS takes place, go to <https://heavens-above.com>, put in your location, and see the next workable pass. To see the current status of the different ham station configurations aboard the station, go to <https://tinyurl.com/ypv3fyym>.

Remember, the ISS can be worked daily, nightly, in broad daylight or dead of night, not just when it is twilight visible, so spot ALL passes over your region. See more ISS cross band info at <ARISS.org> and *my* favorite free website to see the ISS and all satellite passes is <www.heavens-above.com>. Log in with your location, click on ISS, then click ALL PASSES (not just visible), then click on a good time for you to hear a nice high pass, then click *ground track* (see *Photo G*).

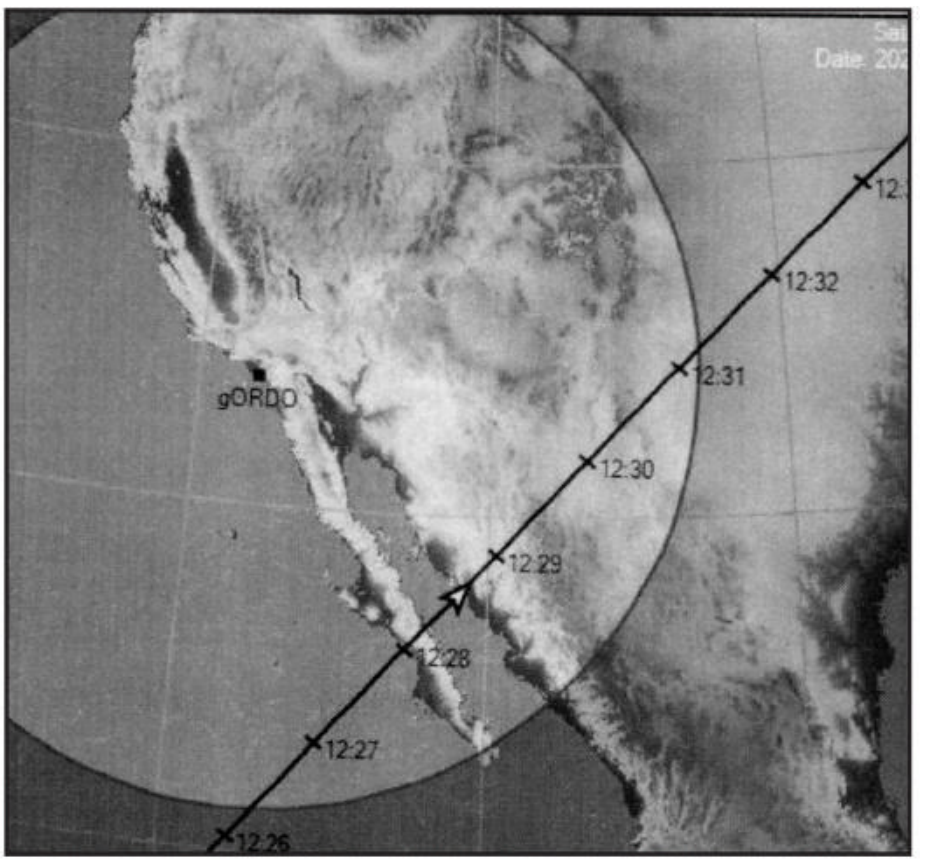


Photo G. The Heavens-above.com ground track of the International Space Station. (Courtesy of heavens-above.com)

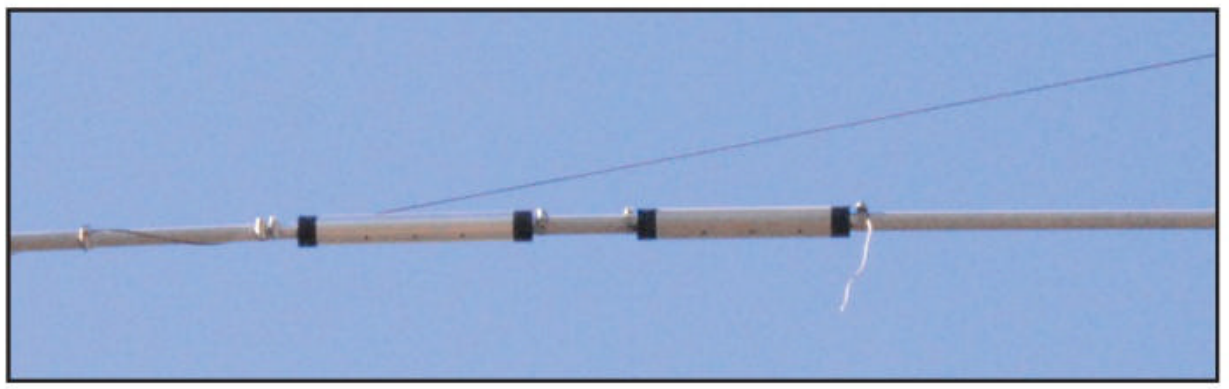


Photo H. Traps on multiband beams or verticals will benefeit from a "wiggle" once a year.

Wiggle Your Traps

As we get ready for Solar Cycle 25 to continue its climb for DX this summer, time to give a trap multi-band antenna a wiggle of the outside aluminum trap cover (*Photo H*).

A single self-tapping screw (*Photo I*) secures one end of the trap outer covering for capacitive reactance, covering the inner coil for inductive reactance. This forms a high impedance parallel resonant circuit at resonance, which traps that band from that band's RF going any farther out to the element. On lower frequency bands, the trap is non-resonant, and acts like a simple series loading coil.

Many times on trap verticals, and trap beam antennas, the 10-meter and 15-meter trap self-tapping screw gets loose, causing the outside aluminum cover to easily rotate a few degrees, and the trap becomes "defective," as intermittent.

But don't buy a new one — just peel back the plastic bug covering, and with a nut driver, tighten up that sheet metal screw, and best-you-can, get the plastic covering back in place to keep out the bugs from the inner coil (*Photo J*).

Only one end of most parallel-resonant traps has a screw connection to the coil shaft, hidden under the black plastic bug-stop. The opposite end of the trap has a spacer to keep it centered, with NO connection to the coil shaft.

My black plastic trap bug-out was so brittle, it went into pieces, so I stuffed the entry with fiberglass shreds.

Be sure that the trap holes on beams point DOWN, for rainwater to fall out.

Simple fix. Unless you were running a kilowatt key down in wet weather causing the inner coil to arc over, there is little that goes wrong with an individual parallel resonant trap, *other than* the outer cover providing capacitive reactance gets loose. (*For more on the basics of trap antennas, see this month's "Learning Curve" column, elsewhere in this issue. – ed.*)

Photo I. This self-tapping screw underneath a trap's bug cover may need to be tightened.

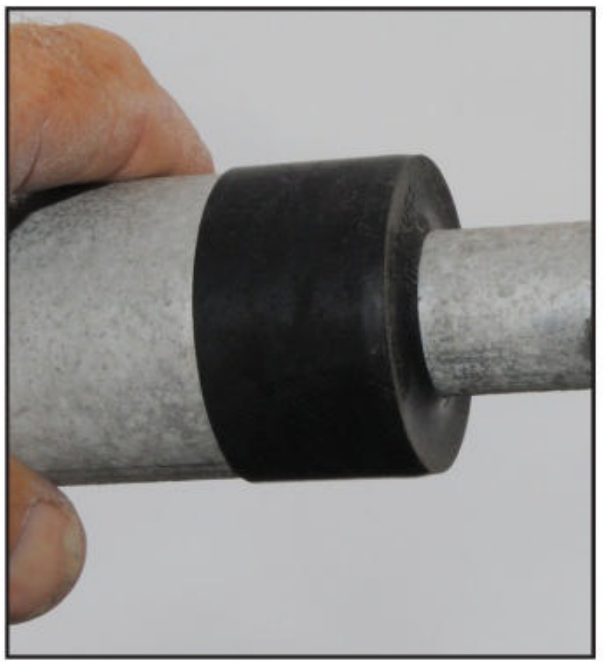


Photo J. Once you've tightened the inner screw, do your best to get the plastic bug shield snugly back in place.

Finally, if putting up a new aluminum antenna, be sure and use the manufacturer supplied-black conductive lubricant to keep the telescopic aluminum elements from seizing from inevitable internal corrosion. Keep this goo away from your favorite clothing — it won't come out!

Have a great summer, and hear you on the bands!

the ham notebook

TEXT AND PHOTOS BY WAYNE YOSHIDA*, KH6WZ

More Projects on the Workbench

Well, it's back to the workbench once again. This time, some projects made their way to my bench unexpectedly. These are the projects that often make me mad.

For example, my fairly new docking station for my new computer dual-monitor setup stopped working. It just lost power and connection to my external monitors and USB items. It made that "disconnect from USB sound" and the somewhat too bright blue LEDs were not lit. Pretty simple. The diagnosis should be something like "No power. Bad fuse. Bad power supply. Loose or disconnected wire."

I was about to throw it away and order a new one, but it is just out of its warranty period (of course). I figured I have nothing to lose, I don't have an alternative right now, and it's an approximately $200 unit, so I opened it up (*Photo A*).

Like most consumer electronics products these days, there are no accessible fuses in the power supply. However, there are two small surface-mount fuses in the 20-volt path. I checked those first. They are good. I checked the wall wart power supply for proper voltage. The output is fine. I looked at the power connector and it looked okay, although the solder is a bit grainy looking. Typical of lead-free joints. Sort of ugly, but fine.

I plugged the power cord into the unit and poked around with my digital multimeter. Zero volts coming into the board. Duh, I knew that because the LEDs were not illuminated.

But that is strange. The power supply has the correct voltage. But the board is not getting power. I measured the voltage coming out of the power connector, and — there was nothing coming out.

Bad connector? Looking closely at the power connector from the inside, the center pin was held in place with a rivet. The contact was corroded and so that was my first guess.

I scraped the tarnish off with a pin and soldered the center pin to its contact on the circuit board side (*Photo B*).

Photo A. I opened the case on this universal docking station for my computer setup. The symptoms were simple, but the cure not as much. (All photos by KH6WZ)

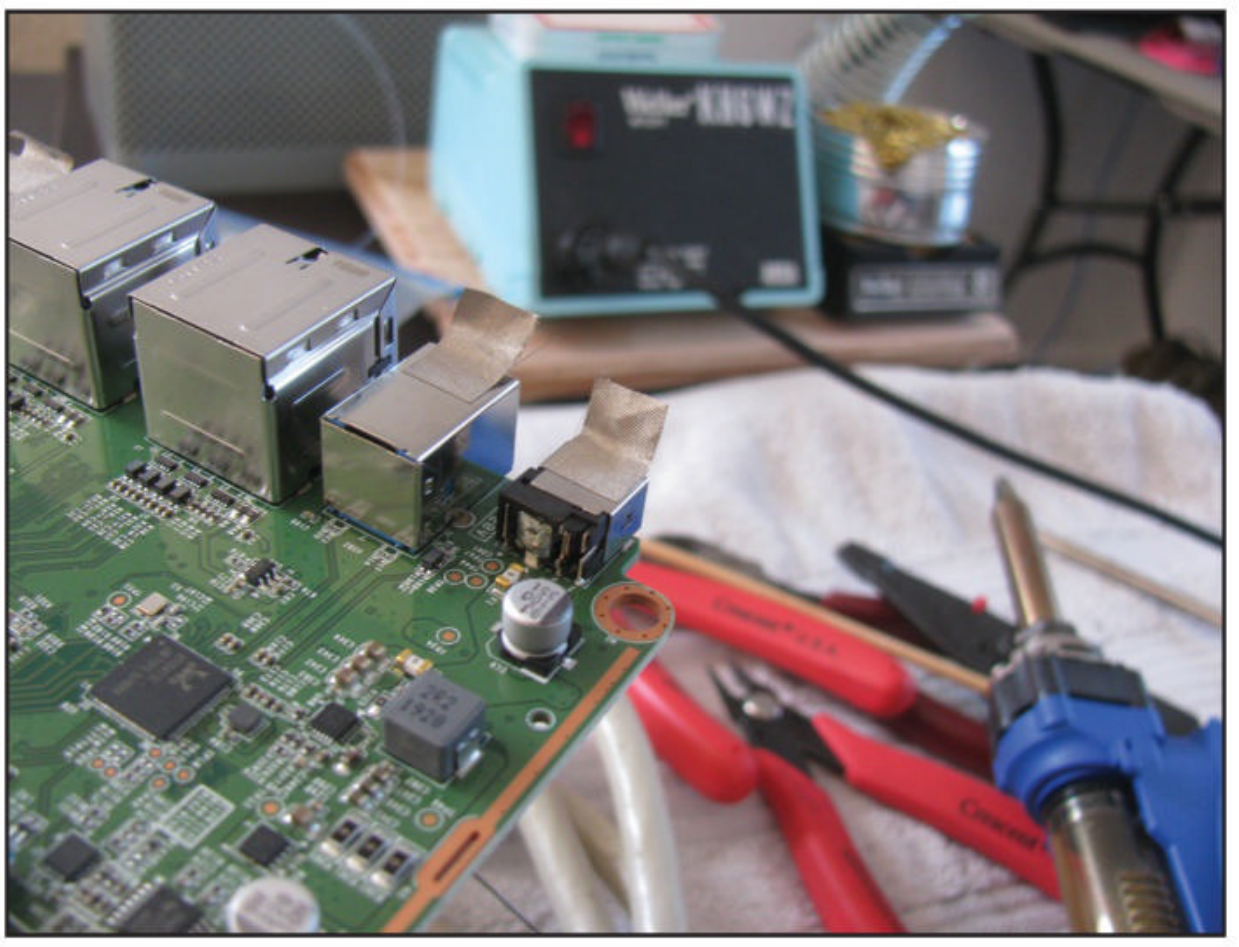


Photo B. The wall wart power supply was working, but the connector inside the unit did not look so good. So, I cleaned and soldered the connection.

email: <kh6wz@cq-amateur-radio.com>
Linkedin: www.linkedin.com/in/wayneTyoshida

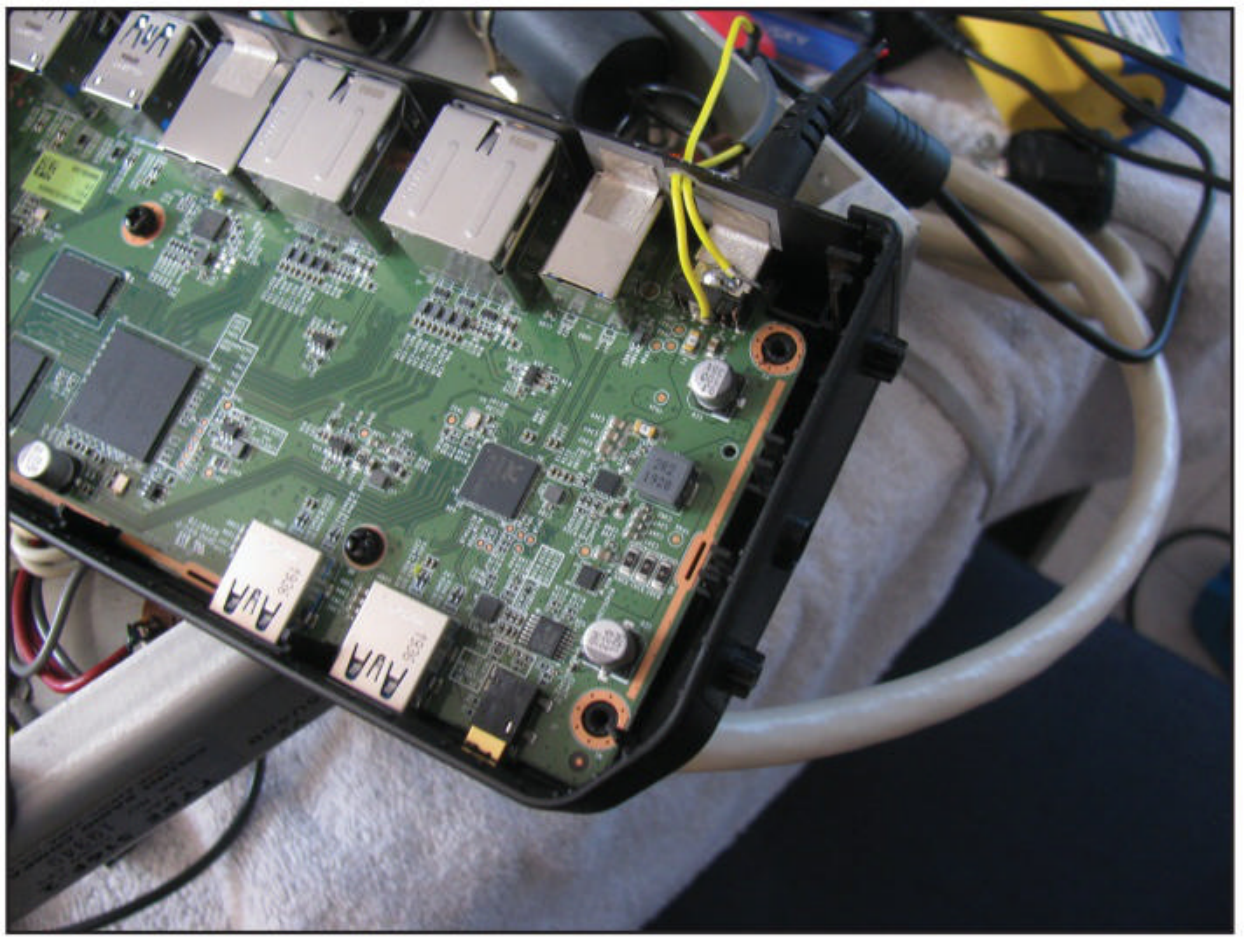


Photo C. I cut the power supply connector and soldered wires directly to the board.

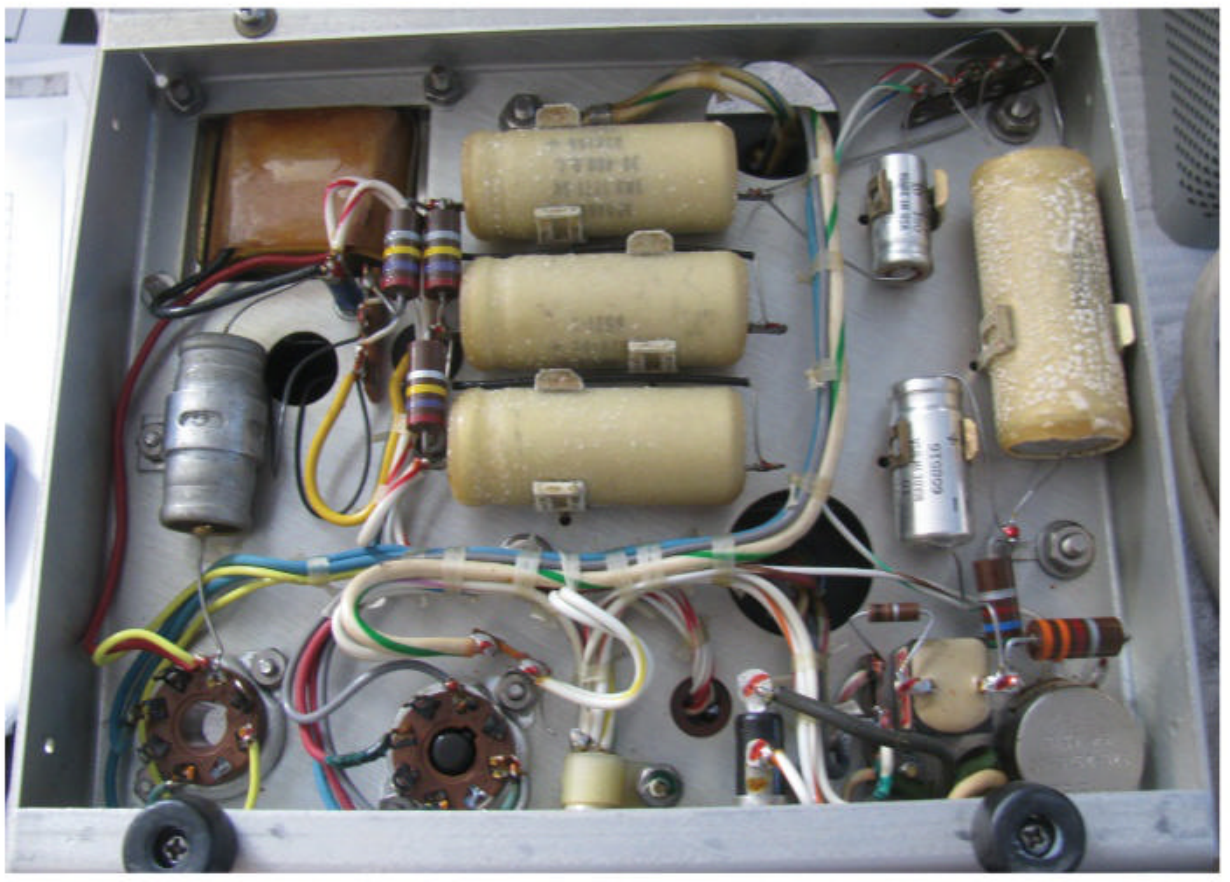


Photo D. An under-chassis view of my Collins 516F-2 power supply.

I tested the power connection again. Zero volts. What!

The positive connection is now fine, it must be the ground lead. I tested it, plugged the power cube back in and noticed no blue LEDs. Still not working.

Okay, let's bypass the connector and connect power from the wall wart to the circuit board. I cut the wire coming from the wall wart supply and soldered wires to the ground and the positive pad on the circuit board side of the connector (*Photo C*).

I plugged it in and — still nothing. What again!

I am taking a break to write this column, without my docking station and external monitors. I have eliminated all (most?) of the possibilities, except for one: Is the 20-volt wall wart power supply failing under load? At no-load, it is fine. But when it is plugged into the docking station, it is not able to power the unit. I think the wall wart is partially working. I have to say that I have never seen this before.

I have to also wonder how many of these units have been scrapped because of an inadequate power supply. How many perfectly working units were repaired or replaced under warranty because of a dead (or nearly dead) wall wart?

And why does the unit require a 20-volt power supply?

These questions remain as I write this article. Stay tuned for an update on this one.

Restoring a Classic Collins Station

Meanwhile, on the happier side of the workbench, I am finally getting to restoring my classic Collins KWM-2 station. Over several years (decades, actually), I have accumulated an almost complete KWM-2 station, consisting of the KWM-2 transceiver, PM-2 lightweight power supply, and 30L-1 amplifier. I also have one Collins CC-3 carrying case. I should look for the external VFO, the 312B-5. Then it will be a truly complete KWM-2 station.

My renewed interest was inspired by my recent acquisition of the 516F-2 power supply in excellent shape. There's not much to see on the outside, so *Photo D* shows the chassis' underside. It is fully functional, but I want to replace the power supply filter capacitors, which are a bit "fuzzy-looking." This is very common with vintage vacuum tube era equipment. It is not corrosion or mold as I thought by looking at pictures, it looks like melted or overheated wax.

As you can see, this power supply manufactured more than 40 years ago looks brand new on the inside. Some wires are corroded, but I will correct this as I refurbish the unit. The original Collins inspection paint marks are present on all connections (*Photo E*). There is one modification on this unit. The connection between the output cable shield and a ground lug is cut, visible in *Photo F*. I will restore this connection.

I am replacing the electrolytic capacitors with modern equivalents (*Photo G*). I am adding terminals to the leads to mimic the originals as well as to help improve their mechanical connections.

Today's electrolytic capacitors are not only smaller, but they have better performance than the old versions. Unfortunately, high value, high voltage, axial lead electrolytic capacitors may be difficult to find, although radial-style capacitors seem to be more common today.

A quick Google search turns up several sources of replacement capacitors, including kits to either modernize to solid state, or to simply replace the capacitors.

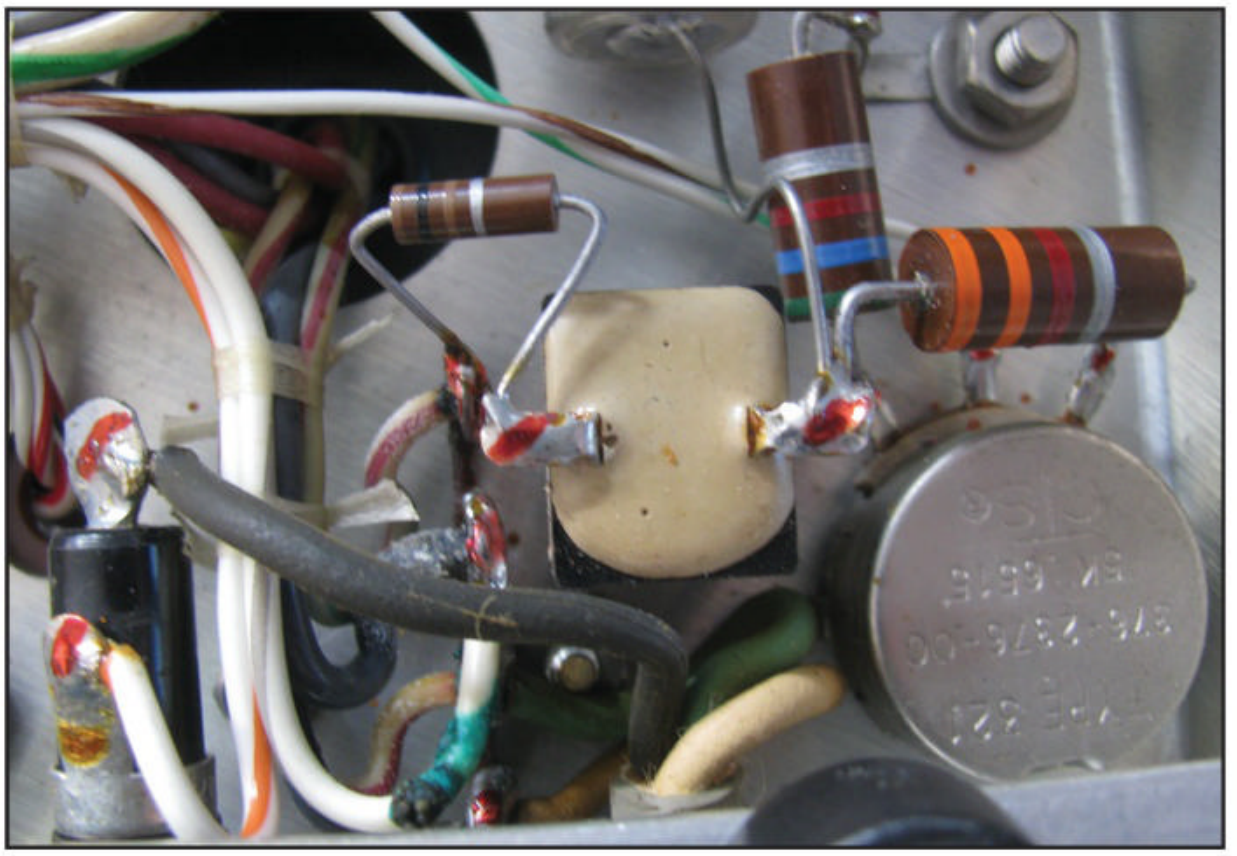


Photo E. The vintage power supply is amazingly clean on the inside.

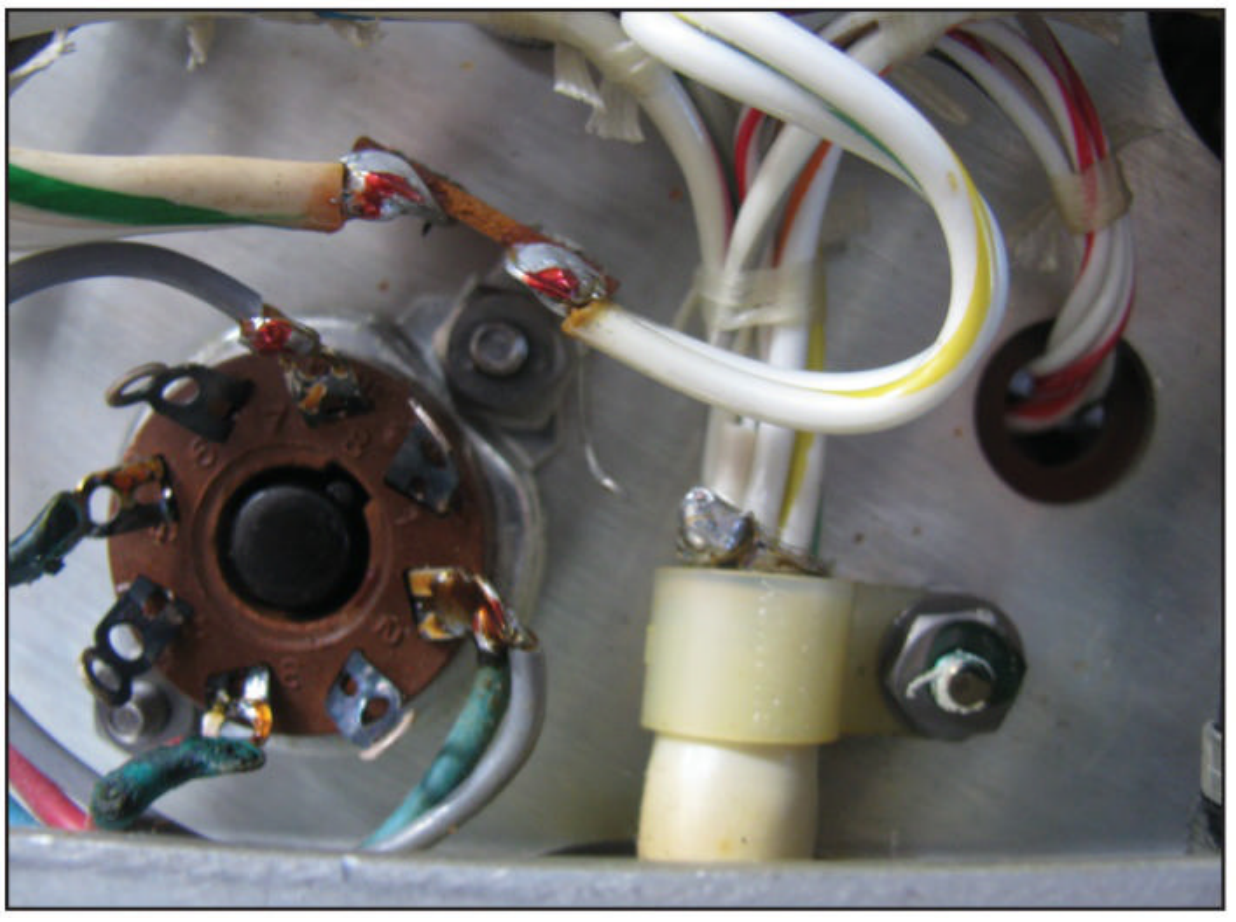


Photo F. This looks like the only modification: The power output cable shield connection to ground is cut.

I am still working on this project, and at this rate it may take several more years to get this station running. Stay tuned for updates on this, too.

So far, I am not doing anything special on these rigs. All repairs, modifications, restorations, and improvements have been documented very well by others. I am grateful for all the contributors who took the time to create and share their work so the rest of us do not have to re-invent the wheel.

And, as a technical writer by trade, I am impressed and grateful to the Collins engineers and technical writers who performed the original work.

Another Special and Highly Useful Tool

One of the first things to replace on vintage electronic gear is the AC mains power cord. My dislike for those AC cord plastic strain relief bushing things start-

ed many years ago when I had to install the power cord in my Heathkit IM-28 bench model vacuum tube voltmeter (VTVM).

Using pliers of various types, getting injured, and fumbling around each time I had to remove or install these things, I decided to buy the installation / removal tool made just for these grommets (*Photo H*).

I'm so glad I finally bought this special tool. It makes removing and installing these bushings incredibly fast and simple, as you see in *Photos I, J,* and *K*. If you work on vintage gear

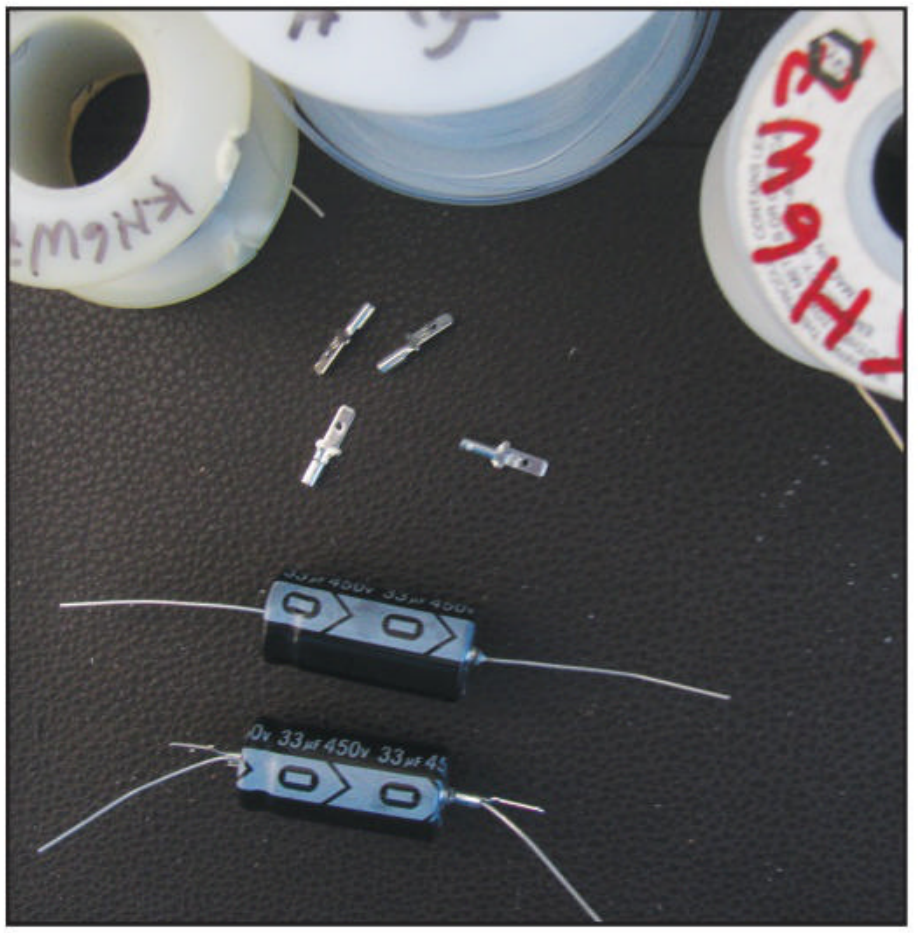


Photo G. New electrolytic capacitors are smaller and better than before. The restoration will make the power supply work even better than before.

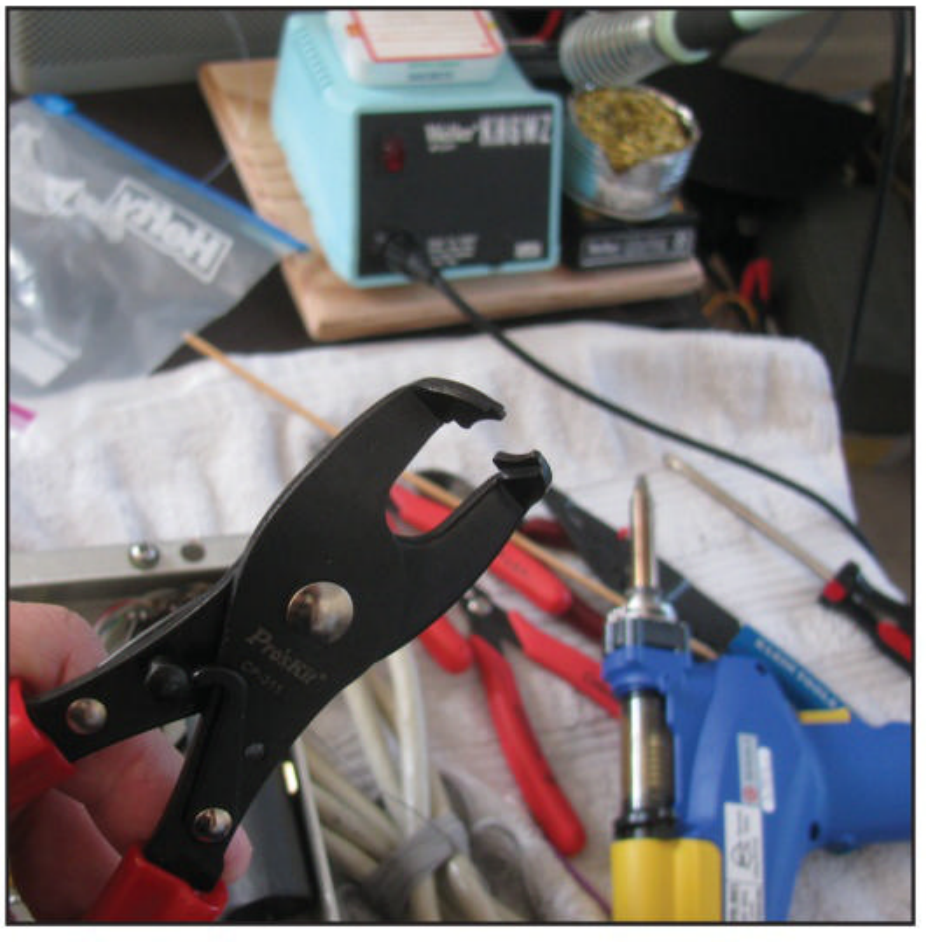


Photo H. The special tool makes removing and installing plastic strain-relief grommets safe, fast, and easy.

Photo I. I have a long-standing revulsion for these grommets.

Photo J. The special grommet tool securely grips the grommet.

Photo K. Removing and installing plastic strain relief grommets is fast and simple with the right tool.

Photo L. Useful for Field Day at night: A dimmable red light for nighttime use.

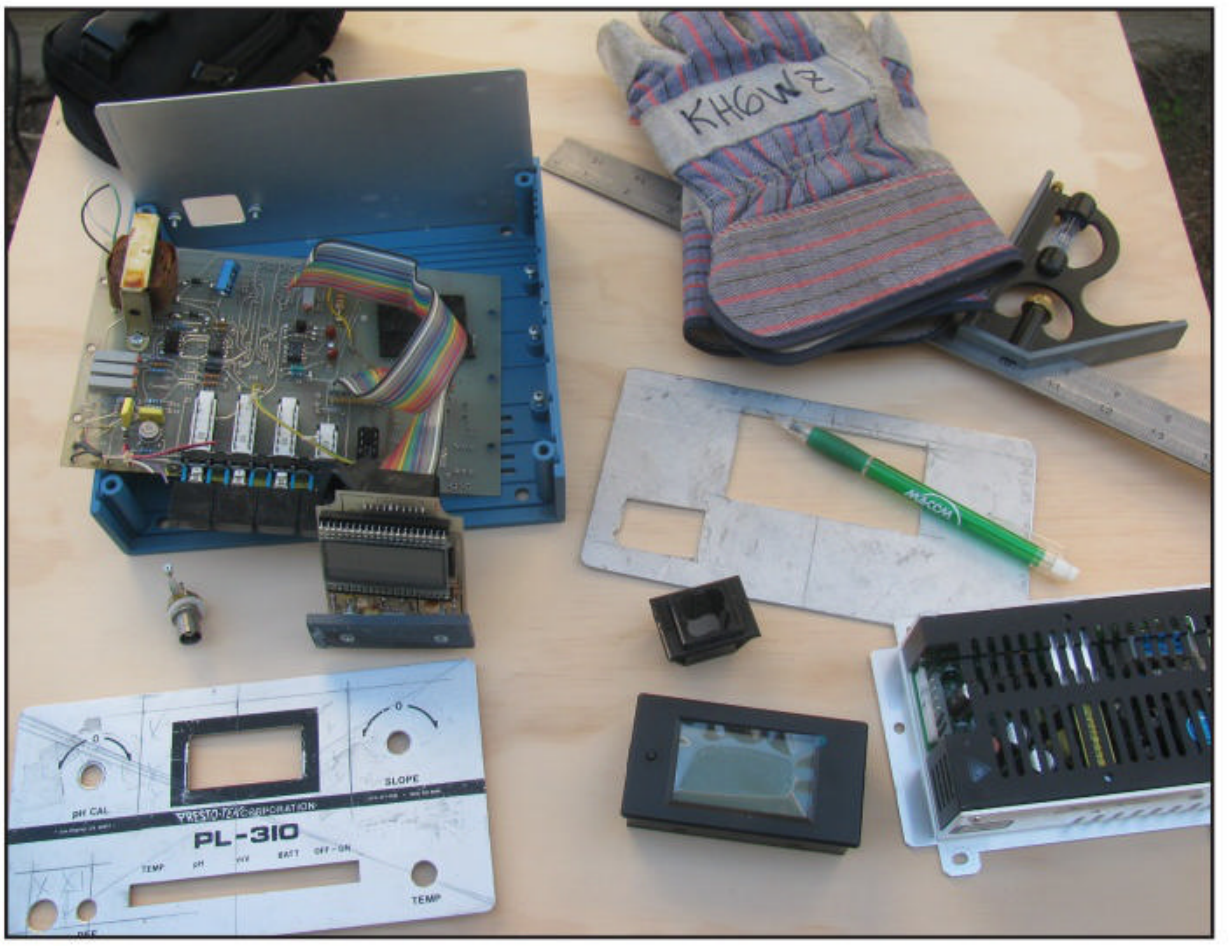


Photo M. The various parts for my telescope mount power supply.

and run into these bushings, I highly recommend getting the special tool.

Other Projects on the Bench

My new hobby is astronomy and in addition to the excitement of this new venture comes more opportunities to create electrical or electronic projects for astronomy.

For example, I decided to make a dimmable red light for use during star parties. (Red light preserves night vision.) Using a white light of any kind may get anyone kicked out of a nighttime event, or at least will harm one's reputation. It is something that is never done when stargazing. In addition to being red, the light is dimmable, since many people complain that someone's red light is too bright.

In addition to my red LED flashlight, I made a dimmable light source for when I am at a star party and need to root around for something. Of course, it requires AC mains voltage. Fortunately, many locations have AC power available (*Photo L*).

It is a mechanic's work light equipped with a red bulb and dimmer. Everything is hard-wired together so nothing can be lost.

The red light might be useful for Field Day or other nighttime events, you may want to consider adding something like this to your emergency preparedness go bag.

I also built a 12-volt, 6-amp power supply for my telescope tracking mount (German Equatorial Mount [GEM]). I am not sure if built is the correct word, since I basically assembled

Photo N. The completed unit features a multi-function digital meter, Anderson PowerPole®, and USB output ports.

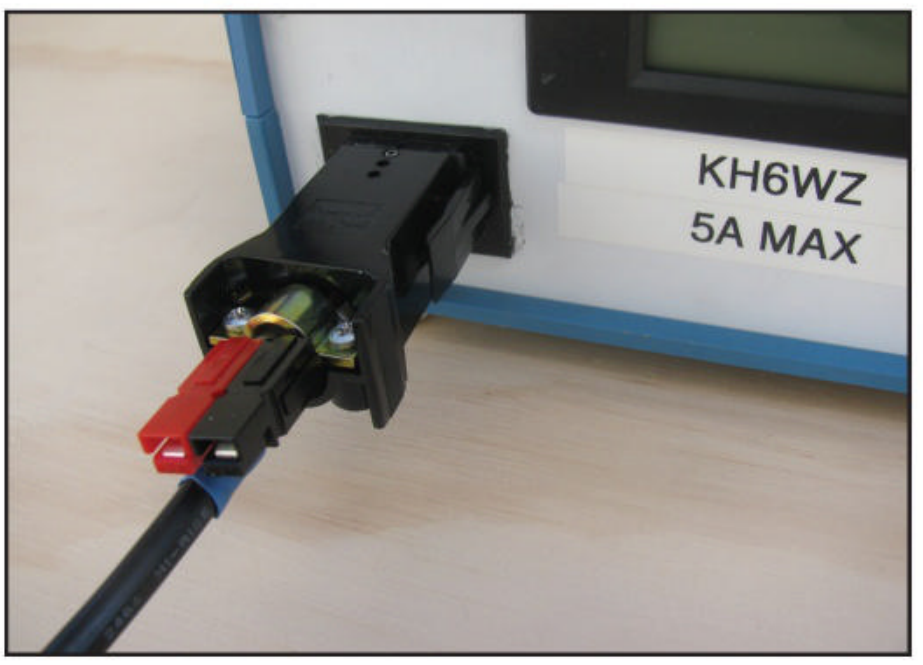


Photo O. The 12-volt output mates with the cable-mounted locking housing. An extra pair can mate with other accessories near the power supply if needed.

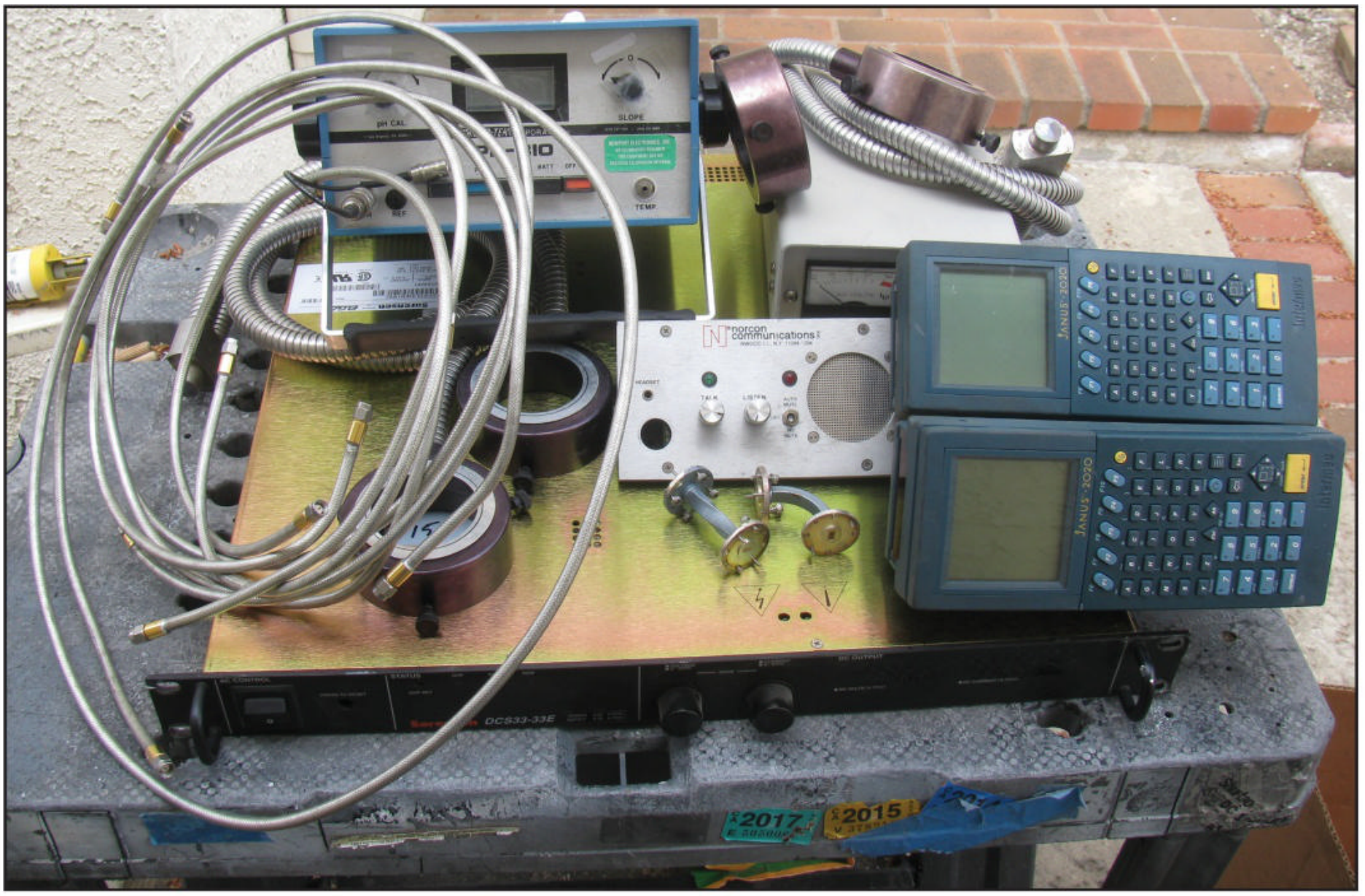


Photo P. When buying surplus items, I always think more about what the item can become than what it currently is.

several different already-built items into a handy case. (*See Photos M, N, and O*).

The nice box is a re-purposed instrument case. Like so many projects, the cabinet or chassis is often the most expensive item on the parts list.

But I found a great solution many years ago and I continue my tradition: I buy electronic items not for what they are, but for what they can become.

The telescope power supply is a great example of this. *Photo P* shows the batch of things I purchased at a recent ham radio swap meet. The pH meter on the upper left of the photo is missing its probes and does not work. It had a very nice price tag of $5 and came in a very nice cabinet.

I have no use for a pH meter, but the cabinet was in good shape and a handy size. It housed my open frame switching power supply (15 volts DC [adjustable] at 5 amps) perfectly.

As you can see, the power supply features a very nice LCD power indicator for volts, amps, current, and energy. It is called "Large Panel-Mount Digital Power Meter — 6.5-to-100 volts DC up to 20 amps" at Adafruit Industries. The scope power supply includes a double-Anderson PowerPole® output as well as a dual 5-volt USB outlet for cellphone charging and other functions.

I am gathering parts for another version that I will use for the telescope as well as my ham radio gear. It will include one of those new technology LiFePO4 (Lithium Iron Phosphate) or LiPo (Lithium Polymer) battery as well as a 12-volt, 20-amp AC power supply. It might include a solar charger as well.

What have you been building lately?

– 73, Wayne, KH6WZ

References:

These entries are examples of what is available online. I am not affiliated with nor do I endorse these specific companies or individuals. All references and other similar ones can be found on the internet. Use your favorite search engine to find more information and fully understand before making decisions.

Replacement capacitor kits for vintage Collins and other gear:

•Harbach Electronics, Jeff Weinberg, W8CQ
<https://tinyurl.com/24xfxh8d>

• Nationwide Radio & Eq. Sales LLC (Mark Olson, KE9PQ)
<https://ke9pq.com/collins-items>

• Rebuilding the Collins 516F-2 Power Supply. Jim Garland, W8ZR, wrote an excellent article on rebuilding the 516F-2
<https://tinyurl.com/4nv6bd8v>

• Radio Farm Projects
<https://tinyurl.com/22j2f6cj>

• Collins Collectors Association: An excellent organization for all active Collins radio amateurs.
<www.collinsradio.org>

• AC cord bushing/strain-relief tool. Available at your favorite electronics dealer
Pro's Kit model 300-151/CP-311

• Large Panel-Mount Digital Power Meter — 6.5- to 100-volt DC up to 20 amps from Adafruit Industries
<www.adafruit.com/product/3626>

• LiFePO4 (Lithium Iron Phosphate) and LiPo (Lithium Polymer) batteries, chargers and accessories from Bioenno Power / Bioenno Tech LLC
<www.bioennopower.com>

• Celestron CGEM 1100 telescope. I found a great deal on a telescope via my astronomy club Adopt-A-Scope program. This concept might be a good idea for radio clubs, too.
<https://tinyurl.com/5av6jswf>

• Orange County Astronomers Adopt-a-Scope Program
<https://ocastronomers.org/adopt-a-scope>

magic in the sky

BY JEFF REINHARDT,* AA6JR

The Dead Band Challenge

Recently, after having completed a number of mundane office chores, I switched on the HF rig to see who may be "out there" playing on the airwaves.

Alas, as I slowly swept up, then down, then back up again, it was apparent very little in the way of SSB (my preferred mode) was making its way through the noise that I found on just about every band. In short, some imaginary monster was feasting on signals and devouring them with an insatiable appetite. In other terms, the bands were deader than the disco era.

So after monitoring for signs of the Big Bang and coming to the conclusion that listening to background noise is boring, I decided to follow up on some long-deferred radio education pursuits.

Following Alice

A friend from our local club, Stu Sheldon, AG6AG, has been producing a series of videos on a wide variety of ham radio topics. He then posts them on YouTube for viewing by any and all. Down the rabbit hole I went.

And once inside and seeing the vast number of postings by Stu, time just melted away. Not every topic was of direct interest (to me), but once the YouTube website had its grip on me, it was "clickbait city" with a myriad array of ham topics, seemingly enough to satisfy your curiosity on just about any subject. From the basics of theory to license exam prep and up through operating modes, antenna installations, club activities and more, you can easily lose yourself in the resources available at just this one website.

However, a few words of caution: Like so many other topics, don't assume that everything you see posted on the internet is accurate, factual, or accepted practice. (*Also see last month's QRP column, "Video Killed the QRP Star." – ed.*) While the vast majority of what's available may in fact be good advice or guidance, beware of rushing into new areas without the guidance of a friend or Elmer who is more familiar with the subject at hand.

Nevertheless, kudos go to those who have taken the time to plan, research, write, produce, and post a sea of resources that can enlighten, entertain, and educate. Like the Dormouse in Jefferson Airplane's "White Rabbit" is reported to have said, "Feed your head." (Even though that quote does not appear in the Lewis Carroll story. See what I mean by checking your facts?)

Midsummer Dreams

Continuing a musical theme, here's hoping you're enjoying a "Summertime, and the livin' is easy…" From the days of our youth when school vacations left us months of free time to just be a kid, to the mountains, beachfront, or lakeside pleasures of adulthood, the pleasant days of summer give us a chance to take a deep breath, reset and perhaps ponder that challenging question of "what's next?" What better time to consider a reset of your ham radio activities, from

updating your shack or mobile, learning a new mode, choosing a list of speakers for the club meetings of autumn & winter, installing a new antenna or two, or helping another ham with similar projects? The opinion here is that we are blessed with reliable equipment that allows us to get on the air for pleasure or to act in the service to others as we do in times of emergency.

Summer should also bring us operational opportunities like gray-line openings, Sporadic-E (E_S) contacts that defy the norms and don't forget the Perseids meteor shower, which should occur this year from August 11-13th.

Another outreach opportunity may await your club or ARES / RACES group at the many annual county and state fairs across this great nation. With (hopefully) the worst of Covid-19 behind us, these popular rustic gatherings often make space available for community organizations at little or no cost. What a great way to meet prospective newcomers and offer visitors the opportunity to send a radiogram to a loved one. An information booth and / or radio support can also be welcomed by the many communities that conduct summer concerts in the park.

Establishing a link with other community organizations can also bring benefits to both. Groups like the Kiwanis, Rotary, Chamber of Commerce, etc. often plan and conduct summer street fairs, art shows, chili cook-offs, antique auto shows, etc. Offering to assist with public safety or community service communications (like finding a lost child) can build long-lasting bridges. I'm aware of one club that teamed up with the Rotary and was later surprised by a rather substantial gift to the club's treasury by the Rotarians, as an expression of their gratitude and support.

Don't overlook the creation of a special event station to support your community. It seems that every year there's some kind of special anniversary that marks a historical

*5904 Lake Lindero Drive, Agoura Hills, CA 91301
e-mail: <aa6jr@cq-amateur-radio.com>

event in communities large and small. It could mark the founding of a city or county or the commemoration of a significant accomplishment, like the completion of a project (such as the transcontinental railroad). There have been special event stations for occasions as large in scope as the World Series or the Indy 500 and as small as the founding of your locality. Use your imagination and reach out to the organizers of a special event in your area with an offer to "put it on the map."

And remember that summer is a good time to line up your club's scheduled speakers for the fall and winter months. A little planning now pays big benefits later.

It's Election Time

A lot of emphasis has been placed on the importance of this year's federal election but don't overlook the significance of your state and local offices either. While it may seem a bit early to consider your choices, this is actually the best time to advocate for your radio interests. What's important is that this is the time candidates seek to shore up their local support through "meet and greet" events in their communities, and yes, they also seek financial support for their campaigns. These are opportunities for you to express your concerns about the rules and regulations that apply to our radio pursuits.

At the federal level, your congressional representative and senators play a significant role in determining policies that impact our hobby, from the makeup of the FCC, through rule making and important matters such as the recent proposal to charge fees on the placement of amateur radio repeaters in national parks. It would be appropriate to remind your representatives of the important roles we play as emergency communicators and disaster relief volunteers.

Closer to home, your state and local representatives determine matters such as zoning regulations that apply to antenna structures, and non-government homeowner associations exert even more influence on matters such as antennas and the appearance of your home. Some even govern what types of vehicles can be parked in your driveway.

While these matters may seem complicated, a few simple "elevator speech" reminders can convey your concern and solicit the support of your elected officials. If they hear similar messages from several commenters, trust me, they take notice. Phrases such as, "I'm part of the ham radio volunteers that serve the public when we're needed. I hope we have your support for continuing our services to the community." Or, "Did you know there are (insert number here) ham radio operators in your district? We need your help to ensure our ability to serve the public when necessary." You can easily obtain the number of licensed hams in your county or state at <www.qrz.com>.

The federal government, and many state elected officials, often take an extended summer recess through much of August through the Labor Day weekend. That means they are in their home districts doing constituent work. Be alert to the opportunities there may be to attend an outreach event. A little effort can go a long way.

Back to the Bands

So with all the other happenings under control, it's time for me to check the bands again. After all, no matter what the season, there are few things more enjoyable than making a new friend through *The Magic In The Sky*.

digital connection

BY DON ROTOLO,* N2IRZ

High(ish) Speed Packet

Some Practical Advice on Breaking the 1k2 Barrier

Most hams I speak with believe that packet on VHF and above is almost all 1,200-baud FM, and it is likely that you agree, since it is true. Way back in the day, we had links with higher speeds, including 56 kilobaud — the GRAPES modem — but this and others never really caught on because of several significant issues.

Rather than revisit history, this month we'll take a practical look at running 9,600-baud (9k6) packet, regaining wider popularity as network backbones, TARPN links, on Winlink and, just recently, the 2022 Appalachian Trail Golden Packet, where it is reported to have worked even better than the 1,200-baud attempt. We'll start with a look at the technical requirements for higher-speed packet, cover some details of getting and/or modifying a radio, and then how to check that it works.

The gold standard for higher-speed radio modems is arguably the G3RUH design. It is scalable to 38.4 kilobits per second (kb/s), but has some stringent requirements for the radio. First, any distortion of the audio signal, including pre- or de-emphasis that is commonly used in voice radios, is unacceptable. Second, the transmitted and received signals need a frequency response down to DC — particularly the receive audio. Lastly, the "group delay" — the difference by audio frequency of the phase of the audio signal — needs to be as close to zero as possible. These significant requirements very much limit the range of radios that can be made to work well with a G3RUH modem.

On the transmitter side, the prevalence of phase modulation, which is indistinguishable by ear from true frequency modulation, takes most radios out of the running: True FM is necessary. The pre-emphasis circuits almost universally used for voice communications must be bypassed, as do any modulation limiters. This generally requires interpreting the schematic diagram and doing some soldering in tight quarters for direct access to the modulator circuit. For what it's worth, crystal-controlled transmitters tend to be pretty good for generating clean true FM signals, but crystals are getting harder and harder to find, and the inflexible frequency assignment is a downside.

On the receiver side, direct access to the FM discriminator signal is required, bypassing the de-emphasis circuit. Too far down the demodulation chain and you encounter series blocking capacitors, which block the DC response. But too early in the demodulation chain and you lose filtering that keeps the signal clean.

Not everyone is comfortable making internal connections, but for the most part these involve some relatively simple soldering work. Many modern radios bring these signals out to an external connector, but some do this better than others: In many cases, "9,600-ready" is more marketing than technical fact: Often the IF bandwidth is too narrow for 9k6 (8 kHz is ideal, 6 kHz works) and the transmit-receive / receive-transmit turnaround times are several hundred milliseconds. It makes little sense to use a radio where the TX Delay is longer than a packet. Check the specifications before assuming "9,600-ready" is really true.

Do be aware that there are some commercial radios out there that are designed specifically for higher-speed data, such as the Tait TM8105. These are sometimes found on eBay or at hamfests, but (caveat emptor) there are several versions and not all of them are useful on amateur frequencies. Nonetheless, without any modifications (except programming) these carry 9k6 quite well.

All of these are brought up not in an attempt to dissuade you from attempting higher data rates, but to illustrate just why speeds above 1,200 baud never really caught on in a big way. The Bell 202 modem used for 1,200 baud, in comparison, was developed specifically for using voice-grade audio (e.g., telephone) channels, and is largely insensitive to "defects" in the audio chain. If you can talk simplex, a 1,200-baud link will work.

I've written about the NinoTNC before, but as an introduction it is a 300-9,600 baud KISS TNC kit, with the same form factor as a Raspberry Pi. Developed for use in the TARPN network (for which it is ideally suited), it is inexpensive (under $40) and has some unique advantages (such as IL2P forward-error correction). But one very useful advantage, previously unknown to me, is that even though it is interoperable with G3RUH modems, it does not have a requirement for DC response in the transmit or receive audio chain. At least, it works well even with a blocking capacitor in line, so that's my conclusion.

Not that big a deal, you think, until you realize that you can change the internal radio modulator and discriminator access points to places a little bit farther down the line, which are often far easier to access. And that is exactly the case for the Kenwood TK-762G/TK-862G radios: The modulation tap requires some soldering, but the remaining signals are found on an easily accessed internal connector.

The Kenwood radio family we'll be discussing includes the TK760G, TK-762G, TK860G, and TK-862G. The 7xx series radios are VHF and the 8xx series are UHF; standard power is 25 watts while high power (the GH version) is 50 watts; models without the G (e.g., TK-760) are different and this information doesn't apply to them. While each model has some different features, they are all basically the same radio and are modified for 9,600-baud operation in the same way. Note that it may be possible that other models can be used; I don't know about them, but I will encourage you to try by going through the thought processes used to identify how and where to modify the radio. I modified both TK-762GH and TK-862G radios in preparation for this article.

I was loaned two TK-862G radios and a Tait TM8105 to be used as a reference. Now that I was familiar with the radio, I managed to find four TK-762GH radios for sale at Hamvention. It was later on Saturday, and rain was predicted for Sunday, so the seller was ready to make a deal. I fished out the four radios (from a bin of mixed models), held out a $10 bill and said, "now, you don't really want to bring these home, do you?" He was a little hesitant, but he grabbed the $10 and away I went.

*c/o CQ magazine
Email : <N2IRZ@cq-amateur-radio.com>

Fast-forward a couple of days, at home in the workshop, where I verified that each radio powered up and transmitted. Not knowing how they were programmed, I just connected them to a dummy load and used my frequency counter to verify RF output. I couldn't verify receive since they were programmed with a split for repeater use; that would come later.

On eBay, I found the online store of "BlueMax49ers", also known as Mark Dunkle KJ6ZWL, and bought an "FTDI USB Kenwood Programming Cable" for the TK-762G. Mark's been doing this for a while, with hundreds of cables offered, and he stands behind all his products. You can also get the non-FTDI cable for a little less, but the FTDI USB interface chip is the gold standard for such things, and I thought it would be a false economy to get the cheaper version.

Waiting for the cable to show up, I went to the CHIRP website <https://bit.ly/3lPPyeR> to download the free, open-source programming software for hundreds of ham and commercial radios (including mine). Although it's freeware, if you use it successfully, it would be gracious of you to make a small donation to the project (*Figure 1*) .

I found a copy of the service manual on the Repeater Builders website at <www.repeater-builder.com>. Checking the schematic, I identified the audio modulation path and picked a place to access the modulator (have a look at the nearby simplified TX schematic and block diagram (*Figure 2*). Moving to the PC Board view, I found a couple of places where access might be less difficult, and then opened the radio to see the lay of the land (*Photo A*). It turned out that my preferred access point — the MD signal pin going into the VCO — was under the cast aluminum RF shield. No problem, but it did complicate things slightly.

It was at this point that the programming cable arrived, so I reprogrammed the radio for 145.01 MHz, wide IF, low power (for testing) and no tones or other options. The software warned me that frequencies out of the commercial band are only partly supported, but the radio programmed just fine. A friend with the genuine Kenwood software confirmed that he gets a warning for out-of-range frequencies but the radio accepts them anyway.

I started by testing 1,200-baud operation, adjusting the TX Audio by ear for a nice clean signal. Moving up to 4,800 baud, which uses the same modulation scheme as 9,600 (but half

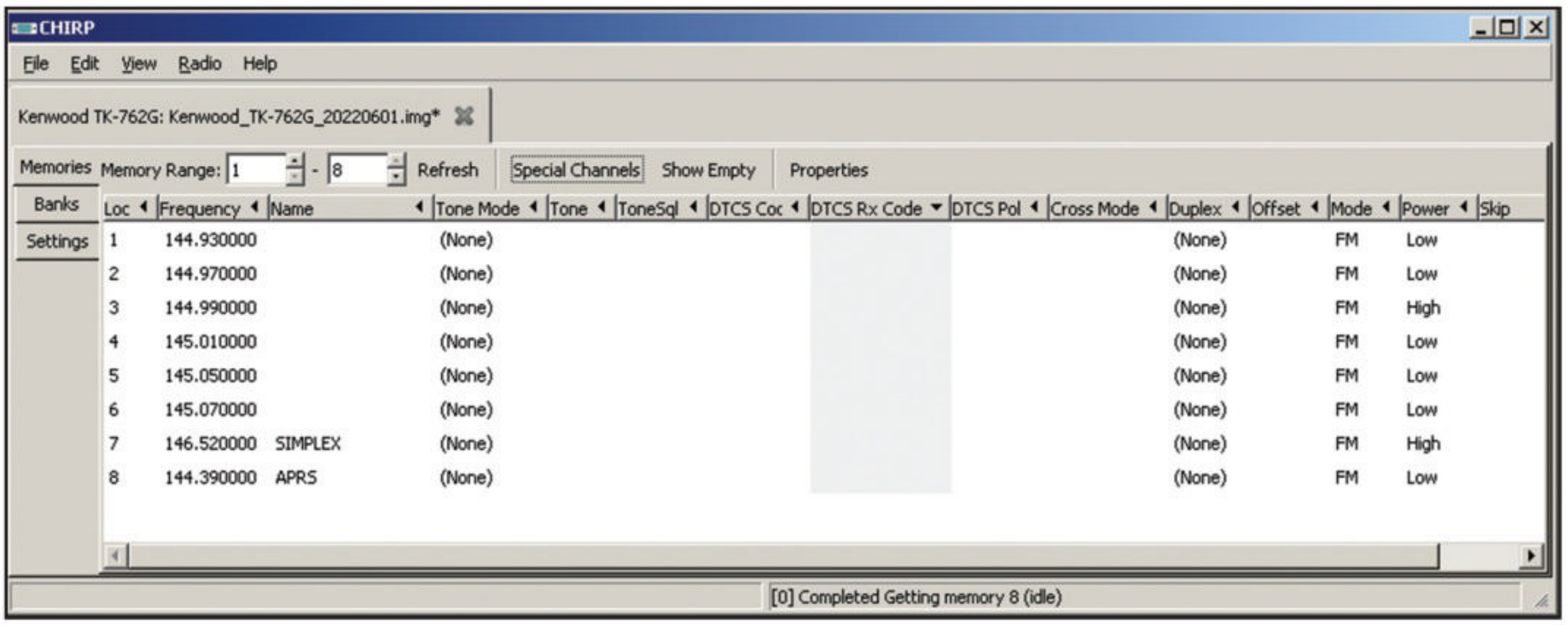


Figure 1. The CHIRP main screen. CHIRP is freeware programming software for many ham and commercial radios. You'll also need the correct programming cable for this to work. Here you can see how I programmed my TK-762GH radio, mostly on low power for testing. If CHIRP works for you, it would be gracious if you'd send them a small donation in support of their efforts.

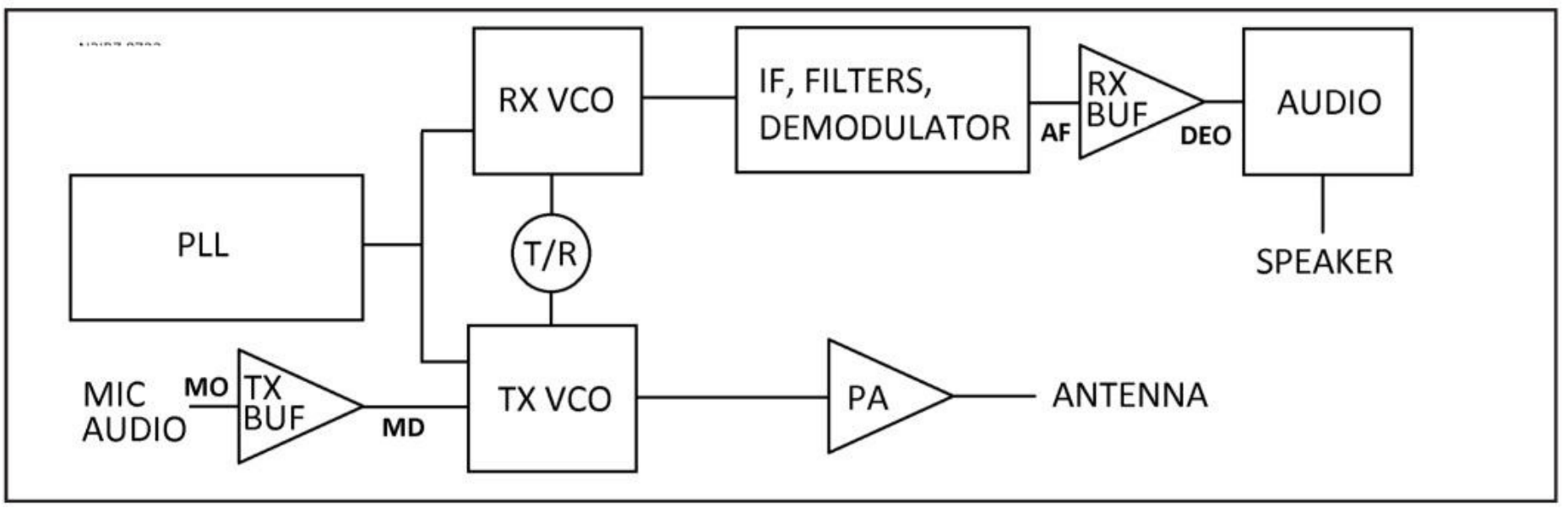


Figure 2. A simplified block diagram of the Kenwood TK-x62G modulation and demodulation circuits. Ideal 9,600-baud tap points for transmit are just before the transmit VCO and just after the demodulator. In my case, I found better performance by including the buffer amplifiers in the signal chains.

the speed), I made most of my adjustments. Once I was satisfied, I made the final adjustments and testing at 9,600. Most of what follows was done at 9,600.

I started testing the transmit section first, the NinoTNC's test modes coming in handy. I used the Tait radio for reference, just so I could evaluate my radio's transmitter and receiver separately. Watching the eye diagram, I got a good eye pattern with about 120-mV drive from the TNC and so soldered a wire onto the board for further testing. Do keep in mind that I was trying to avoid a point in the chain that passed through a capacitor, as this would remove any DC response. It seemed way too easy ... and it was. More in a moment.

Just a side note on my RF test setup: The antenna connector on both the transmitter and receiver were covered in aluminum foil. My thinking was that the transmitter (on low power) would fold back gracefully to very low output, and the foil shielding the receiver would attenuate the signal a lot. While it was a complete guess, I think the signal level into the receiver was

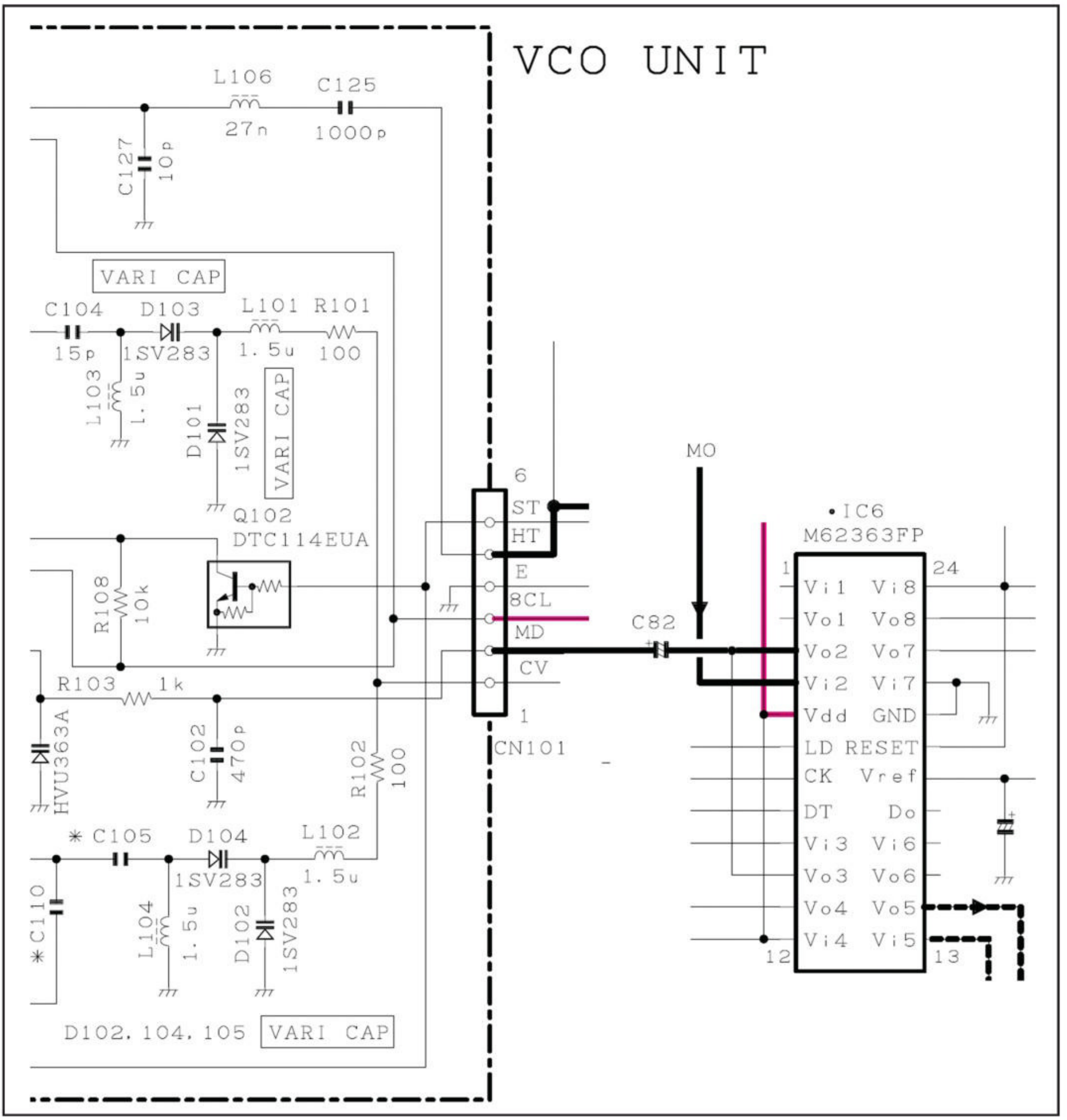


Figure 3. A simplified transmit chain schematic for the Kenwood TK-x62G. Taken from the Kenwood service manual, we see where the MO signal enters IC6 for buffering, passes through C82 and into the modulator circuit as the MD signal. As described in the text, I found better performance using the MO signal despite the presence of C82.

pretty small. Note to self: Get an adjustable attenuator for next time. And maybe use a dummy load.

For the receiver, I first looked at the discriminator output (Pin 9 of IC505) I again found a few likely places (see the simplified RX schematic [*Figure 3*]) and went into the radio to see if I could actually connect to anything. To my surprise, I found TP1, an undocumented test point connected directly to Pin 9. Perfect. I soldered another wire and started testing receive, where I found a fair amount of distortion on the signal. Ugh!

Looking more closely, I saw that just after my selected point was a small filter circuit (R59, C60) that would filter out noise. That means either I figure out a way to tap into this spot (too small), recreate the filter on my wire (parts not in stock), or find a place downstream that I could physically access. TP1 was truly too good to be true. Poking around, the best place I could find was just after a buffer amplifier, but there was a blocking capacitor in the circuit, which I figured I could bypass if necessary.

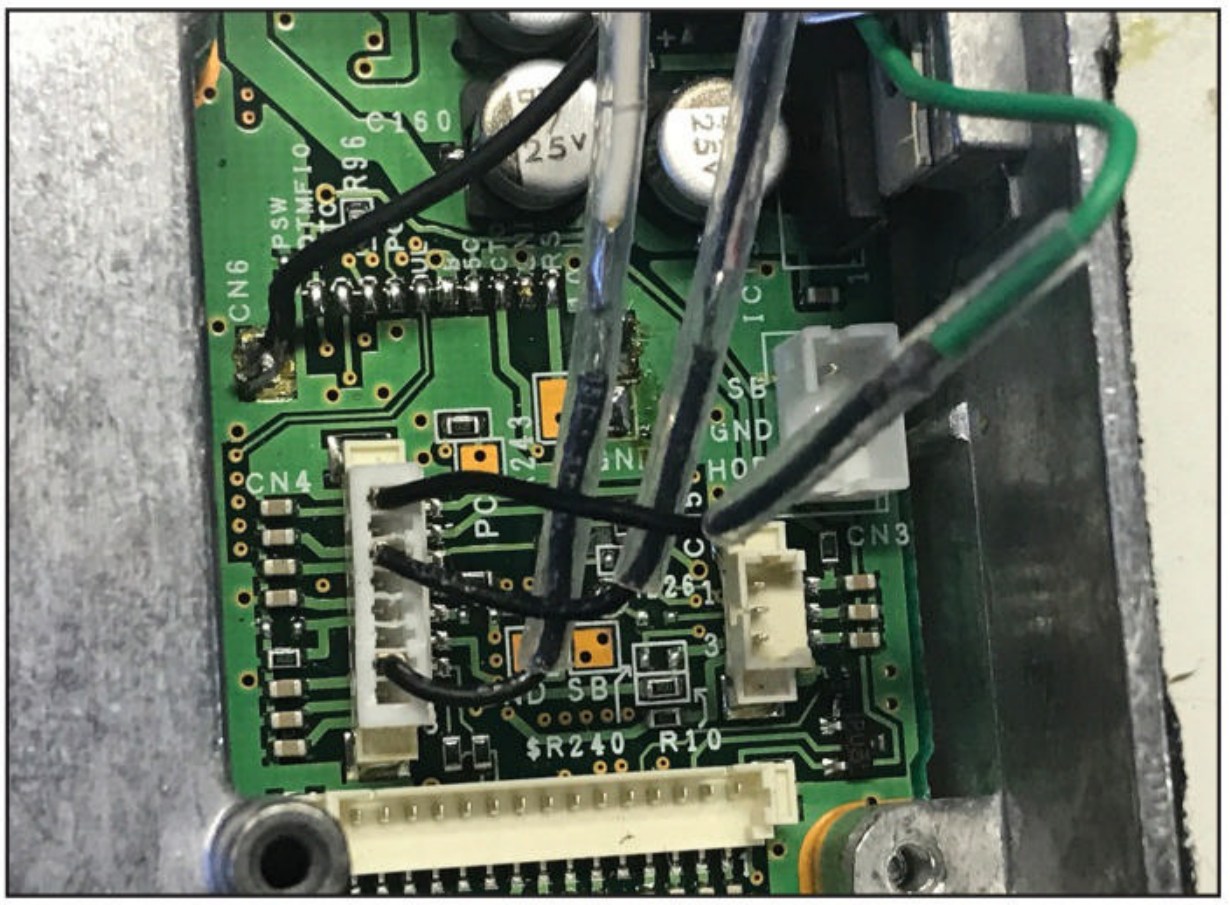


Photo A. Inside the Kenwood TK-762G. The TNC needs only four signals: TXA, RXA, PTT, and GND. The GND signal is taken from a pad near CN6, while RXA and PTT are taken from CN4, making for quick and easy access to most of the needed signals. The third wire in CN4 is for an unrelated modification.

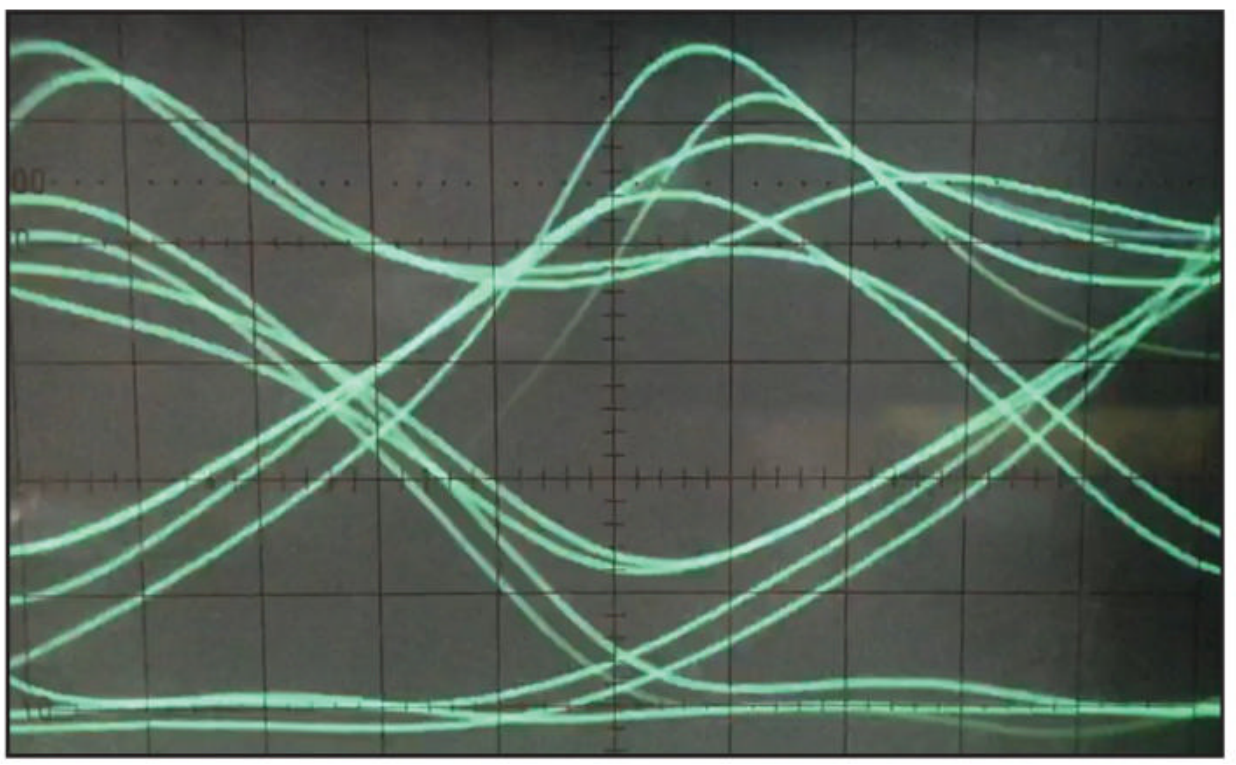


Photo B. This is the received eye pattern at 9,600 baud, using the reference radio as the transmitter. Ideally, we want to see a clearly-formed "eye" in the middle and compact crossing points at top and bottom. This one is less than ideal, with the crossings spread out about 1/5 of the signal's height at top and bottom, but more than good enough for our purposes.

Not wanting to make any permanent modifications just yet, I found that the buffer amp's output was available on an internal connector (CN4) which was otherwise unused. I connected my oscilloscope to that signal (DEO) and found to my surprise that it worked pretty well, despite that capacitor. After dialing in the transmit modulation adjustment I got the eye pattern shown in *Photo B* and saw 100% success in packet reception.

Why was I surprised? The amplifier was on the wrong side of a capacitor, meaning that no DC was getting through which, according to G3RUH, was fatal for decent performance. Pinging Nino Carrillo, KK4HEJ, the NinoTNC's designer, he said that he was pretty sure his implementation didn't care about DC response. To say that was a revelation would be an understatement. I was now free to ignore capacitors in the audio chains.

There was still a bit of distortion in the received signal, and so I poked around the receive chain but could not find a better signal. I believe that the distortion I was seeing in the received eye pattern was an artifact of the 6-kHz "wide" IF filter, which is a little bit narrower than ideal. I looked at replacing the IF filter, but it would be far too involved to be practical. The answer was to live with it and accept a few dB less link margin.

Back to the transmit chain. With the freedom from worrying about capacitors, I decided to poke around the transmit chain to see if I could find a better spot. And, it turns out, I did, at the input to the last buffer amplifier, where a signal called "MO" is found. This buffer amplifier helps regulate the voltage being fed into the modulator, allowing for a less fussy transmit audio adjustment on the TNC. MO is also under the shielding, accessible at a via (PC Board through-hole). I soldered a small wire into the via (for mechanical robustness) and soldered my signal wire to the small wire (*Photo C*).

If you want to see a detailed write up of the modification, check on the TARPN builder's Radios + Wiring page <https://bit.ly/3GCkOYa> or write to me. Before starting to invent my own wheel, I did look around at what others had done and found them to be less than ideal. Some were focused on voice

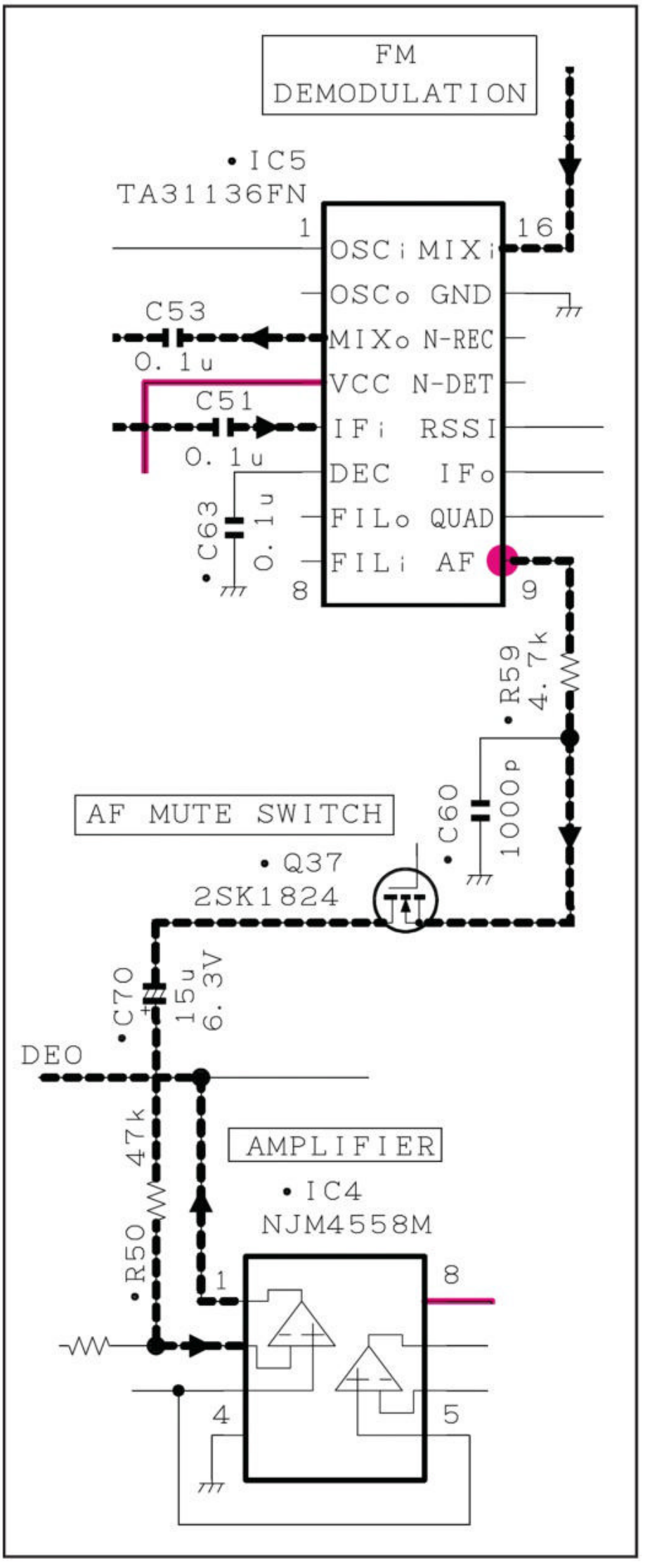


Figure 4. A simplified receive chain schematic for the Kenwood TK-x62G. We can see the direct output of the discriminator on Pin 9 of IC5 (the AF signal – the red dot denotes TP1 on the main board), but I ended up with better performance using the DEO signal after the buffer amplifier, despite the presence of C70. The filtering effects of R59/C60 turned out to be important.

repeaters, and so didn't actually modify the audio chains. One place claimed to show a 9k6 modification for packet, but they use microphone audio, which makes me wonder if they really ever tested 9k6 operation. I'm not saying that my version is perfect, but the microphone audio on the front panel is definitely before the pre-emphasis circuit and will injure a 9k6 signal.

When evaluating a radio for 9k6 conversion, consider the answers to these questions (all should be "yes"): Does the transmitter use true FM? Are the TX/RX turnaround times on the order of tens of milliseconds? Can you get a schematic for the radio? If it is programmable, can you get both a cable

New Test Modes for NinoTNC

In May 2022, Nino Carrillo, KK4HEJ, added some new features to the NinoTNC, including a DPSK mode for 300-baud HF operation and three test modes:

Linktest Beacon Mode: Without needing an external host, the NinoTNC sends brief numbered packets about every second until told to stop, helping check link performance. In this mode, the TNC isn't listening to KISS commands or received packets. This function is available for every operating mode and is persistent through mode changes and power cycles. It uses the most recent callsign (default is N9600A-3) used for regular operation, so be sure to have transmitted a few packets with a valid callsign previously. To enter Linktest Beacon Mode, press and hold the TX Test button for more than 13 seconds. Starting at 10 seconds, the LEDs on the NinoTNC will light sequentially, and once the final LED is lit the mode is entered. To exit the mode, press the TX Test button.

Bit Error Rate Transmit Mode: Also without needing an external host, the NinoTNC sends a 2-minute-long string of uninterrupted bits, encoded in a way that can be evaluated for bit errors by another NinoTNC in the Bit Error Receive Mode. This function is available only with the AX.25 protocol switch setting, but can be used in all modulation selections (AFSK, GFSK, DPSK). To enter Bit Error Rate Transmit Mode, press and hold the TX Test button for more than 10 seconds and, as the LEDs start lighting sequentially, release the TX Test button when the green (RXPKT) lights (before DCD lights). The TNC will transmit a test packet, then start the bitstream transmission about a second later. It can be stopped by pressing the TX Test button again, or waiting the full 2 minutes, which will likely exceed the PTT time-out timer in most modern radios.

Bit Error Rate Receive Mode: Used in conjunction with the Bit Error Rate Transmit Mode, the NinoTNC receives the bitstream and counts the errors. Set up a host that can receive KISS frames from the TNC, then start the mode as described below. The TNC will send bit error report frames to the host every second for about 10 minutes. The report frames contain the demodulator number (there are 2, each with different equalization), total bits received since start and total bits received in error. These counts will remain at zero for about 1.5 seconds after start to allow things to stabilize, and then continually increase. If the error count is not increasing, or increasing very slowly, the link has a low Bit Error Rate. Due to the way the GFSK data stream is encoded, two errors will be counted for each pulse actually received in error, so the error count increases by two in practice. This isn't very important, since we are more interested in the order of magnitude of the BER than in the actual count. A BER of 10^{-6} is considered pretty good.

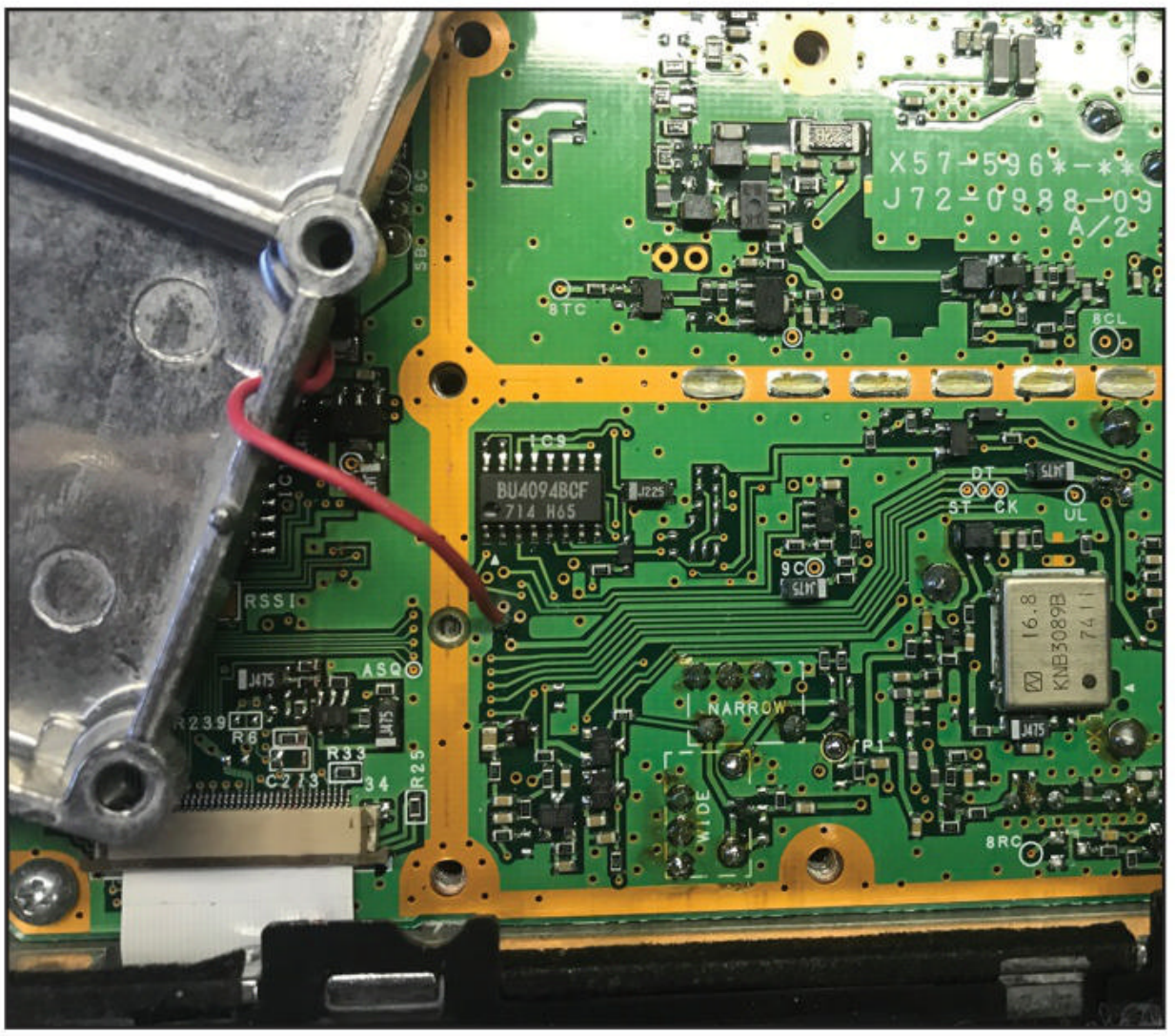


Photo C. Under the RF shielding in a Kenwood TK-762G. The best connection point for the transmit audio requires a small hole drilled in the shield case to pass the wire to outside. This shows a larger red wire connected directly to a via (through-hole) on the PC board; later, I decided to solder a small wire into the via and connect the signal wire to that, since the via is somewhat fragile.

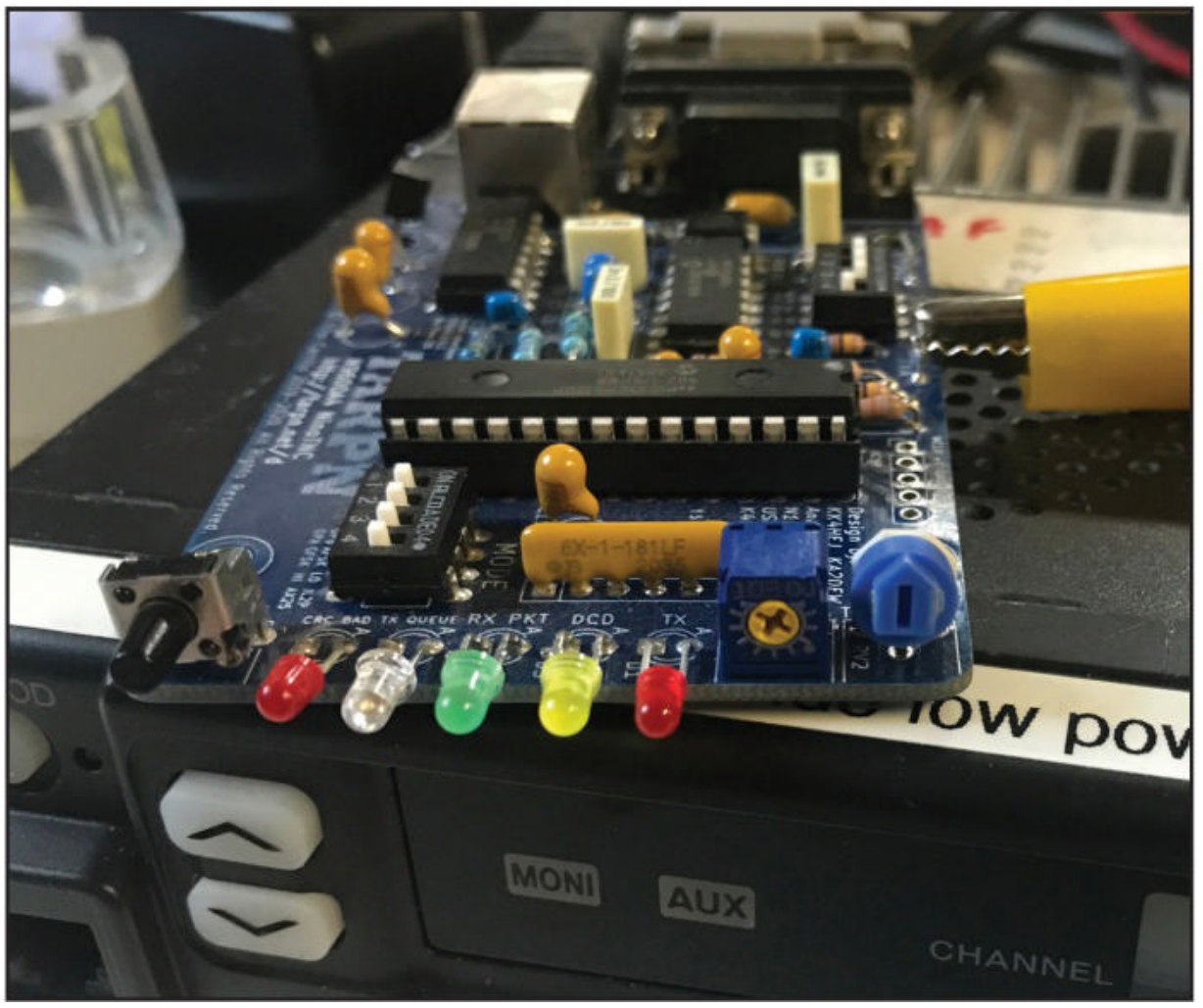


Photo D. Receive testing the Kenwood TK-762G with a NinoTNC. TXA and RXA test points on the NinoTNC, along with transmit test modes, make it easier to adjust the transmit audio level for best performance.

and software? Will it operate in the amateur bands?

With schematic in hand, find the modulator. Is there a place you can tap into that? Same with the discriminator. You might have to move a little down the chain to find a spot. Be careful of impedances, if your TNC audio inputs and outputs are too low impedance they might distort the radio signals. Have a look on the internet to see if anyone has already published modification instructions. Lastly, have a reference radio on hand if possible, so you can easily isolate whether a problem is in your radio.

I hope this overview of a 9k6 modification helps you both better understand the process and encourages you to try 9,600-baud operation. Many suitable commercial radios are available both online and at hamfests for reasonable prices. Most hams avoid these radios, both out of ignorance of what they can do, and being unfamiliar with the various models. Pick a few brands and models, research them and, armed with knowledge, go looking. And don't be afraid to bargain!

While I am no expert, please write if there's anything I can help clarify for you.

– Until next time, 73 de N2IRZ.

vhf plus

BY TRENT FLEMING,* N4DTF

Making Super High Frequencies Available to the Masses

Recently, Icom announced not a new product, but a new project that might result in a product. The company's SHF Project <www.icomjapan.com/lp/shf> is focused on providing commercial gear for two of the SHF bands accessible to amateurs: 2.4 and 5.7 GHz. Today, most of the equipment in use on these bands is either converted from other uses or built from scratch. Icom appears to be leveraging the popular IC-705 platform for this new effort. Perhaps some of you saw the proof of concept that was shown at Dayton in May.

I reached out to our friend, Ray Novak, N9JA, at Icom, and he offered the following: "At this time, this is an experimental project and a proof of concept. We are a long way out to take a new concept to a sellable product. Who knows, it may never see production."

* <n4dtf@cq-amateur-radio.com>

In spite of those appropriately cautious words, I am at least appreciative that one of the major manufacturers is taking a look at providing SHF equipment. Make sure you read the Icom link about the project; the proposal includes some interesting things, such as placing the RF section right at the antenna. Since most folks run these bands portable anyway, that kind of setup makes sense.

I sampled the Gig and above community for feedback. Several folks have already weighed in with YouTube videos or blog posts as well. The consensus seems to be that most are glad about SHF getting some attention, but of course concerned about price and availability. In addition, the two bands in Icom's initial proof of concept are not the most popular, in part due to noise issues and in the case of 2.4, shared services. The consensus seems to be that 10 GHz is the "best" SHF band for a newcomer to get involved with. Of course, there

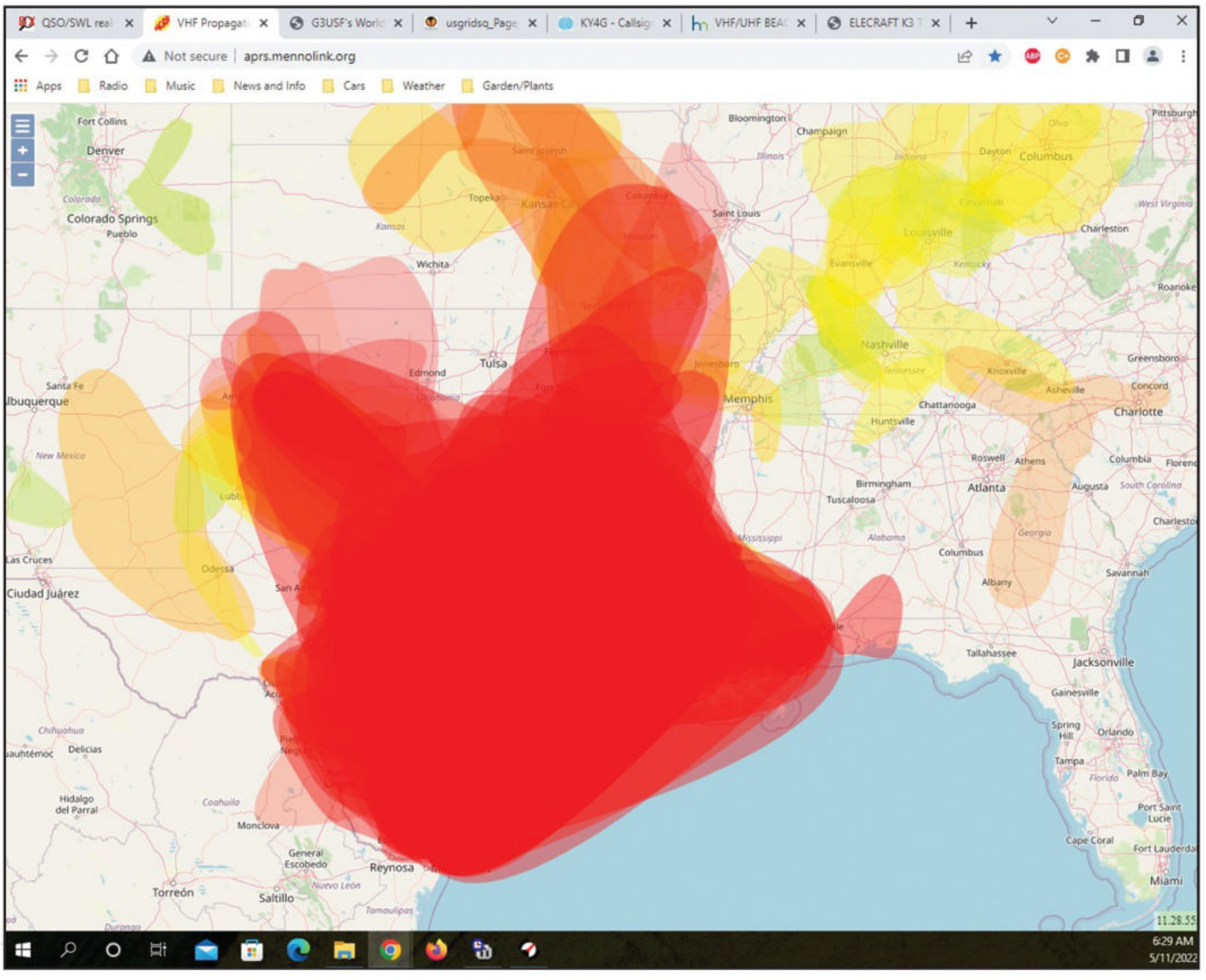


Photo A. Map of major 2-meter tropo opening on May 11, 2022. (Map courtesy aprs.mennolink.org)

are other opinions about that and all such opinions are welcomed. Let me know *your* thoughts about SHF opportunities.

Open for Discussion

Last month, I posed a question about transverters vs. all mode rigs. The focus here is mainly on weak-signal modes, as commercial FM units remain available for several "non-standard" bands. I heard from a few of you who expressed thoughts or preferences and I wanted to share those here. An important determination is the desired band, of course. In the states, 222 MHz is probably the most popular band that is not commercially available. There are some popular older rigs, including the venerable FT-736r, but these are rapidly aging, so most folks are turning to transverters for this band. The 902-MHz band (33 cm) is another band that is almost exclusively transverter driven, and until recently, 1.2 GHz was as well. While some manufacturers offered modules for 1.2, it was rare to see it built into a radio until the newer radios such as the IC-9700 came on the market.

Feature function is also important, and today's modern transceivers have excellent receivers, thus enhancing the ability of a transverter by allowing those features to be used. While setting up the transverter initially may be a little challenging, adding a new band to a transceiver you are already familiar with can make operating easier.

The final point is power out. Transverters are often designed to produce lower power — 5 or 10 watts depending on drive — so you may need an amplifier to reach power levels that are usable. There are transverters — primarily those from Down East Microwave / Q5 — available with significant power out, and these may be an option for some of you. Finally, remember that both transverters and power amplifiers are well suited to homebrew activity, so if you have the interest and the skills, you may want to roll your own. I continue to be interested in how you are set up for the bands from 2 meters through 1.2 GHz in particular, so that we can help others who may be interested in those bands.

On the Air

May saw a number of good "tropo mornings" on 2 meters and above. One such morning was May 11th (Photo A). KF4WE, Charlie in EM56, was working west and south before 8 a.m.

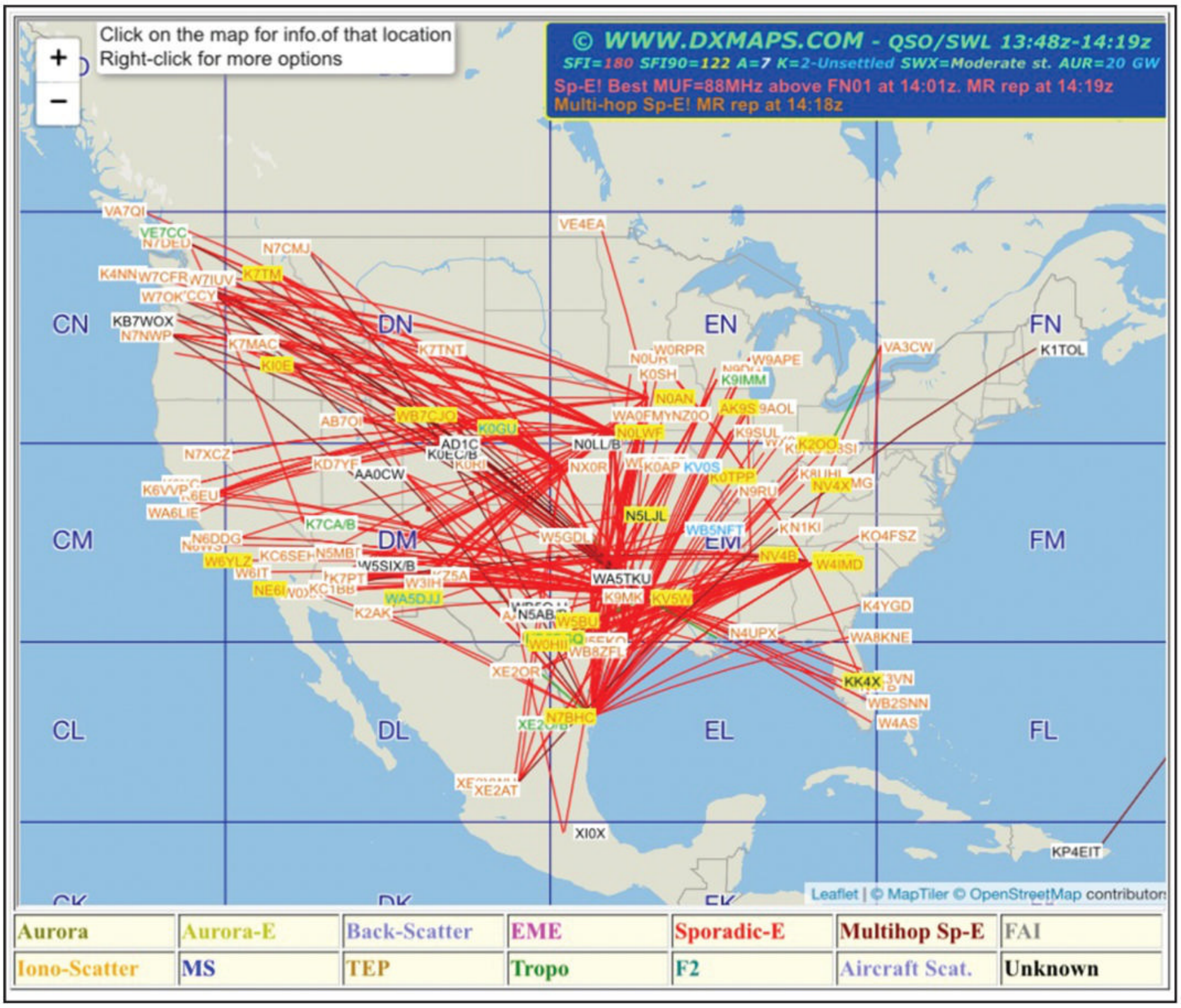


Photo B. This 6-meter Sporadic-E opening of May 19th covered much of the continental U.S. (Map courtesy DXmaps.com)

CDT. I worked him mobile (with 50 watts via a 5/8-wave vertical) with 5x5 signals from EM45, roughly 100 miles away. Charlie reported other contacts in Texas and Oklahoma.

David, WA3GWK, reported: "From EM60, on SSB, I worked EM10, EM22, EL49, El09, EL39, EM00, and EM25 on 2 meters. On 432, I worked EL09, EL39, EM10, and EM00 with 75 watts also SSB. A good morning!"

As I write this in early June, we are still seeing good tropo across the Gulf coast and Mid-south, so pay attention these early humid mornings!

May also had some good 6-meter activity … see *Photo B* for an example from May 19th. June started off well for 6 meters. On Friday, June 3rd, we experienced a long-lasting opening over most of the U.S. Your humble columnist was actually at home and able to spend some time on the air. There were openings in so many directions that I began using my HF vertical to better listen in all directions, then swing the beam. In an off and on effort (I have a day job, you know) I worked a couple of dozen stations from Arizona to New England and Colorado to Florida. Added two new grids, EM13 and DM67, thanks to a couple of really good operators in those grids. All of my contacts were phone, and the stations were spread out from 50.125 to 50.170 MHz or so. I heard that 50.313 MHz was active as well and I saw a number of good reports from stations who had great success.

One last report: On the morning of June 7th, Steve, W5KI, had a nice FT8 opening to Europe on 6 meters. He heard from stations on the U.S. East Coast that reported even better conditions. Steve added three new countries, upping his total to 118 worked. Lots of new eastern European and Italian grids on. He mentioned that this opening to EU had some of the worst / shortest QSB he ever remembers. "You have to be quick, even with the strong stations," he noted. "It appears I'm on the very western edge, slipping in and out of the opening."

Steve continued, "And probably better was opening to JA/AS on evening of June 3rd local time. Long opening. Worked 48 JA stations and a new DXCC with Taiwan — already confirmed in LOTW. FT8 screen was full, 35-40 JAs per sequence with solid signals. Fun!"

Steve is in EM36, northwestern Arkansas. He enjoys a little Ozarks elevation at his QTH!

That's it for this month! Please keep sending me your signal reports, comments, questions, and information about your activities!

awards

BY STEVE MOLO,* KI4KWR

Changes Coming to CQ Award Certificates
WAZ and WPX First to Change Over

CQ has some important updates and announcements about its award programs, so this month I am turning the keyboard over to Worked All Zones Award Manager José Castillo, N4BAA, and Editor Rich Moseson, W2VU. – KI4KWR

As many participants in our awards programs are aware, we have become quite backlogged in producing and mailing certificates. This has been due to a combination of factors, including competing demands on the time of our (volunteer) calligrapher, shortages of the special parchment paper on which the certificates are printed, as well as the cardboard mailing envelopes and the ever-rising cost of postage (another increase kicked in last month).

The good news is that we finally got resupplied with certificate blanks, are making great progress in getting caught up (see photo), and hope to be current very soon. However, due to the ever-increasing popularity of digital modes and ease of applying for awards, CQ can no longer absorb the cost of providing hand-lettered award certificates. (The award fees — which haven't increased in many years — go to the award managers to cover their costs in administering each award program; CQ has — until now — always covered the costs of printing, completing, and mailing the certificates.)

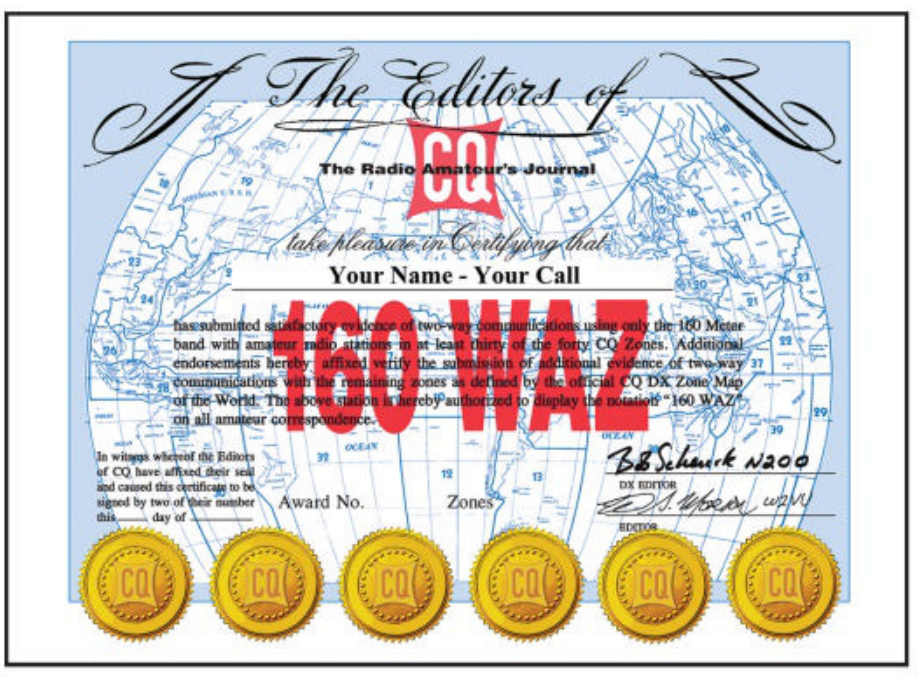
*Email: <KI4KWR@cq-amateur-radio.com>

Changes to WAZ and WPX Awards

Effective September 1, 2022, the "standard" award certificate for WAZ and WPX will be a high-definition digital PDF file (suitable for printing and framing) delivered via email from the award manager the same day as the CQ award letter is sent. [WPX awards have been delivered in digital form for quite some time; we will no longer automatically provide hand-lettered paper certificates (see below)]. CQ DX and USA-CA awards will follow once the software is set up for their award managers.

Hand-lettered certificates will continue to be processed from CQ's home office in New York (these certificates are not processed by the award managers or checkpoints), but as an added-cost option for a fee of $19.00 U.S., which includes shipping (multiple certificates mailed in one envelope will be $5 U.S. each after $19 for the first one). Updated rules will be posted on the CQ website and individual award websites prior to the September 1st effective date of the new policy. Award certificates "in the pipeline" before September 1st will not be subject to the new fee.

CQ calligrapher Cathy Ross hard at work lettering WPX certificates. Our certificate backlog has been significantly reduced. (K2MGA photo)



New Address for WAZ Applications and Inquiries

WAZ program participants: Please make note of the contact information for our new award manager:

José A. Castillo, N4BAA
6773 South State Road 103
Straughn, IN 47387
USA
Email: <n4baa@cq-amateur-radio.com>

All WAZ-related correspondence should be sent to José. Please do not send any award-related correspondence to former manager John Bergman, KC5LK.

BY BOB SCHENCK,* N2OO

DX Chasing Guide for Novice and Technician Licensees

Changes Coming to CQ Awards

We are in the process of changing "standard" CQ award certificates from hand-lettered parchment certificates to high-definition PDF files suitable for printing and framing. Parchment certificates will continue to be available as added-cost options. Please see this month's "Awards" column for details and an update on our certificate backlog.

Are you a USA Novice or Technician class licensee and wondering what it would be like to work some DX? Bearing in mind that working "DX" can also include working stations across the country as well as around the world? Are you tired of trying to talk on your local 2-meter repeater? Well, with the recent increase in sunspot activity, there is a band available to you that has been opening almost every day now around the country as well as around the world: 10 meters. There are other bands available, but none as easy to do and as much fun as 10 meters can be. Your "phone" band on 10 meters is 28.300-28.500 MHz. Most SSB activity on 10 meters can be found in this portion of the band. The full phone band for all other U.S. licensees runs from 28.300 MHz all the way up to 29.700 MHz (see *Figure 1*). But most activity higher than 28.500 MHz is generally found only during contests or during periods of wide-open band conditions. Another mode available for you on 10 meters is digital. This is allowed for you from 28.000-28.300 MHz. Although other digital modes are out there (such as RTTY, PSK, etc.), the most prevalent digital mode today (by far) is FT8.

*email: <n2oo@comcast.net>

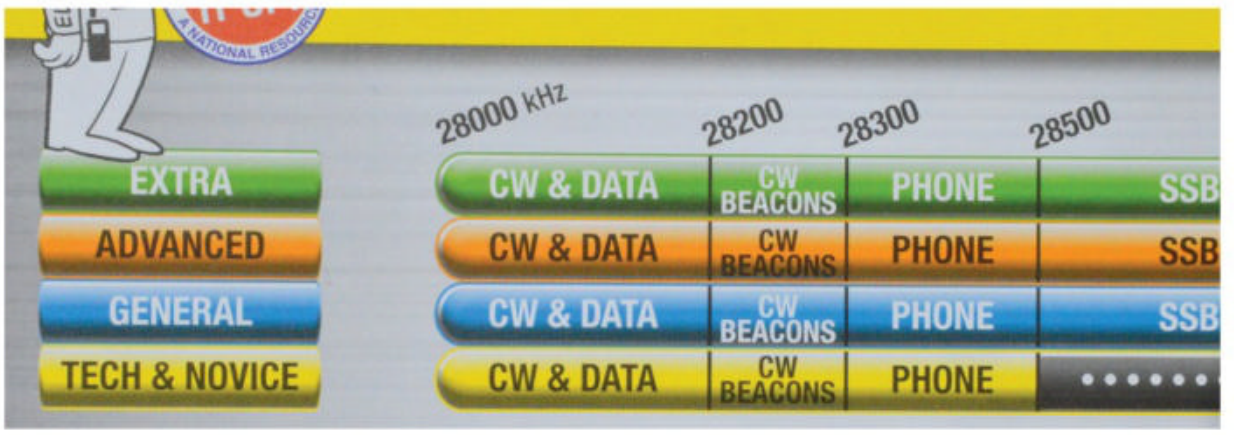


Figure 1. Novice / Technician privileges on the 10-meter band. With the sunspot cycle rising, 10 meters offers great opportunities for working DX. (Band charts courtesy Gordon West, WB6NOA and W5YI.org)

Figure 2. In addition to voice, digital, and Morse code (CW) privileges on 10 meters, Novice and Technician Class licensees also have CW privileges on the 80-, 40-, and 15-meter bands.

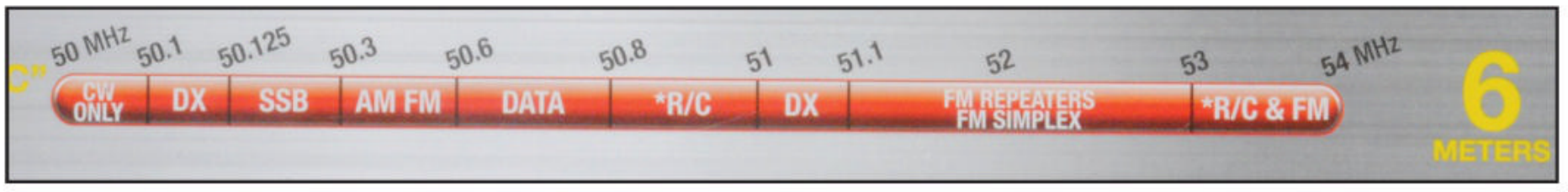


Figure 3. Technician Class hams (but not Novices) have all privileges on the 6-meter band, which typically opens for DX up to 1,300 miles (sometimes much farther) in the summertime.

Digital, Voice, or Code?

Over the past several years, FT8 has become extremely popular by hams of all classes around the world. The worldwide FT8 frequency on 10 meters is 28.074 MHz, which is within the band allowed for Novice / Technician digital communications. Another similar mode is FT4 and can be found on 28.180 MHz. It is twice as fast, ever so slightly less sensitive, and usually only used during periods of high propagation. Finally, let us not forget good old CW, or Morse code. Novices and Technicians may operate CW on other HF bands besides 10 meters. So, if you are willing to take on the CW challenge, then I encourage you to take the plunge and try to learn CW. It is a fun mode with a lot of activity. Once you learn it, you will be proud to have done so. Novices and Technicians have access to CW "only" on 80 meters (3.525-3.600 MHz), 40 meters (7.025-7.125 MHz), and 15 meters (21.025-21.200 MHz), as seen in *Figure 2*. Don't get confused, CW and digital are two different modes. You may only do CW in these segments on 80/40/15 meters. Ten meters is the exception where you can do both CW and digital from 28.000-28.300 MHz. Another band that could be fun is 6 meters (50-54 MHz) to which Technicians have full access (sorry, not novices). More on that later in the article.

I found a good "introduction" to FT8 that I found here: <https://tinyurl.com/ky6m9esc>, and a pretty extensive FT8

The WPX Program

CW

4061 ..... SQ8LUV

SSB

4430 ..... W1TRK
4431 ..... DL8YDU

Mixed

4437 ..... KØBYJ
4438 ..... AEØGV
4439 ..... W9NB
4440 ..... JL2GSN

Digital

1750 ..... AEØGV
1751 ..... JA6PKH
1752 ..... W8MHB
1753 ..... JS1LQI
1754 ..... KA6AIM

CW: 500: WU9D. **3200:** PY5EG. **5800:** N6JV.

SSB: 400: F4GVE. **500:** DL8YDU, PU4MMZ. **700:** KC3HXF. **3500:** PY5EG.

Mixed: 500: JL2GSN, WP4JLZ, W2SUB. **600:** F4GVE. **700:** KC7RAS. **850:** KC3HXF. **1100:** KM4VI. **1150:** I1YDT. **1250:** LX2SM. **1350:** K3DFL. **1650:** WU9D. **1750:** PU4MMZ. **1800:** K4IJQ. **2100:** KSØAA. **2400:** JR3UIC. **2500:** HB9EFK. **4300:** PY5EG.

Digital: 400: AEØGV, W9NB, KØBYJ, KC3HXF. **500:** WP4JLZ, W2SUB. **700:** KC7RAS. **750:** I1YDT. **1100:** LX2SM. **1350:** K3DFL. **1450:** WU9D. **1600:** PU4MMZ. **1900:** PY5EG. **2050:** JR3UIC. **2150:** KSØAA. **2200:** HB9EFK.

80 Meters: KSØAA
40 Meters: KC3HXF, KSØAA, F4GVE, HB9EFK
30 Meters: KØBYJ, I1YDT
20 Meters: KC3HXF, KSØAA
15 Meters: K3DFL, KSØAA
10 Meters: LX2SM, KSØAA

Asia: JA6PKH, JS1LQI, KSØAA, DL8YDU
Europe: W9NB, KC3HXF, KSØAA, DL8YDU, SQ8LUV
Oceania: JA6PKH, LX2SM, JS1LQI, I1YDT
North America: KØBYJ, KA4RUR, AEØGV, W9NB, W8MHB, KSØAA
South America: KC3HXF, KSØAA

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. and the ARRL Logbook of The World (LoTW).

*Please Note: The price of the 160, 30, 17, 12, 6, and Digital bars for the Award of Excellence are $6.50 each.

The WAZ Program

SINGLE BAND WAZ

6 Meter

189 ..... HB9FMN, 25 Zones

10 Meter CW

224 ..... K9ZO

10 Meter SSB

612 ..... SP5EWX

15 Meter CW

378 ..... K9ZO

17 Meter Digital

23 ..... JJ1OHH
24 ..... W3BNN

17 Meter SSB

67 ..... K4EM

20 Meter CW

681 ..... JR1BAS
682 ..... K9ZO

20 Meter Digital

44 ..... JR1BAS
45 ..... K9ZO
46 ..... W3BNN

20 Meter RTTY

87 ..... JR1BAS

20 Meter SSB

1270 ..... JR1BAS
1271 ..... K9ZO
1272 ..... SP5EWX

30 Meter CW

167 ..... OP4K

40 Meter CW

338 ..... K9ZO

40 Meter Digital

25 ..... JR1BAS

80 Meter CW

113 ..... WC6DX

ALL BAND WAZ

CW

1185 ..... SMØGII
1186 ..... JR1BAS
1187 ..... HK1MW
1188 ..... K9ZO
1189 ..... OP4K
1190 ..... K5TIA
1191 ..... W8BZY
1192 ..... SP5EWX
1193 ..... Q8LUV

Digital

349 ..... MI1DLB
350 ..... K3NQ
351 ..... K9ZO
352 ..... NN5E
353 ..... W6DF
354 ..... AA8SW
355 ..... JR1KEI

Mixed

10195 ..... IW8FEA
10196 ..... MI1DLB
10197 ..... N8IK
10198 ..... K3NQ
10199 ..... SMØGII
10200 ..... K6JBH
10201 ..... EA8DIB
10202 ..... JA7JPZ
10203 ..... NE1RD
10204 ..... W4CG
10205 ..... NE1B
10206 ..... AD3C
10207 ..... WX3P
10208 ..... K1CYQ
10209 ..... HK1MW
10210 ..... IK6IHU
10211 ..... AF4T
10212 ..... K9UWY
10213 ..... JH1TMX
10214 ..... KB1YNT
10215 ..... IKØTIX
10216 ..... W7EED
10217 ..... W4ARK
10218 ..... AD5ZA
10219 ..... K9ZO
10220 ..... NN5E
10221 ..... W6DF
10222 ..... JG3LHR
10223 ..... AA8SW
10224 ..... DK8MM
10225 ..... YB1TQL
10226 ..... KN4RNO
10227 ..... WC7F
10228 ..... IK8VRH
10229 ..... SP5EWX
10230 ..... KLØS
10231 ..... DB3KE
10232 ..... JR1KEI
10233 ..... AB1RZ
10234 ..... JJ1VFE
10235 ..... KC9K
10236 ..... KQ6K
10237 ..... W3BNN

SSB

5533 ..... JR1BAS
5534 ..... K9ZO
5535 ..... SP5EWX

ALL Phone

637 ..... JA1BF

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, Jose Castillo, N4BAA, 6773 South State Road 103, Straughn, IN 47387. 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 John Bergman. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. KC5LK may also be reached via e-mail: <n4baa@cq-amateur-radio.com>.

guide can be found here: <https://tinyurl.com/5n8s4jpw>

Software Suggestions

Two programs work together to make your FT8 operating experience more fun. First, WSJT-X, which is the basic program that does all the work creating and decoding the FT8 signals. Second, JT Alert, which interfaces with WSJT-X to help you track the stations that you see on the screen and tell you if you need them for award tracking, or to simply tell you if you already worked them in the past. Both are FREE to download: You can find WSJT-X here: <https://tinyurl.com/ykv4snrr> and JT Alert here: <https://hamapps.com>.

Finally, these programs can also interface with a logging program. I use AC Log by N3FJP. This is a pretty straightforward logging program. The cost is reasonable, it covers just about everything, and the support is extremely good. You can download your free copy here: <www.n3fjp.com>.

There are other logging programs out there. I suggest discussing them with your local ham friends to find one that suits your needs.

What about a radio? If you do not yet have an HF transceiver, most of the newer radios on the market today include all bands from 160 through 6 meters. Older radios may not have 6 meters. So, if you can afford something newer, now might be the time to find something appropriate. Talk to your locals, or your favorite ham radio shop for advice if desired, and of course, check out the ads here in *CQ*.

Antenna Basics

Let's talk antennas. If you have coax, a few antenna insulators and wire, then you can put together a quick 10-meter antenna to get you on the air. A simple 10-meter dipole with a center frequency of 28.300 MHz is only 16 feet, 6 inches long (that is 8-feet 3 inches for each

5 Band WAZ

As of June 1, 2022
2375 stations have attained at least the 150 Zone level, and 1101 stations have attained the 200 Zone level.

As of June 1, 2022
The top contenders for 5 Band WAZ (Zones needed on 80 or other if indicated):
CHANGES shown in **BOLD**

Callsign	Zones	Zones Needed
AK8A	199	17
DM5EE	199	1
EA5RM	199	1
EA7GF	199	1
H44MS	199	34
HAØHW	199	1
HA5AGS	199	1
I5REA	199	31
IKØXBX	199	19 on 10M
IK1AOD	199	1
IZ3ZNR	199	1
JA1CMD	199	2
JA5IU	199	2
JA7XBG	199	2
JH7CFX	199	2
JI4POR	199	2
JK1AJX	199	2 on 10M
JK1BSM	199	2
JK1EXO	199	2
K1LI	199	24
K1OA	199	28
K4HB	199	26
K5TR	199	22
K7UR	199	34
KZ4V	199	26
N3UN	199	18
N4NX	199	26
N4WW	199	26
N4XR	199	27
N6PF	199	23 on 10M
N8AA	199	23
N8DX	199	23
N8TR	199	23 on 10M
RA6AX	199	6 on 10M
RU3DX	199	6
RWØLT	199	2 on 40M
RX4HZ	199	13
RZ3EC	199	1 on 40M
S58Q	199	31
SM7BIP	199	31
SP9JZU	199	19 on 10M
USØSY	199	1 on 15M
VK3HJ	199	34
VO1FB	199	19
W1FJ	199	24
W1FZ	199	26
W3LL	199	18 on 10M
W3NO	199	26
W4LI	199	26
W6DN	199	17
W6RKC	199	21
W6TMD	199	34
W9OO	199	18 on 10M
W9XY	199	22
9A5I	198	1, 16
EA5BCX	198	27, 39
F5NBU	198	19, 31
F6DAY	198	2 on 10M & 15M
G3KDG	198	1, 12
G3KMQ	198	1, 27
HB9FMN	198	1 on 80M & 10M
I1EIS	198	1 & 19 on 10M
JA1DM	198	2, 40
JA3GN	198	2 on 80M & 40M
JA7MSQ	198	2 on 80M & 10M
JH1EEB	198	2, 33
KØDEQ	198	22, 26
K1BD	198	23, 26
K2EP	198	23, 24
K2TK	198	23, 24
K3JGJ	198	24, 26
K3LR	198	22, 23
K3WA	198	23,26
K3XA	198	23,34
K4JLD	198	18, 24
K9MM	198	22, 26
KI1G	198	24, 23 on 10M
KZ2I	198	24, 26
LA3MHA	198	31 &32 on 10M
N4GG	198	18, 24
NXØI	198	18, 23
ON4CAS	198	1,19
OZ4VW	198	1, 2
RL3FA	198	2 on 80 & 10M
UA4LY	198	6 & 2 on 10M
UN5J	198	2, 7
US7MM	198	2, 6
W2IRT	198	28, 28
W5CWQ	198	17, 18
W6RW	198	2 & 22 on 10M
W7AH	198	22, 34
W9RN	198	26, 19 on 40M
WC5N	198	22, 26
WL7E	198	34, 37
Z31RQ	198	1, & 2 on 10M
ZL2AL	198	36, 37

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

Callsign	5BWAZ #	Date	# Zones
K3NQ	2369	5/1/2022	172
NE1B	2370	5/6/2022	193
AA8SW	2371	5/11/2022	157
HI8RD	2372	5/16/2022	188
SP5EWX	2373	5/15/2022	190
WC6DX	2374	5/19/2022	200
W3BNN	2375	5/30/2022	175

Updates to the 5BWAZ list of stations:

Callsign	5BWAZ #	Date	# Zones
K1OA	1312	2/22/2003	199
VO1HP	2302	4/12/2021	188

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

5BWAZ #	Callsign	Date	All 200 #
None			

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, Jose Castillo, N4BAA, 6773 South State Road 103, Straughn, IN 47387. 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 Jose Castillo. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N4BAA may also be reached via email: <n4baa@cq-amateur-radio.com>.

***Please note: Cost of the 5 Band WAZ Plaque is $100 shipped within the U.S.; $120 all foreign (sent airmail).**

The CQ DX Field Award Program

No Update

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, Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604 USA. Please make all checks payable to the award manager.

CQ DX Awards Program

No Update

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, Please make checks payable to the Award Manager, Keith Gilbertson. Mail all updates to Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604 USA. We recognize 341 active countries. Please make all checks payable to the award manager. Photocopies of documentation issued by recognized national Amateur Radio associations that sponsor international awards may be acceptable for CQ DX award credit in lieu of having QSL cards checked. Documentation must list (itemize) countries that have been credited to an applicant. Screen printouts from eQSL.cc that list countries confirmed through their system are also acceptable. Screen printouts listing countries credited to an applicant through an electronic logging system offered by a national Amateur Radio organization also may be acceptable. Contact the CQ DX Award Manager for specific details.

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, Keith Gilbertson. Mail all updates to Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604.

Mixed

K2TQC.....288	N8PR.....229	OK1AOV.....208	HA1ZH.....190
W1CU.....267	HA5AGS.....228	F6HMJ.....206	BA4DW.....188
VE7IG.....254	9A5CY.....227	KF8UN.....205	K2AU.....187
HAØDU.....253	K9YC.....227	OM2VL.....205	K8YTO.....186
OM3JW.....253	VE3ZZ.....226	VE7SMP.....204	WO7R.....185
W6OAT.....252	KØDEQ.....221	RW4NH.....203	N3RC.....184
HA5WA.....250	WI8A.....219	K1NU.....201	K2SHZ.....182
IK1GPG.....245	HA1AG.....218	HB9AAA.....200	KJ6P.....180
OK1ADM.....245	JN3SAC.....214	N5KE.....200	W6XK.....180
K8SIX.....240	HA9PP.....213	W3LL.....199	W5ODD.....177
HA1RW.....239	WA5VGI.....213	NIØC.....196	NØFW.....176
VE3XN.....239	IV3GOW.....211	ON4CAS.....194	WA9PIE.....176
I6T.....230	W4UM.....210	HB9DDZ.....193	HB9BOS.....175
K8OOK.....229	N4MM.....208	N4NX.....192	NKØS.....175

SSB

W1CU.....249	KØDEQ.....198	N4MM.....189	NØFW.....176
W4ABW.....202	W4UM.....198	WA5VGI.....189	DL3DXX.....175
VE7SMP.....201	JN3SAC.....191	W3LL.....187	

CW

W1CU.....253	JN3SAC.....211	OK1AOV.....198	N4MM.....186
HA5WA.....234	DL3DXX.....210	WA5VGI.....197	OK2PO.....184
DL6KVA.....233	DL2DXA.....209	NIØC.....196	N4NX.....177
KØDEQ.....214	W4UM.....201	HB9DZZ.....189	N7WO.....175

Digital

W1CU.....195	HA5WA.....177	KØDEQ.....175

side). This will easily cover 28.000-28.500 MHz. If you want to put up a simple 10-meter beam, many are available out there and are fairly reasonable and easy to put up. Even an indoor attic dipole might be adequate for you to be able to work some DX. Of course, the old adage goes … the higher the better. Again, the sky is the limit. If you have the room and ambition, then you can at least think ahead for future antenna projects for when you upgrade your license to General or Extra. I have a feeling that once you get "HF radio active" and start working some far off and rare DX, you will be hooked.

The "Magic Band"

Let's talk a little *six meters*. Six is known as the "Magic Band" for many reasons. The most prevalent reason for this is that it simply does not follow normal HF band propagation. The full 6-meter band is available for all Technician class licensees (sorry, not Novices). Here's a quick frequency guide (also see *Figure 3*): 50.000-50.100 MHz is strictly CW only; 50.100-54.000 MHz is for digital and phone. The FT8 frequency on 6 meters is 50.313 MHz. When the band is open to DX, sometimes a secondary FT8 frequency of 50.323 MHz is activated. It is very important to recognize that 6 meters is used for multiple modes within these categories. A very useful

On the Air from the Birthplace of "In the Air"

During our visit to the Dayton Aviation National Historical Park Museum and the Wright Brothers Bicycle Shop while in town for the Hamvention®, we came across David, NK4Q/HI8DL, operating his Parks on the Air (POTA) station on a picnic table right outside the museum. For more information on POTA, visit <https://parksontheair.com>.

David, NK4Q, running CW from Parks on the Air "POTA K-0732" just outside the Wright Brothers "Dayton Aviation Heritage National Park" in Dayton, Ohio.

David, NK4Q; Bob, N2OO; and Bob, W2ARP, share some stories at the museum.

chart that you could print out and keep handy can be found here: <https://tinyurl.com/yt324b36>

There are multiple types of propagation on VHF. You can view them on this page that I found: <https://tinyurl.com/yc35wbsp>

Many of these propagation types are “seasonal.” In the northern hemisphere, for example, Sporadic-E (E_s) mainly occurs in the summer months with openings as far as several thousand miles. Higher activity on 6-meter FT8 has made it easier to find band openings. I have only gotten active on 6 meters during the last four years. I have already worked 106 DX entities, all but one on FT8. Patience is required since band openings are sometimes sporadic. But when 6 meters opens, it can be a thrilling experience chasing DX on the Magic Band.

Antenna thoughts: Although a simple dipole will work, it probably would be far better to have a directional beam on 6 meters. A simple three-element, 6-meter beam is small, and could be put onto a portable mast and turned by hand. Try to get it up at least 25 feet and follow all safety protocols. A

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

9459 9A2AA	4763 KW9A	3099 N6FX	2400 N7ZO	1870 N5KAE	1480 K4JKB	1217 AB1QB	1032 DG5LAC	757 WB3D
8188 K2VV	4757 I2MQP	3077 K1PL	2394 AE5B	1828 K7LV	1462 AC7JM	1204 VA2IG	1023 N4WQH	750 AB1Q
8143 W1CU	4703 IK2ILH	3059 NXØI	2391 WO7R	1824 WF7T	1462 DL4CW	1201 K9BO	1016 W9QL	736 JA3MAT
7922 9A2NA	4681 JH8BOE	3028 IK2DZN	2391 IZØFUW	1821 PY5FB	1447 K3XA	1167 WA9PIE	1012 NØVVV	711 AG1T
7059 EA2IA	4574 JN3SAC	2987 AG4W	2356 NE6I	1746 K6UXO	1437 KC1UX	1153 N3CAL	1010 VE3RZ	695 W8WDW
6919 KF2O	4462 K1BV	2968 AB1OC	2322 N6PM	1741 N6PEQ	1422 I2VGW	1148 SP8HKT	1007 AA4QE	682 AI8P
6040 KØDEQ	4365 N1RR	2963 N3RC	2225 JH1APK	1711 NS3L	1408 NH6T	1141 4F3BZ	1006 NØRQV	678 WE8L
5715 S53EO	4342 WB2YQH	2712 W2YR	2203 KI1U	1707 K4WY	1398 ES4RLH	1137 YO5BRZ	1000 WB6IZG	674 N5JED
5677 ON4CAS	4298 VE3XN	2697 AK7O	2176 V51YJ	1684 W1FNB	1361 VA3VF	1136 KO9V	999 N3DF	661 AL4Y
5602 ON4APU	4249 WD9DZV	2651 HK3W	2159 VA7CRZ	1672 WU9D	1333 AF4T	1116 YU7FW	995 PU2GTA	633 TI5LUA
5539 N4NO	4241 N6QQ	2642 AA8R	2133 KØKG	1667 AD3Y	1322 AA4FU	1112 N6MM	966 W6WF	621 K4HDW
5521 N8BJQ	4215 W3LL	2616 9A2GA	2113 W2FKF	1643 SV1DPI	1301 KB9OWD	1107 PY2MC	953 JP1KHY	616 AC6BW
5482 VE1YX	4201 YO9HP	2591 IK2RPE	2077 JH1QKG	1639 N7QU	1301 K1DX	1100 WA3GOS	919 ON7MIC	605 IW2FLB
5453 YU1AB	3818 K9UQN	2589 DG7RO	2056 NKØS	1616 TA1L	1301 KM5VI	1109 KE8FMJ	889 WU1U	
5409 N6JV	3793 AB1J	2583 PA2TMS	2046 YO8CRU	1590 JF1LMB	1299 JA6JYM	1088 NJ4Z	866 K2KJ	
5387 W9OP	3538 9A4W	2550 K6ND	2016 N2WK	1570 PY5VC	1295 NIØC	1084 KG4JSZ	857 R1AV	
5215 I5RFD	3459 W9IL	2457 K5UR	1995 JR3UIC	1568 N3AIU	1280 WF1H	1069 IZ4MJP	835 K6RAH	
4970 WA5VGI	3130 SV1EDY	2538 K4HB	1972 K3CWF	1524 NH6T/W4	1260 UR6LEY	1058 N6DBF	801 N2YU	
4934 W9OO	3109 W6XK	2420 WA6KHK	1955 NIØC	1484 FG4NO	1219 K6HRT	1036 DL5KW	758 N4JJS	

SSB

7045 OZ5EV	3172 YO9HP	2515 W9IL	2093 W2WC	1587 N3XX	1146 SQ7B	1004 WA5UA	758 IV3GOW	637 K5WAF
6334 9A2NA	3171 N1RR	2483 AG4W	2084 K5UR	1550 IK2RPE	1136 K3CWF	978 EA7HY	724 WF1H	630 W6US
6145 K2VV	3141 DL8AAV	2451 EA3GHZ	2082 WD9DZV	1442 DG7RO	1112 NH6T	957 W9QL	724 W3TZ	624 K6KZM
5404 VE1YX	3138 N8BJQ	2443 JN3SAC	2076 K2XF	1393 N5KAE	1098 K4CN	934 PY5VC	717 KØDAN	606 KJ4BIX
5149 KF2O	3108 I4CSP	2335 KG1E	2048 W4QNW	1389 NKØS	1096 JA7HYS	931 YB1AR	717 N3JON	604 GØBPK
4916 EA2IA	3101 WA5VGI	2327 K1PL	1955 EA3NP	1386 HK3W	1093 N6MM	929 NS3L	714 YB2TJV	
4410 I2MQP	3067 N6QQ	2326 CX6BZ	1935 SV1EOS	1386 IK4HPU	1089 IZ8FFA	919 KA5EYH	713 JH1APK	
4165 KØDEQ	2990 KF7RU	2209 IK2QPR	1884 WA6KHK	1371 VE6BF	1089 IT9ABN	893 W9RPM	710 WA9PIE	
3723 I8KCI	2984 KI7AO	2201 NQ3A	1879 K3IXD	1338 NE6I	1063 W6XK	889 N3AIU	700 N4FNB	
3681 N4NO	2946 PT7ZT	2200 N6FX	1848 AB5C	1334 EA3EQT	1042 IZØBNR	875 K7SAM	700 JA1PLL	
3585 SV3AQR	2903 IN3QCI	2198 AB1OC	1825 KQ8D	1264 N6PEQ	1032 DG5LAC	854 K6HRT	694 KG4HUF	
3535 KW9A	2857 4X6DK	2155 K9UQN	1812 K6ND	1262 K7LV	1031 K4CN	833 DK8MCT	690 W6PN	
3456 W9OO	2650 IK2DZN	2131 N3RC	1646 VE7SMP	1258 N1KC	1031 IK8OZP	808 UR6LEY	684 KO9V	
3416 W3LL	2595 EA1JG	2122 AE5B	1641 AE9DX	1222 YF1AR	1022 NW3H	802 N6OU	675 F1MQJ	
3348 CT1AHU	2582 PA2TMS	2113 W2FKF	1624 W2YR	1187 IZ1JLG	1012 KU4BP	801 K3XA	655 VA3VF	
3274 YU7BCD	2576 AA1VX	2106 NXØI	1622 K5CX	1183 KI1U	1006 NJ4Z	766 I2VGW	647 YB8NT	
3174 I3ZSX	2568 SM6DHU	2094 I8LEL	1611 W2ME	1150 VE6BMX	1004 K4HB	763 K4JKB	640 UA9YF	

CW

7543 WA2HZR	4162 WA5VGI	3031 EA7AAW	2357 W9HR	1708 NIØC	1421 KN1CBR	992 F5PBL	807 N5KAE	620 AF5DM
7200 K2VV	4076 I7PXV	2948 IK3GER	2291 N3XX	1691 KI1U	1389 IT9ELD	968 K3CWF	783 YB1AR	615 JH6JMM
6024 9A2NA	3974 JN3SAC	2943 N6QQ	2212 AC5K	1620 DG7RO	1342 VE6BMX	962 K7LV	752 K6HRT	608 W9RPM
5392 EA2IA	3804 W9OO	2915 KA7T	2160 NXØI	1619 W2YR	1235 JH1APK	944 AB1OC	743 JA5NSR	600 NY4G
5311 N6JV	3773 KW9A	2811 OZ5UR	2022 AF5CC	1595 PY5FB	1220 AA4FU	908 NH6T	738 NH6T/W4	600 IK2SGV
5261 KF2O	3624 N1RR	2679 W9IL	1998 K5UR	1555 K1PL	1210 DL4CW	897 HK3W	732 SQ7B	
5160 N4NO	3504 YU7BCD	2548 EA2CIN	1973 N3RC	1508 W6XK	1196 N3AIU	891 DK8MCT	727 JF1LMB	
4946 W8IQ	3462 K9UQN	2531 I2MQP	1905 WA6KHK	1505 R3IS	1098 LU5OM	890 NS3L	722 WA9PIE	
4916 IZ3ETU	3279 IØNNY	2497 W3LL	1832 N4YB	1483 VE1YX	1062 K3XA	889 N3AIU	720 K4CN	
4886 I3FIY	3214 SM6DHU	2490 N6FX	1762 K6ND	1480 WO3Z	1036 DL5KW	864 YO5BRZ	652 IK2DZN	
4874 KØDEQ	3159 WD9DZV	2477 VE6BF	1744 NE6I	1458 AG4W	1027 AE5B	848 PY5VC	636 NKØS	
4776 N8BJQ	3041 YO9HP	2424 W2WC	1727 K6UXO	1443 WA2VQV	997 N6PEQ	821 HB9DAX	629 IV3GOW	

DIGITAL

3187 KØDEQ	2139 WA5VGI	1704 IK2DZN	1345 KC1UX	1093 KI1U	992 N3DF	862 JP1KHY	750 NH6T/W4	611 KO9V
3137 KF2O	2217 YO9HP	1643 N3RC	1333 W1FNB	1091 VA3VF	992 K9UQN	855 R1AV	681 PY5VC	600 ADØFL
2996 W3LL	2103 K2YYY	1501W2/JR1AQN	1319 W2YR	1089 AC7JM	983 PU2GTA	812 UR6LEY	680 K2KJ	
2978 N8BJQ	2004 N6PM	1500 JH1APK	1308 NKØS	1060 AF4T	966 NS3L	811 WF1H	672 K9AAN	
2827 WD9DZV	1836 AG4W	1478 N1RR	1227 ES4RLH	1054 KW9A	947 I2VGW	810 N3CAL	670 IV3GOW	
2628 W6XK	1818 W1EQ	1461 WU9D	1189 JF1LMB	1051 KH6SAT	917 K7LV	800 WA3GOS	668 KA5EYH	
2558 NT2A	1790 JN3SAC	1426 AB1OC	1149 W9IL	1047 RW4WZ	881 NE6I	783 YB1AR	654 JA3MAT	
2251 EA2IA	1759 N7ZO	1378 K3CWF	1112 AB1QB	1009 GUØSUP	870 WB6IZG	758 N4JJS	640 WA9ONY	
2242 HK3W	1710 NXØI	1353 K1PL	1108 KE8FMJ	1002 NØRQV	866 SQ7B	750 ON7MIC	636 W9RPM	

REMOTE OPERATION

CW	MIXED	SSB	DIGITAL
7277 K9QVB	4026 N1RR	2953 N1RR	671 N1RR
3292 N1RR			

basic three-element, 6-meter beam typically has a 6-foot boom, and each of the elements is generally 10 feet or less end to end. Depending on the model, the turning radius is about 6 feet. There are many different models out there to purchase as well as homebrew designs available. A quick internet search will be helpful. More elements will increase your gain and directivity. But three elements is adequate for a start.

Remember, 6 meters "can be" frustrating at times. But when the band opens, it can be a thrill. As such, considering the current propagation trends, I fully recommend getting on 10 meters first. You will have tons of fun there and gain valuable experience pretty much every day.

Local research! I strongly recommend that you reach out to your local ham friends and/or radio club for assistance in getting set up for entering into your HF (and VHF) DXing experience. Also, with FT8 becoming so widely popular, there will probably be fellow hams nearby who can assist you if you get into any problems. My personal experience is that once you work your way through it, and get everything set up, you will be able to fire up every day without issues. As with any computer program, if things don't suddenly seem right, simply shutting everything down and then turning it all on again will often let you return to normal operation.

I hope that I have tweaked your interest in learning how to enter the HF DX world with your Novice or Technician license. I realize that there are probably very few Novice licensees out there anymore since the FCC stopped issuing that class of license many years ago. But "some" are still out there because they were grandfathered and continue to be renewable. Regardless, there are *tons* of Technician licensees who just might need a little nudge to break into some more exciting aspects of amateur radio.

DXing is what really got my juices flowing back in the 1960s when I was first licensed, and it has continued to this day. What better "incentive" for upgrading to a General or Extra Class license is there besides actually experiencing the taste of chasing DX on 10 meters? If you catch the DX enthusiasm, then once you upgrade you will find that there are many other bands that you could go to that will provide some of the best constant propagation year-round, even during sunspot lows. Thanks to the upswing of the current sunspot cycle, now is the time to get your feet wet! Get on 10 meters and chase some DX!

contesting

BY TIM SHOPPA,* N3QE

How Many Active Contesters Are There?

How many contesters are there in the world? Let's dive into results and logs from 2021, the year that set the high-water mark for on-the-air participation and contest log submittals. We will come up with two possible measures for the counting contesters, and make some wild guesses at the values of factors that enable a ham to become a contester.

Table 1 lists the 24 contests in our analysis. Nine of the contests are sponsored by *CQ* magazine and 13 are sponsored by the ARRL. We also include the WW Digi contest, sponsored by the World Wide Radio Operators Foundation and Slovenian Contest Club, as well as the IARU HF Contest. These contests were chosen because results data listing individual operators and (in many cases) public logs were available for ready download in machine-processable formats.

We'll start by counting operators in these 24 contests. Why count operators instead of callsigns used on the air? Many active contesters operate not just using their own personal call at their home station, but also as operators at a multi-op station using the station owner's call. Especially when they get on the air for the CQ WPX contests, they may borrow a club's or friend's callsign with an unusual prefix.

The results of these 24 contests list 28,960 distinct operator callsigns. *Table 2* shows how many contests each of the 28,960 operators participated in. Approximately 43% of the operators were listed in only a single contest in 2021, while 57% entered two or more contests, and 38% entered three or more contests. At the extreme upper end, two especially active contesters with modest home stations entered 21 of the 24 contests: John Fuller, K4FTO, and Joel Rubincam, NF3R.

What's the overlap between HF and VHF contest operators? Seven of the 2021 contests included in *Table 1* are VHF only; the other 17 are HF only. *Figure 1* shows an area-proportional Venn diagram based on this HF/VHF distinction. More than half the 3,575 VHF contest operators also were part of an HF contest effort that year. Only 7% of HF contesters also submitted a VHF contest log. I note that the June ARRL VHF and July CQ VHF contests vary a lot in participation from year to year, and thanks to exceptional band conditions, 2020 had higher VHF participation than 2021.

How many hams entered contests in more than one major mode? The third

email: <n3qe@cq-amateur-radio.com>

Contest	Operators listed in submitted logs	Single-Mode	HF/VHF	Public Logs
CQ WW SSB	11911	SSB	HF	Y
CQ WW CW	9683	CW	HF	Y
CQ WPX SSB	8157	SSB	HF	Y
CQ WPX CW	6579	CW	HF	Y
IARU HF	6405		HF	Y
ARRL DX CW	5001	CW	HF	Y
CQ WPX RTTY	4089	Digital	HF	Y
ARRL DX SSB	3952	SSB	HF	Y
CQ WW RTTY	3847	Digital	HF	Y
CQ 160 CW	3453	CW	HF	N
ARRL 10 Meter	3204		HF	Y
ARRL RTTY Roundup	2420	Digital	HF	Y
ARRL SS SSB	1925	SSB	HF	Y
CQ 160 SSB	1762	SSB	HF	N
ARRL June VHF	1721		VHF	Y
ARRL 160 Meter	1654	CW	HF	Y
WW Digi	1499	Digital	HF	Y
ARRL SS CW	1478	CW	HF	Y
CQ VHF	1255		VHF	N
ARRL Jan VHF	1233		VHF	Y
ARRL Sep VHF	841		VHF	Y
ARRL EME	314		VHF	Y
ARRL 222 MHz	144		VHF	Y
ARRL 10 GHz	135		VHF	Y

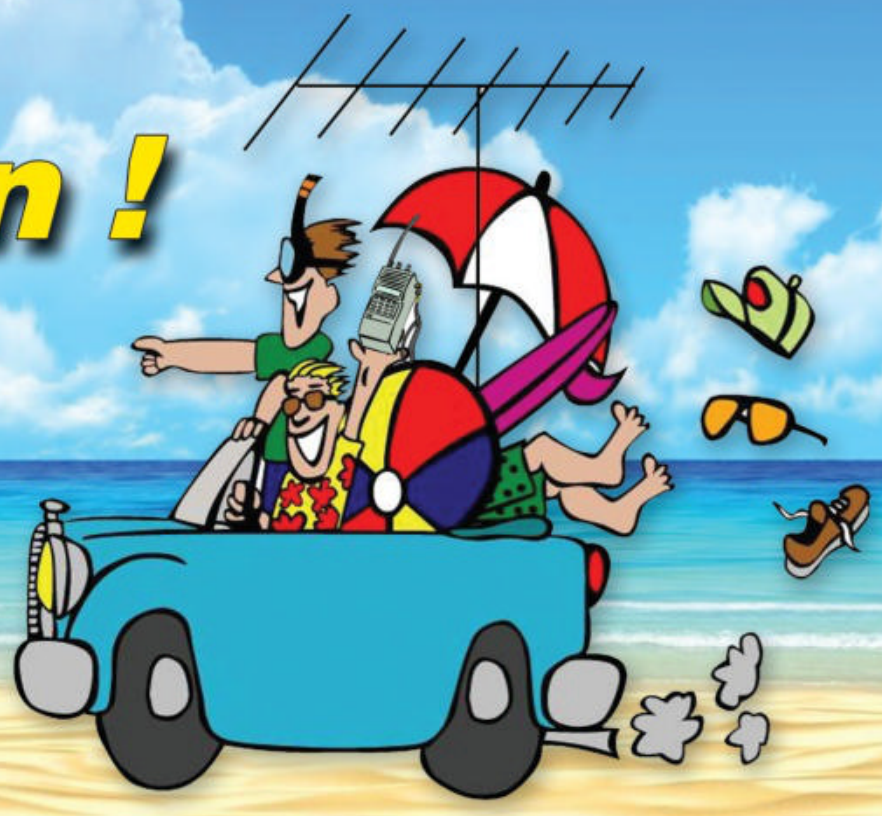
Table 1. Tabulated data was analyzed from these 24 contests held in 2021

Contests	Operators	%
1	12459	43.02%
2	5547	19.15%
3	3375	11.65%
4	2217	7.66%
5	1536	5.30%
6	1050	3.63%
7	828	2.86%
8	522	1.80%
9	436	1.51%
10	278	0.96%
11	205	0.71%
12	138	0.48%
13	111	0.38%
14	78	0.27%
15	52	0.18%
16	47	0.16%
17	24	0.08%
18	24	0.08%
19	20	0.07%
20	11	0.04%
21	2	0.01%

Table 2. Breakdown by number of contests entered

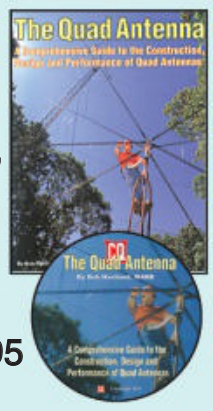
Fun in the Sun !

Hobby Books for Summer Reading...



The Quad Antenna

by Bob Haviland, W4MB

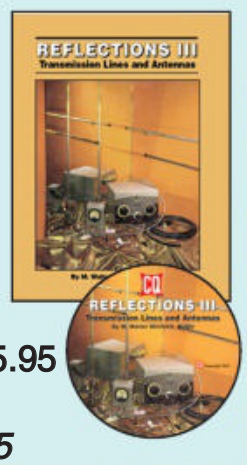


Comprehensive guide to the construction, design and performance of Quad Antennas. General Concepts, Circular-Loop & Arrays, Rectangular & Square Loops, Multi-Element Quads and more!

8.5 X 11 Paperback $21.95
CD Version $15.95
Buy both for only $32.95

Reflections III

by Walt Maxwell, W2DU

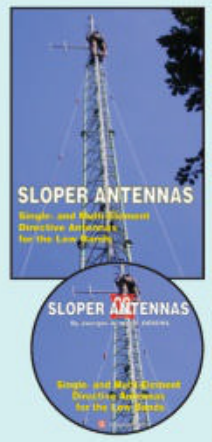


All the info in Reflections I and II and more! This completely revised and updated, 424-page 3rd edition is a must-have!

8.5 X 11 Paperback $45.95
CD Version $35.95
Buy both for only $70.95

Sloper Antennas

by Juergen A. Weigl, OE5CWL

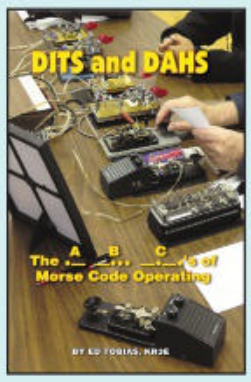


Single- and Multi-Element Directive Antennas for the Low Bands
With calculations and practical experience, this book shows which basic concepts have to be considered for sloper antennas for the low bands.

6 X 9 Paperback $25.95
CD Version $19.95
Buy both for only $38.95

DITS and DAHS The A B C's of Morse Code Operating

by Ed Tobias, KR3E



This small by solid guide is the perfect read for those interested in learning or improving CQ operating techniques!

Within its pages you'll find

- The secret of becoming a proficient CQ Operator
- Where and how to practice, practice, practice.
- Straight Key or Paddle?
- Adjusting your Straight Key or Paddle
- Keyers, Iambic Keying and Bugs

and much, much more!

6 x 9 Paperback $15.95

Understanding, Building & Using Baluns & Ununs

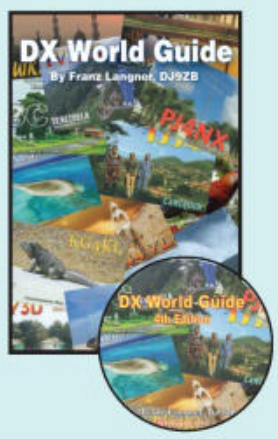
by Jerry Sevick, W2FMI

The successor to the popular and authoritative Baluns and Ununs. Great deal of new tutorial material, and designs not in previous book, with crystal clear explanations of how and why they work.

8.5 X 11 Paperback $21.95
CD Version $15.95
Buy both for only $32.95

DX World Guide-4th Edition

By Franz Langner, DJ9ZB



This is the fourth edition of Franz Langer's series of books bearing the title *DX World Guide*. This 380-page, fourth edition, full color throughout, includes information on well over 300 DX entities.

Whether used as a desk reference for the DXer of any level of proficiency or as a "wish book" for DXers just starting his or her DXCC journey, the new *DX World Guide* is a worthy and pleasant companion!

6 X 9 Paperback – $49.95 CD Version–$34.95
Buy both tfor only $68.95

Please note: Prices listed above do not include applicable shipping charges. Shipping prices listed here are for most, but not all products.

Books, CDs & DVDs Shipping & Handling U.S. add $7 for the first item, $3.50 for the second and $2 for each additional item.
CN/MX $25 for 1st item, $10 for 2nd and $7 for each additional. **All other countries** $35 for the first item, $15 for second and $10 for each additional.

CQ Communications, Inc.

Phone: 516-681-2922 http://store.cq-amateur-radio.com

Calendar of Events

All year	**CQ DX Marathon**	**http://bit.ly/vEKMWD**
July 1	RAC Canada Day Contest	www.rac.ca/contesting-results
July 2	Venezuelan Ind. Day Contest	https://bit.ly/3NDZghb
July 2-3	Original QRP Contest	www.qrpcc.de/contestrules/index.html
July 2-3	Marconi Memorial HF Contest	www.arifano.it/contest_marconi.html
July 2-3	NZART Memorial Contest	https://bit.ly/3wYqvx1
July 2-3	PODXS 070 Club 40 Meter Firecracker Sprint	http://bit.ly/2FUmeOL
July 4	RSGB 80m Club Championship, CW	https://bit.ly/31qpcJl
July 6	VHF-UHF FT8 Activity Contest	www.ft8activity.eu/index.php/en
July 9-10	10-10 Int. Weak Signal QSO Party	http://bit.ly/1FrFeBc
July 9-10	IARU HF Championship	www.arrl.org/iaru-hf-world-championship
July 9-10	Veron SLP Contest	http://bit.ly/2L9eT1L
July 10	QRP ARCI Summer Homebrew Sprint	www.qrparci.org/contests
July 13	RSGB 80m Club Championship, SSB	https://bit.ly/31qpcJl
July 13	VHF-UHF FT8 Activity Contest	www.ft8activity.eu/index.php/en
July 16-17	**CQWW VHF Contest**	**www.cqww-vhf.com**
July 16-17	IARU Region 1 70 MHz Contest	https://bit.ly/3r1kqvT
July 16-17	North American RTTY QSO Party	http://ncjweb.com/NAQP-Rules.pdf
July 17	CQC Great Colorado Gold Rush	www.coloradoqrpclub.org/contests/gold.htm
July 17	RSGB International Low Power Contest	www.rsgbcc.org/hf/rules/2022/rqrp.shtml
July 18	RSGB FT4 Contest Series	https://bit.ly/31qpcJl
July 20	VHF-UHF FT8 Activity Contest	www.ft8activity.eu/index.php/en
July 23	YOTA Contest	www.ham-yota.com/contest
July 28	RSGB 80m Club Championship, Data	https://bit.ly/31qpcJl
July 30	WAB 144 MHz Low Power Phone	http://bit.ly/31yE4kT
July 30-31	RSGB IOTA Contest	www.rsgbcc.org/hf/rules/2022/riota.shtml
July 31	ARS Flight of the Bumblebees	http://arsqrp.blogspot.com
Aug. 3	VHF-UHF FT8 Activity Contest	www.ft8activity.eu/index.php/en
Aug. 6-7	10-10 Int'l Summer Contest SSB	http://bit.ly/1FrFeBc
Aug. 6-7	ARRL 222 MHz and Up Distance Contest	http://bit.ly/2IJZcy9
Aug. 6-7	Batavia FT8 Contest	https://batavia-ft8.com/
Aug. 6-7	North American CW QSO Party	http://ncjweb.com/NAQP-Rules.pdf
Aug. 7	SARL HF Phone Contest	http://bit.ly/H0IqQf
Aug. 10	VHF-UHF FT8 Activity Contest	www.ft8activity.eu/index.php/en
Aug. 13	Kentucky State Parks on the Air	https://k4msu.com/kypota
Aug. 13	SARL Youth Sprint	http://bit.ly/H0IqQf
Aug. 13-14	Maryland-DC QSO Party	www.w3vpr.org/node/325
Aug. 13-14	50MHz Fall Sprint	https://svhfs.org/2022VHFSprintRules.pdf
Aug. 13-14	Worked All Europe CW Contest	https://bit.ly/36ubggF
Aug. 14	NJQRP Skeeter Hunt	http://w2lj.blogspot.com/p/njqrp-skeeter-hunt.html
Aug. 14	SARL HF Digital Contest	http://bit.ly/H0IqQf
Aug. 17	VHF-UHF FT8 Activity Contest	www.ft8activity.eu/index.php/en
Aug. 20-21	ARRL 10 GHz and Up Contest	www.arrl.org/10-ghz-up
Aug. 20-21	CVA DX Contest CW	http://cvadx.org/regulamento.pdf
Aug. 20-21	International Lighthouse Lightship Weekend – ILLW	https://illw.net
Aug. 20-21	SARTG RTTY Contest	www.sartg.com/index.html
Aug. 20-21	North American SSB QSO Party	http://ncjweb.com/NAQP-Rules.pdf
Aug. 21	ARRL Rookie Roundup RTTY	www.arrl.org/rookie-roundup
Aug. 27-28	ALARA Contest	www.alara.org.au/contests
Aug. 27-28	CVA DX Contest SSB	http://cvadx.org/regulamento.pdf
Aug. 27-28	Kansas QSO Party	www.ksqsoparty.org
Aug. 27-28	Ohio QSO Party	www.ohqp.org/index.php/rules
Aug. 27-28	YO DX HF Contest	www.yodx.ro/en
Aug. 27-28	World Wide Digi DX Contest	https://ww-digi.com
Aug 27-28	W/VE Island QSO Party	https://usislands.org/qso-party-rules
Aug. 27-29	Hawaii QSO Party	http://hawaiiqsoparty.org
Aug. 28	SARL HF CW Contest	http://bit.ly/H0IqQf
Sept. 24-25	**CQWW RTTY DX Contest**	**www.cqwwrtty.com**

column of *Table 1* identifies 15 of the HF contests as single-mode only. Let's ignore the distinction between RTTY and FT8/FT4 modes and classify all of these as "digital." We arrive at five SSB-only contests, six CW-only contests, and four digital contests, in which 25,915 operators participated. The mode choices of operators entering these 15 mode-specific contests are shown in *Figure 2* as another area-proportional Venn diagram.

Far and away the most accessible mode is SSB, with 17,210 operators choosing to enter an SSB-only contest. Fewer than half of these SSB entrants (47.5%) chose to enter a contest in another mode. Just behind in popularity are the CW-only contests, with 13,544 operators listed in submitted logs. Among those, 60% also submitted a log in at least one other mode. Finally, 7,206 operators were listed in submitted logs for digital (RTTY and FT8/FT4) contests in 2021. More than 70% of the digital entrants were also on for either or both CW and SSB contests.

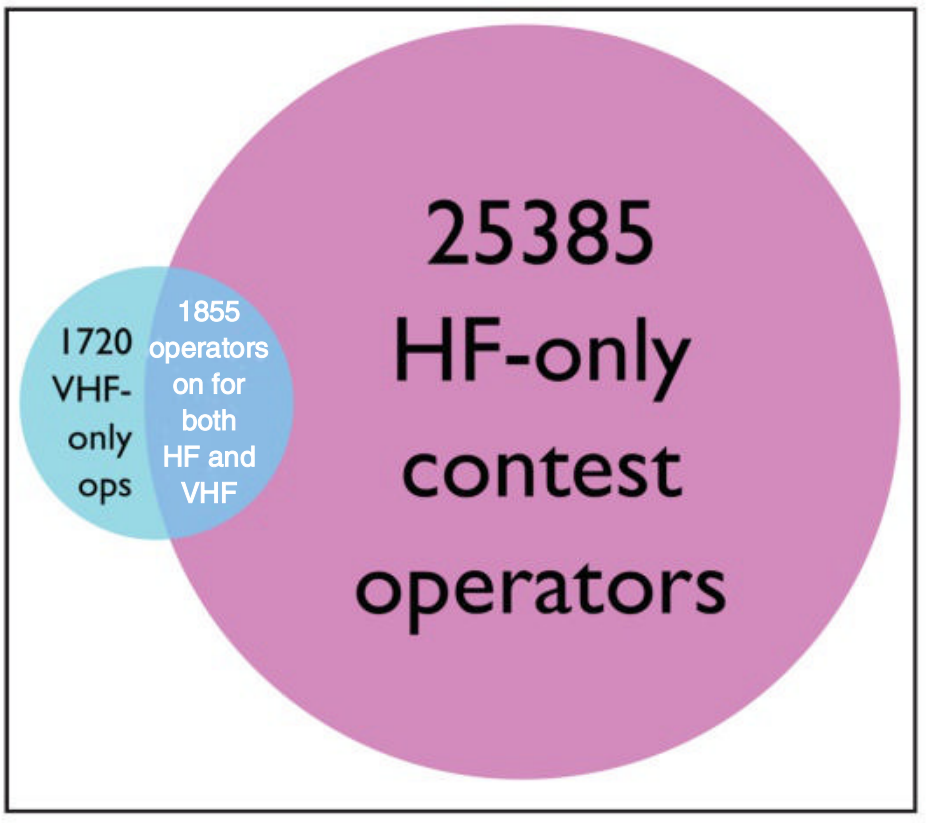


Figure 1. HF and VHF contesting area-proportional Venn diagram for the contests listed in Table 1

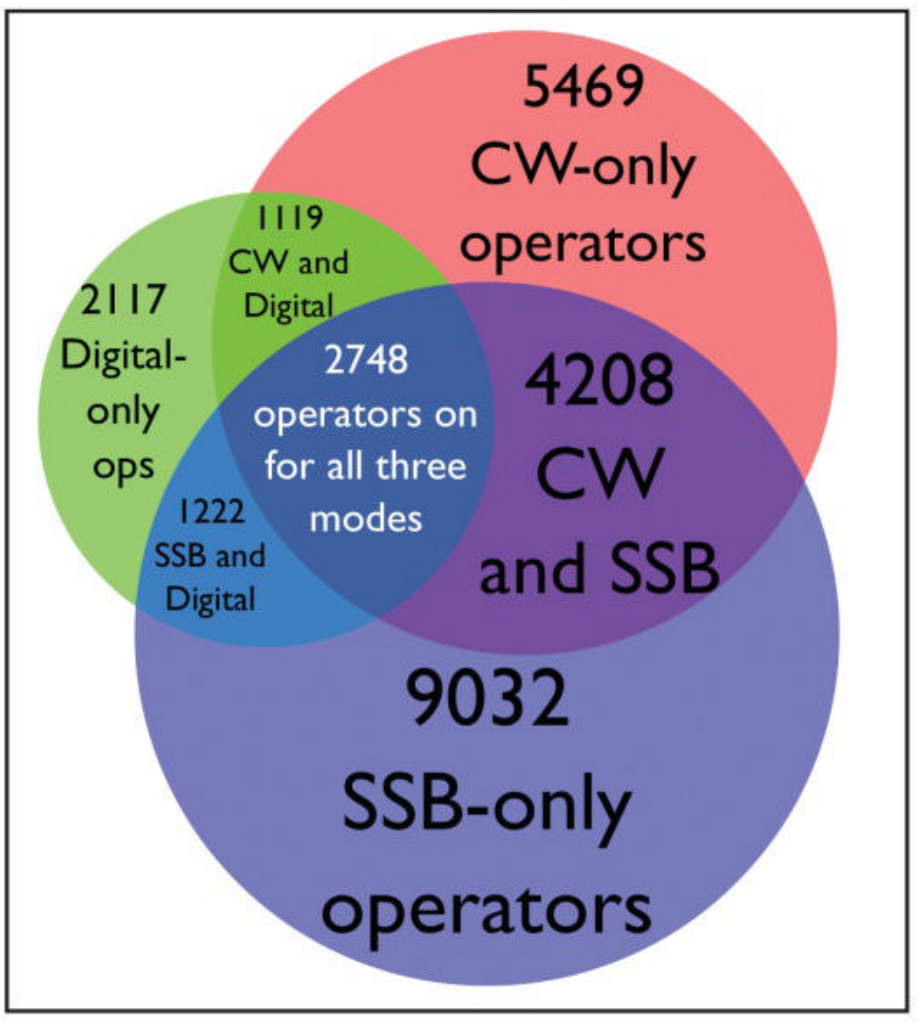


Figure 2. SSB, CW, and digital area-proportional Venn diagram for the mode-specific contests listed in Table 1

The intersection of the three circles in *Figure 2* represents operators who were listed in submitted logs for all three modes — CW, SSB, and digital. These 2,748 operators are just a little more than 10% of the operators we're tracking for 2021.

Let's compare our count of 28,960 contest operators, with an estimate of active DXers made by Michael Wells, G7VJR. Through his popular <https://clublog.org> website, Michael had ready access to most DXpedition logs from 2012 and 2013 — 24 million QSOs in total. You can find his complete analysis in his blog at <https://bit.ly/3wlbQva>. If Michael counts unique calls appearing in these logs, he finds 573,000 unique callsigns. Looking at how more than half of these callsigns appeared only once, he notes that, "Counting just unique callsigns appears to strongly emphasize problem QSOs," most notably callsigns that were busted (incorrectly copied) callsigns of DXers. He applies the simple heuristic of counting only callsigns appearing at least six times in the DXpedition logs, and arrives at a more modest total of 151,000 likely DXers.

Our count of 28,960 contest operators is less than a fifth of the number of DXers that G3VJR estimates. Can we apply the same techniques to mine public contest logs to find active callsigns that never submitted a log?

In the 2021 dataset, we have a total of 68,619 public logs that are readily available for 13 ARRL contests, the six CQ WW and WPX contests, the IARU HF contest, and the WW Digi contest. There are just over 24 million QSO records amongst these logs — identical to the number of QSOs in G3VJR's 2013 analysis of DXpedition logs. Now that we're dealing with "big data," how many unique callsigns appear in these logs at least once? That total is 275,566. Of those, 155,058 were recorded only once and an additional 60,956 were recorded only twice.

How many of these calls are incorrectly copied or busted? The technology used in contest log-checking has grown quite advanced and is often capable of identifying busted callsigns. Let's look at the detailed public log checking report for John Dorr, K1AR, in the 2019 CQWW CW, which is available online at <https://bit.ly/3sFcUaT> (John is the CQWW Contest Director). John made 1,709 QSOs that weekend, of which his QSO partners busted his call 20 times, into nine incorrect callsigns. Five variants of John's callsign — K1UR, K1RR, K1AC, K1A, and KØAR — were logged just once. His call was busted into K1AN twice, K1AA four times, K2AR four times, and K1TR five times.

As an example of how often a more difficult call can be busted, look at the CQWW CW log check report for Ben Och, DL6FBL's, 2017 effort in which he made 4,709 QSOs. This can be found online at <https://bit.ly/3sFcUaT>. Ben's call was busted 32 different ways, with 21 of the incorrect forms occurring only once. The incorrect callsign DL6FDL — in which a single dit was lost from the "B" in his QSO partner's ears, turning it into a "D" — was logged an astonishing 71 times.

If we use DL6FBL's LCR to set a rule of thumb that we'll ignore any call logged 71 times or less in the 2021 public logs, we would arrive at a count of 26,018 active contest callsigns. This is fewer than the number of operators listed in submitted logs (28,960) and is certainly too stringent. If

instead we use K1AR's LCR to set a rule of thumb, that we'll ignore any call logged five times or less in the 2021 logs, we arrive at 68,666 active contest callsigns. I will choose a number halfway between these two extremes, and arrive at 49,000 active contest callsigns as determined from public logs.

Pondering the relation between the 49,000 active contest callsigns on the 28,690 distinct operator callsigns listed in submitted logs, it occurs to me that a little more than half of on-air contest participants may have sent in their logs, which sounds reasonable. Log submission is much easier today — with computer logging so prevalent and log submissions accepted via website submissions — than it was 50 years ago when the only way to submit your log was on paper after doing a dupe check. Published results for the 2019 CQWW CW contest quote a figure of 93% of claimed QSOs having been cross-checked against other submitted logs. The 93% statistics are skewed to weigh the most active on-air participants more heavily than the very part-time guys who only made a few QSOs and may have not kept either a paper or electronic log for submission. I'll guess that counting the small-timers, only 60% of hams making some QSOs in a contest, get around to submitting their logs.

This log-submission fraction immediately reminded me of the Drake Equation. Radio astronomer Frank Drake considered, in 1961, the possibility of detecting radio-capable civilizations in other solar systems. His equation is written as a long chain of highly speculative factors. At the time he wrote his equation, there were some reasonable (within a factor of 10) estimates for star formation in our galaxies, but among the many almost completely unknown factors in his equation are the number of stars with planets, the fraction of those planets supporting life, the fraction of life-supporting planets that have civilizations, and how long those civilizations are active emitters of radio communications that we might be able to detect.

Let's follow Drake's example and write an equation for the number of contesters who submit logs, as the product of the number of licensed hams multiplied by four fractional factors. In 2011, David Sumner, K1ZZ, collected statistics from national licensing databases and amateur radio societies worldwide. You can find the details of this in the August 2011 *QST*, page 9 (online archive available to ARRL members at <https://bit.ly/3lID7S2>). He arrived at a total number of 4 million licensed amateurs worldwide.

Not all amateur radio licenses adapt themselves readily to the most popular contests, HF contests. In particular, in the US, almost half of licenses are Technician class, the introductory class with little to no voice or digital privileges on the HF bands. While Technicians could get on for CW contests or for VHF contests, in practice they rarely do. License class details vary widely across the nations of the world, but let's assume that only half of ham licenses worldwide are well-suited to contest activity.

Not every licensed ham has a capable home station at all points in their life. Frequent moves for education and a series of jobs, financial and space limitations, and HOA restrictions may result in a minority of licensed hams having a suitable home contest station. I know that I had a modest home station in my youth, but through college and a series of travel-intensive jobs, I wandered away from having an assembled station for several decades. Then I settled down and strung a wire in my trees and have been active again for the past 14 years. Let's say that one-fifth of suitably licensed hams have access to a contest capable station.

Finally, let's consider that not all equipped and licensed hams have time to get on for contests every year. In particular, mainstream contests all take place on weekends when social and school events most commonly are scheduled, and re-arranging your family priorities to make time for contesting isn't always an option. Hams may prefer slow-paced CW and SSB ragchewing rather than rapid-fire contest exchanges with no room for pleasantries, or the chase of the DX. I will postulate that only 12% of active and equipped hams get on for contests each year.

I'll write down my own equation that lets us think about the total contesting population in terms of these factors:

$$N = H \bullet a \bullet s \bullet c \bullet \ell$$

Where:
N = 28,960 = operators submitting logs in 2021
H = 4,000,000 = total licensed radio amateurs
a = 0.5 = fraction of licenses with usable contesting privileges
s = 0.2 = fraction of radio amateurs owning or with access to a contest capable station
c = 0.15 = fraction with station access who get on for at least one contest each year
ℓ = 0.6 = fraction of contesters who submit logs

How can we help the number of active contesters and submitted logs grow? By increasing any factor in the above equation. Licensing new hams increases *H*, the number of total hams. By encouraging hams to upgrade their license classes, we increase the number with usable contesting privileges, listed as factor *a*. Donating older radios and helping these hams raise basic antennas will increase *s*, the fraction with capable stations. In 2020 and 2021, I would argue that the factor *c*, the number who found time to contest, increased as hams chose to get on the air when weekend activities may have been canceled during pandemic restrictions. And finally, make an effort to help local contesters get started with computer-based logging and encourage them to submit their logs, increasing the factor ℓ. I'm looking forward to continued growth in contest activity and log submissions!

July and August Contest Highlights

The three modes of the summer **North American QSO Parties** use a friendly name and state / province exchange and attract large numbers of beginning contesters on three Saturdays this summer. The 100-watt power limit in the NAQP levels the playing field so that beginners with modest stations can quickly build their "running" (CQing) skills rather than go entirely search-and-pounce. More advanced contesters enter as well, building their on-the-air SO2R (single operator two radio) and 2BSIQ (two band synchronized interleaved QSOs) techniques. The RTTY NAQP is held starting at 1800 UTC July 17th, the CW session is 1800 UTC August 7th, and the SSB session is 1800 UTC August 21st. As the sunspot numbers rise, expect the 10-meter and 15-meter bands to pack more action than in previous years. Find full rules on the *National Contest Journal* website at <https://ncjweb.com/naqp>.

The **CQ World Wide VHF Contest** is the weekend of July 16th and 17th this year. In his 2021 results article, John Kalenowsky, K9JK, notes, "the higher scoring stations in the various categories have included the 'legacy' modes in their QSO mixes, not relying exclusively on using FT8 and other digital modes." If you start out on FT8 because band conditions are marginal, be sure to change to CW and/or SSB modes for the higher rates you'll be able to achieve in those modes. You can find John's writeups, rules, and past results at <www.cqww-vhf.com>.

propagation

BY TOMAS HOOD,* NW7US

What Does July Propagation Have in Store For Us?

Quick Look at Current Cycle 25 Conditions:
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, May 2022: **92**
12-month smoothed, November 2021: **50**

10.7-cm Flux:
Observed Monthly, May 2022: **134**
12-month smoothed, November 2021: **98**

One Year Ago:
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, May 2021: **20**
12-month smoothed, November 2020: **13**

10.7-cm Flux:
Observed Monthly, May 2021: **76**
12-month smoothed, November 2020: **76**

Many DX hunters view July as the least exciting month of the year. With generally lower summertime Maximum Usable Frequencies (MUF), the highest of the amateur high-frequency (HF) bands suffer some east-west paths that depend on the F-layer. When the 10.7-cm Radio Flux index climbs above 160, these paths open up, but remember that trans-polar paths suffer when the geomagnetic field is active or worse.

While F-layer propagation of the highest HF frequencies will be poor, radio signals near the Best Usable Frequency (BUF) will be stable over paths that could remain open for longer periods than during the winter and early spring season. In addition, July's Sporadic-E (E_s) ionization is near the year's seasonal peak. This should result in a considerable increase in short-skip openings on almost all HF amateur bands and on the VHF 6- and 2-meter bands as well.

Twenty meters should continue to be the best band for all-day (24-hour) DX propagation during the month. When conditions are at least Low Normal, the band is expected to remain open to one area of the world or another.

Peak conditions on 20 meters are expected for a few hours after local sunrise and again during the late afternoon and early evening, when the band should open in almost all directions. When conditions are at least Low Normal, expect 20-meter openings toward South America, the South Pacific, and Oceania until as late as midnight. When conditions are excellent, the band should also remain open to most other areas of the world past midnight.

Considerably greater DX openings via the F-layers are expected on 15 meters this July than the number of openings seen during the last several years. When conditions are at least Low Normal, 15 meters should occasionally open toward the south. Look for some short-skip openings into the Caribbean area and Central America as early as 10 a.m. local time, with a peak expected to all areas of Latin America from 3-5 p.m. local daylight time. When conditions are High Normal or better, the band may also open to Africa during the late afternoon from the eastern half of the U.S,, and to Australasia and the South Pacific area during the late afternoon and early evening from the western half of the country. Seventeen meters will act somewhat the same as 15, but openings will tend to be longer, and signals perhaps stronger and more stable.

Expect short-skip openings on 10 and 12 meters during July toward the Caribbean and possibly Central America as a result of E_s ionization. When conditions are High Normal or better, an occasional opening deeper into South America may be possible, especially during the afternoon hours.

Overall, look for frequent short-skip openings on 10, 12, 15, and 17 meters between distances of 500 and 1,300 miles. During the afternoon hours, skip may extend to beyond 2,300

** P.O. Box 110*
Fayetteville, OH 45118
Email: <nw7us@nw7us.us>
@NW7US (https://Twitter.com/NW7US)
@hfradiospacewx (https://Twitter.com/HFRadioSpaceWX)

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for July 2022

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 1-3, 7-8, 12, 17-20, 26-30	A	A	B	C
High Normal: 4-6, 9-11, 13-16, 24-25, 31	A	B	C	C-D
Low Normal: 21, 23	B	C-B	C-D	D-E
Below Normal: 22	C	C-D	D-E	E
Disturbed: n/a	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. Using the **Propagation Charts** appearing in "The CQ Shortwave Propagation Handbook, 4th Edition," by Carl Luetzelschwab, George Jacobs, Theodore J. Cohen, and R. B. Rose.

a. Find the *Propagation Index* associated with the particular path opening from the **Propagation Charts**.

b. With the *Propagation Index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the **Propagation Charts** with a *Propagation Index* of **3** will be excellent on July 1st through July 3rd, good on July 4th through July 6th, and so forth.

2. Alternatively, you may use the *Last-Minute Forecast* as a general guide to space weather and geomagnetic conditions throughout 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 geomagnetic conditions. In general, when conditions are *High Normal* to *Above Normal*, signals will be more reliable on a given path, when the ionosphere supports the path that is in consideration. This chart is updated daily at <https://SunSpotWatch.com> provided by NW7US.

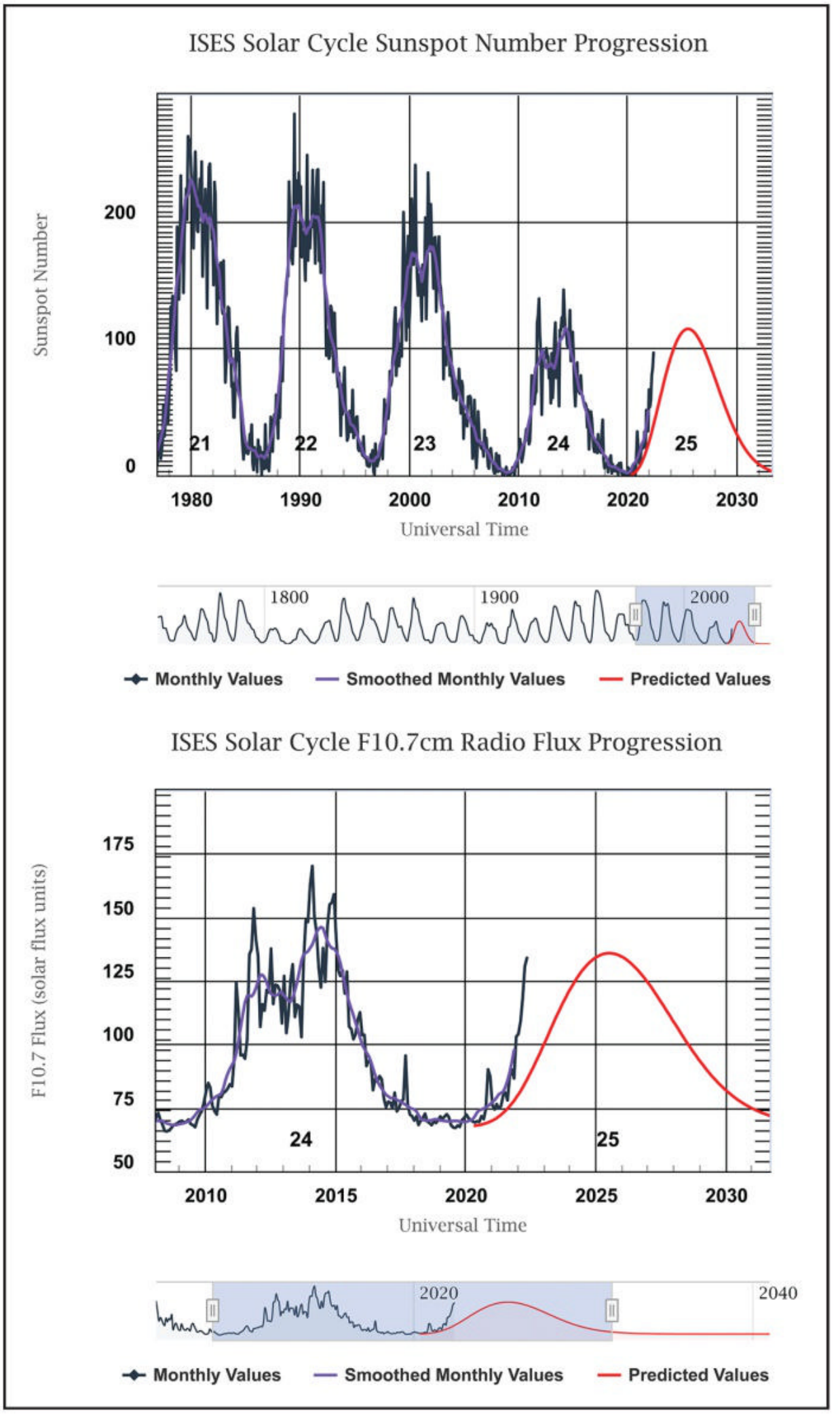


Figure 1. Again, the numbers for this month reveal that Solar Cycle 25 is still outpacing the official NOAA / SWPC / NASA forecast (so far)! If you look at the rise to date in this cycle, and compare it with the last three cycles, it seems like the slope of the rise is resembling the rise of Solar Cycles 22 and 23 instead of Cycle 24. If this is true, we may well see this cycle achieve a much higher peak than that of Cycle 24. The increase in each plot shows a faster rise in overall solar activity and resulting solar flux each month of this cycle. With daily 10.7-cm Radio Flux readings climbing to higher levels this month (May) compared to during April 2022, the 10-meter band had plenty of east-west DX over 3,000 kilometers or greater paths. Could this cycle also prove to be a stronger one than is expected? We think so! (Courtesy of SWPC / NOAA)

miles as a result of F-layer reflection. Short-skip openings should range between 250 and 2,300 miles on 20 meters. Peak conditions are most likely to occur during the late morning and again during the late afternoon and early evening hours. Daytime openings on 40 and 30 meters should range between 100 and 600 miles, increasing to between 250 and 2,300 miles after sunset. Look for openings up to about 300 miles on 80 meters during the day, extending out to the maximum short-skip (one-hop F-layer reflection) distance of 2,300 miles during the hours of darkness.

Nighttime openings into many areas of the world are possible on 20, 30, and 40 meters. But seasonally high static levels may often make DX reception difficult on both 30 and 40 meters. High static levels are also expected to result in somewhat poorer DX conditions on 80 meters, although some long-distance openings are forecast during the hours of darkness. Usually, 160 meters is virtually shut down due to the high static levels of summer. Your best bet for 40-, 80-, and 160-meter DX openings is an hour or two before midnight toward the north and east, and just before local sunrise toward the south and west. Expect some 160-meter openings between sunset and sunrise for distances up to approximately 1,300 miles, if the seasonally high static levels permit.

VHF Conditions

Statistical studies show that a sharp increase in E_s propagation takes place at mid-latitudes during the late spring and summer months. During July and August, short-skip propagation over distances ranging between approximately 600 and 1,300 miles should be possible on 6 meters. Openings may also be possible on 2 meters during periods of intense E_s ionization, with stations up to 1,300 miles away. While E_s short-skip openings can take place at just about any time of the day or night, statistics indicate that conditions should peak for a few hours before noon and again during the late afternoon and early evening. During July you can expect 6-meter E_s propagation on at least three out of every four days. Openings may last from a few minutes up to hours.

For a detailed list of meteor showers, check out <https://tinyurl.com/f9v7fj2u> for a complete calendar of meteor showers in 2022.

If you use Twitter.com, you can follow <@hfradiospacewx> for hourly updates that include the K-index numbers. You can also check the numbers at <https://SunSpotWatch.com>, where this columnist provides a wealth of current space weather details as well as links. Please report your observations of any notable propagation conditions, by writing this columnist via Twitter, or via the Space Weather and Radio Propagation Facebook page at <https://fb.me/spacewx.hfradio>.

Current Solar Cycle Progress

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for May 2022 is 92.45, quite a jump from April's 76.43. The 12-month running smoothed sunspot number centered on November 2021 is 50.2, up from October's 45.0. A smoothed sunspot count of 62, give or take about 6 points, is expected for July 2022.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 133.98 for May 2022, up from April's 130.63. The 12-month smoothed 10.7-cm flux centered on November 2021 is 97.7, up from October's 93.0. The predicted smoothed 10.7-cm solar flux for July 2022 is 104, give or take 9 points.

Geomagnetic activity level this month is expected to range from quiet to stormy, resulting in occasional degraded propagation. Remember that you can get an up-to-the-day ***Last-Minute Forecast*** at <https://SunSpotWatch.com> on the main page.

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. You may email me, write me a letter, or catch me on the HF amateur bands. If you are on Facebook, check out <https://fb.me/spacewx.hfradio> and <https://fb.me/NW7US> — speaking of Facebook — check out the *CQ Amateur Radio* magazine fan page at <https://fb.me/CQMag>. Also, please check out the new alternative social networking ham radio group at <https://amateurhamradio.locals.com> and please share this with your amateur radio friends and clubs.

– 73, Tomas, NW7US

Number groups after call letters denote folowing: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. Late logs are listed in Italic. (Note that country names and groupings reflect the DXCC list at the time of the contest.)

SINGLE OPERATOR
NORTH AMERICA

United States
District 1

WK1Q	**A**	**4,404,699**	**1705**	**801**
			(OP: K1MK @K1TTT)	
WV1K	"	3,232,311	1607	701
				(OP: N1IXF)
AE1P	"	1,854,657	1324	567
NG1M	"	1,530,650	1103	506
K1DBO	"	1,193,614	1010	463
K1AR	"	1,142,050	993	455
K2RB	"	1,137,040	970	466
KB1W	"	937,615	798	445
K1SM	"	932,688	821	459
KA1YQC	"	655,361	748	373
KV1J	"	583,648	642	368
W1HS	"	571,786	651	367
W1ARY	"	504,036	671	351
N1UZ	"	388,800	560	324
WA1ZYX	"	311,750	532	290
K1VW	"	290,358	386	283
KX1X	"	132,096	247	192
NX3Z	"	125,550	247	186
K3IU	"	84,000	209	175
W1TO	"	60,702	160	134
K1VOI	"	46,475	177	143
W1HNZ	"	35,640	144	120
NN1SS	"	24,892	122	98
AA1SU	"	20,880	118	90
***AK1W**	**A**	**3,187,866**	**1672**	**726**
				(OP: K5ZD)
*KQ1F	"	1,808,884	1101	539
				(OP: K1XM)
*NG1R	"	967,146	975	449
				(OP: W1QK)
*NN1D	"	614,075	779	385
*KS1J	"	402,636	490	348
*N1EN	"	365,862	504	281
*AF1R	"	274,833	428	261
*N1DID	"	259,200	448	270
*N1IBM	"	215,824	306	287
*KA1C	"	189,696	351	228
*W1DYJ	"	187,644	347	228
*KG1V	"	107,694	271	193
*N1API	"	85,848	196	196
*WV1H	"	60,643	191	149
*N1DCH	"	54,908	200	148
*K1RO	"	40,430	149	130
*KE1DX	"	31,680	129	110
*N2HX	"	30,873	156	123
*WD1S	"	30,805	134	101
*WA2TNX	"	30,740	130	106
*AE1T	"	25,344	122	99
*K1LHO	"	22,473	133	99
*WB1AEL	"	20,256	100	96
*WG1V	"	18,616	131	104
*W1RPG	"	15,323	101	77
*KC1SA	"	5,704	48	46
*KC1NCN	"	5,564	55	52
***AB1J**	**21**	**236,504**	**408**	**296**
*NY1E	"	42,624	185	144
***W2TT**	**14**	**1,595**	**30**	**29**
***KC1RLS**	**7**	**17,596**	**103**	**83**
*N1CEO	"	3,330	42	37

District 2

KU2M	**A**	**2,397,915**	**1374**	**585**
K2XA	"	1,893,712	1220	568
K4RUM	"	1,628,099	1118	523
KE2D	"	1,445,940	976	522
WT2J	"	1,299,678	1022	502
NR2C	"	1,132,560	982	495
WX2NJ	"	1,083,780	870	486
				(OP: K2RET)
NN2NN	"	898,650	899	450
WA2DNI	"	759,984	822	426
WS9M	"	756,540	912	405
N2HMM	"	709,082	743	386
WA2CP	"	614,385	632	333
				(OP: KC2GOW)
AA2GF	"	601,152	717	372
AK2S	"	597,750	701	375
KA2K	"	518,584	514	332
W2JV	"	496,551	581	367
KF2TI	"	467,535	581	355
W2MKM	"	425,068	486	329
NS2N	"	379,312	507	302
W2CG	"	329,940	376	282
N2RC	"	246,760	317	248
N2YBB	"	218,596	407	259
WB2PJH	"	216,250	383	250
K2QB	"	172,752	337	244
WB2NFL	"	161,348	303	209
KD2UBH	"	150,234	364	219
N2LK	"	124,852	314	196
WO2Y	"	85,314	221	177
NG2P	"	60,236	199	148
AA7G	"	48,927	171	141
KE1IH	"	48,585	144	123
KB2CKN	"	39,936	160	128
K2NV	"	38,794	142	119
KA2AEY	"	32,214	153	118
KD2DVW	"	21,141	114	87
WA2VIU	"	10,920	68	60
W2TB	"	5,310	47	45
AB2E	"	5,060	56	46
NW2P	*28*	*3,320*	*48*	*40*
				(OP: N6EE)
N2NF	**21**	**178,563**	**316**	**231**
W2YK	**14**	**20,874**	**103**	**98**
W2QQ	"	20,196	140	108
NB2P	**7**	**1,030,200**	**761**	**425**
KY2N	**3.5**	**94,864**	**238**	**154**
				(OP: N2ZN)
***AA2EQ**	**A**	**850,560**	**883**	**384**
*WB2JVO	"	704,946	803	363
				(OP: K2AL)
*W2NO	"	544,440	532	390
*KI2D	"	496,184	690	338
*KC2WUF	"	486,239	662	331
*KW2O	"	476,790	504	345
				(OP: KA2D)
*WB2WPM	"	438,900	598	350
*WB2COY	"	367,267	571	281
*WA2QAU	"	318,478	531	289
*WB2WGH	"	231,902	415	254
*NA2NY	"	163,268	387	238
*KS2G	"	85,340	250	170
*K3WHD	"	77,592	257	159
*W2RLK	"	64,200	228	150
*W2DXE	"	59,675	208	155
*W2FDJ	"	55,380	183	130
*KM2O	"	49,149	156	127
*K2DAR	"	36,089	154	151
*WB2NVR	"	33,638	152	121
*K2ZC	"	33,222	116	98
*W2LCQ	"	33,012	186	131
*KD2SGM	"	27,864	145	108
*ND2K	"	19,952	117	86
*K2DD	"	17,336	111	88
*K2CS	"	16,704	108	87
*WA3AFS	"	16,380	78	78
*KB2URI	"	15,170	82	74
*AC2RL	"	10,812	71	68
*WB2KWC	"	10,692	85	66
*KD2PTX	"	6,890	56	53
*N2UZQ	"	6,144	55	48
*KF2FK	"	4,092	48	44
*AC2ZZ	"	2,015	35	31
*KC2KZJ	"	1,456	19	16
*NC1A	"	494	19	19
***W2VTV**	**7**	**256,486**	**361**	**257**
*KA2WIK	"	1,300	27	26
***K2TW**	**3.5**	**54,784**	**186**	**128**

District 3

AA3B	**A**	**7,598,899**	**2650**	**913**
K3MM	"	6,701,282	2341	889
N3QE	"	3,631,232	1742	704
NB3R	"	2,984,100	1378	700
NF3R	"	2,870,072	1590	712
W3FV	"	2,660,175	1374	675
K3WJV	"	1,922,696	1202	596
KA3GIK	"	1,694,777	1154	581
				(OP: W3FIZ)
N3FJP	"	1,497,760	1090	506
K3WW	"	1,242,012	954	516
WY3A	"	929,464	727	446
WC3N	"	900,567	826	423
NE3F	"	823,044	883	428
NE3MD	"	730,317	691	419
WA3AAN	"	501,248	561	352
K3CY	"	475,844	581	337
K3UL	"	335,777	501	299
AK3B	"	264,322	454	283
N8WXQ	"	226,688	399	253
KD3TB	"	218,124	380	249
K3MD	"	202,426	373	266
W2CDO	"	177,160	289	206
KB3Z	"	173,160	305	222
KX2S	"	160,965	308	219
K2LNS	"	159,192	293	216
WW3S	"	156,434	248	214
K1RZ	"	148,608	277	192
KA3YJM	"	138,420	316	180
N3DUE	"	126,251	287	191
KT3R	"	124,551	316	189
NY3B	"	96,330	243	190
K3QIA	"	82,144	211	151
K3RMB	"	81,940	222	170
K3FH	"	78,740	213	155
NN3RP	"	63,216	229	144
AA3R	"	60,000	207	150
N3ZP	"	51,338	170	133
N3FM	"	45,630	157	117
W3IZ	"	43,416	191	134
N3XL	"	35,400	156	118
K3TN	"	33,880	131	110
W3OU	"	26,260	119	101
AA3S	"	25,662	107	91
K3AU	"	22,000	88	80
W3XOX	*"*	*19,050*	*101*	*75*
KA3D	"	18,810	95	95
N3WMC	"	17,572	124	92
W3GVX	"	11,880	72	66
KG4USN	"	5,616	56	48
AI3Q	**28**	**20,424**	**109**	**92**
N3MWQ	**21**	**14,760**	**91**	**82**
NA3M	**14**	**851,904**	**798**	**544**
W3LL	**3.5**	**293,056**	**387**	**241**
*KB3AAY	A	547,740	670	340
*AG4Q	"	503,672	604	334
*AC5XK	"	395,281	570	311
*WA3FAE	"	306,571	468	281
*N3FR	"	304,668	529	273
*KC3RPO	"	223,260	391	244
*K3QP	"	207,378	397	246
*WB3LGC	"	199,836	399	234
*AB3GY	"	195,794	361	223
*K3URT	"	165,165	374	195
*W3FR	"	144,144	333	208
*NO3U	"	85,860	214	159
*K3NO	"	73,872	233	152
*KC2VON	"	70,532	208	154
*W3RE	"	70,380	181	153
*WA3ZSC	"	67,200	212	140
*W3TAS	"	65,096	204	158
*W3IDT	"	41,088	170	128
*AB3SX	"	40,599	152	117
*KQ3F	"	35,433	142	127
*N3AML	"	23,987	115	83
*W3MAM	"	22,659	106	91
*KC3TD	"	16,849	105	83
*KC3ODW	"	14,904	87	69
*N8NA	"	13,608	112	81
*N3OJU	"	13,366	98	82
*WA3WXR	"	13,020	95	84
*AJ3DI	"	12,728	97	86
*AJ3M	"	3,116	46	41
*K3BTE	"	1,620	32	30
*WD8RYV	"	945	29	27
*KN3A	"	528	17	16
*W4GMN	"	364	13	13
*WC3B	"	140	10	10
***KE3ZT**	**28**	**1,938**	**41**	**34**
***NE3R**	**14**	**3,478**	**50**	**47**
*K3HW	"	589	19	19
***K3JSJ**	**7**	**3,404**	**38**	**37**

District 4

W9SN	**A**	**3,406,790**	**1760**	**739**
N6AR	"	3,030,795	1566	705
W4PK	"	2,003,926	1213	578
N4ZZ	"	1,467,432	1213	534
N1RM	"	1,439,672	1001	508
W4GE	"	1,406,224	1114	491
NR4O	"	1,297,789	1128	463
NS4X	"	1,281,784	1148	487
AA4DD	"	1,207,165	1047	485
W1AJT	"	1,202,698	766	542
NN4NN	"	1,115,500	1077	485
				(OP: K3SV)
AI4WW	"	1,097,600	1143	448
K5VIP	"	850,176	740	432
AA4CF	"	839,124	771	429
AB4SF	"	829,440	719	405
NY2DX	"	818,840	973	440
				(OP: W4CU)
ND4Y	"	811,112	1031	424
KG4W	"	805,920	623	438
WS6X	"	754,372	805	412
W5MX	"	691,875	787	375
WF4W	"	676,746	736	393
N4IQ	"	661,044	854	372
AB4GG	"	647,264	815	358
K4RO	"	620,919	703	377
AA8R	"	595,197	678	369
N4CW	"	585,237	572	373
W4CQE	"	579,120	780	380
K3IE	"	488,229	540	347
AF4T	"	444,160	551	320
W4BBT	"	422,266	662	298
NQ4J	"	417,934	506	314
				(OP: K8LF)
NZ4N	"	394,348	495	317
K4WW	"	370,240	534	320
AG2N	"	334,662	420	289
				(OP: N3MN)
N4CF	"	331,200	441	300
W3SA	"	320,160	498	290
KB4QZH	"	275,098	425	263
WB4YDY	"	258,781	441	251
K8KI	"	250,708	555	269
KN4BIT	"	230,892	513	271
W4UK	"	230,092	500	244
W3DQS	"	229,120	403	256
K3DNE	"	202,864	402	248
K7OM	"	195,960	380	230
W4OX	"	194,820	363	255
AG4TT	"	190,944	323	234
				(OP: N4GU)
W4VIC	"	169,850	315	215
K4NV	"	155,230	343	190
W4GHV	"	155,150	290	214
NA4DA	"	144,720	247	201
KF5MU	"	133,380	319	190
KF4FC	"	125,255	247	205
K4YCR	"	116,600	276	200
N4TL	"	116,415	270	199
W4WWQ	"	111,882	228	174
NØSMX	"	111,153	286	201
N4QS	"	99,360	233	180
K6ELE	"	80,324	320	172
K4XL	"	80,145	168	137
ND4G	"	74,412	187	159
N4KH	"	73,134	222	153
WB5WAJ	"	71,775	240	165
K4NWX	"	62,181	194	147
K4SO	"	54,849	167	141
KSØCW	"	46,624	176	124
KO8V	"	44,880	138	110
NF4J	"	44,407	209	121
AD4TJ	"	40,293	125	111
N3PV	"	37,147	146	121

K8AC	"	36,408	128	111
W3GQ	"	35,816	138	121
NU4E	"	35,088	118	102
W4SDX	"	30,888	184	132
KC4WQ	"	29,592	135	108
N3KN	"	27,775	130	101
KD4S	"	22,750	106	91
W4PF	"	19,140	97	87
KK4PH	"	17,808	92	84
WA2SCB	"	16,643	105	89
W4ZGR	"	11,376	92	72
NY4I	"	10,795	98	85
K2PS	"	5,184	39	36
N4QWF	"	3,504	52	48
N6DW	"	3,485	50	41
K4WI	**28**	**163,506**	**354**	**229**
WO4O	"	3,780	55	42
N3UA	**21**	**244,510**	**378**	**245**
WB5NHL	"	37,170	145	126
KT4O	"	2,001	30	29
K9OM	**7**	**1,610,840**	**842**	**523**
WJ2D	"	426,736	423	298
K4ADR	"	19,188	82	78
NK4I	"	15,750	98	75
***KK9A**	**A**	**3,780,388**	**1984**	**709**
*K5EK	"	789,012	741	404
*N4TB	"	475,020	607	348
*N3HEE	"	465,607	543	353
*AC4G	"	451,906	604	338
*K4GM	"	427,347	558	309
*WA3LXD	"	411,939	537	297
*K2MK	"	403,830	596	315
*W4TMO	"	363,297	484	327
*KTØR	"	290,160	510	260
				(OP: KEØL)
*N5SMQ	"	266,640	441	264
*N9TF	"	250,190	492	254
*KM4FO	"	247,205	483	245
*KG4IGC	"	244,038	436	267
*K4BX	"	191,178	395	234
*N3GTG	"	189,996	367	223
*KS4YX	"	186,354	377	238
*K4FTO	"	176,054	356	226
*W4PJW	"	167,134	359	214
*KW4J	"	155,940	345	230
*KC4LZN	"	154,280	368	232
*KK9DX	"	125,048	316	203
*K4YDE	"	113,528	270	184
*N3MM	"	107,736	292	201
*KB4OI	"	107,540	261	190
*KS4S	"	106,536	281	184
*KT3T	"	99,330	226	165
*N4QI	"	97,376	309	179
*N3CKI	"	94,977	273	173
*N4FWD	"	90,090	275	182
*WA4EEZ	"	83,250	263	185
*K4DR	"	80,676	256	166
*K4BRU	"	74,205	194	153
*KA4JRY	"	69,044	232	164
*NX3A	"	63,921	157	149
*KO4ENU	"	61,072	242	176
*NN4RB	"	56,658	208	142
NE8O/4	*"*	*54,708*	*194*	*141*
*W4EE	"	52,471	178	137
*WO4X	"	49,580	188	134
*AE4Y	"	49,446	207	134
*W9FFA/4	"	42,630	197	145
*AA4HG	"	40,690	181	130
*WBØCJB	"	39,186	180	126
*KO4NIK	"	30,847	144	109
*WA4IPU	"	29,150	141	106
*KK4HEG	"	27,756	134	108
*W8KRZ	"	26,040	135	105
*WA8OJR	"	26,001	135	107
*WN8Y	"	24,852	147	109
*W4BCG	"	21,945	131	95
*KA3MTT	"	21,120	115	88
*WF7T	"	20,274	113	93
*KT6D	"	18,881	84	79
*AI4GR	"	18,321	117	93
*KO4Z	"	18,286	101	82
*KO4XB	"	17,835	111	87
*K9EZ	"	17,533	100	89
*W4GDG	"	16,340	130	95
*NQ4K	"	14,362	100	86
*KT4DW	"	13,485	130	93
*WB4MM	"	12,218	100	82
*KI4WVW	"	5,684	56	49
*K4FJW	"	4,515	38	35
*N8AID	"	4,416	52	48
*K8ARY	"	4,368	42	42
*K8RAR	"	3,807	54	47
*K4KZ	"	3,773	56	49
*W4PFM	"	3,075	45	41
*KM4RK	"	2,975	39	35
*AAØO	"	2,646	27	27
*KG4WOJ	"	2,457	43	39
*N4KXO	"	2,184	46	42
*NØFIR	"	1,995	36	35
				(OP: NØFIR-)
*WD4LBR	"	1,632	34	32
*WJ4HCP	"	1,175	27	25
*KO4IUM	"	968	25	22
*W4GHD	"	460	21	20
*KO4PSQ	"	304	20	19
KF4FMQ	*"*	*156*	*12*	*12*
*W9LN	"	56	8	8
*AF4NM	"	5	5	5
K4FT	**28**	**1,122**	**25**	**22**
WA1FCN	**21**	**260,429**	**445**	**299**
KA4RRU	**14**	**584,309**	**662**	**439**
*W4LC	"	190,680	375	280
*K4RFK	"	180	12	12
K4MIL	**7**	**63,248**	**176**	**134**
		District 5		
N5HC	**A**	**1,865,864**	**1517**	**572**
AC4CA	"	1,813,511	1514	577
AD5XD	"	1,426,852	1370	524
WBØTEV	"	1,134,406	792	542
NT5V	"	1,090,452	1089	484
K5WE	"	728,112	901	394
W5JAY	"	536,200	810	350
K5CS	"	378,190	694	295
K5XH	"	210,816	479	216
K5CKS	"	140,896	343	224
WØZW	"	108,273	276	187
KØGEO	"	96,570	334	174
N5XJ	"	73,935	192	159
W2GS	"	65,349	220	159
N5RZ	"	62,909	218	133
NN5O	"	58,290	206	145
N5LPT	"	53,215	227	145
W5GFI	"	43,416	195	134
WA5LXS	"	34,456	158	118
W5TN	"	32,725	172	119
K5FNQ	"	20,145	101	85
K5GZR	"	4,536	47	42
NE5A	"	3,825	55	45
WV5Y	"	1,612	35	31
KG5RXE	"	399	20	19
W5PR	**28**	**104,448**	**303**	**192**
WJ5DX	*7*	*29,388*	*114*	*93*
				(OP: W5AJ)
***NN5T**	**A**	**400,959**	**657**	**299**
*KG5VK	"	384,990	658	313
*WQ5L	"	366,582	543	321
WA8ZBT	*"*	*334,048*	*719*	*292*
*WB5BHS	"	329,129	710	283
*N5KWN	"	271,397	586	283
*K5TXM	"	269,874	583	261
*AD5LU	"	253,760	606	260
*K5LY	"	248,490	597	251
*WB5JJJ	"	189,840	439	240
*WB5K	"	167,860	489	218
*KD2KW	"	104,144	332	184
*N5XE	"	83,700	206	186
*WDØGTY	"	82,164	295	167
*N5CHA	"	73,628	268	158
*AC5EZ	"	44,220	200	134
*N5JGE	"	40,656	148	112
*WA5LFD	"	28,919	156	121
*N5AF	"	24,750	127	99
*WA9AFM/5	"	20,972	143	98
*W5XY	"	16,740	135	90
KK5OQ	*"*	*15,834*	*106*	*87*
*AB8YZ	"	14,514	118	82
*K5IFA	"	13,056	94	68
*K5LGX	"	11,016	95	81
*W5MT	"	7,700	70	55
*K7ZYV	"	5,734	71	61
*K5VOP	"	3,432	56	52
*N5UWY	"	900	27	25
*KI5RQG	"	736	30	23
*KB5DJX	"	722	20	19
*AJ4F	"	378	14	14
***K5QR**	**21**	**203,225**	**385**	**275**
*KF5RLL	"	6,111	73	63
*AF5CC	"	2,331	42	37
***KN5S**	**14**	**1,496**	**34**	**34**
				(OP: K5WW)
*KK5LO	"	252	12	12
		District 6		
KK6P	**A**	**2,812,231**	**2036**	**607**
				(OP: W7IV)
KYØW	"	2,118,272	1808	536
				(OP: WØYK)
WQ6K	"	1,388,140	1321	494
AG1RL	"	1,259,192	1295	451
				(OP: W1SRD)
AJ6V	"	1,045,170	1189	441
W6EU	"	814,368	1103	408
KN6MYI	"	700,977	804	417
WE6Z	"	677,430	882	390
W6SX	"	656,270	991	365
K6TQ	"	585,858	986	377
WD6T	"	412,824	724	309
WX6V	"	364,156	563	298
W6DR	"	299,766	413	282
WQ6Q	"	279,825	719	287
W1RH	"	258,240	607	269
K6NR	"	233,359	491	259
NN6DX	"	222,816	444	264
				(OP: W1PR)
AF6SA	"	220,215	425	265
K6NV	"	203,840	465	224
N6QQ	"	178,281	327	213
K6RC	"	163,800	387	234
K6RIM	"	145,152	399	216
N6RV	"	122,285	274	185
NF6A	"	121,352	267	154
				(OP: K6XX)
N6RVI	"	118,940	366	190
WF6C	"	103,416	313	186
				(OP: N6XI)
K6YK	"	87,084	288	177
NC6R	"	75,420	308	180
N6GEO	"	67,320	232	153
W6IA	"	55,200	196	138
W6TK	"	48,077	177	131
K6HGF	"	40,506	208	129
W6MOB	"	31,284	124	99
AK6M	"	20,646	152	111
				(OP: K6MM)
KO6LU	"	15,300	93	85
NN6NN	"	7,592	64	52
				(OP: W6XK)
W6JBR	"	5,656	60	56
K6MI	"	4,469	49	41
K8TR	"	2,728	49	44
N5KO	"	121	11	11
NR6O	**28**	**290,652**	**616**	**318**
				(OP: N6RO)
WV6I	**21**	**817,236**	**971**	**483**
				(OP: N6WM)
NK6A	"	89,166	302	193
AK6W	*14*	*431,068*	*762*	*388*
				(OP: K6AW)
WX5S	**7**	**765,992**	**630**	**362**
				(OP: @N6RO)
W6DMW	**3.5**	**150,920**	**338**	**196**
***K6EI**	**A**	**336,540**	**490**	**316**
*WQ6X	"	131,200	399	205
*KF6RY	"	128,132	460	206
				(OP: W6ZL)
*W8GJK	"	115,392	376	192
*KE6GLA	"	103,664	284	176
*KE6SHL	"	92,026	343	178
*K6TLH	"	67,473	266	147
*KK6KMU	"	52,264	263	139
*K6BIR	"	46,376	218	136
*N6GP	"	43,772	195	124
*KC9EI	"	29,700	170	110
*WU6X	"	21,100	146	100
*N3KA	"	17,901	110	81
*KA6W	"	4,664	49	44
*K6DF	"	4,576	63	52
*AG6AG	"	3,960	52	44
*AA7GT	"	3,510	54	45
				(OP: K6ST)
*N6LL	"	1,890	31	30
*NJ6G	"	558	18	18
*AG6JA	"	253	12	11
*KM6RRS	"	50	11	10
***WM6Y**	**28**	**12,728**	**135**	**86**
*K6KM	"	4,224	51	48
KW6AA	*21*	*1,450*	*33*	*29*
***N3RC**	**14**	**8,736**	**99**	**78**
***KJ6MBW**	**7**	**42,292**	**158**	**109**
*NG6O	"	27,648	106	96
				(OP: K6GHA)
*AB1U	"	3,420	31	30
				(OP: W6RKC)
***WZ6ZZ**	**3.5**	**2,904**	**41**	**33**
*N6BHX	"	364	15	14
		District 7		
WK6I/7	**A**	**2,636,552**	**2107**	**556**
KO7SS	"	2,191,131	1460	639
KZ7X	"	2,049,248	1856	544
				(OP: K6LL)
KU1CW	"	1,895,234	1372	554
KA6BIM	"	1,358,570	1018	515
N7GP	"	1,342,120	1616	445
W7GES	"	1,285,284	1420	462
K7QA	"	964,483	1247	439
W7YAQ	"	949,950	1002	450
WA7AN	"	862,245	1108	405
				(OP: K9DR)
WC7Q	"	571,436	932	383
N9NA	"	558,441	757	333
N7ZUF	"	535,717	724	377
N7GCO	"	383,474	631	343
W7XQ	"	359,950	636	313
AC7GL	"	349,370	676	310
K7GS	"	343,067	577	349
K7RL	"	331,866	543	309
K7JQ	"	285,936	588	276
W7FN	"	281,952	461	288
K7LFY	"	273,240	521	270
NG7M	"	237,567	532	253
KD7PCE	"	235,466	459	242
K7VIT	"	161,557	382	209
K7UT	"	153,428	470	242
K9PY	"	133,563	361	211
WR7Q	"	122,958	344	198
W7PP	"	112,728	253	183
W7VJ	"	95,312	216	184
K7BVT	"	85,635	268	173
W7BP	*"*	*67,338*	*282*	*174*
NO7R	"	58,806	243	162
				(OP: AA7V)
WU6W	"	51,972	208	142
W7UDH	"	44,473	186	143
K9RZ	"	43,434	173	127
KG7QXE	"	41,500	195	125
WA7DUH	"	40,119	160	129
W7JHR	"	37,888	200	128
KØIP	"	30,300	128	100
N7VGO	"	24,255	148	105
WB6JJJ	"	22,825	117	83
W7CXX	*"*	*16,652*	*105*	*92*
				(OP: WA7LNW)
KF7ZN	"	4,128	47	43
W7SLS	"	3,168	55	44
W7DBA	"	9	3	3
WZ7ZR	**28**	**71,154**	**293**	**177**
				(OP: W7ZR)
N7EPD	"	2,812	52	37
K6SEA	**14**	**20,944**	**145**	**112**
				(OP: KA6BIM)
K7WP	**7**	**191,350**	**275**	**215**
KW7MM	**3.5**	**376,376**	**544**	**286**
***K7TQ**	**A**	**644,088**	**1024**	**376**

*WZ8T	"	404,595	722	333
*W7TMT	"	322,307	691	281
*WS7V	"	280,112	623	287
*WAØWWW	"	275,720	483	305
*W7OM	"	244,868	510	277
*W7BOB	"	195,741	523	239
*NK9I	"	153,224	428	214
*KJ9C	"	148,887	444	213
*K7VAP	"	141,006	409	213
*WN6W	"	135,300	401	220
*KN7K	"	117,585	335	201
*N7ESU	"	113,680	366	196
*WA7YAZ	"	112,048	397	188
*NU7F	"	89,946	322	171
*KD6TR	"	73,080	278	180
*WA7BRL	"	68,058	237	171
*N7DB	"	67,459	288	161
*K7AZT	"	64,676	265	148
*N7EZQ	"	63,801	260	153
*AD7XG	"	59,817	195	157
*N7PWZ	"	49,700	242	142
*NW7D	"	43,524	189	124
*N7DSX	"	34,515	172	117
*KX7L	"	32,956	168	107
*KB7AK	"	27,454	153	106
*AK6A	"	26,700	120	100
*W8MYL	"	22,632	190	123
*N7AME	"	20,544	150	107
*W7MTL	"	19,040	124	85
*KG7VIZ	"	17,760	140	96
*N7XCZ	"	16,665	127	101
*WB7WHG	"	16,185	110	83
*KT7G	"	13,572	108	87
*WØVQ	"	10,710	105	70
*W7ZDX	"	10,656	114	74
*KB7SDM	"	7,614	92	54
*K7NWF	"	7,560	129	90
*KJ7DHY	"	6,944	72	56
*KW7WP	"	6,240	75	65
*KB7BTO	"	3,744	50	48
*NN7M	"	3,478	42	37
*W7ETZ	"	3,268	57	43
*WB7CYO	"	3,128	52	46
*WN7Y	"	2,790	48	45
*K7ARJ	"	2,450	37	35
N7VS	*"	*2,301*	*41*	*39*
*K7MK	"	2,275	36	35
*N8FKF	"	1,978	50	43
*K7RBT	"	1,860	34	31
*K7JSG	"	1,242	33	27
*KD7GHZ	"	160	17	16
***K7ULS**	**28**	**1,288**	**28**	**28**
*W7WSV	"	924	22	21
***N7CKJ**	**14**	**999**	**31**	**27**
***W7QDM**	**7**	**89,308**	**222**	**166**
*K6VHF	"	6,240	63	48
*KC7CM	"	4,160	43	40
		District 8		
KI6DY	**A**	**1,593,394**	**1162**	**517**
KI8I	"	557,326	779	329
WA8Y	"	541,680	776	370
W8JE	"	424,514	543	334
K8JQ	"	400,680	653	280
KD8FS	"	392,350	594	350
WC1X	"	380,666	565	286
KX8AA	"	374,220	602	315
				(OP: K2CUB)
WZ8P	"	298,080	405	288
AB8RL	"	224,092	405	242
N4EL	"	173,201	321	227
W8JWN	"	164,502	357	222
WX8C	"	155,701	364	203
K8MM	"	127,058	289	202
KA8G	"	57,343	170	143
WA8CLT	"	50,099	147	119
K8PK	"	33,428	156	122
K8ESQ	"	29,046	112	103
N8GAS	"	20,332	119	92
K8RCT	"	6,624	60	48
K8YE	**14**	**415,276**	**561**	**394**
***N8CWU**	**A**	**848,400**	**929**	**400**
*AD8IG	"	844,886	1041	406
*KC8YDS	"	653,310	815	366
*KE3K	"	561,750	700	350
*WA8MCD	"	484,692	676	338
*W8TWA	"	468,093	627	337
*AA8OY	"	374,035	539	313
*WB8JUI	"	344,784	558	264
*K3JT	"	332,920	515	290
*K8RGI	"	289,940	495	266
*N8WCP	"	253,796	423	268
*WB8TDG	"	144,800	330	200
*ND3N	"	143,468	388	178
*KA8CNI	"	139,752	330	216
*AB8OU	"	139,160	350	196
*KB8DX	"	110,544	307	188
*W8JGU	"	109,998	258	189
*K8AJS	"	95,725	239	175
*K8VUS	"	85,772	243	164
*K7DR	"	81,472	225	152
*N8HHG	"	70,700	187	140
*W8DW	"	51,300	206	150
*WA8YZB	"	41,952	213	138
*AA8SW	"	36,840	155	120
*N8TFD	"	30,906	149	101
*K4YJ	"	30,500	121	100
*N8QE	"	29,295	144	105
*AB8SF	"	26,362	113	98
*KE8QZC	"	21,420	134	90
*N8QNT	"	19,834	115	94
*N8TCP	"	13,200	80	75
*N8DNG	"	7,134	65	58
*N8FYL	"	4,940	59	52
*W8KNO	"	3,612	45	42
*W3CRZ	"	3,318	49	42
*KT8X	"	1,860	30	30
*AC8ZU	"	800	27	25
AC8JW	*"	*336*	*17*	*16*
***WB8JAY**	**28**	**888**	**27**	**24**
*KG9Z	"	200	10	10
***W8OX**	**21**	**20,884**	**98**	**92**
***W8WTS**	**3.5**	**6,256**	**51**	**46**
		District 9		
KD9MS	**A**	**1,112,740**	**1080**	**460**
AC9S	"	998,036	1061	442
WB8BZK	"	851,851	919	407
N7US	"	844,998	730	462
WI9WI	"	703,010	958	385
WT2P	"	493,698	760	321
K9UC	"	462,561	692	321
W9PDS	"	278,196	500	291
N9WG	"	251,489	448	259
AA9L	"	246,586	495	278
K9DUR	"	235,872	415	252
WA9IVH	"	219,641	422	239
K9MMS	"	195,075	442	225
KC9K	"	194,740	389	260
W9PA	"	179,304	344	241
KC9EOQ	"	177,684	394	221
W9YK	"	175,828	391	226
KBØV	"	175,244	338	227
AJ9C	"	147,947	318	197
N2BJ	"	119,350	311	175
KZ9DX	"	70,920	242	180
KB9OWD	"	61,920	223	160
K9WO	"	36,850	138	110
NT9E	"	32,004	166	127
W9ILY	**21**	**762,375**	**696**	**475**
N9LQ	"	1,612	27	26
NN9C	**14**	**1,131**	**32**	**29**
***ND9G**	**A**	**794,880**	**980**	**414**
*K9PW	"	623,834	874	379
*K9CW	"	447,888	624	336
*KG9X	"	433,260	493	348
*N9UA	"	401,436	616	324
*KB9YOJ	"	365,371	575	293
*KYØQ	"	289,060	494	298
*W9FY	"	278,698	617	238
*WU9D	"	241,056	489	243
*W9TD	"	187,456	475	232
*WE9V	"	177,712	353	232
*KI9A	"	160,560	378	223
*KØTQ	"	101,094	278	174
*N9LYE	"	93,984	274	178
*KF9VV	"	73,428	305	174
*W9KG	"	65,562	227	147
*KD9ERS	"	65,100	237	155
*KB9DVC	"	63,269	244	151
*WB9VGO	"	63,063	214	147
*N9VPV	"	60,853	211	151
*N9SB	"	52,950	220	150
*K9KE	"	49,912	195	136
*KD9NHZ	"	49,132	206	142
*N9KT	"	48,972	187	132
*WB9UGX	"	38,870	185	130
*N9TNT	"	35,934	149	113
*W9VQ	"	32,657	124	113
*WB9BWP	"	31,436	162	116
*KB9S	"	21,100	138	100
*KC9GHA	"	19,270	97	82
*AA9RK	"	19,158	130	93
*AA9WP	"	17,088	116	89
*N9OQC	"	15,326	105	79
*W9PI	"	13,770	101	85
*K9QC	"	13,442	112	94
*KD9PLD	"	10,354	65	62
KD9NYE	*"	*8,374*	*68*	*53*
*KB9TVR	"	3,154	38	38
*WA9LKZ	"	2,925	52	45
*AF9FA	"	735	36	35
*N9AKR	"	442	13	13
***KB9RUG**	**28**	**1,914**	**31**	**29**
***W9AKS**	**7**	**63,732**	**198**	**141**
*KA9VLC	"	2,664	40	36
*NV9X	"	24	4	4
***K9CS**	**3.5**	**75,184**	**238**	**148**
		District Ø		
ACØC	**A**	**3,397,686**	**1910**	**734**
N7WY	"	1,286,256	1274	508
W7II	"	821,525	1019	425
WØMB	"	678,862	927	394
NØTA	"	478,458	871	342
KØAP	"	478,296	699	364
KIØF	"	440,376	672	354
AAØFO	"	359,674	585	322
KSØAA	"	357,604	735	299
KS9W	"	306,324	694	268
NØAT	"	300,150	588	290
ABØS	"	261,568	516	244
NØKQ	"	242,469	676	261
KØTC	"	207,208	512	236
NØBUI	"	165,880	438	232
NOØL	"	141,000	378	200
KVØI	"	134,126	460	199
WBØWIV	"	97,527	253	177
NØGN	"	95,700	315	174
WAØJZK	"	94,656	280	174
WØHRO	"	71,136	242	152
KØFJ	"	70,065	318	173
NFØN	"	51,100	201	140
W5AP	"	48,580	244	140
WAØO	"	46,492	221	118
WØTY	"	44,712	197	138
KØHB	"	42,000	180	120
AEØA	"	27,875	193	125
KØTLG	"	23,920	154	115
WØRX	"	18,584	109	92
K5ZG	"	14,842	95	82
WAØTXJ	"	14,688	131	96
ADØTR	"	10,540	79	68
N6RSH	"	8,680	70	62
WD5ACR	"	6,270	64	55
W8LYJ	"	2,597	71	53
NØLEF	"	2,442	41	37
ACØE	"	1,392	24	24
NØXR	**21**	**618,018**	**731**	**438**
				(OP: @NØNI)
KFØIQ	"	4,620	43	42
WA2PCN	**14**	**324**	**18**	**18**
NØVT	**7**	**95,142**	**230**	**157**
NØNI	**3.5**	**547,288**	**598**	**337**
***WDØT**	**A**	**565,211**	**1038**	**317**
*KZØUS	"	412,347	631	327
				(OP: W7RY)
*AD1C	"	346,890	607	310
*AI6O	"	325,130	554	305
*KØKX	"	235,276	425	262
*KØJJR	"	205,573	421	241
*WO7U	"	205,344	449	248
*KØRC	"	168,144	386	226
*NØQM	"	134,723	415	199
*WBØN	"	126,336	364	192
*NNØG	"	84,667	282	179
*WXØZ	"	84,001	249	167
*KBØGT	"	82,425	318	175
*NWØM	"	60,760	249	155
*KØIL	"	54,720	176	152
*N5TU	"	48,490	165	130
*KØITC	"	44,016	195	131
*WØNOZ	"	41,920	192	131
				(OP: WBØULX)
*KV5Y	"	36,890	179	119
*NØTXW	"	35,836	187	124
*WØDC	"	35,369	172	113
*KBØNES	"	19,900	130	100
*KØMPH	"	18,326	141	98
*NØLLH	"	16,590	101	79
*KØWOI	"	15,438	99	83
*KJØP	"	14,062	105	79
*NEØDA	"	13,932	105	81
*KF6YU	"	13,770	120	85
*ABØCD	"	9,044	86	68
*KDØWUQ	"	6,955	78	65
*KØNC	"	6,900	84	69
*NØMHL	"	5,217	53	47
*NØIS	"	2,196	46	36
*KØRJK	"	2,173	48	41
*N5KB	"	56	8	7
*KØXU	"	25	5	5
***WAØMHJ**	**21**	**23,544**	**122**	**109**
***WAØEJX**	**14**	**25,000**	**175**	**125**
		Alaska		
KL7SB	**A**	**509,218**	**646**	**289**
AL7A	"	183,744	399	198
AL7LO	"	85,169	241	161
N6QEK/KL7	"	50,307	181	123
AL2F	"	33,024	138	86
KL2ZZ	"	13,298	77	61
NL7S	"	105	7	7
		Barbados		
***8P1W**	**A**	**82,295**	**239**	**151**
		Belize		
V31DJ	**A**	**127,395**	**286**	**171**
				(OP: WØCP)
***V31MA**	**A**	**1,437,648**	**1083**	**488**
		Bermuda		
***WA2DE/VP9**	**A**	**48,070**	**158**	**115**
				(OP: WA2DE/VP9)
		Canada		
		District 1		
VE1ANU	**A**	**436,224**	**494**	**284**
VO1CH	"	64,768	144	128
VE9AA	**21**	**102,600**	**244**	**180**
***VA1XH**	**A**	**998,002**	**747**	**394**
*VE1RSM	"	611,632	586	344
*VY2LI	"	449,121	466	283
*VE1QY	"	106,344	212	168
*VE9WH	"	6,468	52	49
		District 2		
VE2EZD	**A**	**194,682**	**323**	**213**
VE2SG	"	25,830	99	82
VA2QR	"	22,977	85	69
VE2GSO	"	16,275	89	75
VE2GT	"	18	3	3
VE2RYY	**14**	**1,141,686**	**875**	**533**
***VE2BVV**	**A**	**1,015,904**	**776**	**424**
*VE2HEW	"	549,375	593	293
*VE2NMB	"	420,783	466	311
*VA2FO	"	211,678	317	218
*VE2OWL	"	53,325	155	135
*VE2ZWA	"	24,479	106	91
***VA2VT**	**28**	**874**	**22**	**19**
***VE2ZT**	**14**	**20,424**	**118**	**92**
		District 3		
VA3DF	**A**	**2,911,090**	**1312**	**637**
VE3EY	"	2,399,085	1277	585

VE3KI	"	1,810,230	1072	498
VA3LR	"	1,668,675	1076	475
VE3JI	"	1,310,246	1002	434
VE3GYL	"	1,096,464	835	431
VE3RZ	"	977,040	680	460
VE3TW	"	508,599	572	299
VE3BR	"	416,195	526	247
VE3ORY	"	255,438	402	207
VE3DZP	"	218,538	301	213
VE3EEJ	"	35,203	136	107
VA3IK	"	32,242	119	98
VE3NE	**7**	**591,164**	**480**	**301**
VA3WW	"	37,310	124	91
***VE3MGY**	**A**	**1,159,614**	**960**	**414**
*VE3PJ	"	653,250	617	325
*VA3SB	"	539,090	596	310
*VE3TM	"	518,612	572	317
*VA3RTG	"	309,203	415	241
*VA3PC	"	299,584	400	248
*VA3TTB	"	296,930	438	230
*VE3LVW	"	282,506	384	238
*VE3NZ	"	255,460	308	241
*VA3ROC	"	149,150	316	190
*VE3FZ	"	143,088	283	176
*VA3EC	"	121,948	252	172
*VA3RSA	"	99,532	222	149
*VA3PAF	"	78,468	191	156
*VE3NFN	"	55,926	152	117
*VA3EON	"	38,218	134	97
*VE3EJ	"	30,780	111	90
*VA3WR	"	22,199	95	79
*VE3MZD	"	8,150	62	50
*VA3FN	"	6,426	54	51
*VE3MCF	"	5,900	59	50
*VE3ZDR	"	2,970	32	27
*VE3BFU	"	72	6	3
***VE3VSM**	**28**	**3,096**	**38**	**36**
		District 4		
VE4VT	**A**	**941,815**	**997**	**379**
***VA4HZ**	**A**	**281,120**	**465**	**224**
				(OP: VE4HAZ)
*VE4DL	"	90,432	244	144
		District 5		
VE5CPU	**A**	**583,656**	**816**	**332**
***VE5SF**	**A**	**302,915**	**514**	**235**
		District 6		
VE6BBP	**A**	**449,121**	**632**	**283**
VE6UM	"	323,790	567	251
				(OP: VE6BMX)
VE6LQ	"	137,256	323	172
***VA6RCN**	**A**	**115,940**	**300**	**155**
*VE6FRD	"	53,824	188	116
*VE6AX	"	18,130	103	74
		District 7		
VA7KO	**A**	**766,674**	**821**	**382**
VA7ST	"	546,916	725	292
VE7LWW	"	324,024	532	276
VA7XH	"	301,600	493	260
VA7MAY	"	181,636	328	182
VE7DX	"	156,107	372	203
VA7DX	**21**	**102,527**	**325**	**163**
***VA7RY**	**A**	**208,848**	**392**	**229**
*VE7JMN	"	138,093	311	191
*VE7AX	"	28,737	110	93
*VA7ZM	"	27,807	129	93
*VE7BGP	"	15,708	85	68
*VE7AB	"	14,707	92	77
		District 8		
VY1XY	**A**	**2,888**	**39**	**38**
		Costa Rica		
***TI2WMP**	**A**	**136,620**	**318**	**207**
***TI2BSH**	**21**	**31,375**	**170**	**125**
*TI2ALF	"	7,936	74	64
		Cuba		
CO2VE	**A**	**108,383**	**259**	**167**
***CO8NMN**	**A**	**737,242**	**728**	**341**
*CO6WD	"	387,399	471	263
*CO2KY	"	55,342	145	118
*CO2QM	"	46,816	179	112
*CO2GL	"	40,424	156	124
***CO2XK**	**21**	**261,025**	**520**	**265**
*CO6LE	"	171,160	385	220
*CO2AJ	"	164,256	333	232
***CM2IU**	**7**	**250,160**	**331**	**212**
		Dominican Republic		
***HI3K**	**A**	**732,607**	**710**	**379**
*HI3MM	"	453,534	596	281
		Grenada		
***J35X**	**28**	**45,902**	**192**	**118**
		Guatemala		
***TG9ANF**	**A**	**1,026,182**	**1083**	**389**
***TG9ADQ**	**14**	**131,950**	**322**	**203**
		Honduras		
HR1LEO	*A*	*19,264*	*103*	*86*
		Martinique		
***FM/VE3DZ**	**A**	**320,840**	**378**	**260**
		Mexico		
XE2SSN	**A**	**107,606**	**280**	**173**
***XE2B**	**A**	**571,356**	**716**	**354**
*4A9ØAGS	"	151,152	373	201
				(OP: XE2AU)
*4A9ØPUE	"	68,256	262	144
				(OP: XE1SPM)
*XE1YD	"	38,720	177	110
*XE2YWB	"	35,432	152	103
XE1SVT	*"*	*1,026*	*19*	*19*
***XE1CT**	**28**	**25,480**	**127**	**91**
*XE2S	"	11,776	79	64
*XE2N	"	405	15	15
***4A5E**	**14**	**168,630**	**385**	**219**
				(OP: XE1EE)
*4A9ØQRO	"	27,270	150	101
				(OP: XE1CL)
*XE1AY	"	576	18	16
***6D5C**	**7**	**53,340**	**134**	**105**
				(OP: XE1H)
		Panama		
HP1DCP	**21**	**20,925**	**111**	**93**
***HP3SS**	**A**	**15,840**	**94**	**80**
		Puerto Rico		
KP4/K6DTT	**A**	**2,504,977**	**1252**	**571**
***NP4TX**	**A**	**1,038,597**	**780**	**411**
*KP4JFR	"	43,125	145	115
***WP4WW**	**21**	**4,429**	**45**	**43**
				(OP: KP4JRS)
		St. Kitts & Nevis		
***V47UM**	**A**	**312,924**	**416**	**267**
				(OP: W3UL)
*V4/KG9N	"	169,400	311	200
		U.S. Virgin Islands		
***KP2DX**	**A**	**295,612**	**415**	**263**
				(OP: KP2BH)
*NP2KW	"	179,333	267	187

AFRICA

		African Italy		
***IH9YMC**	**28**	**25,830**	**99**	**90**
		Canary Islands		
EA8AH	**A**	**7,922,330**	**2654**	**818**
				(OP: OH4KA)
EA8DO	"	4,235,958	1611	654
***EA8AQV**	**A**	**492,981**	**456**	**303**
*EA8OM	"	381,900	411	300
				(OP: DJ1OJ)
EA8BQM	*"*	*102,000*	*155*	*125*
***EA8TR**	**28**	**95,927**	**219**	**157**
***EA8DED**	**21**	**1,038,345**	**781**	**465**
				(OP: OH2BP)
*EA8CNR	"	27,027	104	91
***ED8L**	**14**	**499,848**	**490**	**353**
				(OP: EA8DHH)
*EA8ARG	"	10,325	62	59
		Cape Verde		
D4L	**14**	**931,068**	**714**	**444**
				(OP: IK2NCJ)
		Cueta & Melilla		
***EA9ACD**	**21**	**178,972**	**301**	**202**
		Gabon		
TR8CA	**A**	**41,952**	**128**	**114**
		Madeira Islands		
CT3HF	**A**	**345,999**	**407**	**291**
		South Africa		
*ZS2EZ	A	23,840	98	80
		Zimbabwe		
Z22O	*28*	*30,705*	*119*	*89*
				(OP: DL7BO)

ASIA

		Asiatic Russia District 9		
RT9A	**A**	**3,850,308**	**1595**	**693**
RO9A	"	1,594,596	997	498
RL9LR	"	1,267,452	890	436
UC8U	*"*	*1,136,135*	*864*	*455*
UA9TF	"	766,935	728	345
R9OK	"	654,066	612	358
RK8I	"	498,888	554	338
RZ9A	"	233,006	365	226
UA9UR	*21*	*306,362*	*436*	*277*
RA9Y	**14**	**1,234,791**	**870**	**551**
				(OP: R9YCY)
RA9AU	"	490,290	491	354
UA8J	**7**	**262,880**	**251**	**212**
***RW9MZ**	**A**	**100,377**	**216**	**171**
*RA9YE	"	48,585	157	123
*UA9AX	"	45,621	138	111
*R9RA	"	27,876	104	92
*RK9AY	"	24,210	101	90
*RQ9O	"	12,544	79	64
*UA9OV	"	2,688	30	28
*RN8C	"	1,100	23	20
***RZ9AD**	**21**	**506,726**	**529**	**341**
***RA9AFZ**	**14**	**18,480**	**87**	**80**
*RC9T	"	14,892	76	73
*RA8AI	"	9,296	60	56
		District Ø		
RDØA	**A**	**1,639,764**	**1081**	**482**
UCØA	"	1,633,715	1023	551
RAØFLP	"	874,368	864	368
RAØACM	"	537,102	557	318
UAØOK	"	336,676	475	292
RWØSR	"	289,940	411	266
RMØW	"	257,856	369	237
RWØUM	"	124,640	345	160
RAØAM	"	58,674	172	127
UAØSR	**28**	**62,495**	**186**	**145**
UAØSU	**7**	**68,432**	**121**	**104**
***RNØJT**	**A**	**208,608**	**415**	**212**
*RAØWHE	"	185,954	325	218
*RØUT	"	148,596	304	203
*RØJD	"	98,880	260	160
*UAØJFD	"	88,950	259	150
*UBØAZR	"	62,712	171	134
*UAØJGI	"	45,998	192	109
*UAØLKD	"	27,573	125	91
*RØAS	"	6,716	48	46
***RGØS**	**28**	**28,812**	**135**	**98**
*RØSBZ	"	5,715	46	45
***RØCW**	**14**	**13,664**	**122**	**56**
*RCØAJ	"	5,625	49	45
		Asiatic Turkey		
***TA7I**	**A**	**2,324,426**	**1135**	**529**
*TA2E	"	28,884	96	83
*TA4RC	"	14,616	77	72
*TA3GO	"	1,914	22	22
*TA4CS	"	1,056	22	22
***TC7YOTA**	**28**	**12,480**	**80**	**65**
				(OP: TA7MNA)
***TA4AU**	**14**	**76,806**	**180**	**153**
*TA7AO	"	6,240	55	48
*TA3OER	"	4,290	43	39
***TA2FT**	**7**	**169,950**	**194**	**165**
***TA3LHH**	**3.5**	**28,408**	**73**	**67**
***YM7KK**	**"**	**15,392**	**56**	**52**
				(OP: TA7EB)
		Bahrain		
A96A	**A**	**22,673**	**89**	**79**
				(OP: A92AA)
		China		
BG2VIA	**A**	**31,050**	**138**	**90**
BH7PFH	"	8,856	61	54
BD3CB	**21**	**174,369**	**327**	**221**
***BD3GNI**	**A**	**175,980**	**321**	**210**
*BG3ILY	"	151,788	298	182
*BG8DIV	"	142,129	288	169
*BG3HMQ	"	116,887	256	179
*BG5BAA	"	76,255	197	151
*BH8PHG	"	58,110	178	130
*BD7BW	"	43,673	178	119
*BA3MM	"	6,250	64	50
*BGØAVI	"	4,031	31	29
*BA4SCP	"	1,955	30	23
*BA4VE	"	784	19	16
***BG8PM**	**28**	**1,584**	**27**	**24**
*BI4VIP	"	1,518	31	22
***BD4SDO**	**21**	**56,070**	**186**	**126**
*BD4RHV	"	31,899	141	93
		Cyprus		
***P3AA**	**A**	**1,332,792**	**891**	**428**
				(OP: RN3QO)
		Georgia		
4L8A	**21**	**84,372**	**208**	**158**
		Hong Kong		
VR2XYL	**28**	**42,375**	**158**	**113**
VR2CC	**21**	**20,826**	**122**	**78**
				(OP: VR2XMT)
		India		
VU2DED	**A**	**445,300**	**448**	**292**
VU2IBI	"	96,596	204	164
***VU2GRM**	**A**	**26,960**	**113**	**80**
***VU2FGQ**	**21**	**83,772**	**211**	**156**
		Israel		
***4Z1TL**	**A**	**191,386**	**303**	**221**
*4X1ST	"	11,715	58	55
***4X1AJ**	**28**	**3,640**	**37**	**35**
***4Z5MY**	**21**	**13,464**	**74**	**68**
4Z5FI	*3.5*	*12,864*	*49*	*48*
		Japan District 1		
JA1CSN	**A**	**1,692,469**	**972**	**493**
JM1XCW	"	1,628,145	990	485
JN1THL	"	670,704	603	356
JE1LFX	"	645,099	578	357
JF1LMB	"	387,528	463	268
7K4VPV	"	250,390	355	245
JA1BWA	"	204,108	338	233
JH1RFM	"	200,546	305	197
JG1LHB	"	170,755	287	185
JH1CTV	"	165,020	279	185
JL1CNY	"	129,960	259	180
JA1HOX	"	128,856	239	177
JA1AYO	"	126,672	251	168
JA1OVD	"	122,411	220	167
JA1XRA	"	106,876	216	154
JA1IAZ	"	102,765	234	155
JA1QOW	"	94,446	215	159
JH1HIC	"	70,320	167	120
JJ1XBQ	"	61,642	168	119
JF1UOW	"	39,895	131	101
JJ1RXC	"	16,520	68	59

JH1NCZ	"	15,853	86	83
JH1LNL	"	5,544	48	42
JA1WWO	"	1,953	21	21
JR1BAS	"	1,950	26	25
JS1NDM	"	1,550	27	25
JA1WSK	**28**	**36,966**	**139**	**122**
JA1SJV	"	25,220	102	97
JH1OAI	"	24,472	97	92
JA1FNO	"	14,775	81	75
JR1NHD	**21**	**149,449**	**281**	**199**
JK1BAB	**14**	**72**	**8**	**8**
***JA1MZM**	**A**	**420,980**	**525**	**310**
*7N2UQC	"	413,325	507	275
*JM1NKT	"	351,862	444	287
*JK1OLT	"	167,384	249	196
*JA1SCE	"	160,650	274	189
*JG1XIO	"	139,840	269	184
*JH1BHW	"	131,763	274	167
*JF1WNT	"	129,696	248	168
*JS1KKY	"	106,920	207	162
*JK1JAS	"	82,800	196	138
*JA1EMQ	"	77,736	187	158
*JR1EMO	"	77,220	191	156
*JK1NSR	"	76,557	202	151
*JA1IZ	"	72,116	181	149
*JI1FWH	"	46,200	184	120
*7K1PYG	"	42,728	165	109
*JA1ATM	"	38,306	136	107
*JK1HIY	"	35,739	114	99
*JA1IE	"	20,088	95	72
*JA1RRA	"	19,890	94	78
*JI1SAI	"	16,863	89	73
*JA1GZK	"	11,132	57	46
*JH1DWQ	"	1,976	28	26
*JG1TGQ	"	1,725	27	25
*7L2VPL	"	920	20	20
*JA1PTO	"	324	14	12
***JF1OVA**	**28**	**11,656**	**71**	**62**
***JH1KYA**	**21**	**103,722**	**213**	**177**
*JJ1ENZ	"	77,922	186	162
*JA1UII	"	53,950	151	130
*JG1UKW	"	51,570	157	135
*JE1RRK	"	29,007	112	99
*JI1BBN	"	24,208	107	89
*JI1AQY	"	10,560	62	60
*JF1RYU	"	8,262	60	51
*JA1WBX	"	3,318	43	42
***JF1TEU**	**14**	**20,336**	**95**	**82**
*JA2JNC/1	"	14,271	89	71
*7L4AKT	"	1,872	30	26
*JP1LRT	"	1,456	27	26
*JA3GZE/1	"	490	15	14
*JE1GZB	"	207	10	9
*JF1WCK	"	3	1	1

District 2

JA2AXB	**A**	**361,560**	**443**	**276**
JR2PMT	"	334,871	404	257
JA2FSM	"	311,553	437	297
JA2HYD	"	242,202	355	222
JG2REJ	"	172,601	284	187
JF2FIU	"	155,185	308	205
JR2BCF	"	17,633	79	77
JH2BTM	**21**	**73,647**	**178**	**147**
JF2BDK	**14**	**7,140**	**52**	**51**
***JK2XXK**	**A**	**434,704**	**529**	**269**
*JA2ODB	"	208,236	315	222
*JE2BOM	"	115,784	228	164
*JH2MYN	"	103,999	218	179
*JA2GHP	"	88,160	211	160
*JH2LMH	"	78,300	169	150
*JA2FXV	"	72,240	179	129
*JE2PCY	"	11,700	69	60
***JE2CPI**	**28**	**3,128**	**35**	**34**
*JH2JNU	"	2,100	31	30

District 3

JR3NZC	**A**	**423,706**	**485**	**302**
JA3HBF	"	296,920	408	260
JG3RPL	"	171,521	275	229
JR3RIU	"	113,736	250	168
JM3UGA	"	96,869	196	157
JH3QFY	"	77,700	184	150
JP3UBR	"	11,151	64	59
JR3UIC	"	8,058	56	51
JK3NSD	"	2,808	26	26
JG3KMT	"	210	10	10
JF3LOP	**28**	**10,044**	**71**	**62**
JR3RIY	**21**	**357,133**	**435**	**313**
JF3NDW	"	17,380	86	79
JA3VOV	**14**	**6,930**	**63**	**55**
JA3GOJ	"	3,922	40	37
JH3FUK	**7**	**200,934**	**210**	**183**
***JA3JM**	**A**	**107,520**	**234**	**160**
*JH3WKE	"	102,663	215	153
*JE3RMQ	"	81,548	192	148
*JN3LNI	"	28,080	112	90
*JJ3QJI	"	27,200	125	85
*JH3GMI	"	17,550	93	78
*JA3MIB	"	8,496	66	59
*JF3LGC	"	1,240	21	20
***JF3IYW**	**21**	**143,524**	**263**	**212**
*JR3GPP	"	6,721	51	47
*JA3RAZ	"	4,185	46	45
***JA3JND**	**14**	**4,100**	**48**	**41**
*JH3IQL	"	846	20	18
***JR3XEX**	**7**	**286**	**13**	**13**

District 4

JR4OZR	**A**	**3,610,645**	**1475**	**673**
JR4CTF	"	203,153	333	223
JA4CZM	"	198,030	300	205
JG4AKL	"	167,647	261	197
JI4WAO	"	106,240	219	166
JM4WUZ	"	32,292	117	92
JR4VEV	**7**	**25,200**	**77**	**72**
***JH4UTP**	**A**	**437,166**	**511**	**298**
*JE4MHL	"	269,240	377	254
*JI4WHS	"	164,052	298	186
*JA4RMX	"	30,906	109	102
*JA4RWN	"	8,268	63	53
*JH4RUM	"	4,602	50	39
***JH4FUF**	**21**	**6,579**	**54**	**51**
*JH4PUS	"	3,774	45	37

District 5

JE5JHZ	**A**	**228,464**	**295**	**218**
JH5MXB	**28**	**11,524**	**71**	**67**
JA5NSR	**3.5**	**140**	**7**	**7**
***JH5HDA**	**A**	**40,664**	**124**	**104**
*JA5OXV	"	8,183	49	49
*JA5ENO	"	8,003	55	53
***JA5CBU**	**21**	**216**	**10**	**9**

District 6

JA6BZI	**A**	**496,112**	**471**	**307**
JA6MWW	"	240,875	361	235
JE6QQN	"	145,119	248	183
JA6FFO	"	42,400	139	106
***JH6QIL**	**A**	**206,492**	**327**	**209**
*JM6CIP	"	31,428	147	97
*JS6UEY	"	26,100	142	100
*JE6TUP	"	10,476	67	54
*JS6UGC	"	9,955	67	55
*JK6JAB	"	1,065	15	15
*JH6TNH	"	1,034	23	22
***JH6WHN**	**28**	**62,050**	**163**	**146**
***JA6WFM**	**21**	**284,022**	**370**	**279**
*JR6YAA	"	53,328	184	132
				(OP: JR6AG)
***JA6GCE**	**14**	**559,104**	**564**	**416**

District 7

JH7QXJ	**A**	**789,120**	**704**	**384**
JH7RTQ	"	595,584	617	376
JG7AMD	"	519,480	494	333
JF7PHE	"	448,911	518	279
JO7KMB	"	112,412	196	157
JR7IWC	"	92,235	207	165
JM7OLW	"	80,398	204	122
JA7GYP	"	45,045	124	105
JA7ACM	"	5,016	47	38
JA7MAD	**21**	**173,428**	**290**	**227**
JA7LLL	**14**	**47,872**	**140**	**128**
***JA7MWC**	**A**	**29,133**	**121**	**83**
*JQ7AXT	"	9,800	61	49
*JR7ANB	"	7,900	55	50
*JA7ZP	"	6,232	51	41
***JO7GVC**	**21**	**4,600**	**44**	**40**
***JN7TAN**	**7**	**7,068**	**39**	**38**

District 8

JA8KSF	**A**	**783,900**	**682**	**402**
JA8IDS	**21**	**70,366**	**174**	**151**
JA8TGD	"	1,650	25	25
JH8DBJ	**14**	**25,806**	**122**	**102**
***JM8FEI**	**A**	**98,685**	**243**	**153**
*JK8PBO	"	37,408	141	112
***JE8KKX**	**21**	**352**	**11**	**11**
***JA8UON**	**7**	**3,016**	**32**	**29**

District 9

JA9CWJ	**A**	**302,974**	**399**	**266**
JA9CCG	"	54,663	155	133
JH9CEN	"	11,600	66	58
***JA9LX**	**A**	**152,684**	**281**	**196**
***JR6QFV/9**	**7**	**8**	**2**	**2**

District Ø

JHØMJY	**A**	**98,690**	**200**	**139**
JHØILL	*21*	*6,834*	*57*	*51*
***JJØPJD**	**A**	**211,560**	**320**	**205**
*JRØDZH	"	57,856	151	113
*JAØBZY	"	16,835	70	65
**JRØBNF*	*"*	*8,874*	*61*	*51*
*JHØMUC/Ø	"	8,154	63	54
*JAØBJY	"	6,110	52	47
*JRØGXA	"	3,380	29	26
*JAØJHQ	"	1,800	31	24
***JHØEPI**	**14**	**51,600**	**157**	**129**
*JHØDUG	"	1,254	28	22
*JIØWVQ	"	3	1	1

Kazakhstan

UP5B	**A**	**105,347**	**198**	**157**
				(OP: UN7ZO)
UN3M	**28**	**478,330**	**546**	**310**
***UP7L**	**A**	**1,560,399**	**1061**	**489**
				(OP: UN6LN)
***UN8PT**	**28**	**77,700**	**207**	**150**
***UN4PG**	**21**	**334,712**	**417**	**301**
***UN7CN**	**14**	**100,713**	**205**	**177**

Lebanon

***OD5ZF**	**7**	**211,548**	**210**	**183**

Mongolia

***JT1DN**	**7**	**7,298**	**43**	**41**

Qatar

A71AE	**28**	**63,801**	**175**	**139**
A71MM	**7**	**226,320**	**226**	**184**

Republic of Korea

HL2WA	**A**	**742,972**	**703**	**356**
HL4CEL	"	2,574	49	33
HL3AMO	**21**	**85,668**	**216**	**177**
HL2KV	"	12,220	74	65
***HL2DCM**	**A**	**103,936**	**260**	**128**
*DS5DNO	"	43,512	117	98
***HL1VAU**	**21**	**85,956**	**203**	**174**
***D9K**	**3.5**	**64**	**8**	**8**
				(OP: HL3AMO)

Saudi Arabia

***HZ1TT**	**A**	**1,512,875**	**912**	**455**
***7Z1OO**	**21**	**8,856**	**58**	**54**
***HZ7C**	**14**	**728,875**	**610**	**425**
				(OP: 7Z1SJ)

Taiwan

BV2LA	**A**	**326,692**	**423**	**268**
BX4AG	**21**	**95,076**	**246**	**171**

Thailand

HS5NMF	A	533,511	663	317
HS3NBR	14	14,820	81	76
*HS7WMU	A	11,634	79	42
*HS8JWH	"	684	21	19
**HS4MLV*	*"*	*522*	*21*	*18*
*E25KAE	21	129,310	272	193
*E2ØXMG	14	40,926	145	114

United Arab Emirates

A65DR	**3.5**	**216,720**	**207**	**180**
				(OP: G7SLP)

Uzbekistan

***UK8LC**	**A**	**6,319**	**83**	**71**
***UK7AL**	**28**	**55,622**	**165**	**137**

Vietnam

***XV9NPS**	**A**	**1,092**	**27**	**26**

West Malaysia

***9M2TDX**	**A**	**54,641**	**172**	**101**
*9W2FHG	"	1,014	17	13
*9W2EYR	"	180	6	5
***9M2MAD**	**7**	**6,510**	**40**	**31**

EUROPE

Austria

OE5TXF	**A**	**687,312**	**496**	**344**
				(OP: G3TXF)
OE3NHW	"	228,932	279	242
***OE2E**	**A**	**1,430,620**	**837**	**466**
				(OP: OE2GEN)
*OE9SEV	"	519,560	491	310
*OE4EIE	"	431,648	431	328
*OE5CYL	"	194,694	292	222
*OE1CIW	"	115,596	206	171
*OE1TKW	"	28,179	121	93
***OE3MCS**	**14**	**3,612**	**43**	**42**
***OE7MOP**	**7**	**198,400**	**249**	**200**

Balearic Islands

EC6DX	**3.5**	**139,896**	**217**	**174**
***EA6ZS**	**A**	**34,299**	**125**	**111**

Belarus

EU4E	**A**	**2,340,296**	**1173**	**632**
EV1R	"	2,323,290	1180	645
EW8DX	"	1,650,285	1108	507
EU8U	"	1,196,616	892	438
EW8OM	"	501,534	535	306
EW1OW	"	289,826	372	263
EU1ST	"	198,008	297	212
EU1DX	**14**	**552,942**	**615**	**417**
EW4A	**3.5**	**519,110**	**453**	**305**
***EW7B**	**A**	**1,422,520**	**941**	**488**
*EU1VA	"	661,430	595	385
*EW6DM	"	655,095	645	367
*EW1NM	"	580,280	615	356
*EU4T	"	281,058	392	278
*EU8RO	"	40,544	139	112
***EW8AX**	**14**	**165,735**	**302**	**261**

Belgium

ON7ET	**A**	**342,172**	**335**	**262**
***ON5GQ**	**A**	**1,561,958**	**997**	**521**
*OO4O	"	1,216,430	808	515
*ON4CT	"	510,260	438	310
*ON6AT	"	251,442	304	229
*ON3UN	"	236,848	368	262
*OT1V	"	59,696	150	112
				(OP: ON8VM)
*ON2AD	"	28,322	110	98
*ON3AR	"	27,795	108	85
*ON8HW	"	4,700	53	50
***OR2A**	**14**	**153,186**	**299**	**242**
				(OP: ON1DX)
*ON4LY	"	8,442	63	63
*ON2VHF	"	7,168	66	64
***ON4CBA**	**7**	**181,984**	**231**	**188**

Bosnia-Herzegovina

E72U	**A**	**69,375**	**139**	**125**
E77CFG	"	7,350	59	49
***E78T**	**A**	**207,393**	**299**	**219**
*E77D	"	186,048	286	204
*E74HJ	"	25,443	103	99
***E74SL**	**7**	**69,688**	**142**	**124**
***E77EA**	**3.5**	**477,128**	**428**	**292**
*E78CB	"	88,416	161	144

Bulgaria

LZ5R	**A**	**12,465,658**	**3370**	**1054**
				(OP: LZ5DB)
LZ6K	"	1,858,272	915	624
				(OP: LZ2PL)
LZ2YO	"	1,353,820	962	508
LZ1ZJ	"	1,237,613	880	481
LZ6DX	"	820,454	742	409
LZ4AE	"	182,427	295	219
LZ2ZG	**21**	**2,480**	**31**	**31**
LZ4A	**14**	**1,013,430**	**849**	**555**
				(OP: LZ1YQ)
LZ6E	"	484,449	620	391
				(OP: LZ1GU)
LZ5K	**7**	**1,364,960**	**749**	**449**
LZ33E	**3.5**	**277,508**	**301**	**238**
				(OP: LZ5XQ)
***LZ3QE**	**A**	**1,122,735**	**891**	**445**
*LZ2ZY	"	639,360	596	384
*LZ1ZM	"	36,855	116	105
*LZ1MC	"	31,416	100	84
*LZ1YR	"	12,159	72	63
*LZ2DF	"	416	15	13
***LZ5ØYE**	**14**	**704,868**	**783**	**453**
				(OP: LZ1YE)
*LZ2JA	"	589,680	707	405
*LZ5GM	"	53,138	181	163
*LZ1G	"	28,044	119	114
				(OP: LZ5RG)

Crete

***SV9FBP**	**A**	**65,728**	**198**	**158**
***SY9DOK**	**21**	**69,915**	**240**	**177**

Croatia

9A5X	**A**	**1,024,088**	**796**	**458**
9A2ZI	"	872,364	568	417
9A4WY	"	87,984	220	156
9A5Y	**21**	**2,191,840**	**1174**	**721**
				(OP: 9A7DX)
9A5D	**14**	**2,011,283**	**1282**	**703**
				(OP: 9A7Z)
***9A7V**	**A**	**685,785**	**551**	**349**
*9A3LET	"	408,778	444	313
*9A1DR	"	171,150	270	210
*9A3AAW	"	12,834	69	62
***9A8A**	**28**	**22,088**	**96**	**88**
***9A6KZH**	**21**	**238,506**	**358**	**254**
*9A1CFR	"	195,409	314	263
				(OP: 9A2NO)
*9A4W	"	72,075	189	155
***9A4R**	**14**	**22,557**	**108**	**103**
***9A9TT**	**3.5**	**130,442**	**206**	**173**

Czech Republic

OK7W	**A**	**9,124,070**	**2660**	**955**
OK1MR	"	2,528,580	1120	629
OL6D	"	2,358,315	1069	647
				(OP: OK1DWQ)
OK1PI	"	183,000	256	200
OK1EP	"	122,000	200	200
OK1DOL	"	81,696	189	138
OK3X	"	24,200	96	88
				(OP: OK1VK)
OK1WCF	"	19,035	89	81
OK1XC	**28**	**16,401**	**84**	**77**
OL4C	**21**	**1,160,916**	**834**	**534**
				(OP: OK1NP)
OK2SWD	**7**	**756**	**14**	**14**
OL7R	**3.5**	**2,679,528**	**1099**	**582**
OL3W	"	546,392	461	308
				(OP: OK5MM)
OK2BXW	"	279,444	335	219
***OK4GP**	**A**	**1,646,204**	**839**	**518**
*OK2LC	"	604,440	579	365
*OK1HEH	"	551,038	537	323
*OK1PMA	"	482,678	488	322
*OK2WY	"	393,372	432	294
*OK1SI	"	295,036	361	257
*OK2PF	"	293,120	380	256
*OK2VIR	"	237,654	311	243
*OK1FIA	"	194,253	285	219
*OK1MGA	"	118,816	269	188
*OK1ULL	"	77,087	211	157
*OK1BJ	"	61,899	173	141
*OK2PGJ	"	56,342	169	143
*OK1DAR	"	44,940	135	107
*OK1XBF	"	37,056	104	96
*OK1CT	"	31,007	114	101
*OK7N	"	24,696	96	84
***OK1AUO**	**21**	**57,378**	**170**	**146**
*OK1MGW	"	37,177	141	113
*OK2DIK	"	18,955	97	85
***OK1DLX**	**14**	**4,444**	**45**	**44**
OK4T	*"	*2,244*	*34*	*33*
				(OP: OK1FIK)
***OK2RU**	**7**	**1,252,710**	**674**	**449**
*OK1FWG	"	19,738	71	71
***OK6T**	**3.5**	**1,434,640**	**777**	**454**
				(OP: OK1WCF)

Denmark

OZ11A	**A**	**1,620,038**	**1063**	**542**
OZ9GA	"	1,302,375	888	453
OZ3ØEU	"	861,464	598	419
OZØJD	"	612,480	640	384
OZ1LFI	"	198,810	327	235
OZ1ADL	**21**	**174,002**	**298**	**241**
***OZ1AOO**	**A**	**163,200**	**259**	**200**
*OZ6AGX	"	103,842	226	162
*OZ4NE	"	101,736	189	162
*OZ1QX	"	96,096	201	154
*OZ7DK	"	36,072	132	108
***OZ1JVX**	**7**	**3,304**	**32**	**28**

Dodecanese

***SV5DKL**	**14**	**82,080**	**224**	**180**

England

GØHDV	**A**	**754,326**	**683**	**366**
M1X	"	727,638	543	346
				(OP: GØCKP)
GX5EA	"	362,558	390	266
				(OP: M1DDD)
M2J	"	286,000	341	250
				(OP: G4NBS)
G2U	"	269,418	347	249
				(OP: GØUGO)
G1SCT	"	45,980	138	110
G4RKO	"	28,726	116	106
MØNPK	"	18,009	80	69
G1N	**7**	**1,384,944**	**749**	**473**
				(OP: GØURR)
MØUNI	"	338,778	324	261
M3A	"	155,978	198	167
				(OP: MØUKR)
***2EØINN**	**A**	**1,040,003**	**850**	**431**
*G9F	"	632,968	590	356
				(OP: G4BVY)
*GØFGI	"	592,950	545	354
*G3XTZ	"	582,470	508	314
*M3AWD	"	473,583	515	339
*G1P	"	424,650	466	298
				(OP: MØIEP)
*GØW	"	391,560	426	260
				(OP: GØVDZ)
*MØTQR	"	225,600	343	240
*MØICL	"	220,900	360	235
*G8S	"	204,392	306	232
				(OP: G4IDF)
*M1VPN	"	190,092	296	219
*G4OZG	"	157,454	275	187
*GØH	"	134,829	279	211
				(OP: GØHEU)
*MØLKW	"	133,320	296	202
*G4DDL	"	117,936	235	182
*G7RTI	"	116,399	224	167
*GØNRL	"	90,560	207	160
G4RQI	*"	*74,654*	*198*	*163*
*GØOOR	"	72,369	156	153
*GØVSS	"	71,168	177	139
*G4TSH	"	63,074	145	122
*G4ENZ	"	46,854	131	114
*MØSAR	"	44,982	119	119
*G8CRB	"	44,363	143	109
*G5ROB	"	39,382	120	97
*M3X	"	38,804	119	109
				(OP: MØIHT)
*MØYWA	"	33,152	137	112
*GØMTN	"	32,864	120	104
*2EØOBO	"	25,235	112	103
*2EØEBM	"	23,120	95	80
*G5C	"	21,658	107	91
				(OP: G4OGB)
*G8GHD	"	20,995	107	95
G3KNU	*"	*20,925*	*106*	*93*
*MØGBP	"	18,540	113	103
*G1VWC	"	11,700	67	60
*MØIPU	"	10,602	67	57
*G4PDF	"	10,309	61	61
*G3RTU	"	9,350	61	55
*G2E	"	2,232	34	31
*MØRYB	"	132	6	6
***GØC**	**28**	**7,750**	**57**	**50**
				(OP: GØCER)
*G4NXG/M	"	663	18	17
***MØBLF**	**21**	**115,245**	**257**	**195**
*2EØCVN	"	51,100	177	146
*G7G	"	21,510	102	90
*G1VDP	"	11,418	76	66
***M5P**	**14**	**266,304**	**421**	**292**
				(OP: M5BIR)
*M4N	"	7,125	63	57
				(OP: G4IZZ)
*MØHWT	"	2,112	48	48
***G8X**	**7**	**2,082,144**	**885**	**552**
				(OP: G4FJK)
*G4N	"	1,065,064	640	418
				(OP: G4ZVB)
*G2W	"	280,840	282	238
				(OP: G4DBW)
*M5W	"	199,980	247	202
*2E1FVS	"	3,150	27	25
				(OP: MØHOM)
***G6N**	**3.5**	**166,130**	**245**	**185**
				(OP: GØGDU)

Estonia

ES4RD	**A**	**890,330**	**732**	**395**
***ES1BH**	**A**	**52,920**	**169**	**140**
***ES2MC**	**14**	**387,919**	**467**	**367**

European Russia District 1

R1FZ	**A**	**1,367,548**	**1095**	**476**
***RA1ALC**	**A**	**623,760**	**659**	**368**
*RX1AG	"	171,820	303	220
*RN1AO	"	152,856	307	198
*R1AV	"	126,027	285	209
*R9MA/1	"	4,185	46	45
*R1LN	"	1,224	18	18
*RD1T	"	1,078	22	22
***UA1COA**	**14**	**103,873**	**247**	**209**

District 3

R2AA	**A**	**7,001,316**	**2989**	**882**
RM3DA	"	2,064,440	1307	584
RX3ASQ	"	1,651,380	1224	510
RC5Z	"	1,363,713	1063	479
RT2H	"	623,328	606	344
R5DT	"	393,442	459	314
UD3T	"	242,088	431	264
RA3TT	"	166,208	299	224
RU3OZ	"	133,772	263	212
RA3NC	"	75,640	189	155
RV3TG	"	62,100	165	138
RQ3M	"	54,812	151	142
R3LC	**21**	**161,590**	**316**	**226**
R3TE	**14**	**347,282**	**508**	**361**
UA3MCH	*"	*8,400*	*72*	*70*
RG2A	**7**	**175,084**	**219**	**182**
RG2Y	**3.5**	**109,968**	**187**	**158**
***R3AQ**	**A**	**559,874**	**514**	**406**
*R5ACQ	"	421,440	508	320
*RX3Z	"	317,124	419	276
*RZ3AV	"	303,869	438	277
*R2XM	"	298,984	435	266
*RY3PAE	"	281,340	408	270
*R3VL	"	276,149	413	271
*RX3VF	"	257,040	388	252
*RU5X	"	232,023	341	237
*R2UZ	"	216,372	340	247
*UC5D	"	178,688	327	256
*R3DCB	"	169,947	308	207
*RW2WR	"	161,112	296	196
*UA3YFL	"	148,400	278	200
*RC2MT	"	111,492	207	163
*UB5MBA	"	107,744	250	182
*R2YES	"	91,349	196	167
*RA3V	"	80,181	196	151
*RK2M	"	76,650	198	150
*UI3A	"	73,606	173	149
*RW3WX	"	59,502	172	141
*RA3FD	"	51,852	130	116
*UA3MKI	"	35,836	129	124
*R3GZ	"	34,164	124	117
*R3OR	"	33,060	107	95
*RX3MM	"	21,648	105	88
*RK3DSW	"	19,422	96	83
*R2DEM	"	14,418	97	81
R2ATC	*"	*12,084*	*63*	*57*
*RA3RLJ	"	6,670	62	58
*UB3SAR	"	1,682	33	29
*RX3AFE	"	1,400	25	25
*UB3APP	"	1,232	24	22
***R2AL**	**21**	**365,085**	**549**	**315**
*RK2U	"	64,962	211	162
*RD5R	"	63,623	185	149
*RA3QH	"	33,630	142	114
*UA3PI	"	25,152	117	96
*R3YBS	"	18,128	107	88
***RZ3Z**	**14**	**16,289**	**96**	**91**
*RJ3F	"	3,120	40	40
***RA3Y**	**7**	**682,344**	**527**	**351**
*R5DF	"	352	8	8

District 4

RA4PQ	**A**	**887,065**	**617**	**485**
R4CI	"	87,423	228	161
RA4ZA	"	73,432	168	137
R4RB	"	67,971	215	163
UA4CC	**21**	**82,296**	**225**	**162**
***RG4A**	**A**	**1,439,478**	**1092**	**513**
*RW4W	"	1,146,642	867	483
*RU4PH	"	236,439	379	243
*RA4CL	"	219,736	371	242
*UA4FX	"	182,952	348	252
*UC4I	"	177,240	291	210
*RT4W	"	136,250	294	218
*R4WT	"	127,490	296	209
*RU4LM	"	91,620	242	180
*RN4CA	"	82,250	219	175
*RA4L	"	78,064	211	164
*RA4UDC	"	43,940	153	130
*R4AJ	"	10,787	72	67
*R4WZ	"	4,182	45	41
***RU4SO**	**21**	**64,370**	**208**	**157**

District 6

UA6CE	**A**	**1,876,997**	**1054**	**673**
R7CD	"	1,536,665	1103	503
UA6AA	"	742,278	726	386
RC7LS	"	42,718	119	106
RU6YJ	**21**	**162,554**	**355**	**238**
UC6N	**14**	**397,705**	**537**	**385**
***R7MM**	**A**	**1,418,844**	**984**	**532**
*RY6AAG	"	293,754	506	283
*RQ7R	"	229,432	365	238
*R6KX	"	188,256	289	212
*RT6N	"	168,642	332	243
*RK6ART	"	75,950	178	155
*RT6DI	"	63,705	179	137
***RU7A**	**28**	**101,460**	**254**	**178**
***RO7C**	**21**	**272,246**	**471**	**283**
				(OP: R6CC)
*R7CT	"	25,376	127	104
*R6KEE	"	23,625	114	105
***RA6LIS**	**14**	**273,126**	**472**	**294**
*UA6ARR	"	36,031	143	137
*R7MT	"	25,546	118	106
***R7LY**	**7**	**74,782**	**158**	**139**
***R7RBE**	**3.5**	**236,848**	**296**	**226**

District 9

***R9FE**	**A**	**640,215**	**713**	**369**

*UA9XL	"	106,266	242	199
*R9FCY	"	70,560	190	147
		European Turkey		
***TA1SOR**	**A**	**277,718**	**367**	**239**
		Fed. Rep. of Germany		
DP8M	**A**	**3,345,590**	**1394**	**730**
				(OP: DL6NDW)
DM7XX	"	3,208,205	1331	715
DK8ZZ	"	3,174,138	1313	759
DF8XC	"	2,485,148	1224	662
DL1NEO	"	2,392,407	1055	723
DFØKU	"	2,035,764	1078	586
				(OP: DJ3NG)
DL4VDA	"	1,985,404	1103	548
DK2OY	"	1,872,563	1063	581
DC6O	"	1,866,600	956	610
				(OP: DL3DW)
DH8BQA	"	1,724,408	933	581
DAØBCC	"	1,720,020	1017	526
				(OP: DL6MHW)
DR5W	"	1,471,355	885	515
				(OP: DL1RTL)
DL9GTB	"	1,454,002	762	638
DQØY	"	1,328,860	861	494
				(OP: DF2RG)
DF8QB	"	1,314,402	863	474
DL6ZBN	"	1,296,840	741	505
DJ9RR	"	1,232,789	739	571
DQ1P	"	1,148,284	736	521
				(OP: DK1IP)
DJ8EW	"	1,023,327	686	453
DJ5IW	"	1,012,512	688	424
DK2LO	"	994,926	723	474
DH1TST	"	960,057	654	441
DK6WL	"	929,989	618	421
DL4ME	"	883,652	683	418
DL7URH	"	882,740	569	437
DK4VW	"	859,872	697	416
DL5YM	"	859,536	721	423
DL1PSK	"	844,525	663	415
DL7VOG	"	795,025	671	385
DH6BH	"	759,278	614	377
DQ9Y	"	667,408	542	404
				(OP: DF2SD)
DK3RA	"	640,662	576	374
DK8EY	"	571,504	572	368
DJ9MH	"	521,500	497	350
DG5E	"	511,550	365	325
				(OP: DK2CX)
DK1FW	"	507,236	493	346
DL5AXX	"	506,632	507	332
DL1SWB	"	497,493	488	331
DF4XX	"	488,592	479	348
DK6CQ	"	481,452	450	318
DHØGHU	"	480,940	461	346
DL1EKO	"	478,668	484	339
DJ5MW	"	478,108	498	356
DL5BCF	"	467,100	518	346
DL8RDL	"	417,920	424	320
DF5BX	"	380,380	437	286
DL4PT	"	374,586	446	298
DL4AMK	"	360,525	414	285
DK5PH	"	359,682	424	302
DL6DJ	"	285,768	354	252
DL1STG	"	274,050	345	261
DF4ØBGK	"	256,434	317	237
				(OP: DL1DAW)
DL5NDX	"	242,847	305	223
DJ2IA	"	231,280	336	245
DL9UP	"	218,736	323	248
DL9NCR	"	218,295	296	231
DK2AT	"	207,200	320	224
DL2RMC	"	194,701	285	221
DK3GI	"	192,213	292	243
DL5ST	"	178,752	275	228
DM2BPG	"	176,190	293	210
DL1ASA	"	161,568	250	198
DJ9KM	"	161,454	268	213
DJ5AN	"	157,210	249	199
DK1AX	"	153,786	268	213
DF8V	"	144,970	256	190
				(OP: DF8VO)
DL8MKG	"	127,512	227	184
DJ9HX	"	119,140	218	185
DL7JOM	"	117,648	221	171
DG7CF	"	109,648	225	154
DF2LH	"	95,496	208	173
DK6IM	"	72,628	193	134
DL4ABR	"	62,064	160	144
DL1LOD	"	61,770	166	142
DLØVBG	"	59,265	150	135
				(OP: DF5AN)
DP7R	"	56,500	162	125
				(OP: DL1DJH)
DL8DWL	"	51,088	140	124
DK2CC	"	40,228	130	113
DL4YAO	"	37,944	113	93
DF8JK	"	26,677	118	103
DL7CX	"	25,317	99	87
DL1DBR	"	25,230	104	87
DK3AX	"	21,716	107	89
DC2VE	"	21,567	104	91
DQ6Q	"	19,530	100	90
DL6NAV	"	17,520	88	80
DF6QE	"	10,320	70	60
DF6RI	"	8,162	57	53
DL9NDV	"	3,395	38	35
DL2AMD	"	60	6	5
DH8AF	**28**	**98,324**	**216**	**188**
DL3BQA	**21**	**808,535**	**692**	**455**
DL1DTL	"	178,782	314	249
DP7D	"	1,403	24	23
DA3X	**14**	**896,880**	**729**	**505**
				(OP: DL5JS)
DG7NFX	"	14,560	84	80
DP4M	**7**	**3,526,430**	**1179**	**695**
				(OP: DJ4MH)
DRØY	"	47,952	117	108
				(OP: DJ6JH)
DJ8VH	"	33,616	99	88
DK1WU	"	33,432	99	84
DL3SWR	**3.5**	**1,136,640**	**742**	**444**
DH8WR	"	650,160	550	344
DM5TI	"	211,990	294	215
DL6DH	"	69,420	144	130
***DD5M**	**A**	**1,428,781**	**835**	**541**
				(OP: DJØZY)
*DK1KC	"	1,326,450	843	478
*DO4OD	"	1,048,452	731	492
*DL5RMH	"	1,035,568	697	472
*DL8TG	"	989,638	717	442
*DK8NT	"	967,430	727	445
*DM3M	"	913,230	715	417
				(OP: DM3XRF)
*DM7W	"	908,048	674	464
				(OP: DL8MAS)
*DR7T	"	851,445	589	477
				(OP: DF1DN)
*DA3T	"	726,624	574	432
				(OP: DL8DXL)
*DK5DQ	"	644,280	516	364
*DB2KT	"	631,674	566	342
*DL3MXX	"	572,760	507	387
*DL4ZA	"	555,660	552	343
*DG2BWG	"	530,348	540	329
*DJ4WT	"	490,646	492	334
*DHØHAN	"	456,536	504	298
*DL6RDR	"	455,832	479	312
*DL3RAR	"	439,593	384	363
*DK9IP	"	372,048	378	276
*DL3DRN	"	354,000	441	295
*DL1ZBO	"	347,913	405	261
*DL75HIL	"	328,335	374	265
				(OP: DL1EAL)
*DO1SSB	"	310,024	382	271
*DJ5FS	"	308,990	414	265
*DF2F	"	307,530	382	255
				(OP: DF2SD)
*DD7UW	"	305,810	401	265
*DHØGDS	"	304,028	396	263
*DL2DIE	"	301,000	389	280
*DF4ZL	"	290,408	360	248
*DL6SFR	"	286,465	352	235
*DK7TY	"	273,628	364	268
*DL3FCG	"	270,976	326	232
*DL9PN	"	251,505	341	243
*DL7ULM	"	244,260	344	230
*DF6WE	"	240,840	380	270
*DNØUKW	"	232,405	342	265
				(OP: DO9PL)
*DL5ARM	"	214,969	309	227
*DJ2AX	"	205,160	313	230
*DL1EHG	"	204,497	321	229
*DL1EMA	"	199,817	298	211
*DJ4WM	"	193,104	306	216
*DM5JBN	"	188,600	329	230
*DK9FEC	"	185,094	298	226
*DL2HYH	"	179,100	245	225
*DL1GME	"	167,741	284	217
*DO3PKE	"	150,903	249	207
*DG1VL	"	145,266	258	213
*DK7MCX	"	140,118	247	193
*DL7UKT	"	133,650	271	198
*DK7GH	"	130,494	218	182
*DF6QV	"	129,038	229	182
*DGØAM	"	125,760	234	192
*DL2IAN	"	117,208	261	184
*DL6EZ	"	115,362	249	174
*DG3BZ	"	109,375	237	175
*DF1DX	"	106,134	187	147
*DL8ARJ	"	104,319	215	173
*DL2RUG	"	103,831	201	163
*DP5P	"	99,528	185	143
				(OP: DL1MHJ)
*DL4FAP	"	96,624	214	183
*DL1HSI	"	92,895	216	165
*DC8SG	"	90,275	196	157
*DK6OR	"	89,604	214	171
*DK4EF	"	77,345	183	155
*DF7IH	"	75,543	183	149
*DH2DAM	"	73,947	191	157
*DL3LJ	"	66,859	154	139
*DR1E	"	65,688	162	136
				(OP: DB1WA)
*DL7ØWOB	"	65,016	149	126
				(OP: DM6EE)
*DL8ZU	"	63,228	153	132
*DL3SYA	"	62,400	166	130
*DF7OA	"	59,998	166	131
*DF3EH	"	59,850	184	150
*DL5AWI	"	57,816	158	132
*DO2SBS	"	56,855	163	137
*DL1GWS	"	52,533	158	117
*DK4IO	"	50,826	148	129
*DJ3GE	"	50,370	149	115
*DJ6TK	"	49,343	148	133
*DL9ZWG	"	47,702	147	122
*DF3TZ	"	46,172	146	119
*DL6RBH	"	46,107	131	109
*DK1LRS	"	45,430	140	118
*DL5ANS	"	44,965	134	115
*DL2NBU	"	44,400	111	111
*DM7RO	"	43,439	142	121
*DJ6MK	"	42,837	134	109
*DL3DUE	"	42,012	132	108
*DG4AM	"	38,709	120	99
*DL75DRG	"	37,236	119	107
				(OP: DL4EAX)
*DJ4MX	"	36,960	107	96
*DM2DLG	"	36,685	138	115
*DK2VM	"	36,084	110	97
*DL2FK	"	36,036	133	117
*DL1AOB	"	35,904	112	96
*DK2NVA	"	35,424	124	108
*DF3IS	"	35,256	122	113
*DG3FAW	"	34,594	120	98
*DL1EJD	"	33,100	118	100
*DK3WW	"	32,190	123	111
*DO5MCL	"	30,345	114	105
*DL8ZAJ	"	30,048	109	96
*DK3PM	"	29,355	103	103
*DL4KW	"	28,482	100	94
*DJ1MM	"	28,424	98	88
*DL2FQ	"	28,025	119	95
*DG3FA	"	27,544	112	88
*DF1LX	"	26,144	97	86
*DH1MJ	"	21,924	93	84
*DL2GMK	"	19,402	99	89
*DL3AS	"	17,860	86	76
*DL7YS	"	17,625	80	75
*DL2LBK	"	17,328	82	76
*DL8MRE	"	16,717	89	73
*DL9FBF	"	14,427	74	63
*DF2RT	"	12,975	84	75
*DL1JPF	"	11,224	68	61
*DK5WN	"	11,144	61	56
*DL7VDX	"	9,983	77	67
*DB8AH	"	8,874	66	58
*DL5MHX	"	8,721	60	57
*DL7ALM	"	8,140	60	55
*DM6WAN	"	7,905	52	51
*DF7XH	"	6,900	51	46
*DB1KK	"	6,345	48	47
*DK9BM	"	6,204	52	47
*DL3IAS	"	5,980	48	46
*DK9ZE	"	5,264	49	47
*DJ2MX	"	5,004	39	36
*DLØIFM	"	4,736	41	37
				(OP: DF9VN)
*DL5HN	"	4,032	45	42
*DF6YC	"	3,895	44	41
*DO7ES	"	3,404	38	37
*DL6NEJ	"	2,546	39	38
*DL9FB	"	2,052	28	27
*DM3PKK	"	1,920	31	30
*DK4QT	"	1,560	26	26
*DG2BPW	"	1,242	25	23
*DG1YKW	"	1,000	21	20
*DM2RN	"	560	17	16
*DHØJAE	"	527	17	17
*DL2LMS	"	440	11	11
*DP4X	"	105	6	5
				(OP: DJ2MX)
***DR6K**	**21**	**70,785**	**190**	**165**
				(OP: DF6RK)
*DJ9KH	"	24,341	110	101
*DO1BEN	"	16,686	95	81
*DK7ZT	"	11,736	72	72
*DJ6OI	"	8,874	60	58
*DL1RPR	"	6,765	58	55
*DJ6XB	"	4,816	43	43
*DL2AK	"	1,296	26	24
***DJ7UC**	**14**	**151,866**	**304**	**234**
*DL4HCF	"	61,884	188	162
*DL1AKL	"	41,656	159	127
*DB5ØAFZ	"	41,616	157	136
				(OP: DL3CQ)
*DL1STV	"	2,997	40	37
*DG9AK	"	2,622	42	38
*DG3DJ	"	72	6	6
***DB7QJ**	**7**	**224,082**	**297**	**211**
*DK2AJ	"	203,850	243	225
*DF9VN	"	45,100	113	110
*DL2KWA	"	11,536	65	56
*DJ3IV	"	5,120	42	40
*DL5NAM	"	1,312	16	16
***DF1MM**	**3.5**	**516,800**	**449**	**323**
*DO6BE	"	104,006	198	161
*DF1LON	"	45,770	115	115
*DL1HUH	"	17,952	71	68
*DMØE	"	14,112	66	63
				(OP: DG1HXJ)
*DK7FU	"	11,716	59	58
*DM7CW	"	11,252	58	58
		Finland		
OH1F	**A**	**4,221,712**	**1797**	**748**
				(OP: OH1TM)
OH3FM	"	2,360,950	1424	575
OG4W	"	1,869,030	1091	570
				(OP: OH4KZM)
OG2P	"	951,762	743	434
OH3EX	"	536,284	457	358
OH7KBF	"	192,058	302	218
OH6BA	"	165,444	282	204
OH3GLY	"	111,066	227	173
OH2BBT	"	22,659	104	91
OH2XX	"	11,136	65	58
OG7A	"	8,262	57	54
				(OP: OH6MW)
OH1XX	*"*	*385*	*11*	*11*
***OH7L**	**A**	**1,050,105**	**740**	**511**
				(OP: OH8TV)

*OG95AA	"	690,506	628	391
			(OP: OH8KVY)	
*OH1NOA	"	464,100	492	325
*OH2LZI	"	331,476	451	276
*OH2LU	"	242,840	350	260
*OH9GIT	"	68,800	191	160
*OH1XY	"	1,536	27	24
*OH5UQ	"	136	8	8
***OH1FFN**	**21**	**7,752**	**65**	**57**
***OH2HOD**	**14**	**162,306**	**309**	**254**
***OH6JUM**	**3.5**	**3,588**	**40**	**39**
		France		
F4AIF	**A**	**1,657,656**	**976**	**552**
F5OAM	"	898,573	707	409
F6EQZ	"	733,956	628	372
F1AGR	"	700,878	557	398
F5BMI	"	360,108	400	252
F5GFA	"	350,512	468	304
F4FDR	"	197,960	324	245
F4HRM	"	158,670	288	215
F8ARK	"	102,185	219	191
F6FLU	"	75,330	160	155
F5NBX	**28**	**32,118**	**131**	**106**
F4VSD	**21**	**17,425**	**100**	**85**
F4GPB	**7**	**204,960**	**243**	**210**
F4BPJ	"	10,092	66	58
***TM3Z**	**A**	**7,375,214**	**2069**	**913**
				(OP: F4DSK)
*TM7Y	"	2,684,982	1183	677
*F4ERS	"	1,930,065	1038	577
*F4CVO	"	449,208	442	306
*F5RD	"	436,800	468	300
*F4DXX	"	347,616	419	284
*F6GCI	"	300,573	385	273
*F5GKW	"	296,584	379	262
*F6BQG	"	262,836	336	252
*F1IWH	"	250,182	336	246
*TM77SM	"	233,280	310	243
				(OP: F4GYM)
*F4GWY	"	202,560	292	211
*F5IRP	"	137,145	248	205
*F4CZV	"	136,112	251	181
*F8CPA	"	122,668	242	182
*F5PPN	"	114,573	229	181
*F5PVK	"	100,392	204	141
*F4GDI	"	98,808	204	184
*F8AOF	"	45,261	127	107
*F6AUS	"	24,288	101	96
*F5MMB	"	20,910	96	85
*F4BHK	"	14,528	68	64
*F4IQX	"	11,700	83	75
*F1MKC	"	9,150	50	50
*F8FUA	"	7,379	51	47
*F1VEV	"	2,214	27	27
*F4IRV	"	870	16	15
*F5JJA	"	240	12	12
***F6IRG**	**28**	**12,210**	**72**	**66**
***F5TYY**	**21**	**1,344**	**25**	**24**
***F1IKA**	**7**	**85,680**	**159**	**140**
*F6APU	"	13,440	59	56
		Greece		
SV1RK	**A**	**496,620**	**535**	**356**
SV1ABB	"	349,720	437	280
SV1ELI	"	327,500	447	262
SV1JG	**21**	**479,493**	**560**	**387**
SV2ESW	"	304,308	436	321
SV3EXU	"	19,140	103	87
SV3FUP	**14**	**347,800**	**521**	**376**
***SV8DCY**	**A**	**740,411**	**738**	**361**
*SV7QNV	"	271,679	375	263
*SV6EBQ	"	271,469	352	253
*SV2HUD	"	205,005	352	237
*SV1AJO	"	127,652	253	194
*SV1DOO	"	93,000	213	150
*SV7CUD	"	89,076	194	156
*SV8IIR	"	86,184	202	162
*SV1JFL	"	51,480	177	143
*SV4RNT	"	162	9	9
***SV1BJW**	**21**	**288,304**	**452**	**296**
*SV3SKM	"	265,880	436	289
***SV3/SV1BDO**	**14**	**37,211**	**145**	**127**
***SV1CDN**	**7**	**21,888**	**81**	**76**
		Guernsey		
***GUØSUP**	**A**	**602,316**	**495**	**396**
		Hungary		
HA5UX	**A**	**953,955**	**710**	**435**
HA8BE	"	34,384	124	112
HA8FK	**28**	**103,788**	**216**	**186**
HG3DX	**21**	**1,530,664**	**975**	**584**
				(OP: HA1DAE)
HG5D	**14**	**1,220,751**	**928**	**567**
				(OP: HA8QZ)
HA1AD	"	338,062	462	326
HA1TJ	**3.5**	**2,224,690**	**965**	**545**
***HA3OU**	**A**	**323,901**	**374**	**261**
*HA3HK	"	321,030	373	270
*HA5PT	"	37,856	127	112
*HA3MGA	"	32,522	116	101
*HA1NR	"	19,313	98	89
***HAØMS**	**14**	**182,651**	**330**	**269**
***HA1TIB**	**7**	**252,382**	**292**	**221**
*HA1WD	"	33,294	96	93
***HA8WY**	**3.5**	**610,364**	**452**	**331**
		Iceland		
TF1AM	**A**	**2,097,196**	**1449**	**548**
TF2CT	"	205,640	296	265
TF8KY	"	85,920	226	160
TF3AO	**14**	**259,028**	**408**	**308**
***TF2MSN**	**A**	**170,628**	**285**	**236**
*TF3VE	"	12,960	98	81
***TF3PPN**	**14**	**11,856**	**77**	**76**
		Ireland		
EI6JK	**A**	**347,204**	**409**	**286**
EI6HB	"	23,600	123	100
***EI8KW**	**A**	**148,782**	**274**	**181**
*EI2INB	"	42,240	126	110
***EI3CTB**	**28**	**735**	**18**	**15**
		Isle of Man		
MD7C	**A**	**3,557,175**	**1777**	**645**
				(OP: M5RIC)
		Italy		
I5MXX	**A**	**3,697,155**	**1443**	**679**
IC8SQS	"	2,372,860	1338	595
IX1CLD	"	1,929,368	1051	524
IZ2FOS	"	1,424,800	909	520
IZ2BVC	"	1,164,834	865	407
I1JTQ	"	980,460	718	419
IZ3XEF	"	659,892	571	381
IK5FKF	"	626,850	585	398
IK2SND	"	607,824	585	378
I2DJX	"	597,094	544	361
I8JIT	"	505,160	515	365
IZ4FUE	"	463,536	484	333
I1NVU	"	407,721	427	311
IV3WMS	"	393,300	448	300
IZ2ZQP	"	347,700	397	285
IK3SCB	"	326,270	399	295
IV3DXW	"	284,280	295	276
I2WIJ	"	247,203	312	227
I3FIY	"	179,776	288	212
IU1JCZ	"	174,324	276	199
IKØYUT	"	158,916	296	204
IW2NOO	"	148,010	252	205
IZ4UFB	"	109,890	246	185
IZ1PLH	"	97,524	212	172
IU1HHH	"	88,858	189	154
IWØHLZ	"	86,944	227	176
IZØIRH	"	82,144	173	151
IK2AHB	"	79,048	189	164
IK2XYI	"	75,048	200	159
IK4HPS	"	69,438	193	163
IK8SVQ	"	69,300	184	154
IC8FJX	"	68,400	216	171
IK2LFF	"	67,210	157	130
IK2XRW	"	66,232	188	136
IZ2ODM	"	63,315	184	135
IV3ARJ	"	62,560	165	136
IN3BFW	"	53,336	147	118
IW4ECF	"	43,260	117	103
IK1DFH	*"*	*42,784*	*124*	*112*
I7CSB	"	31,296	111	96
IK2IKW	"	29,500	109	100
IW3SSD	"	15,750	77	63
IZ8DVD	"	15,169	81	77
IV3IPA	"	7,943	50	47
IW8BZE	"	6,076	65	62
IV3VFR	"	4,653	40	33
IK2QIN	"	3,003	37	33
IZ8GBT	"	1,334	23	23
IW3QRM	**28**	**12,261**	**76**	**67**
IK3ASM	"	1,281	22	21
IZ4ZZB	**21**	**621,673**	**608**	**377**
IK4ZHH	"	176,484	296	231
IU4CSS	"	31,790	128	110
IQ1RY	**14**	**2,916,377**	**1442**	**851**
				(OP: IZ1LBG)
IZ1PKV	"	823,770	741	486
IU3PMA	"	688,648	705	472
IZ8GUQ	"	254,408	382	308
IV3ZNK	"	21,432	104	94
IC8POF	"	21,203	100	91
IZ4DZD	"	7,581	59	57
IZ4NIC	**7**	**2,454,220**	**934**	**554**
I5WNN	"	867,360	609	390
IZ7XUQ	"	207,834	236	201
IKØLNN	"	66,924	127	117
I1WXY	**3.5**	**510,848**	**456**	**307**
IZ3SQW	"	260,380	293	235
IZ2GNQ	"	166,870	239	185
IKØXBX	"	121,072	203	161
I4AVG	"	7,650	46	45
***IQ6AN**	**A**	**6,121,180**	**1969**	**845**
				(OP: IK6VXO)
*IZ4BOY	"	4,905,648	1654	792
				(OP: IT9RGY)
*IK2BUF	"	1,203,600	841	472
*IW1CBG	"	775,786	628	394
*IW1RLC	"	706,192	605	368
*IU4JJP	"	558,971	511	329
*IZ4OSH	"	558,444	496	346
*IKØGDG	"	522,600	519	312
*IK2FTB	"	510,860	521	356
*IV3BCA	"	485,085	473	365
*IK2SAR	"	380,255	426	295
*IK4QJF	"	373,200	431	300
*I2NKR	"	356,440	469	280
*IZ6BXQ	"	354,575	479	325
*IU4HMY	"	353,976	415	294
*I2XLF	"	334,521	412	279
*IN3OWY	"	317,817	400	237
*IV3XNF	"	302,187	365	263
*IK8HVO	"	300,160	395	268
*IK7DXP	"	292,125	419	285
*IK7RVY	"	253,328	388	284
*IWØGYC	"	249,335	321	235
*IU8MOA	"	235,776	370	256
*IK6CLX	"	230,607	317	243
*IØGIA	"	220,340	311	230
*IK8IOO	"	202,878	314	221
*IW6PWC	"	199,656	314	236
*I2BZN	"	176,157	286	207
*IW5EIJ	"	171,039	292	213
*IZ8CLM	"	169,420	253	197
*IU3FBL	"	167,420	269	220
*IZ8EPX	"	157,456	274	208
*IW2FUT	"	155,420	262	190
*IZ7NMD	"	152,308	279	202
*IK5BSC	"	151,140	286	229
*IU2JWF	"	149,051	247	199
*IZ8FPK	"	142,450	242	185
*IK2OVT	"	138,400	254	200
*IK3MLF	"	126,144	222	192
*IK6OIN	"	120,581	229	173
*IK6BSN	"	112,200	224	165
*IK3BVD	"	100,277	179	149
*IK4XQT/4	"	93,399	216	163
*IK2EBP	"	88,452	190	162
*IW2NKY	"	86,372	206	151
*IK2AUK	"	81,885	208	159
*IKØALT	"	74,690	175	154
*I2LLO	"	71,686	167	146
*IK2YSJ	"	68,036	182	146
*IKØPEA	"	63,840	151	133
*IU1LAR	"	63,797	174	131
*IZ3XNJ	"	61,662	159	129
*IK8TEM	"	57,868	180	148
*I5OYY	"	57,400	160	140
*IK8ARF	"	57,086	178	146
*IK2MXM	"	53,730	159	135
*IZ5HQB	"	52,959	169	139
*IZØGMS	"	49,714	148	134
*IK2SGF	"	44,896	157	122
*IK5JRZ	"	36,966	160	122
*I2XYI	"	35,722	127	106
*IW5AOT	"	31,414	122	113
*IWØAEN	"	26,070	104	79
*IK2REA	"	25,839	98	87
*IZ1KHS	"	25,696	100	88
*IK1TTD	"	25,632	106	96
*IW1CHX	"	24,564	113	92
*IZ1NGZ	"	24,479	105	91
*IK4IDP	"	24,024	99	91
*IK4MTF	"	18,564	95	84
*IKØNOJ	"	15,247	87	79
*IU2GGD	"	12,859	85	77
*IV3IQY	"	11,556	68	54
*IN3FHE	"	10,773	63	63
*IK2TDM	"	10,034	65	58
*IØ/S58Y	"	7,536	50	48
*IZ3ZOO	"	4,968	39	36
*I3WBD	"	4,455	46	45
*IZØYIQ	"	3,333	40	33
*IU4BIP	"	2,436	33	29
*IK4UOA	"	2,225	25	25
*IK2WXQ	"	2,208	35	32
*I2ORX	"	2,070	30	30
*IW2JRV	"	1,200	21	20
*IZ2ABZ	"	874	19	19
*IZ2BHQ	"	189	9	9
*IU2LVV	"	2	1	1
***I4JEE**	**28**	**7,344**	**56**	**51**
*IK2LOL	"	3,162	36	34
***IQ8XS**	**21**	**438,948**	**494**	**356**
				(OP: IZ8GNR)
*IZ7UMS	"	120,716	254	206
*IZ8BGY	"	47,838	171	134
*IZ5OQX	"	13,505	79	73
*IK2UEX	"	7,535	70	55
***IK5AMB**	**14**	**696,532**	**676**	**452**
*IZ8EFD	"	237,349	398	287
*IQ5OX	"	6,496	62	56
*IU3PGL	"	3,358	46	46
*IK7LVE	"	2,166	41	38
***II2V**	**7**	**1,176,480**	**671**	**456**
				(OP: IW2MXY)
*I3PXN	"	1,068,450	640	419
*IW1PNJ	"	975,000	614	390
*IKØREP	"	804,180	513	390
*IK4ZIF	"	710,988	515	358
*IU3OAR	"	235,752	278	228
*IW3RCK	"	170,912	238	196
*IK2WZV	"	79,786	150	139
*IZ1JJF	"	65,772	138	126
*IK7NXU	"	9,646	58	53
*IU4OMO	"	4,032	33	32
*IU7IWT	"	2,028	26	26
*I4IKW	"	1,800	19	18
*IU5BON	"	392	14	14
***IK4RVG**	**3.5**	**593,120**	**491**	**337**
*IKØTUM	"	183,876	252	199
		Kaliningrad		
RN2FQ	**A**	**35,464**	**130**	**104**
		Latvia		
YL9T	**A**	**497,835**	**551**	**333**
YL5T	"	161,880	295	228
				(OP: YL3DQ)
YL2CI	**14**	**1,282,484**	**1035**	**562**
YL3CU	**7**	**3,402**	**29**	**27**
***YL2NK**	**A**	**229,595**	**337**	**235**
*YL3IR	"	216	8	8
***YL2QV**	**21**	**104,880**	**264**	**184**
*YL2LW	"	3,496	42	38
		Lithuania		
LY3CY	**A**	**161,146**	**270**	**197**
LY2FN	**21**	**788,562**	**702**	**459**
LY1R	"	406,468	498	331
LY2NY	**14**	**1,209,030**	**950**	**573**
LY1FW	**7**	**2,516,692**	**983**	**593**

LY2MM	**3.5**	**232,140**	**271**	**219**
***LY2TS**	**A**	**738,606**	**618**	**361**
*LY7W	"	493,108	486	308
			(OP: LY2NZ)	
*LY2BUU	"	448,527	520	307
*LY2SA	"	213,904	309	232
*LY4BF	"	45,656	121	104
			(OP: LY2BBF)	
*LY5T	"	19,370	74	65
***LY2W**	**28**	**455**	**14**	**13**
			(OP: LY1FW)	
***LY2PAD**	**21**	**35,400**	**141**	**118**
***LY5W**	**14**	**800,100**	**698**	**508**
***LY7Z**	**7**	**38,092**	**94**	**89**
		Luxembourg		
LX1ER	**A**	**1,313,671**	**843**	**467**
LX8RTTY	"	485,414	475	326
			(OP: LX1DA)	
LX7I	**14**	**2,119,975**	**1226**	**715**
			(OP: DF7EE)	
LX1HD	**7**	**749,064**	**541**	**354**
***LX5IGRY**	**A**	**173,314**	**248**	**193**
			(OP: LX1ER)	
		Moldova		
ER5LL	**A**	**183,642**	**333**	**241**
		Netherlands		
PD9X	**A**	**797,134**	**673**	**403**
PAØCT	"	558,144	539	342
PA4G	"	379,350	420	281
PA2A	"	286,122	351	258
PAØMBD	"	174,708	291	211
PC4H	"	145,530	247	198
PG3N	"	86,736	195	156
PA3GCU	"	31,924	109	92
PA6AA	"	29,601	102	99
			(OP: PB7Z)	
PA5KT	"	7,440	52	48
PA4B	**21**	**24,288**	**108**	**92**
PB7Z	**14**	**26,606**	**114**	**106**
PA6O	"	17,716	100	86
			(OP: PA1CW)	
***PI4CG**	**A**	**1,395,632**	**962**	**476**
			(OP: PD2PKM)	
*PG7M	"	1,111,038	693	498
*PA2TA	"	448,791	494	301
*PDØMHZ	"	390,852	424	282
*PA3BXR	"	389,983	451	293
*PA3DUU	"	335,795	394	281
*PAØCMF	"	244,902	343	238
*PE1FTV	"	215,712	303	224
*PAØALG	"	192,348	348	234
*PA3JB	"	184,756	316	221
*PD3EM	"	170,144	297	208
*PA3EWG	"	160,128	249	192
*PA3BUD	"	124,916	239	187
*PA2JJB	"	120,960	250	192
*PA4DN	"	119,784	205	168
*PDØJMH	"	119,393	219	179
*PA2LP	"	110,048	247	181
*PDØWVB	"	105,760	193	160
*PA7KY	"	99,372	202	169
*PG5V	"	65,880	145	122
*PE1LZZ	"	62,729	167	149
*PAØPIW	"	58,800	142	120
*PD1RP	"	57,534	153	129
*PA3DBS	"	50,927	149	127
*PA6ANT	"	49,896	154	126
*PAØGJV	"	46,020	155	130
*PE1LDS	"	45,200	138	113
*PA3DVA	"	40,068	134	106
*PE4KH	"	27,348	103	86
*PD5MF	"	23,859	111	99
*PA2LEN	"	23,157	97	83
*PA4GDR	"	22,352	96	88
*PC5D	"	21,730	100	82
*PA6Q	"	19,992	97	84
*PA3ARM	"	19,530	75	70
*PC4C	"	16,128	75	63
*PA3HGF	"	5,474	51	46
*PD1LG	"	1,716	22	22
*PA3DDP	"	1,000	21	20
***PA2REH**	**21**	**125,860**	**263**	**203**
***PE1OYB**	**14**	**77,686**	**220**	**179**
*PAØFVH	"	63,244	192	163
***PA2JCB**	**7**	**28,800**	**87**	**80**
***PA3DTR**	**3.5**	**17,028**	**70**	**66**
		North Macedonia		
Z35T	**21**	**1,472,445**	**1003**	**585**
***Z36W**	**A**	**1,121,076**	**795**	**447**
*Z36N	"	181,412	274	209
*Z33YL	"	111,300	240	175
***Z33F**	**14**	**503,052**	**595**	**412**
***Z39A**	**7**	**437,580**	**362**	**286**
***Z35Z**	**3.5**	**86,180**	**167**	**139**
		Northern Ireland		
***MIØDWE**	**A**	**344,916**	**435**	**286**
*GI4H	"	292,670	339	259
			(OP: GI4JTF)	
*MIØH	"	234,234	312	231
			(OP: MIØKOA)	
*MI4I	"	205,204	308	244
			(OP: GI4SJQ)	
*MIØI	"	59,361	172	141
***GI5NI**	**21**	**354,892**	**471**	**307**
			(OP: MIØSAI)	
		Norway		
LB2TG	**A**	**264,248**	**388**	**268**
LC5Z	"	189,999	326	227
			(OP: LB5GI)	
LA7XK	"	69,498	171	143
LA3TK	"	4,070	38	37
LB6KC	**21**	**21,988**	**102**	**92**
LC9S	**14**	**207,700**	**380**	**268**
			(OP: LA9GSA)	
***LC7N**	**A**	**1,041,798**	**825**	**433**
			(OP: LA5LJA)	
*LB2WG	"	335,795	426	281
*LA2XNA	"	269,730	380	270
*LB6VI	"	222,976	381	256
*LA9RY	"	184,756	284	209
*LA3BPA	"	126,175	204	175
*LA2HFA	"	94,080	208	160
*LA2L	"	65,100	163	140
			(OP: LA3CLA)	
*LA3WAA	"	36,972	133	117
*LA9TY	"	20,979	91	81
*LC1R	"	17,640	99	72
			(OP: LB5SH)	
*LA4NL	"	11,060	73	70
***LB1R**	**14**	**18,810**	**107**	**95**
***LC9T**	**7**	**8,918**	**51**	**49**
			(OP: LA9VKA)	
		Poland		
SN7Q	**A**	**8,695,360**	**2744**	**937**
			(OP: SP7GIQ)	
SO9I	"	3,532,232	1421	712
			(OP: SQ9ORQ)	
SP9DTE	"	632,400	597	372
SN5N	"	480,480	519	308
			(OP: SP5KP)	
SP2QCW	"	208,619	296	229
SP4Z	"	102,765	189	155
SP1JQJ	"	68,640	152	132
SP4W	"	53,083	136	109
SQ7BFC	"	21,460	88	74
SQ8N	*"*	*988*	*19*	*19*
SP6CES	"	234	9	9
SN5X	**21**	**1,084,454**	**846**	**497**
			(OP: SP5GRM)	
SP8K	**14**	**874,650**	**770**	**490**
SP3A	"	51,303	161	147
SQ9DXT	"	26,076	118	106
SP4TKR	**7**	**2,460,028**	**1044**	**586**
SN4X	"	336,336	311	264
			(OP: SP5OXJ)	
SP3DIK	"	249,320	278	230
SN2M	**3.5**	**1,572,900**	**776**	**490**
SP1MWN	"	293,510	326	245
SP7IIT	"	262,416	297	231
SO5E	"	140,976	211	178
***SN6S**	**A**	**1,440,979**	**895**	**509**
			(OP: SP6ZC)	
*SP2EWQ	"	1,238,094	785	481
*SP2GJI	"	766,640	633	370
*SP9DLY	"	739,505	634	367
*SP3KX	"	545,616	525	324
*SQ6PLE	"	472,068	506	324
*SP5GNI	"	459,285	499	335
*SP3QDX	"	355,764	415	276
*SP1TJ	"	316,944	470	279
*SN1LH	"	233,129	344	227
			(OP: SP1EG)	
*SN5WD	"	227,906	324	223
			(OP: SO5WD)	
*SP5CGN	"	217,375	340	235
*SP4BPH	"	191,557	294	223
*SP1DOZ	"	189,056	283	224
*SP6FXY	"	161,452	287	223
*SP6SOZ	"	152,991	240	191
*SP2BAS	"	146,160	231	180
*SP6EIY	"	136,474	247	181
*SP9GMI	"	134,266	237	187
*SP1MWF	"	123,342	237	183
*SP2TQQ	"	117,860	224	166
*SQ7LQJ	"	114,240	195	168
*SP3MEO	"	109,794	214	174
*SQ9FMU	"	108,960	226	160
*SP3MZ	"	90,882	193	162
*SP1DMD	"	81,600	188	150
*SP9ICU	"	78,820	155	140
*SP3CCT	"	73,710	201	162
*SP2FNC	"	57,750	168	125
*SP9BGS	"	53,669	153	119
*SP9WZO	"	50,600	128	110
*SP7Y	"	50,224	169	146
*SP2WGB	"	44,974	132	113
*SP2HHX	"	43,120	135	112
*SP3LGF	"	38,406	126	111
*SP9IVD	"	31,842	105	87
*SP3POB	"	29,252	122	103
			(OP: SP3TYJ)	
*SP3GAX	"	25,380	109	90
*3Z1P	"	25,245	99	99
*SQ9CXC	"	24,640	86	80
*SQ3OOK	"	24,480	92	85
*SP9CTS	"	23,200	90	80
*3Z8Z	"	19,436	91	86
*SP8LBK	"	17,871	73	69
*SP2DKI	"	15,281	67	59
*SQ8L	"	12,137	63	53
*SP3CVT	"	10,098	53	51
*SQ2OMK	"	528	16	16
*SO1RON	"	300	10	10
***SQ9V**	**28**	**12,416**	**72**	**64**
*SNØR	"	3	1	1
			(OP: SQ9IAU)	
***SP2FOV**	**21**	**14,484**	**86**	**71**
*SP4GDC	"	13,735	89	67
*SP5BUJ	"	3,510	42	39
*SOØN	"	3,045	35	35
			(OP: SQ9CNN)	
***HF6C**	**14**	**392,147**	**499**	**371**
			(OP: SP6OPC)	
*SOØA	"	284,445	425	315
*SP8CGU	"	167,486	319	253
*3Z9W	"	160,250	301	250
*SP8N	"	98,107	233	199
*SP6DMI	"	93,702	232	194
***SP8BRT**	**7**	**97,280**	**169**	**152**
*SP3BES	"	5,616	38	36
***SQ5OBV**	**3.5**	**250,040**	**301**	**235**
*SP5DL	"	189,312	244	204
*SQ9PPT	"	35,908	101	94
*SP2MKI	"	12,540	57	55
*SP9KJU	"	8,372	48	46
			(OP: SP9MDY)	
		Portugal		
CT7AIX	**28**	**13,440**	**75**	**64**
CR6T	**21**	**2,284,272**	**1381**	**696**
			(OP: CT1ESV)	
***CR5O**	**A**	**2,356,466**	**1431**	**599**
			(OP: CT7AJL)	
*CT1BXT	"	1,283,724	910	468
*CT1BWU	"	707,209	584	367
*CS2F	"	154,093	280	223
			(OP: CT1FOQ)	
*CT2HPM	"	21,526	112	94
***CT1FKN**	**7**	**42,098**	**97**	**97**
		Romania		
YO9HP	**A**	**4,063,692**	**1711**	**794**
YO4NF	"	2,642,850	1285	630
YO3RU	"	1,451,848	1057	523
YO7CW	"	932,670	698	387
YO4FPF	"	816,200	778	440
YO8DHA	**21**	**136,686**	**297**	**209**
YO9BPX	"	90,780	226	170
YQ6A	**7**	**1,614,760**	**720**	**511**
			(OP: YO6BHN)	
YO3IJ	"	98,600	164	145
YO9RIJ	**3.5**	**60,452**	**135**	**119**
***YO3YV**	**A**	**608,622**	**573**	**337**
*YO6HSU	"	552,948	577	354
*YO4RDW	"	287,280	350	270
*YO2LXW	"	235,575	337	225
*YO4DG	"	169,882	266	202
*YO2LDU	"	153,452	252	169
*YO7LYM	"	119,579	225	197
*YO4SI	"	96,791	206	151
*YO4CVV	"	76,822	176	142
*YO4RST	"	56,170	163	137
*YO4BXX	"	52,716	166	138
*YO2DFA	"	27,846	102	91
*YO4UQ	"	26,028	136	108
*YO5OB	"	23,040	90	80
*YO4GO	"	14,112	74	72
*YO2GL	"	13,300	73	70
*YO3CEN	"	11,330	65	55
***YO2IS**	**21**	**103,212**	**241**	**188**
*YO5AXF	"	34,730	138	115
***YO9BCM**	**14**	**402,336**	**520**	**381**
*YO3LW	"	156,825	293	255
***YO3VU**	**7**	**196,840**	**251**	**190**
*YO9GSB	"	170,520	230	196
***YO3JW**	**3.5**	**2,912**	**28**	**28**
		Scotland		
GM5G	**A**	**2,231,104**	**1315**	**568**
			(OP: 2MØSQL)	
GM2V	"	263,376	347	236
			(OP: GM3WOJ)	
GM9A	**21**	**80,152**	**217**	**172**
			(OP: GM4FDM)	
MMØGOR	"	18,011	95	83
MM1E	**3.5**	**37,620**	**105**	**95**
			(OP: MMØGOR)	
***MM2T**	**A**	**433,006**	**480**	**314**
*GM4JKZ	"	246,302	344	241
*GM5M	"	99,484	259	187
			(OP: GM4ZNC)	
*MMØCPZ	"	96,534	220	173
*GM5BDX	"	52,705	148	127
***GM6DX**	**21**	**4,365**	**47**	**45**
		Serbia		
YTØC	**A**	**1,885,970**	**1099**	**565**
YU3A	"	56,927	171	151
YT1X	**28**	**49,500**	**148**	**132**
YT8A	"	36,288	131	112
			(OP: YU1EA)	
YT9X	**21**	**868,500**	**763**	**450**
			(OP: YU1ZZ)	
YT9A	"	93,104	214	176
YT3X	**14**	**2,810,052**	**1466**	**826**
YT6T	"	237,708	381	284
			(OP: YU7CM)	
YT3D	**7**	**3,745,504**	**1133**	**727**
YT4T	**3.5**	**1,168,172**	**704**	**419**
***YT2U**	**A**	**1,050,420**	**747**	**427**
*YT3H	"	854,568	665	396
*YU1KT	"	591,522	539	317
*YTØX	"	450,561	415	303
*YU3TA	"	97,744	207	164
*YU3ABC	"	35,612	139	116
*YU3MPN	"	30,397	149	113
*YT3AWR	"	19,980	101	90
*YU7OM	"	12,512	75	68
*YU8NU	"	12,480	61	60
*YU3ARP	"	6,048	56	54

***YU4VBX**	**21**	**29,120**	**116**	**104**
***YT1BX**	**14**	**122,202**	**286**	**219**
***YT9VM**	**7**	**1,019,662**	**625**	**421**
**YT9WW*	*"*	*92,272*	*161*	*146*
*YT5DEY	"	78,300	143	135
		Sicily		
IT9QGH	**A**	**604,915**	**574**	**359**
IT9ESW	"	238,108	284	241
IT9UFP	"	129,596	238	179
IT9WDC	**21**	**640,551**	**599**	**447**
IT9SSI	"	51,750	173	138
IT9RBW	**3.5**	**1,307,964**	**676**	**483**
IR9K	"	623,390	486	323
			(OP: IT9IVU)	
***IT9GHW**	**A**	**148,419**	**285**	**207**
*IT9AJP	"	56,304	148	138
*IW9BJP	"	8,100	57	50
*IT9ORA	"	7,670	68	59
***IT9DSZ**	**28**	**1,113**	**22**	**21**
***IT9ATF**	**21**	**197,104**	**333**	**254**
*IT9YMM	"	4,982	47	47
*IW9GRL	"	3,880	41	40
***IT9VCE**	**14**	**205,288**	**389**	**268**
		Slovak Republic		
OM3CFR	**A**	**774,297**	**572**	**379**
OM1II	"	335,808	389	288
OM3KWZ	"	35,805	120	105
			(OP: OM7KW)	
OM8A	"	360	14	12
OM2VL	**14**	**2,218,041**	**1208**	**763**
OM3CW	"	31,501	129	109
***OM5KM**	**A**	**528,984**	**493**	**316**
*OM7AG	"	400,356	457	297
*OM2DT	"	87,900	190	150
*OM5AST	"	80,964	190	156
*OM7JG	"	52,948	140	124
*OM5NL	"	34,476	122	102
*OM3ZBG	"	2,046	34	33
*OM2WX	"	1,824	25	24
*OM8MF	"	168	9	8
***OM2BK**	**14**	**1,925**	**36**	**35**
***OM3ZWA**	**3.5**	**407,042**	**389**	**271**
		Slovenia		
S53X	**A**	**4,473,797**	**1691**	**779**
S52WW	"	1,035,902	779	427
S51DD	"	726,646	693	421
S53M	"	654,376	517	314
			(OP: S51FB)	
S51JQ	"	377,114	492	314
S53F	**21**	**653,850**	**583**	**450**
S5ØOA	"	433,581	503	339
S57DX	**14**	**1,365,936**	**983**	**597**
S51CK	**7**	**2,730,242**	**1056**	**599**
S52X	**3.5**	**2,322,086**	**1002**	**559**
***S57AM**	**A**	**1,122,216**	**790**	**456**
*S51I	"	330,820	360	278
*S52W	"	288,769	327	229
*S57SWR	"	185,523	290	201
*S54Z	"	130,896	193	162
*S52WD	"	121,574	225	178
*S5/MØMPM	"	97,380	212	180
*S57ZM	"	93,170	197	154
*S54X	"	54,752	134	116
***S51W**	**3.5**	**751,410**	**563**	**345**
		Spain		
EA1AKS	**A**	**1,828,408**	**1101**	**523**
EA1L	"	1,545,642	1114	522
EA2ESB	"	1,514,625	937	525
EA2A	"	1,268,955	887	519
EA4Z	"	1,193,550	910	438
EA5JX	"	902,000	657	410
EA4FME	"	439,520	486	335
EC5K	"	363,052	403	281
EB5F	"	214,200	345	238
ED4T	"	146,985	255	205
			(OP: EA4R)	
EA1DA	"	38,626	108	89
EA7Z	**21**	**471,540**	**596**	**348**
EA7KI	"	444,264	560	346
EA1B	**14**	**1,293,216**	**991**	**608**
EF1C	"	147,616	346	224
			(OP: EC1RS)	
EB5A	"	104,949	237	207
EA5TS	"	1,860	31	30
EA5GIE	7	41,356	118	98
***EE4Y**	**A**	**4,144,700**	**1789**	**700**
			(OP: EA4GOY)	
*EF7N	"	2,743,104	1374	624
			(OP: EA7KHB)	
*EA4BAS	"	1,376,949	934	493
*EB4GOO	"	574,668	535	313
*EA2BJM	"	474,192	486	296
*EA7EQ	"	421,515	482	323
*EA2XR	"	344,814	469	303
*EA2CCG	"	341,817	451	287
*EA7TG	"	289,380	393	265
*EA3AQ	"	268,570	342	251
*EA2RE	"	243,708	382	276
*EA1BJE	"	243,380	317	215
*EA4HKF	"	187,306	335	238
*EE5H	"	156,088	323	218
			(OP: EA5HRT)	
*EA7KFX	"	130,326	267	203
*EA3HKA	"	118,144	284	208
*EB5CS	"	106,568	204	154
*EA2EVM	"	92,612	207	169
*EA1IXQ	"	85,008	191	154
*EA5HYJ	"	62,928	187	144
*EA7JTP	"	55,728	164	129
*EA3GGW	"	46,150	155	130
*EA1EWY	"	43,318	147	121
*EA5KE	"	33,659	109	97
*EA5MR	"	29,355	122	103
*EA3JW	"	28,896	109	96
*EA4FIT	"	21,606	90	78
*EF4A	"	11,252	61	58
*EB3DKE	"	10,773	60	57
*EA4AFP	"	4,773	43	37
*EA7FDO	"	4,187	58	53
*EA1IQT	"	4,068	38	36
**EA4HFK*	*"*	*50*	*5*	*5*
***EE3Z**	**28**	**39,672**	**139**	**116**
			(OP: EA3NO)	
*ED2V	"	3,234	35	33
			(OP: EA2CYJ)	
***EC7R**	**21**	**922,041**	**821**	**477**
*EA5DF	"	639,105	665	411
*EB3TR	"	66,834	185	158
*EA7K	"	39,497	135	127
*EA3EZD	"	4,635	55	45
***EA5ET**	**14**	**424,847**	**506**	**373**
			(OP: XX9XX)	
*EA4DB	"	149,308	311	229
*EA3X	"	141,911	286	209
*EA2BNU	"	57,350	167	155
*EA3CFV	"	420	14	14
***EA3IAZ**	**7**	**114,240**	**192**	**160**
*EA2EVC	"	3,224	27	26
		Sweden		
SM2M	**A**	**1,991,998**	**899**	**722**
			(OP: SM2LIY)	
SM6MVE	"	297,330	383	255
SM7IUN	"	98,452	191	151
SM3LBP	"	44,770	119	110
SM6M	"	25,116	100	91
SD1A	"	18,320	95	80
			(OP: SM1TDE)	
SC7DX	"	15,895	87	85
			(OP: SM7GIB)	
SK6KU	**14**	**129,600**	**292**	**216**
			(OP: SM6VVT)	
***7S5S**	**A**	**695,400**	**643**	**366**
			(OP: SM5CSS)	
*SM5IMO	"	597,195	547	345
*SM5FQQ	"	464,940	522	315
*SM7BHM	"	459,351	516	321
*SE6K	"	451,705	495	305
			(OP: SM6FZO)	
*SKØQO	"	308,407	392	253
			(OP: SMØLYC)	
*SM5S	"	223,236	305	212
			(OP: SM5SIC)	
**SE6J*	*"*	*146,496*	*225*	*192*
			(OP: SM6XHM)	
*SM6NET	"	95,654	204	169
*SI9YL	"	65,232	186	151
			(OP: SM3LIV)	
**SFØA*	*"*	*47,190*	*160*	*143*
			(OP: SMØLPO)	
*SM5DXR	"	16,872	91	76
*SMØDSF	"	13,080	63	60
***7S9A**	**28**	**297**	**11**	**11**
***SM6IQD**	**7**	**6,248**	**46**	**44**
		Switzerland		
HB9CAL	**A**	**166,760**	**290**	**220**
HB9DQL	"	138,736	255	184
HB9DOS	"	63,940	163	139
HB9DHG	**28**	**6,063**	**53**	**47**
***HB9CU**	**A**	**1,800,716**	**925**	**529**
*HB9HQX	"	254,676	349	228
*HB9MXY	"	160,552	263	188
*HB9TZU	"	134,355	226	159
*HB9GFT	"	70,080	191	146
*HB9CXK	"	31,494	102	87
*HB9BGF	"	22,344	90	76
*HB9FHV	"	15,240	66	60
*HB9CRV	"	920	23	23
*HB9OK	"	280	10	10
		Ukraine		
UW1M	**A**	**9,435,568**	**3266**	**932**
UTØU	"	4,441,728	1987	807
			(OP: UT5UDX)	
EMØI	"	4,181,856	1843	762
			(OP: UT2IZ)	
UT5ECZ	"	1,085,535	693	473
UV5U	"	1,061,943	679	479
			(OP: UX1UA)	
UY5HF	"	609,220	611	415
UR5R	"	280,720	396	319
			(OP: UTØRM)	
UX6IR	"	245,616	361	258
UR5FS	"	167,524	296	217
UR7LY	"	153,307	231	181
US5QUB	"	141,792	258	211
UY2UA	"	99,470	187	145
UT3UV	"	94,990	205	161
UR4EI	"	48,312	147	122
UW3HM	"	32,384	103	92
UW4E	**21**	**897,715**	**866**	**455**
			(OP: UT5EDX)	
UR6F	"	859,656	760	476
			(OP: UXØFF)	
UT2II	"	850,356	844	468
UZØU	**14**	**436,572**	**559**	**362**
			(OP: UY5ZZ)	
US1IV	"	192,576	352	272
UR7QM	"	5,671	60	53
UZ1WW	**7**	**2,304,562**	**936**	**587**
UT3N	"	384,720	379	280
			(OP: UT3NK)	
UR1HR	"	343,200	334	260
UY1HY	"	183,872	230	208
UT2AU	**3.5**	**231,168**	**295**	**224**
***UT4LW**	**A**	**2,926,236**	**1694**	**636**
*UW6E	"	2,852,208	1411	683
			(OP: UR6EA)	
*UX1VT	"	2,132,043	1115	569
*UT5EPP	"	1,531,930	1141	499
*UX7QV	"	1,104,255	877	477
*UZ8I	"	1,004,943	789	457
			(OP: US7IY)	
*US6CQ	"	1,002,144	827	429
*UX1UX	"	935,952	780	444
*UR7CB	"	705,726	659	378
*UT3SO	"	559,240	561	328
*UT7NI	"	498,225	502	325
*UT2SW	"	447,426	513	318
*UX1BZ	"	441,561	474	309
*UR4CU	"	374,712	439	312
*UR5LY	"	362,916	432	306
*UT8IM	"	329,664	439	272
*UT5CL	"	280,980	388	252
**UX1VX*	*"*	*268,570*	*365*	*251*
*US7UK	"	263,142	313	297
*UY5TE	"	256,968	403	258
*UR5ZDZ	"	223,104	379	249
*UT1UW	"	220,033	305	241
*UX6IB	"	210,924	298	243
*UT5EOX	"	210,084	291	244
*UX1CL	"	194,688	334	234
*UT5UML	"	187,956	304	207
*UTØCK	"	178,398	305	198
*UR7EC	"	152,663	242	193
*UT4UXB	"	148,416	278	192
			(OP: UT3UIW)	
*UT3KW	"	138,964	269	196
*US3EW	"	137,970	258	210
*UY8IF	"	120,190	256	202
*UT7MR	"	100,625	250	161
*US5CDH	"	87,675	208	175
*UT4QV	"	73,416	181	138
*UT8AS	"	59,930	171	130
*UX7LL	"	49,824	176	144
*UT2QQ	"	44,196	138	116
*UZ5Q	"	33,522	135	111
			(OP: UY5QZ)	
*UR3QCW	"	33,212	101	92
*US5LOC	"	20,097	103	87
*UR5XMM	"	19,314	95	87
*UW5U	"	10,800	59	54
*UR7GM	"	5,920	40	40
*UW7CN	"	748	19	17
*UR4MLS	"	4	1	1
***UX3IW**	**28**	**26,030**	**116**	**95**
*US5AT	"	11,725	71	67
***UT8EL**	**21**	**229,676**	**396**	**268**
*UR7HCX	"	174,636	378	231
*USØHZ	"	39,412	146	118
***UR7GO**	**14**	**1,463,683**	**1093**	**629**
*UY5VA	"	814,078	803	491
*USØMM	"	426,821	586	367
*UW2Q	"	145,824	291	248
			(OP: UR6QS)	
*UV3QF	"	48,336	168	152
*US1VS	"	16,878	95	87
*US5EEK	"	7,134	58	58
***US7KC**	**7**	**839,384**	**596**	**364**
*UR5WCQ	"	762,012	507	366
*UY2ZA	"	340,480	326	266
*UT3QD	"	46,640	116	106
***UX2X**	**3.5**	**1,347,460**	**776**	**445**
			(OP: UT2XQ)	
*UZ2HZ	"	804,518	557	377
*UR3QTN	"	76,720	157	137
*UW7LL	"	19,040	73	70
		Vienna Intl. Ctr.		
***4U1A**	**A**	**861,931**	**614**	**413**
			(OP: HB9RB)	
		Wales		
GWØA	**A**	**1,116,950**	**808**	**445**
			(OP: GW4SKA)	
GW5NF	"	939,560	703	415
***MW9W**	**A**	**1,260,093**	**844**	**447**
			(OP: GWØKRL)	
*MWØCRI	"	1,036,011	826	453
*GWØARK	"	3,008	35	32

OCEANIA

		Australia		
VJ5W	**A**	**804,384**	**632**	**378**
VK3JA	"	747,146	604	358
VK4SN	"	191,052	370	183
VK4AFU	"	15,162	65	57
VK7BO	"	11,220	62	55
***VK2K**	**A**	**96,403**	**242**	**149**
*VK4ZP	"	43,623	139	111
*VK3LF	"	5,334	45	42
*VK3IU	"	4,370	39	38
*VK3P	"	3,276	41	39
***VK4FJ**	**28**	**4,522**	**44**	**38**
***VJ3O**	**14**	**14,688**	**79**	**72**
				(OP: VK3TX)
***VL3O**	**7**	**14,946**	**54**	**53**
		East Malaysia		
***9M8DEN**	**A**	**103,850**	**237**	**134**

***9W8C**	**7**	**3,380**	**35**	**26**
*9W6AJA	"	3,328	28	26
		Hawaii		
KH6TU	**A**	**1,818,048**	**1221**	**408**
				(OP: AD6E)
WH7T	"	495,396	507	278
				(OP: WH7W)
***KH6CJJ**	**A**	**921,740**	**839**	**340**
*KH6AQ	"	55,952	176	104
*KH6OO	"	7,050	59	50
***KH6ZM**	**7**	**300,460**	**293**	**181**
*KH6PE	"	1,496	17	17
***KH7M**	**3.5**	**6,930**	**39**	**35**
				(OP: KH6ZM)
		Indonesia		
YB1AR	**A**	**587,164**	**584**	**362**
YB2MM	"	454,080	495	320
YB4FIK	"	202,350	354	190
YB2TS	"	105,376	258	178
YB2IQ	"	102,690	209	163
YCØSCZ	"	74,800	186	136
YB6RMT	"	73,160	243	118
YC2GBS	"	46,115	154	115
YC4SIZ	"	46,107	165	109
YB7MYS	"	32,469	130	79
YE3WIL	"	456	22	12
YF3FBV	**28**	**320**	**14**	**10**
YC7YGR	"	290	10	10
YC1JGE	**21**	**187,440**	**298**	**220**
YB2HAF	"	104,075	229	181
YB3BLJ	"	46,970	136	122
YF3FZR	"	126	7	7
YC2KJC	**14**	**46,376**	**152**	**136**
YBØRI	"	19,096	110	77
YB8UTI	**7**	**28,762**	**105**	**73**
***YCØBAS**	**A**	**381,672**	**449**	**279**
*YB1RKT	"	323,640	384	261
*YD9WFT	"	284,088	413	267
*YD7ACD	"	252,072	329	216
*YB1AYO	"	212,180	310	206
*YC1PZ	"	206,367	332	217
*YB9ELS	"	184,210	339	218
*YB4KAR	"	158,650	284	167
*YB1BML	"	122,175	250	181
*YB9ATS	"	109,076	309	148
*YB7OO	"	105,412	222	146
*YD9VE	"	102,489	296	127
*YD3GIF	"	96,150	235	150
*YB1IUQ	"	89,679	249	167
*YB9UA	"	78,498	248	147
*YC1CQU	"	60,928	183	119
*YB4KRZ	"	54,978	201	119
*YB1LUE	"	53,560	150	130
*YB1AM	"	51,750	165	125
*YB9AOS	"	42,942	182	102
*YC7YCP	"	35,600	134	89
*YG3EMH	"	34,768	140	106
*YB8CMT	"	33,120	122	92
*YB2MDU	"	26,712	115	84
*YE8RAF	"	23,200	117	80
*YB1HA	"	18,612	163	99
*YB1DCW	"	16,400	97	82
*YB7GRN	"	16,380	101	70
*YC5AKH	"	15,488	99	64
*YB9BCS	"	15,403	89	73
*YE3ESW	"	15,318	96	69
*YB9GDP	"	9,412	87	52
*YD9BIJ	"	7,224	65	43
*YF9EGU	"	6,006	73	39
*YBØBAC	"	5,964	43	42
*YB7WR	"	5,922	52	47
*YCØNAN	"	5,805	51	43
*YD2UFR	"	5,538	54	39
*YB1GBN	"	5,418	51	42
*YB3COY	"	5,290	57	46
*YC1TCA	"	5,130	59	38
*YE8DWC	"	4,944	78	48
*YB3ATK	"	4,865	54	35
*YB1BJV	"	4,815	55	45
*YC1CKK	"	4,012	85	59
*YD1CAI	"	3,115	50	35
*YD6HRI	"	2,772	40	28
*YB1DUU	"	2,706	38	33
*YC1EYS	"	2,263	43	31
*YC7UDD	"	1,998	28	27
*YD1LYG	"	1,950	47	25
*YCØSCV	"	1,749	35	33
*YB1MBA	"	1,705	33	31
*YDØRFS	"	1,472	34	23
*YD1EMV	"	1,425	34	25
*YB2TDP	"	1,344	36	28
*YD3YGY	"	1,248	26	24
*YC1BTG	"	1,242	31	23
*YC1CBY	"	1,118	32	26
*YB1IM	"	880	24	22
*YC1DGR	"	434	15	14
*YBØECT	"	110	14	11
***YD2UWF**	**28**	**9,396**	**59**	**54**
*YG9EPK	"	1,725	31	23
*YB7SKM	"	1,647	30	27
*YB1HR	"	280	16	14
***YD1EQX**	**21**	**138,690**	**263**	**201**
*YC1IFR	"	57,105	169	141
*YC2XCD	"	53,950	175	130
*YD3ASV	"	47,600	162	119
*YB3BGM	"	30,652	116	97
*YB8JEC	"	29,700	141	90
*YB1UUN	"	26,600	100	95
*YD9MBM	"	20,358	115	87
*YC1JEL	"	11,607	81	73
*YDØBCG	"	10,465	79	65
*YC1GDF	"	7,372	91	76
*YB2UFM	"	3,654	46	42
*YB3OK	"	2,940	35	35
*YB1ELP	"	162	9	9
*YC2DFD	"	84	7	7
*YG1BAX	"	60	10	10
*YG1AJD	"	35	7	7
*YG1AFJ	"	16	4	4
***YBØNSI**	**14**	**86,184**	**209**	**171**
*YE4IJ	"	1,976	28	26
*YB9GV	"	798	23	19
***YD8MUZ**	**7**	**45,318**	**133**	**91**
*YB2ECG	"	17,784	93	57
*YD9BEK	"	11,760	87	56
*YD9ETK	"	2,312	44	34
*YC1BCH	"	1,250	29	25
*YG1AFR	"	918	24	17
*YD2NIR	"	648	25	18
*YC2AUP	"	160	12	8
*YG1AMJ	"	64	4	4
		New Zealand		
ZL3P	**28**	**61,950**	**177**	**118**
				(OP: ZL3PAH)
ZL2RX	**21**	**14,688**	**79**	**72**
***ZL3VZ**	**A**	**119,822**	**229**	**181**
		Philippines		
DV3A	**A**	**501,390**	**580**	**270**
				(OP: DU3TW)
DY1T	"	391,310	504	218
				(OP: DU1IVT)
4GØT	**14**	**17,751**	**102**	**61**
				(OP: DU1RB)
***DU1JM**	**A**	**201,950**	**288**	**175**
*4I1BNC	"	20,377	119	71
*DU1/N6HPX	"	13,013	138	77
				(OP: DU1N6HPX)
*DV6XDS	"	10,143	72	49
*DU1/NFØO	"	2,291	34	29
***4F3BZ**	**28**	**119,790**	**252**	**165**
***DU5A**	**21**	**10,972**	**85**	**52**
				(OP: DU1UGZ)
		Samoa		
***5W1SA**	**28**	**45,968**	**159**	**104**

SOUTH AMERICA

		Argentina		
LU1BJW	**A**	**276,934**	**400**	**262**
LU5DF	"	93,600	209	160
LU3MAM	"	5,800	50	40
LU1DX	**28**	**981,768**	**817**	**456**
LU7HN	"	578,683	604	361
LU6ETB	"	532,560	552	336
LT9H	**21**	**229,653**	**352**	**237**
				(OP: LU3HY)
L2ØX	"	2,040	41	34
LO7H	**14**	**110,775**	**247**	**175**
				(OP: LU7HW)
LU5OM	"	16,428	85	74
***LT6M**	**A**	**1,123,584**	**878**	**448**
				(OP: LU8MHL)
*LV1F	"	419,958	518	303
				(OP: LU4FTA)
*LU3DX	"	10,980	77	60
*LU7EXX	"	1,680	39	24
*LU1KCQ	"	112	8	8
***LU4HK**	**28**	**253,008**	**355**	**251**
*L77D	"	46,056	139	114
				(OP: LU6DC)
*L71D	"	13,317	90	69
*LT5A	"	364	14	13
***LW6EQG**	**14**	**39,780**	**143**	**117**
		Aruba		
***P4/K3DMG**	**A**	**11,520**	**67**	**60**
		Brazil		
PY7ZC	**A**	**3,230,304**	**1500**	**627**
PV2K	"	2,408,320	1281	640
				(OP: PY2KNK)
PY5ZHP	"	577,642	602	338
PY3LX	"	156,208	294	208
PT7WM	"	114,576	182	154
PY2KP	"	99,876	211	164
PV8DX	"	23,055	100	87
PY1VOY	"	36	4	3
PX2A	**28**	**1,722,595**	**1077**	**553**
				(OP: PY2XV)
PV8AAS	**21**	**3,800**	**43**	**40**
PY2XJ	**14**	**10,296**	**76**	**72**
PS7DX	**7**	**8,064**	**46**	**36**
***PY2CX**	**A**	**1,188,052**	**866**	**458**
*PY1ZV	"	872,447	769	373
*PY1FI	"	779,136	684	384
*PP5DZ	"	595,700	619	350
*PU2VLW	"	98,900	235	172
*PY3TD	"	73,537	214	151
*PY2GZ	"	43,240	156	115
*PY2UGO	"	34,884	135	108
*PT2AW	"	34,117	131	109
*PY2VZ	"	32,769	123	99
*PY4ARS	"	24,738	110	93
*PY2OSD	"	21,093	110	89
*PU8PSF	"	19,845	117	81
*PY2MIA	"	17,171	102	77
*PU2LFU	"	16,037	92	79
*PU2NBI	"	11,592	76	63
*ZV2F	"	6,996	73	53
				(OP: PY2SFA)
*PT7BI	"	6,426	71	51
*PY2VCP	"	4,860	47	45
*PU7ASP	"	4,257	45	43
*PY3TR	"	2,924	52	43
*PU2XFF	"	1,173	25	23
*PU4WTB	"	874	20	19
				(OP: PY4WTB)
*PY1SGT	"	378	14	14
*PY2OF	"	216	9	9
***PT4T**	**28**	**278,631**	**388**	**249**
				(OP: PY4XX)
*PU1JSV	"	142,350	262	195
*PU2USK	"	64,935	193	135
*PY1KB	"	31,556	119	98
**PY1SAD*	*"*	*21,384*	*96*	*81*
*PY4LH	"	21,150	105	75
*PY2EBD	"	11,160	69	62
*PY2DPM	"	6,811	54	49
*PU9OJZ	"	5,664	51	48
*PY2BRP	"	2,244	37	33
***PY2QT**	**21**	**537,474**	**548**	**382**
*PY2KO	"	127,161	251	199
*PY2ZR	"	93,870	238	149
*PY1DX	"	84,364	190	161
*PY2CAT	"	52,930	150	134
*PY2XC	"	15,318	82	74
*PT8DX	"	12,730	74	67
*PU2YMH	"	10,080	76	72
*PY2KC	"	9,699	63	61
*PU2RTO	"	4,687	47	43
*PY2GTA	"	3,500	36	35
*PT2JC	"	3,362	42	41
*PU2MST	"	2,940	37	35
*PY2ATR	"	1,782	27	27
*PU3VON	"	1,734	57	51
*PU5WMG	"	270	15	15
*PV8AJ	"	12	4	4
***PY2NY**	**14**	**547,680**	**559**	**336**
*PY2UD	"	35,741	123	103
*PY6TS	"	16,116	94	79
***PP5NY**	**7**	**884**	**13**	**13**
		Chile		
3G1B	**21**	**360,858**	**482**	**274**
				(OP: CE1KV)
***CE3GRU**	**A**	**15,876**	**95**	**63**
*CE2/YV5IAL	"	2,040	37	30
*CE3KRM	"	646	17	17
*XR3Y	"	78	6	6
				(OP: XQ7UP)
***XQ3SK**	**21**	**167,000**	**303**	**200**
***CE3BN**	**14**	**53,431**	**163**	**119**
		Colombia		
***HK6J**	**A**	**46,305**	**130**	**105**
***HK3JJB**	**7**	**230,640**	**288**	**186**
*HK6RF	"	19,040	59	56
		Equador		
***HC7AE/1**	**A**	**43,860**	**106**	**86**
***HC1JQ**	**21**	**58,528**	**164**	**124**
		Paraguay		
***ZP6/N3BNA**	**A**	**320,040**	**448**	**254**
		Peru		
***OA4DOS**	**A**	**99,840**	**240**	**156**
		Suriname		
***PZ5RA**	**A**	**1,707,048**	**1097**	**504**
		Trinidad & Tobago		
***9Z4L**	**A**	**581,504**	**502**	**308**
		Uruguay		
CW1ØØA	**A**	**565,862**	**600**	**374**
CV7S	**21**	**1,940,400**	**1087**	**660**
				(OP: CX7SS)
		Venezuela		
YV6BXN	**A**	**46,272**	**114**	**96**
YV4ABR	**21**	**498,597**	**551**	**319**
***4M1W**	**28**	**313,496**	**435**	**263**
***YV5KAJ**	**14**	**212,382**	**335**	**243**

QRP

RM5F	**A**	**1,176,602**	**1182**	**458**
IZ8JFL	**"**	**955,239**	**677**	**447**
YU1A	**"**	**682,803**	**602**	**363**
				(OP: YU1LM)
KV2U	**"**	**516,975**	**624**	**339**
				(OP: K2YG)
EA3F	**"**	**394,670**	**452**	**305**
HG6C	**"**	**357,984**	**425**	**288**
				(OP: HA6IAM)
DK8R	**"**	**321,440**	**419**	**280**
				(OP: DL8LR)
LZ3RR	**"**	**312,734**	**405**	**271**
LZ7K	"	309,960	406	270
				(OP: LZ3GW)
SN3ØWOSP	**"**	**235,940**	**370**	**235**
				(OP: SP2UUU)
EA1GT	"	222,984	361	228
				(OP: EA1GT/QRP)
HA7ME	"	185,526	266	198
YCØVM	**"**	**173,840**	**320**	**205**
WW2G	"	158,461	367	211
HB2QRP	**"**	**149,720**	**243**	**190**
				(OP: HB9BAS)

W6QU	"	**109,848**	**324**	**184**
				(OP: W8QZA)
MM7BWK	"	**95,700**	**220**	**165**
N4IJ	"	**84,072**	**205**	**186**
RW6AVK	"	**82,400**	**203**	**160**
E77T	"	**81,954**	**187**	**157**
JH7UJU	"	**81,420**	**204**	**138**
RZ4AZ	"	**76,475**	**215**	**161**
RV3DBK	"	69,150	193	150
W1IG	"	**68,637**	**195**	**137**
PE2K	"	**68,098**	**189**	**158**
EW8G	"	**65,664**	**167**	**128**
G4FPA	"	**63,000**	**168**	**140**
HA5OB	"	59,182	150	127
F4HHL	"	**58,995**	**168**	**135**
OK1DMP	"	**58,528**	**147**	**124**
DL2AMT	"	56,070	152	126
VE3KJQ	"	**50,050**	**174**	**110**
SP6NIV	"	48,929	143	113
I2BPP	"	46,529	138	119
DL5CV	"	45,890	147	130
UT1IM	"	**43,845**	**129**	**111**
IZ2JPN	"	39,032	144	119
WAØMN	"	**38,608**	**195**	**127**
				(OP: NØUR)
DG3T	"	34,800	105	100
				(OP: DF5RF)
DL1GBQ	"	31,066	122	98
OK1BR	"	29,150	140	110
W4ER	"	24,503	130	107
EE2A	"	20,992	100	82
				(OP: EA2SN)
IZ2QKG	"	20,444	92	76
SP9RQH	"	20,210	97	86
YC2VOC	"	17,380	87	79
YB2NDX	"	14,807	99	67
F4FSB	"	13,467	71	67
KK7A	"	**13,260**	**120**	**78**
YD6ROA	"	13,020	131	93
K3FHP	"	12,859	88	77
DL2BIS	"	12,709	83	71
LA3DV	"	**11,346**	**71**	**62**
K8ZT	"	**8,866**	**65**	**62**
LY2F	"	**8,836**	**53**	**47**
IZ5IOM	"	7,316	62	59
OK7PZ	"	6,985	58	55
OK2BWC	"	6,466	60	53
N6HI	"	6,440	80	56
SQ2RH	"	5,618	57	53
EA4U	"	5,304	41	39
DF5EM	"	5,047	50	49
YO4AAC	"	**4,944**	**50**	**48**
7L4IOU	"	**4,551**	**44**	**41**
DL2TM	"	4,515	51	43
UT4UBZ/P	"	2,739	40	33
NH6O	"	**1,800**	**27**	**25**
DL5PF	"	792	25	22
YB1ICC	*"*	*779*	*22*	*19*
OE5FDM	"	**598**	**15**	**13**
DL1AQU	"	588	17	14
YB2ERL	"	312	14	12
IT9KXK	"	**132**	**6**	**6**
PA6ML	"	55	5	5
				(OP: PE1MR)
YB6UAF	"	44	5	4
DF5GO	"	16	8	8
UX7UW	"	6	1	1
TIØRC	**28**	**198,848**	**374**	**239**
				(OP: TI2YO)
WE6EZ	"	**23,800**	**120**	**100**
7S2A	"	**10,251**	**74**	**67**
				(OP: SA2SAA)
DV9IHK	"	**4,200**	**51**	**40**
W2NTN	"	**3,450**	**53**	**46**
JH3DMQ	"	**2,695**	**37**	**35**
CO6EC	"	**1,750**	**27**	**25**
YT1BD	"	**40**	**4**	**4**
SP3ZHP	"	**3**	**1**	**1**
UA3QJJ	**21**	**276,120**	**456**	**295**
HG3IPA	"	**143,594**	**274**	**214**
				(OP: HA3JB)
YC1LJT	"	**87,363**	**217**	**153**
7N4WPY	"	**63,106**	**169**	**139**
UY5QQ	"	**60,098**	**179**	**151**
YO3DAC	"	**57,810**	**174**	**141**
JR1NKN	"	37,152	133	108
SP4NKJ	"	**34,980**	**149**	**110**
PY2RKG	"	**27,146**	**107**	**98**
JK1TCV	"	25,389	99	91
NK5G	"	**21,922**	**140**	**113**
KKØU	"	**17,424**	**102**	**88**
HA3HX	"	15,678	91	78
R4FCJ	"	**14,400**	**92**	**80**
UT7AA	"	12,160	88	76
SP2QOT	"	10,395	77	63
SP4LVK	"	7,888	70	58
JR2EKD	"	**2,883**	**34**	**31**
K3EO	"	**1,767**	**35**	**31**
YG1AJC	"	84	8	7
OQ4B	**14**	**87,840**	**213**	**183**
				(OP: ON4BHQ)
HAØGK	"	**44,485**	**183**	**155**
DJ3HW	"	**34,181**	**147**	**133**
DF8AN	"	28,305	121	111
JG1LFR	"	**15,400**	**95**	**77**
R3IBT	"	**11,023**	**77**	**73**
LY2LF	"	**11,020**	**79**	**76**
CT9/OH2KW	"	**10,788**	**66**	**62**
CB3R	"	**9,918**	**62**	**58**
				(OP: XQ3SK)
N8URE	"	**8,216**	**93**	**79**
UV3RT	"	**6,612**	**58**	**57**
GØSBN	"	**5,635**	**57**	**49**
DK1YH	"	5,355	54	51
M4C	"	3,569	44	43
				(OP: GØFCT)
EA3FHP	"	**1,484**	**28**	**28**
9A5HZ	"	**1,200**	**25**	**24**
JE1CAC	"	364	13	13
RG4D	*"*	*312*	*12*	*12*
MØORY	"	312	13	13
IT9RJE	"	**270**	**15**	**15**
K7ILO	"	**195**	**13**	**13**
ON9EEE	"	50	5	5
4X6HX	**7**	**452,804**	**321**	**251**
SP9KAG	"	**159,048**	**223**	**188**
				(OP: SP9CXN)
R7KO	"	**124,780**	**195**	**170**
DF2BR	"	**37,600**	**107**	**100**
9A6TT	"	**21,000**	**79**	**70**
CO2WL	"	**15,042**	**84**	**69**
OG4T	"	**10,976**	**59**	**56**
				(OP: OH4MFA)
IKØBDO	"	**9,520**	**61**	**56**
YB2CTE	"	**4,134**	**71**	**39**
VE6EX	"	**2,294**	**37**	**31**
CM2DAH	"	1,518	34	33
IT9CND	"	**252**	**9**	**9**
YC8FEE	"	168	8	7
JO1EEQ	"	**128**	**8**	**8**
WE9N	"	**56**	**8**	**7**
ON3DI	**3.5**	**216,070**	**271**	**205**
SP3EMA	"	**87,870**	**160**	**145**
G5Q	"	**41,208**	**111**	**101**
				(OP: G3SVL)
UD2F	"	**37,632**	**104**	**96**
CO2JD	"	**7,920**	**54**	**45**
EA5FQS	"	**6,132**	**46**	**42**
DK1DSA	"	**1,116**	**18**	**18**

ROOKIE

NORTH AMERICA

United States

District 2

KD2UBH	**A**	**150,234**	**364**	**219**
***KI2D**	**A**	**496,184**	**690**	**338**
*KD2SGM	"	27,864	145	108

District 3

AA3R	**A**	**60,000**	**207**	**150**
***KC3RPO**	**A**	**223,260**	**391**	**244**
*W3FR	"	144,144	333	208
*N3AML	"	23,987	115	83
*W3MAM	"	22,659	106	91
*W4GMN	"	364	13	13

District 4

***KO4ENU**	**A**	**61,072**	**242**	**176**
*KO4NIK	"	30,847	144	109
*K8RAR	"	3,807	54	47
*KO4IUM	"	968	25	22
*KO4PSQ	"	304	20	19

District 5

***N5JGE**	**A**	**40,656**	**148**	**112**

District 6

KN6MYI	**A**	**700,977**	**804**	**417**
W6DMW	3.5	150,920	338	196

District 7

***KB7SDM**	**A**	**7,614**	**92**	**54**

District 9

***KD9PLD**	**A**	**10,354**	**65**	**62**
KD9NYE	*"*	*8,374*	*68*	*53*

ASIA

Asiatic Russia

District Ø

***UBØAZR**	**A**	**62,712**	**171**	**134**

Japan

District 1

JK1BAB	**14**	**72**	**8**	**8**

District 6

****JS6UGC**	**A**	**9,955**	**67**	**55**

West Malaysia

***9M2MAD**	**7**	**6,510**	**40**	**31**

EUROPE

Belarus

***EU1VA**	**A**	**661,430**	**595**	**385**

Crete

***SY9DOK**	**21**	**69,915**	**240**	**177**

England

***MØLKW**	**A**	**133,320**	**296**	**202**
*MØYWA	"	33,152	137	112

European Russia

District 6

***R7RBE**	**3.5**	**236,848**	**296**	**226**

Fed. Rep. of Germany

DL3SWR	**3.5**	**1,136,640**	**742**	**444**
DK5PH	A	359,682	424	302
***DG2BPW**	**A**	**1,242**	**25**	**23**
*DL5PF	A	792	25	22

France

***F4IQX**	**A**	**11,700**	**83**	**75**

Hungary

***HA3MGA**	**A**	**32,522**	**116**	**101**
*HA1NR	"	19,313	98	89

Italy

IV3IPA	**A**	**7,943**	**50**	**47**
***IW1CHX**	**A**	**24,564**	**113**	**92**

Netherlands

***PD5MF**	**A**	**23,859**	**111**	**99**

Norway

***LB6VI**	**A**	**222,976**	**381**	**256**

Serbia

***YU3ABC**	**A**	**35,612**	**139**	**116**
*YU3MPN	"	30,397	149	113
*YT3AWR	"	19,980	101	90
*YU3ARP	"	6,048	56	54

Slovenia

***S51I**	**A**	**330,820**	**360**	**278**
*S57ZM	"	93,170	197	154

Spain

EA2ESB	**A**	**1,514,625**	**937**	**525**
***EA4HKF**	**A**	**187,306**	**335**	**238**
*EA2EVC	7	3,224	27	26

Sweden

SM6M	**A**	**25,116**	**100**	**91**

OCEANIA

Indonesia

***YD1EQX**	**21**	**138,690**	**263**	**201**
*YD3GIF	A	96,150	235	150
*YD8MUZ	7	45,318	133	91
*YDØBCG	21	13,651	79	65
*YD9BIJ	A	7,224	65	43
*YD2UFR	"	5,538	54	39
*YD6HRI	"	2,772	40	28
*YG1AFR	7	918	24	17
*YG1AMJ	"	64	4	4
*YG1BAX	21	60	10	10
*YG1AJD	"	35	7	7
*YG1AFJ	"	16	4	4
*YG1AJC	21	84	8	7

CLASSIC

NORTH AMERICA

United States

District 1

NG1M	**A**	**1,530,650**	**1103**	**506**
***AF1R**	**A**	**274,833**	**428**	**261**
*W1DYJ	"	187,644	347	228
*KE1DX	"	31,680	129	110
*WB1AEL	"	20,256	100	96
*KC1RLS	7	17,596	103	83

District 2

KU2M	**A**	**2,390,312**	**1374**	**585**
K2XA	"	1,893,712	1220	568
NS2N	"	379,312	507	302
***NA2NY**	**A**	**163,268**	**387**	**238**
*K2TW	3.5	54,784	186	128
*KM2O	A	49,149	156	127
*AC2RL	"	10,812	71	68
*WB2KWC	"	10,692	85	66

District 3

W3LL	**3.5**	**293,056**	**387**	**241**
AK3B	A	264,322	454	283
N3FM	"	45,630	157	117
***N3OJU**	**A**	**13,366**	**98**	**82**
*AJ3DI	"	12,728	97	86
*N8URE	14	9,296	93	79

District 4

N4ZZ	**A**	**1,467,432**	**1213**	**534**
NY2DX	"	818,840	973	440
				(OP: W4CU)
WF4W	"	676,746	736	393
K4RO	"	620,919	703	377
N4CW	"	585,237	572	373
K4WW	"	370,240	534	320
W3SA	"	320,160	498	290
W3DQS	"	229,120	403	256
W4OX	"	194,820	363	255
KF4FC	"	125,255	247	205
ND4G	"	74,412	187	159
K4NWX	"	62,181	194	147
N3PV	"	37,147	146	121
NK4I	7	15,750	98	75
***AC4G**	**A**	**451,906**	**604**	**338**
*WA3LXD	"	411,939	537	297
*KTØR	"	290,160	510	260
				(OP: KEØL)
*K4MIL	7	185,982	176	134
*W4PJW	A	167,134	359	214
*N3CKI	"	94,977	273	173
*K4DR	"	80,676	256	166
*KT6D	"	18,881	84	79
*W9LN	"	56	8	8

District 5

K5WE	**A**	**728,112**	**901**	**394**

W5TN	"	32,725	172	119
***WQ5L**	**A**	**366,582**	**543**	**321**
*K5IFA	"	13,056	94	68
*KB5DJX	"	722	20	19
		District 6		
AJ6V	**A**	**1,045,170**	**1189**	**441**
NN6DX	"	222,816	444	264
				(OP: W1PR)
NF6A	"	121,352	267	154
				(OP: K6XX)
K6YK	"	87,084	288	177
W6TK	"	48,077	177	131
***KF6RY**	**A**	**128,132**	**460**	**206**
				(OP: W6ZL)
*K6TLH	"	67,473	266	147
*KC9EI	"	29,700	170	110
*NG6O	7	27,648	106	96
				(OP: K6GHA)
*WZ6ZZ	3.5	24,638	41	33
*K6KM	28	4,224	51	48
*AG6AG	A	3,960	52	44
		District 7		
KU1CW	**A**	**1,850,275**	**1372**	**554**
K7JQ	"	285,936	588	276
W7BP	*"*	*67,338*	*282*	*174*
WU6W	"	51,972	208	142
***KJ9C**	**A**	**148,887**	**444**	**213**
*K7AZT	"	64,676	265	148
*KX7L	"	32,956	168	107
*W8MYL	"	22,632	190	123
*W7MTL	"	19,040	124	85
*WN7Y	"	2,790	48	45
		District 8		
KI6DY	**A**	**1,593,394**	**1162**	**517**
WA8Y	"	541,680	776	370
***WA8MCD**	**A**	**484,692**	**676**	**338**
*AA8OY	"	374,035	539	313
*WB8JUI	"	344,784	558	264
*K3JT	"	332,920	515	290
*K8AJS	"	95,725	239	175
*WA8YZB	"	41,952	213	138
*AA8SW	"	36,840	155	120
*N8FYL	"	4,940	59	52
*KT8X	"	1,860	30	30
*WB8JAY	28	888	27	24
		District 9		
WI9WI	**A**	**703,010**	**958**	**385**
W9PA	"	179,304	344	241
***KB9YOJ**	**A**	**365,371**	**575**	**293**
*W9TD	"	187,456	475	232
*W9AKS	7	63,732	198	141
*N9KT	A	48,972	187	132
*N9TNT	"	35,934	149	113
*KB9S	"	21,100	138	100
*AA9WP	"	17,088	116	89
*AF9FA	"	735	36	35
		District Ø		
N7WY	**A**	**1,286,256**	**1274**	**508**
NØTA	"	478,458	871	342
NØVT	7	95,142	230	157
KØHB	A	42,000	180	120
WAØTXJ	"	14,688	131	96
***WDØT**	**A**	**565,211**	**1038**	**317**
*KØRJK	"	2,173	48	41
*WAØMN	A	38,608	195	127
				(OP: NØUR)
		Alaska		
NL7S	**A**	**105**	**7**	**7**
		Canada		
		District 2		
VE2EZD	**A**	**194,682**	**323**	**213**
***VE2OWL**	**A**	**53,325**	**155**	**135**
*VE2ZWA	"	24,479	106	91
		District 3		
VE3KI	**A**	**1,810,230**	**1072**	**498**
VE3GYL	"	1,096,464	835	431
VA3WW	7	48,510	124	91
***VA3PC**	**A**	**299,584**	**400**	**248**
*VA3RSA	"	99,532	222	149
*VE3KJQ	A	50,050	174	110
		District 5		
VE5CPU	**A**	**583,656**	**816**	**332**
***VE5SF**	**A**	**302,915**	**514**	**235**
		District 6		
***VA6RCN**	**A**	**115,940**	**300**	**155**
		District 7		
VA7XH	**A**	**301,600**	**493**	**260**
VA7MAY	"	181,636	328	182
		Cuba		
***CO8NMN**	**A**	**530,400**	**728**	**341**
*CO2XK	21	261,025	520	265
		Martinique		
***FM/VE3DZ**	**A**	**320,840**	**378**	**260**
		Mexico		
***XE1YD**	**A**	**38,720**	**177**	**110**
		Puerto Rico		
KP4/K6DTT	**A**	**2,259,766**	**1252**	**571**

AFRICA

		Canary Islands		
EA8DO	**A**	**4,235,958**	**1611**	**654**
**EA8BQM*	*A*	*102,000*	*155*	*125*
***EA8TR**	**28**	**95,927**	**219**	**157**
		Ceuta & Melilla		
***EA9ACD**	**21**	**178,972**	**301**	**202**
		Zimbabwe		
**Z22O*	*28*	*30,705*	*119*	*89*
				(OP: DL7BO)

ASIA

		Asiatic Russia		
		District 9		
UA8J	**7**	**262,880**	**251**	**212**
***RZ9AD**	**21**	**506,726**	**529**	**341**
*R9RA	A	27,876	104	92
*RC9T	14	14,892	76	73
		District Ø		
RDØA	**A**	**1,639,764**	**1081**	**482**
RWØSR	"	289,940	411	266
UAØSU	7	68,432	121	104
***RAØWHE**	**A**	**185,954**	**325**	**218**
*RØUT	"	148,596	304	203
*RCØAJ	14	5,625	49	45
		Asiatic Turkey		
***TA2FT**	**7**	**169,950**	**194**	**165**
*TA7AO	14	6,240	55	48
		China		
***BG8DIV**	**A**	**142,129**	**288**	**169**
*BD4SDO	21	56,070	186	126
*BD4RHV	"	39,188	141	93
*BI4VIP	28	18,673	31	22
*BG8PM	"	5,969	27	24
*BA4VE	A	784	19	16
		India		
VU2DED	**A**	**445,300**	**448**	**292**
		Israel		
***4X1AJ**	**28**	**3,640**	**37**	**35**
		Japan		
		District 1		
JH1CTV	**A**	**165,020**	**279**	**185**
JA1OVD	"	122,411	220	167
JA1XRA	"	106,876	216	154
JA1QOW	"	94,446	215	159
JF1UOW	"	39,895	131	101
JA1FNO	28	14,775	81	75
***JA1MZM**	**A**	**420,980**	**525**	**310**
*JM1NKT	"	351,862	444	287
*JS1KKY	"	106,920	207	162
*JA1ATM	"	38,306	136	107
*JI1BBN	21	24,208	107	89
*JA2JNC/1	14	14,271	89	71
*JA1GZK	A	11,132	57	46
*JG1TGQ	"	1,725	27	25
*JE1GZB	14	207	10	9
*JF1WCK	"	3	1	1
		District 3		
JR3RIU	**A**	**113,736**	**250**	**168**
JP3UBR	"	11,151	64	59
JA3VOV	14	6,930	63	55
JK3NSD	A	2,808	26	26
***JR3GPP**	**21**	**12,480**	**51**	**47**
		District 4		
JM4WUZ	**A**	**32,292**	**117**	**92**
***JH4UTP**	**A**	**437,166**	**511**	**298**
*JH4FUF	21	7,124	54	51
		District 5		
***JA5CBU**	**21**	**216**	**10**	**9**
		District 6		
JA6BZI	**A**	**496,112**	**471**	**307**
***JH6TNH**	**A**	**1,034**	**23**	**22**
		District 7		
JH7QXJ	**A**	**785,150**	**704**	**384**
JG7AMD	"	519,480	494	333
***JA7MWC**	**A**	**29,133**	**121**	**83**
		District Ø		
***JHØDUG**	**14**	**1,254**	**28**	**22**
*JIØWVQ	"	3	1	1
		Lebanon		
***OD5ZF**	**7**	**211,548**	**210**	**183**

EUROPE

		Austria		
***OE2E**	**A**	**1,430,620**	**837**	**466**
				(OP: OE2GEN)
*OE3MCS	14	3,612	43	42
		Belarus		
EW4A	**3.5**	**519,110**	**453**	**305**
EU1ST	A	198,008	297	212
		Belgium		
***ON4CT**	**A**	**510,260**	**438**	**310**
*ON4CBA	7	181,984	231	188
		Bosnia-Herzegovina		
***E74SL**	**7**	**69,688**	**142**	**124**
		Bulgaria		
LZ1ZJ	**A**	**1,237,613**	**880**	**481**
***LZ3QE**	**A**	**1,122,735**	**891**	**445**
*LZ1MC	"	31,416	100	84
		Croatia		
***9A1CFR**	**21**	**195,409**	**314**	**263**
				(OP: 9A2NO)
		Czech Republic		
OK1XC	**28**	**16,401**	**84**	**77**
***OK1PMA**	**A**	**482,678**	**488**	**322**
*OK1MGA	"	118,816	269	188
*OK1BJ	"	61,899	173	141
*OK1AUO	21	57,378	170	146
*OK1DAR	A	44,940	135	107
*OK7N	"	24,696	96	84
		Denmark		
OZ11A	**A**	**1,620,038**	**1063**	**542**
OZ1LFI	"	198,810	327	235
		England		
GX5EA	**A**	**362,558**	**390**	**266**
				(OP: M1DDD)
MØNPK	"	18,009	80	69
***GØFGI**	**A**	**592,950**	**545**	**354**
*MØTQR	"	225,600	343	240
*M5W	7	199,980	247	202
*M1VPN	A	190,092	296	219
*G4DDL	"	117,936	235	182
*G4TSH	"	63,074	145	122
*GØMTN	"	32,864	120	104
*G5C	"	21,658	107	91
				(OP: G4OGB)
*G1VDP	21	11,418	76	66
*GØSBN	14	5,635	57	49
*M4C	"	3,569	44	43
				(OP: GØFCT)
		European Russia		
		District 1		
***UA1COA**	**14**	**103,873**	**247**	**209**
		District 3		
R5DT	**A**	**393,442**	**459**	**314**
***R3AQ**	**A**	**559,874**	**514**	**406**
*RA3RLJ	"	6,670	62	58
		District 4		
***RG4A**	**A**	**1,439,478**	**1092**	**513**
*R4WZ	"	4,182	45	41
		District 6		
UA6CE	**A**	**1,876,997**	**1054**	**673**
***RA6LIS**	**14**	**273,126**	**472**	**294**
*RO7C	21	272,246	471	283
				(OP: R6CC)
*R6KEE	"	31,239	114	105
*R7KO	7	124,780	195	170
		District 9		
***R9FE**	**A**	**602,006**	**713**	**369**
*R9FCY	"	70,560	190	147
		European Turkey		
***TA1SOR**	**A**	**245,160**	**367**	**239**
		Fed. Rep. of Germany		
DAØBCC	**A**	**1,720,020**	**1017**	**526**
				(OP: DL6MHW)
DF8QB	"	1,308,791	863	474
DK1FW	"	507,236	493	346
DL4AMK	"	330,615	414	285
DL4ABR	"	62,064	160	144
***DM3M**	**A**	**913,230**	**715**	**417**
				(OP: DM3XRF)
*DG2BWG	"	340,554	540	329
*DL2IAN	"	117,208	261	184
*DG3BZ	"	109,375	237	175
*DF1DX	"	106,134	187	147
*DR1E	"	65,688	162	136
				(OP: DB1WA)
*DL7ØWOB	"	65,016	149	126
				(OP: DM6EE)
*DJ6MK	"	42,837	134	109
*DB5ØAFZ	14	41,616	157	136
				(OP: DL3CQ)
*DM2DLG	A	36,685	138	115
*DL1EJD	"	33,100	118	100
*DL8ZAJ	"	30,048	109	96
*DL3AS	"	17,860	86	76
**DL8MRE*	*"*	*16,717*	*89*	*73*
*DK9BM	"	6,204	52	47
*DO7ES	"	3,404	38	37
*DL2AK	21	1,296	26	24
*DL2AMT	A	56,070	152	126
*DJ3HW	14	34,181	147	133
*DF5GO	A	16	8	8
		Finland		
***OH1NOA**	**A**	**464,100**	**492**	**325**
		France		
***F5RD**	**A**	**436,800**	**468**	**300**

*F5MMB	"	20,910	96	85
*F6APU	7	13,440	59	56
*F6IRG	28	12,210	72	66
Greece				
SV3FUP	**14**	**282,289**	**521**	**376**
***SV8DCY**	**A**	**740,411**	**738**	**361**
*SV3SKM	21	265,880	436	289
*SV7QNV	A	256,256	375	263
*SV7CUD	"	89,076	194	156
*SV1CDN	7	21,888	81	76
Guernsey				
***GUØSUP**	**A**	**602,316**	**495**	**396**
Ireland				
***EI2INB**	**A**	**42,240**	**126**	**110**
Italy				
I5MXX	**A**	**2,532,703**	**1443**	**679**
IC8SQS	"	1,475,906	1338	595
IZ2FOS	"	1,424,800	909	520
IZ2BVC	"	1,164,834	865	407
IZ1PKV	14	823,770	741	486
IK2SND	A	607,824	585	378
I1NVU	"	407,721	427	311
IZ7XUQ	7	207,834	236	201
IZ4UFB	A	109,890	246	185
IZ1PLH	"	97,524	212	172
IWØHLZ	"	86,944	227	176
IK2AHB	"	79,048	189	164
IV3ARJ	"	62,560	165	136
IK1DFH	*"*	*42,784*	*124*	*112*
IW3SSD	"	15,750	77	63
***I3PXN**	**7**	**1,068,450**	**640**	**419**
*IW1PNJ	"	975,000	614	390
*IKØREP	"	804,180	513	390
*IU4JJP	A	558,971	511	329
*IQ8XS	21	438,948	494	356
				(OP: IZ8GNR)
*IU4HMY	A	353,976	415	294
*IK7DXP	"	292,125	419	285
*IU3OAR	7	235,752	278	228
*IKØTUM	3.5	183,876	252	199
*IW3RCK	7	170,912	238	196
*IZ8FPK	A	142,450	242	185
*IW2NKY	"	86,372	206	151
*IZ1JJF	7	65,772	138	126
*IU1LAR	A	63,797	174	131
*IZ3XNJ	"	61,662	159	129
*IK8TEM	"	57,868	180	148
*I5OYY	"	57,400	160	140
*IK8ARF	"	57,086	178	146
*IZØGMS	"	49,714	148	134
*I2XYI	"	35,722	127	106
*IK2REA	"	25,839	98	87
*IZ1KHS	"	25,696	100	88
*IK1TTD	"	25,632	106	96
*IZ3ZOO	"	4,968	39	36
*I3WBD	"	4,455	46	45
*IU7IWT	7	2,028	26	26
*IZ2ABZ	A	874	19	19
*IKØBDO	7	9,520	61	56
Kaliningrad				
***UD2F**	**3.5**	**197,950**	**104**	**96**
Latvia				
***YL2NK**	**A**	**229,595**	**337**	**235**
*YL2LW	21	3,744	42	38
Lithuania				
***LY7W**	**A**	**493,108**	**486**	**308**
				(OP: LY2NZ)
Netherlands				
***PA3BUD**	**A**	**124,916**	**239**	**187**
*PE1OYB	14	77,686	220	179
*PA6ML	A	55	5	5
				(OP: PE1MR)
North Macedonia				
***Z36W**	**A**	**988,972**	**795**	**447**
*Z36N	"	181,412	274	209
*Z33YL	"	111,300	240	175
*Z35Z	3.5	86,180	167	139
Northern Ireland				
***GI4H**	**A**	**292,670**	**339**	**259**
				(OP: GI4JTF)
*MIØH	"	234,234	312	231
				(OP: MIØKOA)
Norway				
***LC7N**	**A**	**1,038,334**	**825**	**433**
				(OP: LA5LJA)
*LB2WG	"	335,795	426	281
Poland				
SP9DTE	**A**	**548,260**	**597**	**372**
SO5E	3.5	278,631	211	178
***SP2EWQ**	**A**	**1,238,094**	**785**	**481**
*SP5CGN	"	217,375	340	235
*SP1DOZ	"	189,056	283	224
*SP8CGU	14	167,486	319	253
*SP2BAS	A	146,160	231	180
*SP9GMI	"	134,266	237	187
*SP2TQQ	"	117,860	224	166
*SP6DMI	14	93,702	232	194
*SP1DMD	A	81,600	188	150
*SQ9PPT	3.5	35,908	101	94
*3Z1P	A	25,245	99	99
*SP8LBK	"	17,871	73	69
*SP9KAG	7	159,048	223	188
				(OP: SP9CXN)
*SP4NKJ	21	34,980	149	110
Portugal				
CT7AIX	**28**	**13,440**	**75**	**64**
Romania				
YO9RIJ	**3.5**	**60,452**	**135**	**119**
***YO7LYM**	**A**	**119,579**	**225**	**197**
*YO5AXF	21	34,730	138	115
*YO3JW	3.5	25,004	28	28
*YO2GL	A	13,300	73	70
*YO3CEN	"	11,330	65	55
Sicily				
IT9QGH	**A**	**604,915**	**574**	**359**
***IT9VCE**	**14**	**205,288**	**389**	**268**
*IT9ATF	21	197,104	333	254
*IW9BJP	A	8,100	57	50
*IT9ORA	"	7,670	68	59
*IW9GRL	21	3,880	41	40
Slovenia				
S52X	**3.5**	**1,925,616**	**1002**	**559**
Spain				
EA7KI	**21**	**444,264**	**560**	**346**
EF1C	14	147,616	346	224
				(OP: EC1RS)
***EC7R**	**21**	**922,041**	**821**	**477**
*EB4GOO	A	574,668	535	313
*EA3AQ	"	268,570	342	251
*EB3TR	21	66,834	185	158
*EA5HYJ	A	62,928	187	144
*EA2BNU	14	57,350	167	155
*EA4FIT	A	21,606	90	78
*EF4A	"	11,252	61	58
*EA3EZD	21	4,635	55	45
*EA7FDO	A	4,187	58	53
*EA1IQT	"	4,068	38	36
*EE2A	A	20,992	100	82
				(OP: EA2SN)
Sweden				
SC7DX	**A**	**15,895**	**87**	**85**
				(OP: SM7GIB)
***SM5S**	**A**	**223,236**	**305**	**212**
				(OP: SM5SIC)
*7S9A	28	297	11	11
Ukraine				
UT3N	**7**	**384,720**	**379**	**280**
				(OP: UT3NK)
***UT3SO**	**A**	**559,240**	**561**	**328**
*UX1BZ	"	441,561	474	309
*US7UK	"	263,142	313	297
*UR7HCX	21	174,636	378	231
*UW7CN	A	748	19	17
*UT7AA	21	12,160	88	76
*UV3RT	14	6,612	58	57
Vienna Intl. Ctr.				
***4U1A**	**A**	**861,931**	**614**	**413**
				(OP: HB9RB)
Wales				
GW5NF	**A**	**939,560**	**703**	**415**

OCEANIA

Australia

***VK4ZP**	**A**	**43,623**	**139**	**111**
*VJ3O	14	14,688	79	72
				(OP: VK3TX)
*VK3IU	A	4,370	39	38
*VK3P	"	3,276	41	39
Hawaii				
WH7T	**A**	**495,396**	**507**	**278**
Indonesia				
YB2MM	**A**	**454,080**	**495**	**320**
YB2HAF	21	104,075	229	181
YB7MYS	A	32,469	130	79
YB8UTI	7	28,762	105	73
***YB1RKT**	**A**	**323,640**	**384**	**261**
*YB1AYO	"	212,180	310	206
*YBØNSI	14	86,184	209	171
*YB1IUQ	A	77,190	249	167
*YC2XCD	21	53,950	175	130
*YB8CMT	A	33,120	122	92
*YB3BGM	21	30,652	116	97
*YB8JEC	"	29,700	141	90
*YB7GRN	A	16,380	101	70
*YBØBAC	"	5,964	43	42
*YB3ATK	"	4,865	54	35
*YD1LYG	"	1,950	47	25
*YD2NIR	7	648	25	18
*YB2CTE	7	4,134	71	39
*YB6UAF	A	44	5	4
Philippines				
DV3A	**A**	**501,390**	**580**	**270**
				(OP: DU3TW)
***4I1BNC**	**A**	**20,377**	**119**	**71**
*DV9IHK	28	4,200	51	40
Samoa				
***5W1SA**	**28**	**81,153**	**159**	**104**

SOUTH AMERICA

Argentina

LT9H	**21**	**229,653**	**352**	**237**
				(OP: LU3HY)
L2ØX	"	2,016	41	34
*LT6M	A	824,538	878	448
				(OP: LU8MHL)
***L77D**	**28**	**46,056**	**139**	**114**
				(OP: LU6DC)
*LT5A	"	364	14	13
Brazil				
PY5ZHP	**A**	**577,642**	**602**	**338**
***PY2KO**	**21**	**127,161**	**251**	**199**
*PY2DPM	28	42,705	54	49
*PY2OSD	A	21,093	110	89
*PY6TS	14	16,116	94	79
*PU2YMH	21	10,080	76	72
*PY2GTA	"	3,500	36	35
Chile				
***XQ3SK**	**21**	**167,000**	**303**	**200**
*CB3R	14	9,918	62	58
				(OP: XQ3SK)
Paraguay				
***ZP6/N3BNA**	**A**	**320,040**	**448**	**254**

TRIBANDER / WIRES

North America

United States

District 1

AE1P	**A**	**1,854,657**	**1324**	**567**
KA1YQC	"	655,361	748	373
W1HS	"	571,786	651	367
W1TO	"	60,702	160	134
***N1EN**	**A**	**365,862**	**504**	**281**
*N1DID	"	259,200	448	270
*AB1J	21	236,504	408	296
*N1IBM	A	215,824	306	287
*K1RO	"	40,430	149	130
*W1RPG	"	15,323	101	77

District 2

KE2D	**A**	**1,445,940**	**976**	**522**
WX2NJ	"	1,083,780	870	486
				(OP: K2RET)
NN2NN	"	898,650	899	450
W2JV	"	496,551	581	367
AB2E	"	5,060	56	46
***WB2JVO**	**A**	**704,946**	**803**	**363**
				(OP: K2AL)
*W2NO	"	544,440	532	390
*KC2WUF	"	486,239	662	331
*KW2O	"	476,790	504	345
				(OP: KA2D)
*W2VTV	7	256,486	361	257
*KS2G	A	85,340	250	170
*WB2NVR	"	33,638	152	121
*KB2URI	"	15,170	82	74

District 3

N3QE	**A**	**3,631,232**	**1742**	**704**
NF3R	"	2,870,072	1590	712
WA3AAN	"	501,248	561	352
K3MD	"	202,426	373	266
W2CDO	"	177,160	289	206
K1RZ	"	148,608	277	192
AA3S	"	25,662	107	91
K3AU	"	22,000	88	80
N3MWQ	21	14,760	91	82
***AC5XK**	**A**	**395,281**	**570**	**311**
*K3QP	"	207,378	397	246
*KC2VON	"	70,532	208	154
*W3IDT	"	41,088	170	128
*AJ3M	"	3,116	46	41

District 4

K9OM	**7**	**1,610,840**	**842**	**523**
W4GE	A	1,406,224	1114	491
NR4O	"	1,297,789	1128	463
W1AJT	"	1,202,698	766	542
NN4NN	"	1,115,500	1077	485
				(OP: K3SV)
AB4SF	"	829,440	719	405
W5MX	"	691,875	787	375
N4IQ	"	661,044	854	372
AA8R	"	595,197	678	369
KN4BIT	"	230,892	513	271
K3DNE	"	202,864	402	248
***K4GM**	**A**	**427,347**	**558**	**309**
*N5SMQ	"	266,640	441	264
*W4LC	14	190,680	375	280
*K4FTO	A	176,054	356	226
*KA4JRY	"	69,044	232	164
*NX3A	"	63,921	157	149
*W4ER	A	24,503	130	107

District 5

AD5XD	**A**	**1,426,852**	**1370**	**524**
***NN5T**	**A**	**400,959**	**657**	**299**
*K5QR	21	203,225	385	275
*KD2KW	A	104,144	332	184
*WA5LFD	"	28,919	156	121
*AF5CC	21	2,331	42	37

District 6

WE6Z	**A**	**677,430**	**882**	**390**
W6SX	"	656,270	991	365
K6TQ	"	585,858	986	377

WX6V	"	364,156	563	298
K6NV	"	203,840	465	224
K8TR	"	2,728	49	44
***K6EI**	**A**	**336,540**	**490**	**316**
*KE6GLA	"	103,664	284	176
*WM6Y	28	34,710	135	86
*AB1U	7	3,420	31	30
				(OP: W6RKC)
*N6BHX	3.5	1,457	15	14
		District 7		
KO7SS	**A**	**2,191,131**	**1460**	**639**
WA7AN	"	862,245	1108	405
				(OP: K9DR)
WC7Q	"	571,436	932	383
W7FN	"	281,952	461	288
K7VIT	"	161,557	382	209
W7PP	"	112,728	253	183
NO7R	"	58,806	243	162
				(OP: AA7V)
K9RZ	"	43,434	173	127
***N7DB**	**A**	**67,459**	**288**	**161**
*KB7AK	"	27,454	153	106
*KC7CM	7	4,160	43	40
		District 8		
K8YE	**14**	**415,276**	**561**	**394**
KX8AA	A	374,220	602	315
				(OP: K2CUB)
***AD8IG**	**A**	**844,886**	**1041**	**406**
*K7DR	"	81,472	225	152
*W8OX	21	51,471	98	92
*KG9Z	28	200	10	10
		District 9		
W9ILY	**21**	**762,375**	**696**	**475**
W9PDS	A	278,196	500	291
KBØV	"	175,244	338	227
K9WO	"	36,850	138	110
***ND9G**	**A**	**794,880**	**980**	**414**
*K9CW	"	447,888	624	336
*N9UA	"	401,436	616	324
*KI9A	"	160,560	378	223
		District Ø		
NØKQ	**A**	**242,469**	**676**	**261**
NØBUI	"	165,880	438	232
KØFJ	"	70,065	318	173
W5AP	"	48,580	244	140
***KZØUS**	**A**	**412,347**	**631**	**327**
				(OP: W7RY)
*KØKX	"	235,276	425	262
*KØJJR	"	205,573	421	241
*NWØM	"	60,760	249	155
*WØDC	"	35,369	172	113
*KJØP	"	14,062	105	79
*KF6YU	"	13,770	120	85
		Alaska		
N6QEK/KL7	**A**	**50,307**	**181**	**123**
		Belize		
***V31MA**	**A**	**1,437,648**	**1083**	**488**
		Canada		
		District 1		
***VA1XH**	**A**	**998,002**	**747**	**394**
*VY2LI	"	449,121	466	283
		District 2		
VE2GT	**A**	**18**	**3**	**3**
***VE2BVV**	**A**	**1,015,904**	**776**	**424**
		District 3		
VE3EY	**A**	**2,399,085**	**1277**	**585**
VE3TW	"	508,599	572	299
***VE3MGY**	**A**	**1,159,614**	**960**	**414**
*VE3TM	"	518,612	572	317
*VE3LVW	"	282,506	384	238
*VE3MCF	"	5,900	59	50
		District 7		
VE7LWW	**A**	**324,024**	**532**	**276**
VE7DX	"	156,107	372	203
***VA7RY**	**A**	**208,848**	**392**	**229**
*VE7AB	"	14,707	92	77
		Mexico		
***6D5C**	**7**	**53,340**	**134**	**105**
				(OP: XE1H)
		Panama		
***HP3SS**	**A**	**15,840**	**94**	**80**
		Puerto Rico		
***NP4TX**	**A**	**1,038,597**	**780**	**411**
*KP4JFR	"	43,125	145	115
*WP4WW	21	4,429	45	43
				(OP: KP4JRS)

AFRICA

Canary Islands

***EA8CNR**	**21**	**27,600**	**104**	**91**

ASIA

Asiatic Russia

		District 9		
RO9A	**A**	**1,594,596**	**997**	**498**
RL9LR	"	1,267,452	890	436
***RA9AFZ**	**14**	**18,480**	**87**	**80**
*UA9OV	A	2,688	30	28
		District Ø		
UCØA	**A**	**1,633,715**	**1023**	**551**
RAØFLP	"	874,368	864	368
RAØAM	"	58,674	172	127
		Asiatic Turkey		
***TA7I**	**A**	**2,324,426**	**1135**	**529**
*TA4RC	"	14,616	77	72
		India		
VU2IBI	**A**	**96,596**	**204**	**164**
		Israel		
***4Z5MY**	**21**	**23,585**	**74**	**68**
		Japan		
		District 1		
7K4VPV	**A**	**250,390**	**355**	**245**
JG1LHB	"	170,755	287	185
JR1NHD	21	149,449	281	199
JH1HIC	A	70,320	167	120
JJ1XBQ	"	61,642	168	119
***7N2UQC**	**A**	**413,325**	**507**	**275**
*JG1XIO	"	139,840	269	184
*JH1BHW	"	131,763	274	167
*JF1WNT	"	129,696	248	168
*JK1JAS	"	82,800	196	138
*JO1EEQ	7	128	8	8
		District 2		
JF2FIU	**A**	**155,185**	**308**	**205**
JR2BCF	"	17,633	79	77
***JE2BOM**	**A**	**115,784**	**228**	**164**
*JA2FXV	"	72,240	179	129
		District 3		
JA3HBF	**A**	**296,920**	**408**	**260**
JM3UGA	"	96,869	196	157
***JH3WKE**	**A**	**102,663**	**215**	**153**
*JA3MIB	"	8,496	66	59
		District 4		
***JE4MHL**	**A**	**269,240**	**377**	**254**
*JA4RMX	"	30,906	109	102
		District 6		
JE6QQN	**A**	**145,119**	**248**	**183**
***JK6JAB**	**A**	**1,065**	**15**	**15**
		District 7		
JO7KMB	**A**	**112,412**	**196**	**157**
		District 8		
***JM8FEI**	**A**	**98,685**	**243**	**153**
*JK8PBO	"	37,408	141	112
*JE8KKX	21	352	11	11
		District 9		
JA9CWJ	**A**	**302,974**	**399**	**266**
JH9CEN	"	11,600	66	58
		District Ø		
***JJØPJD**	**A**	**211,560**	**320**	**205**
*JHØMUC/Ø	"	8,154	63	54
		Kazakhstan		
***UN4PG**	**21**	**334,712**	**417**	**301**
		United Arab Emirates		
A65DR	**3.5**	**571,956**	**207**	**180**
				(OP: G7SLP)

EUROPE

Austria

***OE4EIE**	**A**	**431,648**	**431**	**328**
		Belarus		
EU8U	**A**	**1,196,616**	**892**	**438**
***EW7B**	**A**	**1,422,520**	**941**	**488**
*EU4T	"	281,058	392	278
*EW8G	A	65,664	167	128
		Belgium		
***ON5GQ**	**A**	**1,561,958**	**997**	**521**
		Bosnia-Herzegovina		
***E77D**	**A**	**186,048**	**286**	**204**
		Bulgaria		
LZ6DX	**A**	**820,454**	**742**	**409**
***LZ1ZM**	**A**	**36,855**	**116**	**105**
		Croatia		
***9A7V**	**A**	**685,785**	**551**	**349**
		Czech Republic		
***OK4GP**	**A**	**1,646,204**	**839**	**518**
*OK2RU	7	1,252,710	674	449
*OK2PF	A	293,120	380	256
		Denmark		
***OZ1AOO**	**A**	**163,200**	**259**	**200**
		England		
G1N	**7**	**1,384,944**	**749**	**473**
				(OP: GØURR)
MØUNI	"	338,778	324	261
***G4N**	**7**	**1,065,064**	**640**	**418**
				(OP: G4ZVB)
*M3AWD	A	473,583	515	339
*2EØCVN	21	288,015	177	146
*GØVSS	A	71,168	177	139
*G4NXG/M	28	663	18	17
		Estonia		
ES4RD	**A**	**890,330**	**732**	**395**
		European Russia		
		District 1		
***RD1T**	**A**	**1,078**	**22**	**22**
		District 3		
R3TE	**14**	**347,282**	**508**	**361**
RA3TT	A	166,208	299	224
R3LC	21	161,590	316	226
***R5ACQ**	**A**	**421,440**	**508**	**320**
*R2AL	21	365,085	549	315
*R3VL	A	276,149	413	271
*UC5D	"	178,688	327	256
*R3DCB	"	169,947	308	207
*RZ3Z	14	16,289	96	91
*R3IBT	14	11,023	77	73
		District 4		
***RU4PH**	**A**	**236,439**	**379**	**243**
*UA4FX	"	182,952	348	252
*RU4SO	21	68,103	208	157
		District 6		
UC6N	**14**	**397,705**	**537**	**385**
***R7MM**	**A**	**1,418,844**	**984**	**532**
*RT6N	"	168,642	332	243
		Fed. Rep. of Germany		
DP8M	**A**	**3,345,590**	**1394**	**730**
				(OP: DL6NDW)
DK8ZZ	"	3,174,138	1313	759
DL1NEO	"	2,392,407	1055	723
DFØKU	"	2,035,764	1078	586
				(OP: DJ3NG)
DJ8EW	"	1,023,327	686	453
DL4ME	"	883,652	683	418
DQ9Y	"	667,408	542	404
				(OP: DF2SD)
DK3RA	"	640,662	576	374
DK2AT	"	207,200	320	224
DL1DTL	21	178,782	314	249
DK1AX	A	153,786	268	213
DL6DH	3.5	69,420	144	130
DRØY	7	47,952	117	108
				(OP: DJ6JH)
DC2VE	A	21,567	104	91
DF6RI	"	8,162	57	53
***DO4OD**	**A**	**1,048,452**	**731**	**492**
*DA3T	"	726,624	574	432
				(OP: DL8DXL)
*DK5DQ	"	644,280	516	364
*DHØHAN	"	456,536	504	298
*DL3RAR	"	439,593	384	363
*DF2F	"	307,530	382	255
				(OP: DF2SD)
*DHØGDS	"	304,028	396	263
*DF4ZL	"	290,408	360	248
*DL3FCG	"	270,976	326	232
*DB7QJ	7	224,082	297	211
*DL8ARJ	A	104,319	215	173
*DP5P	"	99,528	185	143
				(OP: DL1MHJ)
*DC8SG	"	90,275	196	157
*DL3SYA	"	62,400	166	130
*DK1LRS	"	45,430	140	118
*DK3WW	"	32,190	123	111
*DF1LX	"	26,144	97	86
*DK7ZT	21	11,736	72	72
*DF6YC	A	3,895	44	41
*DL5CV	A	45,890	147	130
*DG3T	"	34,800	105	100
				(OP: DF5RF)
		Finland		
***OH7L**	**A**	**1,050,105**	**740**	**511**
				(OP: OH8TV)
*OG95AA	"	690,506	628	391
				(OP: OH8KVY)
*OH2LZI	"	331,476	451	276
*OH2LU	"	242,840	350	260
		France		
F4AIF	**A**	**1,657,656**	**976**	**552**
***TM7Y**	**A**	**2,684,982**	**1183**	**677**
*F4CVO	"	449,208	442	306
*F4GDI	"	98,808	204	184
		Greece		
SV3EXU	**21**	**330,330**	**103**	**87**
SV1ELI	A	327,500	447	262
SV2ESW	21	304,308	436	321
		Hungary		
***HA3OU**	**A**	**323,901**	**374**	**261**
*HA1WD	7	33,294	96	93
*HAØGK	14	44,485	183	155
		Ireland		
***EI3CTB**	**28**	**30,225**	**18**	**15**
		Italy		
IX1CLD	**A**	**1,929,368**	**1051**	**524**
IK5FKF	"	626,850	585	398
I2DJX	"	597,094	544	361
IZ3SQW	3.5	260,380	293	235
I2WIJ	A	247,203	312	227
IZ2GNQ	3.5	166,870	239	185

IKØXBX	"	121,072	203	161
IK2XYI	A	75,048	200	159
IU4CSS	21	31,790	128	110
I7CSB	A	31,296	111	96
IK2IKW	"	29,500	109	100
IV3ZNK	14	21,432	104	94
IW3QRM	28	12,261	76	67
IZ4DZD	14	7,581	59	57
IK2QIN	A	3,003	37	33
***IK2BUF**	**A**	**1,203,600**	**841**	**472**
*II2V	7	1,176,480	671	456
			(OP: IW2MXY)	
*IW1CBG	A	775,786	628	394
*IW1RLC	"	706,192	605	368
*IV3BCA	"	485,085	473	365
*IK4QJF	"	373,200	431	300
*IWØGYC	"	249,335	321	235
*IZ8EFD	14	237,349	398	287
*IZ8CLM	A	169,420	253	197
*IK2OVT	"	138,400	254	200
*IK2AUK	"	81,885	208	159
*IKØALT	"	74,690	175	154
*IK2YSJ	"	68,036	182	146
*IKØPEA	"	63,840	151	133
*IZ5HQB	"	52,959	169	139
*IZ8BGY	21	47,838	171	134
*IK4MTF	A	18,564	95	84
*IKØNOJ	"	15,247	87	79
*IK2TDM	"	10,034	65	58
*IK7NXU	7	9,646	58	53
*IW2JRV	A	1,200	21	20
*IU5BON	7	392	14	14
*IZ8JFL	A	955,239	677	447
*IZ2QKG	"	20,444	92	76
		Lithuania		
***LY2TS**	**A**	**738,606**	**618**	**361**
		Luxembourg		
LX1ER	**A**	**1,313,671**	**843**	**467**
LX1HD	7	749,064	541	354
***LX5IGRY**	**A**	**173,314**	**248**	**193**
				(OP: LX1ER)
		Netherlands		
***PG7M**	**A**	**1,111,038**	**693**	**498**
*PD3EM	"	170,144	297	208
*PE2K	A	68,098	189	158
		North Macedonia		
Z35T	**21**	**1,472,445**	**1003**	**585**
***Z33F**	**14**	**503,052**	**595**	**412**
*Z39A	7	437,580	362	286
		Northern Ireland		
***MIØI**	**A**	**59,361**	**172**	**141**
		Poland		
SP8K	**14**	**874,650**	**770**	**490**
SN4X	7	338,140	311	264
			(OP: SP5OXJ)	
SP2QCW	A	208,619	296	229
***SP5DL**	**3.5**	**189,312**	**244**	204
*SP3CCT	A	73,710	201	162
*SP7Y	"	50,224	169	146
*SP9IVD	"	31,842	105	87
*SP9CTS	"	23,200	90	80
*SP9KJU	3.5	8,372	48	46
			(OP: SP9MDY)	
*SN3ØWOSP	A	235,940	370	235
			(OP: SP2UUU)	
*SP3EMA	3.5	87,870	160	145
*SP3ZHP	28	3	1	1
		Portugal		
***CR5O**	**A**	**2,356,466**	**1431**	**599**
				(OP: CT7AJL)
*CS2F	"	154,093	280	223
				(OP: CT1FOQ)
		Romania		
YO4NF	**A**	**2,642,850**	**1285**	**630**
***YO4DG**	**A**	**169,882**	**266**	**202**
*YO4RST	"	56,170	163	137
*YO2DFA	"	27,846	102	91
		Serbia		
YT8A	**28**	**36,288**	**131**	**112**
				(OP: YU1EA)
***YT2U**	**A**	**1,050,420**	**747**	**427**
*YTØX	"	450,561	415	303
*YT1BX	14	122,202	286	219
		Sicily		
IT9SSI	**21**	**240,090**	**173**	**138**
		Slovak Republic		
***OM5KM**	**A**	**528,984**	**493**	**316**
		Slovenia		
S52WW	**A**	**1,035,902**	**779**	**427**
S51JQ	"	377,114	492	314
***S57AM**	**A**	**1,122,216**	**790**	**456**
*S52W	"	288,769	327	229
*S57SWR	"	185,523	290	201
*S54X	"	54,752	134	116
		Spain		
EA1B	**14**	**1,293,216**	**991**	**608**
EA4FME	A	439,520	486	335
ED4T	"	146,985	255	205
				(OP: EA4R)
EA1DA	"	38,626	108	89
EA5TS	14	1,860	31	30
***EF7N**	**A**	**2,743,104**	**1374**	**624**
				(OP: EA7KHB)
*EA4BAS	"	1,376,949	934	493
*EA7EQ	"	421,515	482	323
*EA2CCG	"	341,817	451	287
*EA4DB	14	149,308	311	229
*EA7KFX	A	130,326	267	203
*EE3Z	28	39,672	139	116
				(OP: EA3NO)
*EA4U	A	5,304	41	39
		Sweden		
SM6MVE	**A**	**297,330**	**383**	**255**
SK6KU	14	129,600	292	216
				(OP: SM6VVT)
SD1A	A	18,320	95	80
				(OP: SM1TDE)
***SE6K**	**A**	**451,705**	**495**	**305**
				(OP: SM6FZO)
SE6J	*"	*146,496*	*225*	*192*
				(OP: SM6XHM)
*SM6NET	"	95,654	204	169
SFØA	*"	*47,190*	*160*	*143*
				(OP: SMØLPO)
*SMØDSF	"	13,080	63	60
		Switzerland		
HB9DQL	**A**	**138,736**	**255**	**184**
		Ukraine		
UZ1WW	**7**	**2,304,562**	**936**	**587**
UY5HF	A	609,220	611	415
UT2AU	3.5	231,168	295	224
UR4EI	A	48,312	147	122
***UT4LW**	**A**	**2,926,236**	**1694**	**636**
*UX1VT	"	2,132,043	1115	569
*UT5EPP	"	1,531,930	1141	499
*UX7QV	"	1,104,255	877	477
*UZ2HZ	3.5	804,518	557	377
*UR7CB	A	705,726	659	378
*UR7EC	"	152,663	242	193
*UT7MR	"	100,625	250	161
*UT8AS	"	59,930	171	130
*UX3IW	28	26,030	116	95
*UR5XMM	A	19,314	95	87
*US5EEK	14	12,384	58	58
*UT1IM	A	43,845	129	111
		Wales		
GWØA	**A**	**1,116,950**	**808**	**445**
				(OP: GW4SKA)
***MW9W**	**A**	**1,260,093**	**844**	**447**
				(OP: GWØKRL)

OCEANIA

Australia

VJ5W	**A**	**804,384**	**632**	**378**
		Hawaii		
***KH6CJJ**	**A**	**921,740**	**839**	**340**
*KH6AQ	"	55,952	176	104
		Indonesia		
YB4FIK	**A**	**202,350**	**354**	**190**
***YB9ELS**	**A**	**184,210**	**339**	**218**
*YB9UA	"	78,498	248	147
*YB2MDU	"	26,712	115	84
*YB2ECG	7	17,784	93	57
*YDØRFS	A	1,472	34	23
*YB2NDX	A	14,807	99	67
*YB2ERL	"	312	14	12
		New Zealand		
***ZL3VZ**	**A**	**119,822**	**229**	**181**
		Philippines		
***4F3BZ**	**28**	**119,790**	**252**	**165**

SOUTH AMERICA

Argentina

LU1BJW	**A**	**276,934**	**400**	**262**
***LU3DX**	**A**	**10,980**	**77**	**60**
		Brazil		
PY3LX	**A**	**156,208**	**294**	**208**
***PP5DZ**	**A**	**595,700**	**619**	**350**
*PT2AW	"	34,117	131	109
*PY4LH	28	21,150	105	75
*PY2XC	21	15,318	82	74
*PT8DX	"	12,730	74	67
*ZV2F	A	6,996	73	53
			(OP: PY2SFA)	
*PU7ASP	"	4,257	45	43
*PY2OF	"	216	9	9
		Chile		
***CE3BN**	**14**	**53,431**	**163**	**119**
		Venezuela		
***4M1W**	**28**	**317,592**	**435**	**263**
*YV5KAJ	14	212,382	335	243

YOUTH

ASIA

Asiatic Russia

District 9

RA9Y	**14**	**1,234,791**	**870**	**551**
				(OP: R9YCY)
		Asiatic Turkey		
***TC7YOTA**	**28**	**47,478**	**80**	**65**
				(OP: TA7MNA)

Japan

Distgrict 7

***JQ7AXT**	**A**	**9,800**	**61**	**49**

EUROPE

Austria

***OE9SEV**	**A**	**519,560**	**491**	**310**
		Croatia		
9A2ZI	**A**	**872,364**	**568**	**417**
***9A3LET**	**A**	**408,778**	**444**	**313**
		Fed. Rep. of Germany		
DM7XX	**A**	**3,208,205**	**1331**	**715**
***DJ4MX**	**A**	**36,960**	**107**	**96**
		Ireland		
***EI8KW**	**A**	**148,782**	**274**	**181**
		Poland		
SO9I	**A**	**3,532,232**	**1421**	**712**
				(OP: SQ9ORQ)
***SP3KX**	**A**	**545,616**	**525**	**324**
*SP8BRT	7	97,280	169	152
		Serbia		
YTØC	**A**	**1,885,970**	**1099**	**565**

OCEANIA

Indonesia

***YD2UWF**	**28**	**132,111**	**59**	**54**
*YC1LJT	21	87,363	217	153

MULTI-OPERATOR
SINGLE TRANSMITTER HIGH POWER

NORTH AMERICA

United States

District 1

NC1CC	**1,179,500**	**919**	**500**

District 4

AA5AU	**4,981,536**	**2182**	**784**

District 5

NK5P	**3,152,349**	**1942**	**681**

District 6

NW6P	**241,109**	**554**	**253**

District 7

KC7V	**2,911,006**	**2155**	**617**
WW7E	1,150,552	1251	481

District 9

KS9R	**2,824,260**	**1809**	**618**

District Ø

AK9D	**249,378**	**732**	**267**

Canada

District 3

VE3KTB	**693,875**	**675**	**325**

ASIA

China

BH2SWB	**194,192**	**321**	**212**

EUROPE

Czech Republic

OK1KSL	**3,924,346**	**1637**	**727**
OL1C	1,870,858	1075	554

England

G2L	**1,672,560**	**1044**	**552**

European Russia

District 3

RK3DXW	**352,070**	**477**	**323**

Fed. Rep. of Germany

DKØ5ØBN	**6,049,110**	**2104**	**870**
DR5N	6,048,240	2031	870
DP6A	5,156,672	1831	818
DR4W	2,339,208	1196	636
DL73AFUG	1,273,192	886	488
DJ5LA	856,536	657	401
DQ9M	437,540	468	334
DKØIU	201,690	322	249
DR2R	78,067	197	151

Finland

OG66X	**5,391,934**	**2116**	**893**
OG7ØAD	972,334	759	458

France

F6KNB	**6,166,611**	**2045**	**891**

F8KCF	4,775,760	1760	810
TM1D	1,101,711	890	507
	Greece		
J42L	**7,509,124**	**2349**	**932**
SZ1A	7,285,500	2419	900
	Italy		
IQ3PN	**361,907**	**441**	**287**
	Norway		
LA1K	**343,200**	**412**	**264**
	Romania		
YO3GNF	**496,731**	**543**	**313**
	Serbia		
YU5R	**6,736,620**	**2149**	**885**
	Slovak Republic		
OM5M	**2,560,140**	**1198**	**660**
	Sweden		
SD3T	**664,170**	**676**	**390**
	Switzerland		
HB9EP	**32,034**	**138**	**114**
	Ukraine		
UT4UWJ	**134,600**	**288**	**200**
UR4NWW	41,256	126	108
UT7AXA	4,160	33	32

OCEANIA

	Australia		
VL3V	**1,441,237**	**850**	**469**
VK2W	25,543	116	89
	Indonesia		
7AØC	**357,864**	**483**	**248**
	New Zealand		
ZM4T	**2,983,680**	**1272**	**592**

SOUTH AMERICA

	Uruguay		
CX5A	**1,156,305**	**971**	**491**

MULTI-OPERATOR SINGLE TRANSMITTER LOW POWER

NORTH AMERICA

	United States		
	District 2		
***NY6DX**	**2,092,678**	**1272**	**679**
	District 3		
***ND3D**	**2,501,324**	**1363**	**628**
	District 9		
***KK9V**	**76,304**	**214**	**152**
*W9JWC	37,450	140	107
	District Ø		
***AGØMN**	**208,800**	**526**	**240**
	Mexico		
***4A9ØNLE**	**140,544**	**298**	**183**
	Puerto Rico		
***WP3C**	**5,777,270**	**2411**	**790**

ASIA

	China		
***BH2RO**	**407,256**	**542**	**284**
	Japan		
	District 2		
***JK2VOC**	**76,152**	**211**	**152**
	West Malaysia		
***9M2S**	**192**	**6**	**6**

EUROPE

	Bosnia-Herzegovina		
***E71FDE**	**119,756**	**232**	**182**
	Croatia		
***9A7B**	**317,072**	**385**	**266**
	Czech Republic		
***OL1Z**	**1,644,577**	**982**	**517**
*OK1RPL	206,298	319	219
	Estonia		
***ES7A**	**1,304,226**	**916**	**462**
	European Russia		
	District 4		
***RN4SW**	**1,849,637**	**1224**	**587**
	European Turkey		
***YM1KE**	**88,871**	**269**	**181**
	Fed. Rep. of Germany		
***DQ4W**	**2,592,990**	**1300**	**613**
*DLØUM	124,600	245	178
	France		
***TM69R**	**177,336**	**294**	**216**
	Hungary		
***HA3KHB**	**370,146**	**403**	**294**
	Lithuania		
***LY2J**	**2,550,925**	**1258**	**611**
	Poland		
***SN8Z**	**1,620,057**	**1039**	**489**
*SP3KRE	50,600	140	115
*SP5KCR	34,080	141	120
*SP9ZPS	25,750	151	125
	Republic of Kosovo		
***Z66BCC**	**2,758,896**	**1343**	**588**
	Romania		
***YO4KAK**	**1,173**	**23**	**23**
	Sicily		
***IT9MBZ**	**6,644,810**	**2087**	**985**
	Slovak Republic		
***OM3KSI**	**1,056,006**	**772**	**406**
	Slovenia		
***S57ZT**	**1,504,568**	**963**	**442**
	Spain		
***EC7MA**	**3,118,878**	**1610**	**666**
*ED3D	1,333,956	976	503
	Sweden		
***SB7A**	**1,006,911**	**794**	**401**
	Ukraine		
***UZ5P**	**387,000**	**469**	**300**

OCEANIA

	Indonesia		
***YB9DE**	**650,880**	**583**	**320**
*7C9R	170,340	329	204

SOUTH AMERICA

	Brazil		
***PS2R**	**27,016**	**111**	**88**
	Chile		
****CE3PCG**	**99**	**9**	**9**

MULTI-OPERATOR TWO TRANSMITTER

NORTH AMERICA

	United States		
K9CT	**9,309,960**	**3655**	**990**
WV4P	**9,112,950**	**3525**	**990**
NCØDX	**4,019,157**	**2620**	**723**
KT7E	**3,897,560**	**2653**	**701**
WT3K	**3,111,098**	**1650**	**722**
WN7M	2,447,290	1998	635
KE1S	**2,445,870**	**1355**	**613**
K3CCR	1,319,432	896	524
AA1SE	1,068,032	1042	448
WU5K	**225,680**	**527**	**280**
W1FM	133,056	333	198

AFRICA

CR3DX	**25,331,940**	**5786**	**1140**

ASIA

C4I	**4,646,016**	**1721**	**654**
JA6ZPR	**942,837**	**767**	**417**

EUROPE

ED1R	**14,812,860**	**4184**	**1084**
UW5Y	**8,004,036**	**2750**	**939**
C37N	**6,233,720**	**2359**	**808**
EI1E	**3,437,440**	**1711**	**656**
DM5B	**3,062,698**	**1512**	**641**
***ES5G**	**2,770,005**	**1494**	**651**
***OK5SWL**	**352**	**16**	**16**

OCEANIA

7E3E	**3,094**	**37**	**34**

MULTI-OPERATOR MULTI-TRANSMITTER

United States

NW8S	**4,382,904**	**2306**	**744**
N1RR	**2,777,934**	**1618**	**642**
W3GH	**804,300**	**911**	**420**

EUROPE

9A1A	**21,386,341**	**5030**	**1217**
LN8W	**10,456,536**	**3174**	**997**

SOUTH AMERICA

LO5D	**1,699,965**	**1117**	**555**

MULTI-OPERATOR MULTI-DISTRIBUTED

NORTH AMERICA

	United States		
NA5NN	**3,824,434**	**2449**	**722**
KZ1W	**2,853,136**	**2285**	**688**

CANADA

VX2X	**4,900,245**	**2297**	**735**

EUROPE

SX2I	**11,902,215**	**3638**	**1005**
IQ3ME	**7,758,630**	**2602**	**922**
EH2VE	**5,054,981**	**2203**	**751**
IQ4RN	3,190,261	1479	667
IQ1NO	2,317,014	1265	639

CHECK LOGS

9A3GX, AB5XM, AB9YC, AC2OC, BH4SCF, DD7CW, DF4WC, DJ2YA, DKØPO, DLØDRG, DL3BXX, DL3FBB, DL3NSM, DL3XM, DL4VBU, DL5BAW, DL6BAD, DL6NDW, DL6UAA, DL7VEE, DL9GCG, DM2GG, E77AR, E7C, EA3CS, EA5HJO, EA7I, EA7ZC, EB1IC, EC1DD, ED2C, EIØW, EU6O, F4VSQ, GØJSP, G5ADY, GMØKWW, HK4NDF, HK4ZZ, I1HNU, I1WUA, IIØWRTC, II1WRTC, II2WRTC, II3WRTC, II5WRTC, II6WRTC, II7WRTC, II8WRTC, IKØFUX, IK2SBB, IK2XSL, IQ8SN, IU1JRN, IU3GJD, IU6PMT, IV3HAX, IZ2DLV, IZ3QFG, IZ5FSA, JA1CHY, JA2YKA, JF1UOX, JG3OML, JH1WOY, JN1RVS, JQ1PCT, JS1IFK, K4HMB, K4SHW, KC3SMW, KD9DJB, KX4OY, LU5MT, LY2BAA, LY6A, LZ1JZ, LZ1YF, LZ7AA, N4JAW, N7MU, NG1I, OH8JJ, OK2AK, OK2AP, OK2BHD, OK2SG, OK2WMC, OK4MM, OM3RM, OM3ZAH, OM5CD, OM5CM, OP4A, OZ6TL, PA3EVY, PA3I, PC4L, PR7KSA, PU1SSH, PU2TRH, PU5WMA, PY1XA, PY3AV, RA3YDA, RA9DZ, RK4NB, RW3RN, S21VU, S59T, SM6BZV, SN4A, SP1O, SP2MKT, SP2PIK, SP3JIA, SP5GDY, SP6M, SP9GKJ, SP9IHP, SP9KAO, SQ1BVG, SQ4NR, SV1ELF, SV1PMQ, SV3DCX, SV3QUP, SV4FFL, SV7BVM, SV9COL, TF3VS, UA6JQ, UI4F, UW5RG, VO1BQ, W6SKD, YB1DBU, YB1GIP, YB1RYJ, YCØSJA, YC1RIK, YC2MPF, YC7WHE, YC8MGN, YD1FRU, YG1AJF, YG9EDE, YU1NR, YU1RH, Z32U.

Looking Ahead

Here are some of the articles we're working on for upcoming issues of *CQ*:

- Results: 2022 CQWW 160-Meter Contest
- USA Foxhunting Championship Report
- 800-MHz QRP – Work the World from Anywhere

Plus…

- A Shocking Experience
- Korean War MARS Operations
- A Simple RF Radiation Detector

Upcoming Special Issues

October: Emergency Communications
December: Technology
February: QRP

Do you have a hobby radio story to tell? Something for one of our specials? *CQ* now covers the entire radio hobby. See our writers' guidelines on the CQ website at :

<http://bit.ly/2qBFOdU>.

ADVERTISERS' INDEX

JULY 2022

Advertiser	Page	Phone	Website
100 Watts & A Wire	78		www.100WATTSANDAWIRE.COM
Advanced Specialties Inc.	75	201-VHF-2067	www.advancedspecialties.net
AirBoss, Olah Technologies LLC	85	336-457-7783	www.olahtechnologies.com
Amateur Radio Roundtable	85	901-570-2188	www.W5KUB.com
Bioenno Power	63	888-336-7864	www.bioennopower.com
Buckmaster International LLC	93	540-894-0907	www.HamCall.net
Buddipole Antennas	69	503-591-8001	www.buddipole.com
CE-Multiphase.com	31		www.Jancarolpublishing.com
CQ Mechandise	87,Cov III	516-681-2922	http://store.cq-amateur-radio.com
CW	85	561-302-7731	www.success-is-easy.com
Communications Concepts, Inc.	39	937-426-8600	www.communication-concepts.com
Electric Radio Magazine	63	720-924-0171	www.ermag.com
HamTestOnline	93	888-857-6164	www.hamtestonline.com
Icom America Inc.	Cov IV		www.icomamerica.com
Impulse Electronics	85	866-747-5277	www.impulseelectronics.com
International DX Association	31		www.indexa.org
Monitor Sensors	63		www.monitorsensors.com/ham/swronly
Ni4L Antennas	75	828-738-6445	www.ni4l.com
Nuts and Volts	60	800-783-4624	www.nutsvolts.com
PreciseRF	45	503-915-2490	www.preciserf.com
PreppComm	63		www.PreppComm.com
QCWA	93	352-425-1097	www.qcwa.org
RF Parts	61	800-921-4834	www.rfparts.com
RT Systems	7,53	800-921-4834	www.rtsystemsinc.com
Radio Amateur Club of JHS 22	37	516-674-4072	www.wb2jkj.org
REACT Int'l	78	301-316-2900	www.REACTintl.org
Shortwave Propagation Book	92	516-681-2922	http://store.cq-amateur-radio.com
SteppIR	Cov II	425-453-1910	www.steppir.com
W2IHY Technologies	39	845-889-4253	www.w2ihy.com
W5SWL	29		www.W5SWL.com
W7DXX Remote	85		www.w7dxx.com
YLRL	92		www.ylrl.org

Let CQ help you get the most for your advertising dollar!
Contact Dottie K, CQ's Advertising Director
at 516-681-2922 x 106 or via email at ads@cq-amateur-radio.com

hamshop

Advertising Rates: Non-commercial ads are 20 cents per word including abbreviations and addresses. Commercial and organization ads are $1.00 per word. Boldface words are $1.50 each (specify which words). Minimum charge $2.00. No ad will be printed unless accompanied by full remittance. All ads must be typewritten double-spaced.
Closing Date: The 10th day in the third month preceding date of publication (example: Jan. 10th for the March issue). Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of *CQ* cannot vouch for the merchandise listed therein. The publisher reserves the right to reject any advertisement. Direct all correspondence and ad copy to: CQ Ham Shop, P.O. Box 1206, Sayville, NY, 11782 (e-mail: <hamshop@cq-amateur-radio.com>).

RF Connectors & Gadgets
Parts — Products — More
www.W5SWL.com

FLASH CARDS for all FCC Exams, Amateur and Commercial. VIS Study Guides <www.visradio.com> 800-655-HAMS and on Amazon Marketplace.

WWW.CABLEHELP.COM 160M antennas for small spaces. (662) 332-8454.

For Sale: HF RADIO ICOM IC-78 TRANSCEIVER. New, unused, perfect condition. Includes power supply. Make offer. chuck_kaptain@wycliffe.org

WANNA START A RAG-CHEW WITH THE GENERAL PUBLIC ABOUT THE VALUE OF AMATEUR RADIO? Introduce them to Harold, a ham who is trying to keep his day job post-Pandemic, and his wife, Sabrina, who is hoping to keep her yarn shop alive. SIDEWALK SALE ACROSS AMERICA, available Amazon Kindle, paperback. Peg Nichols, KD0VQO@arrl.net.

FOR SALE Rare Collins KW-1, serial number 96. Only 150 made and it still works! $16,000 firm. Pictures upon request. Contact Teressa: <Trjtwo@gmail.com> or via telephone 805-878-1691.

Wanted: Original set of knobs for my Heathkit HW-8. Paul, WBØMPG, 538 North Walnut, Wichita, KS 67203. (316) 351-7717.

Wanted: Old slide rules for personal collection. Send info to db_cunningham@hotmail.com

Morse Code on a CD. Just want A to Z and Zero to 9 in code only. Contact Ronald (KD7FWC) (775) 962-5437.

AMECO AC-1 DIY Kits: www.thenewameco.com

Affordable Custom Antenna Design www.ant-build.com

Recognize the signature CW sounds of over 4000 words!
Start to read whole words sent in fast Morse code!
https://www.hearcwwords.com

Yaesu FT-100D (HF-VHF-UHF). Great mobile rig with manual, internal keyer and mike. $300. (281) 934-8783.

Keychain QRP: Worlds Smallest HF Transmitter. Handmade in the USA. <www.bit.ly/KeychainQRP>

GET THE F.C.C. "COMMERCIAL" RADIOTELEPHONE LICENSE! Fast, inexpensive home study course. Command Productions. **www.LicenseTraining.com**. Free info: (800) 932-4268.

NEVER have another fauly patch cable! 15-page, photo-illustrated manual details a revolutionary procedure for assembling failure-proof coaxial cable patches. $10 postpaid U.S., $15 forgeign. R.W. Parker, 1205 Sleepy Hollow Road, Pennsuburg, PA 18073.

CallSign Stuff www.hamQRU.com KTØMMY

WANTED: 500-Kc Ships Transmitter. IE: MACKAY MARINE 2017A. w8wz@aol.com

NO NONSENSE LICENSE STUDY GUIDES: kb6nu.com/cq

Wanted: Channel Master model 110 Quantum Antennas 1 or more in box good condition! W.J. Gibbs, Jr. 601 Howard Street. Columbia, NC 27925

QRP J-36: 1/2-Scale Microkey. Full-Functional "**BUG**" Made in the USA by KA6IRL. <QRPJ36.com>

WANTED: IBM Model M, Space Saving Keyboard, Call KØKG, (218) 850-1500 or email: <keith.gilbertson@q.com>.

AMATEUR RADIO ELECTRONICS: Home Study Software, Apps, and eBooks $2.99. <www.eptsoft.com/HomeStudy

POLYESTER ROPE: excellent for antenna support and guying. Go to **<www.audiotronics.us>**.

REAL HAMS DO CODE: Move up to CW with **CW Mental Block Buster III.** Succeed with hypnosis and NLP. Includes two (2) CDs and Manual. Only $29.95 plus $7.00 s/h US. FL add $2.14 tax. Success Easy, 568 SE Maple Terrace, Port St. Lucie, FL 34983, phone 561-302-7731, <www.success-is-easy.com>.

TWO NEW NOVELS involving ham radio: *Full Circle*, and *Frozen in Time*, by N4XX. Visit <http://www.theodore-cohen-novels.com/>.

QSLing SUPPLIES. e-mail: <plumdx@msn.com>.

CASH FOR COLLINS, HALLICRAFTERS SX-88, & DRAKE TR-6. Buy any Collins equipment. Leo, KJ6HI, phone/fax 310-418-9269, e-mail: <radioleo73@gmail.com>.

MicroLog by WAØH
Easy to use logging program.
Free download . . . www.wa0h.com

www.oldqslcards.com

OVERSEAS AIRMAIL POSTAGE plus complete line of airmail envelopes. Order directly from our website. James E. Mackey, proprietor. website: <www.airmailpostage. com>

TOWER ACCESSORIES Gin Pole Kits – stand off brackets – antenna mounts – vehicle radio mounts – for 30 years. IIX Equipment Ltd., 708-337-8172, <http://www.w9iix.com/>.

HOMEBREW! "Recollections of a Radio Receiver" a 565 page book on HBR homebrew receivers. $10 delivered (eBook on CD-ROM). Details <www.w6hht.com>

DXPEDITION DVD VIDEOS: For full description and how to order . . . <www.k4uee.com/dvd/>.

ARMS – Amateur Radio Missionary Net. Christian Fellowship Net, Everyone Welcome. 14.3075 Daily except Sunday 1500–1700Z, –1 Hr DST. Website: www.qsl.net/arms

VORTEX ANTENNA SYSTEMS specialist in HF and VHF high performance antennas. Yagis and Delta Loops. Linear Loaded 30 and 40m Arrays. OWA Arrays, bespoke individual design solutions. Antenna related hardware. We ship worldwide including North America. <www.vortexantennas.co.uk/>. or by e-mail to <enquiries@vortexantennas.co.uk>.

"World of Keys – Keys III" book features highly detailed views and photos of keys, bugs, and paddles like few people have ever seen ($18)!. Also still available, **"Keys II"** ($16) and **"QRP Romps!"** ($18), plus **"Your Guide to HF Fun"** ($16). Available from dealers nationwide.

PACKET RADIO AND MORE! Join TAPR, connect with the largest amateur radio digital group in the U.S. Creators of the TNC-2 standard, working on Software Defined Radio technology. Benefits: newsletter, software, discounts on kits and publications. For membership prices see the TAPR website: <http://www.tapr.org>).

HONDURAS DX VACATION: K3, Alpha 86, SteppIR, Meals, Private Facilities. HR2J, (206) 259-9688.

HY POWER ANTENNA COMPANY <http://www. freewebs.com/hypower> Multiband dipoles, delta loops, half squares and QRP antennas.

NEW AMATEUR RADIO MAP with DXCC list updates. Full color 22 x 34" – $10. Free shipping on club orders. **http://www.hamradiomap.qth.com/**

Wanna ham in the **CAYMAN ISLANDS**?" Go to <www.martykaiser.com/24a.htm>.

WWW.ISOTRONANTENNAS.COM FOR HF. CHECK IT OUT! Call: 719-687-0650; **<wd0eja@isotronantennas. com>**

RF Connectors & Gadgets
Parts — Products — More
www.W5SWL.com

NEED ROPE? All kinds, types, including: antenna rope, hauling, gin. **FREE**, free consultation, Go to <http://www.davisropeandcable.com/>. Veteran owned, K1PEK, 978-369-1738.

FUTURE TIMES: Dreams and visions of Disasters. Great guide book for Hams. www.xlibris.com/futuretimes.html

HAWAII DX VACATION: SteppIR antennas, amplifiers, private. KH6RC, <www.leilanibedandbreakfast.com>.

HAM TRAVELERS Discount travel, tours, cruises, more. **www.GreatExpectationTravel.com**

www.peidxlodge.com

NEAT STUFF! DWM Communications: <http://qth.com/dwm>

PROMOTIONAL VIDEO: 15-minute DVD describes amateur radio's fun and public service. Details: <www.neoham.org>.

HAM RADIO GIFTS: <www.mainestore.com>

WANTED: OLD QSL CARD COLLECTIONS. Collector seeks US & DX cards. W2VRK, 5 Mohawk Trail, Branchburg, NJ 08876; e-mail: <tpllrs@comcast.net>.

TELEGRAPH KEY INFORMATION AND HISTORY MUSEUM: <http://w1tp.com>

FT243 AND HC6U CRYSTALS: www.af4k.com

OLD QSLs Available. 50's and 60's, DX and USA. Specify call, send SASE. W5SQA@arrl.net

RFI Filters <www.RFchoke.com>

CRANK-A-WATT Power & More via KE5NYS. Visit <www.FactorReady.com>

QRP KITS: <www.breadboardradio.com>

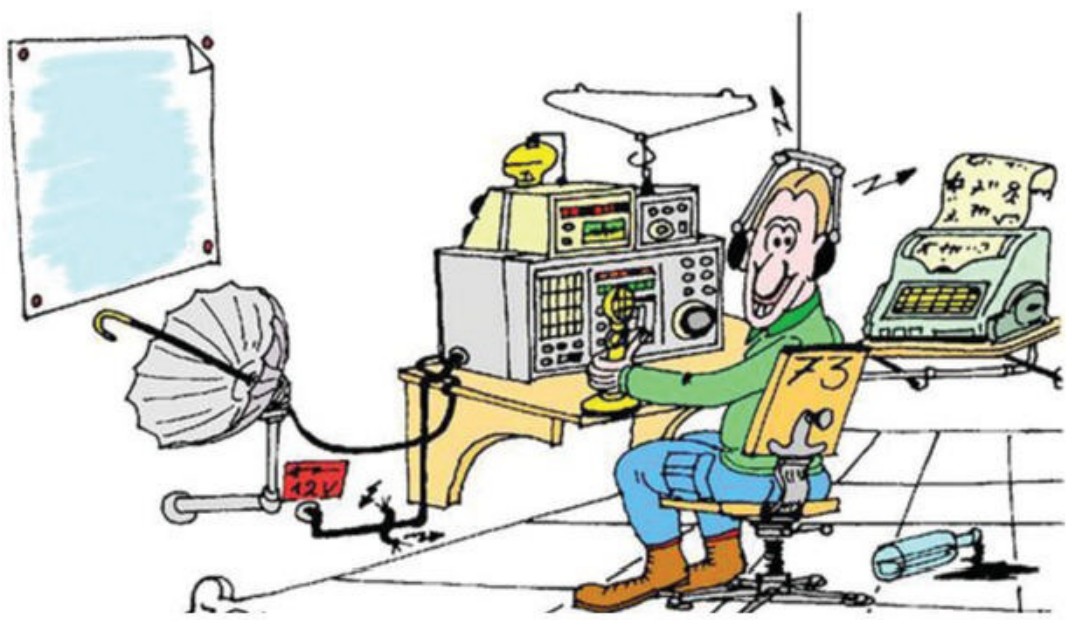
FMTV ARTICLES: Comprehensive transmitter and receiver deviation calibration, standards, intermodulation, power amplifier calculations. WB9OQM, http://mathison.freeshell.org

www.SecondHandRadio.com

HF Mobile or Fixed Virtual X Antenna Patent: For Sale or License. Request Free Power Point Presentation file. Shows design details, pictures, prototype tests. Design applies to a broad frequency range for mant antenna arrays/beams/verticals. <lgslay@sbcglobal.net>. Larry Slay, K5WUL

FOR SALE: Samlex Power Supply Model SEC 1223, 13.8V @ 25 amps. Not working. Includes operating manual and schematic. Price $50 or best offer. Contact Harry, W9HRQ, at <harrygraziano@gmail.com> or phone 1-773-334-4492.

ANTENNA & TOWER HARDWARE: Aluminum plates: Boom to elements, boom to mast, GP/ Vertical antennaground plates, Rohn 25/45 to cross arms plates, Hexabeam / spiderbeam Hubs, Moxon hubs, U bolts with sadles. **All info at: e78WW@yahoo.com or at e-bay store: stores.ebay.com/yz4izØ**



Fun to read, interesting from cover to cover, written so you can understand it. That's CQ. Read and enjoyed by thousands of people each month!

The changes in amateur radio over the years have been astounding. Still some things have remained remarkably the same, namely the type of people who are drawn to the hobby. As a group, hams have a tremendous amount of knowledge on a wide array of topics, an amazing willingness to share that knowledge with each other, and an unwavering commitment to helping neighbors, near or far, in times of need.

So whether you are an old-timer or new to the hobby accept the challenge and read *CQ*. *SUBSCRIBE TODAY!*

Print or Digital...Your Choice

PRINT EDITION ONLY
1yr—12 issues $42.95 2yrs—24 issues $77.95 3yrs—36 issues $111.95

DIGITAL EDITION ONLY
1yr—12 issues $30.00 2yrs—24 issues $57.00 3yrs—36 issues $83.00

COMBO Subscriptions - Get BOTH the PRINT & DIGITAL EDITIONS
1yr—12 issues $61.95 2yrs—24 issues $112.95 3yrs—36 issues $161.95

CQ Communications, Inc.

Phone: 516-681-2922 http://store.cq-amateur-radio.com

Field Day Leaders

Connect with Nature, Connect with Friends

IC-9700
2M / 70cm / 23cm SDR Transceiver

IC-7300
HF / 6M SDR Transceiver

IC-705
Multi-band SDR
Portable Transceiver

IC-7610
HF / 6M SDR Transceiver

IC-R8600
10 kHz – 3 GHz*
Wideband SDR Receiver

www.icomamerica.com/amateur
sales@icomamerica.com

For the love of **ham radio.**

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

ICOM®