Contesters: We've Got Your Number! p. 93

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COMMUNICATIONS & TECHNOLOGY

MARCH 2023

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- **Results, 2022 CQ WW DX RTTY Contest, p. 14**
- **Two Antennas... pgs. 33, 38 ...and Two Tuners, p. 59**

On the Cover: Herb Krumich, K2LNS, of Bear Creek, Pennsylvania (seen here in shadow only) lowers his 20-meter Yagi on a tram line from the 60-foot level of his tower. Details on page 78.

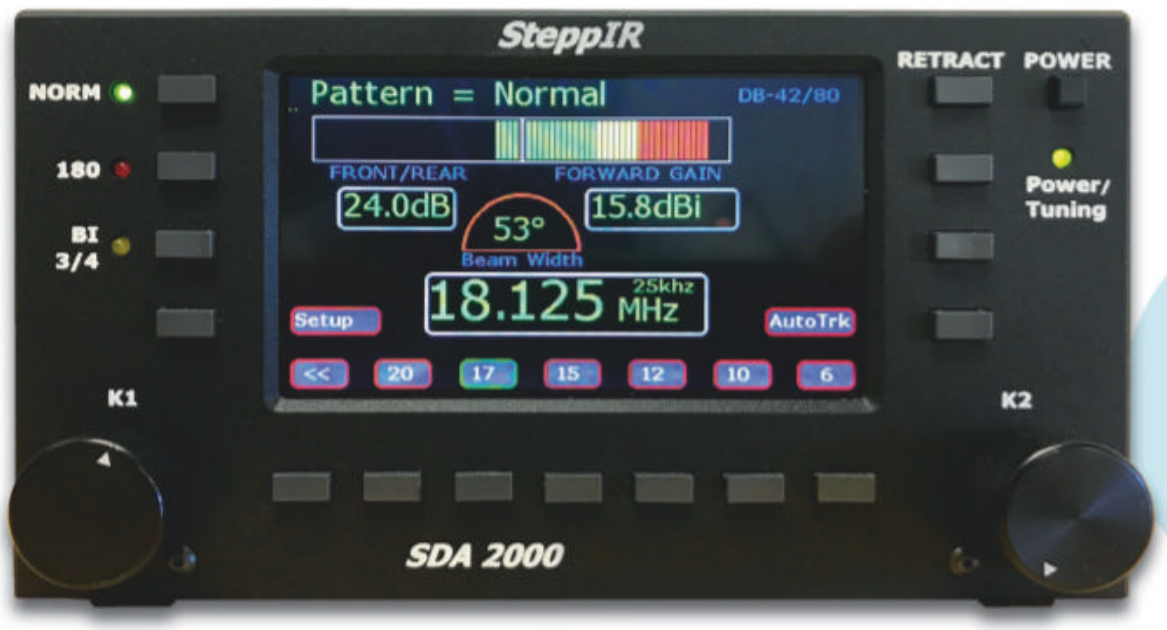
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announcements

MARCH

ROSENBERG, TEXAS — The Brazos Valley Amateur Radio Club will hold the **Greater Houston Hamfest** and **2023 ARRL Texas State Convention** on Friday, March 3 and Saturday, March 4 at the Fort Bend County Fairgrounds, 4310 Texas 36. Phone: (713) 826-6917 or (713) 569-8799. Website: <www.houstonhamfest.org>. Talk-in 146.94 (PL 167.9). VE exams.

TRUSSVILLE, ALABAMA — The Birmingham Amateur Radio Club will hold the **BirmingHAMfest 2023** and **2023 ARRL Alabama Section Convention** from 4-7 p.m., Friday, March 3 and from 8:30 a.m. to 4 p.m., Saturday, March 4 at the Trussville Civic Center, 5381 Trussville-Clay Road. Contact: Rosalind Fazel, KD4ZGO, (205) 853-3220. Email: <rfazel.rf9@gmail.com>. Website: <www.birminghamfest.org>. Talk-in 146.88 (PL 88.5). VE exams.

CAVE CITY, KENTUCKY — The Mammoth Cave Amateur Radio Club will hold the **47th Annual Cave City Hamfest** beginning 7:30 a.m., Saturday March 4 at the Cave City Convention Center, 502 Mammoth Cave Street. Contact: Larry Brumett, KN4IV, (270) 651-2363 or (270) 308-1417 (cell). Email: <lbrumett@glasgow-ky.com>. Website: <http://ky4x.org>. Talk-in 146.35+. VE exams.

CHICOPEE, MASSACHUSSETTS — The Mount Tom Amateur Repeater Association will hold its 34th Annual Amateur Radio & Electronics Hamfest beginning 8:30 a.m., Saturday, March 4 at the Castle of Knights, 1599 Memorial Drive. Contact: Brian Mullarney, N1FI, (860) 478-6790. Email: <n1fi@arrl.net>. Website: <www.mtara.org>. Talk-in 146.94 (PL 127.3). Free VE exams,

DARDANELLE, ARKANSAS — The Arkansas River Valley Amateur Radio Foundation will hold the **Arkansas River Valley Hamfest** beginning 8:30 a.m., Saturday, March 4 at the Dardanelle Community Center, 2059-2099 State Highway 22. Email: <arvhamfest@gmail.com>. Website: <https://tinyurl.com/4pppjp59>. VE exams.

IRVING, TEXAS — The Irving Amateur Radio Club will hold the **Irving Hamfest 2023** from 8 a.m. to 2 p.m., Saturday, March 4 at the Betcha Bingo Hall, 2420 W. Irving Boulevard. Email: <president@irvingarc.org>. Website: <www.irvingarc.org/hamfest>. Talk-in 146.720- (PL 110.9). VE exams.

MCCLELLAND, IOWA — The South West Amateur Radio Club will hold the **SWIARC Hamfest** from 8 a.m. to noon, Saturday, March 4 at 117 Main Street. Email: <hamfest@swiradio.org>. Website: <www.swiradio.org>.

WINDHAM, NEW HAMPSHIRE — The New England Vintage Electronics Club will hold the **New England Vintage Electronics Expo 6** from 8 a.m. to 1 p.m., Sunday, March 5 at the Castleton, 58 Enterprise Drive. Website: <www.nevec.org>.

CONCORD, NORTH CAROLINA — The Mecklenburg Amateur Radio Society will hold the **Charlotte Hamfest** from 3-7 p.m., Friday, March 10 and from 8:30 a.m. to 4 p.m., Saturday, March 11 at the Cabarrus Arena & Events Center-Gold Hall, 4551 Old Airport Road. Phone: (704) 948-7373. Website: <www.charlottehamfest.org>. Talk-in 146.655 or 146.940 (PL 118.8).

ANNANDALE, NEW JERSEY — The Cherryville Repeater Association will hold its **Hamfest and Technology Expo 2023** beginning 8 a.m., Saturday, March 11 at the North Hunterdon Regional High School, 1445 Route 31. Contact Tony Ploski, W2HWW, (908) 256-9568. Email: <aploski@comcast.net> or <w2hww@arrl.net>. Website: <www.w2cra.org>. Talk-in 147.375+ (PL 151.4). VE exams.

BOONVILLE, MISSOURI — The Boonville Amateur Radio Club will hold its Hamfest from 8 a.m. to 1 p.m., Saturday, March 11 at the Zion Lutheran Church, 9171 B Highway. Contact Tom, WAØE, (660) 841-5287 or Dwight, NØQOK, (660) 621-1265. Email: <wa0e@arrl.net> or <dmeyer009@hotmail.com>. Website: <www.w0brc.org>.

GODFREY, ILLINOIS — The Lewis and Clark Radio Club will hold its **2023 Hamfest** from 7 a.m. to noon, Saturday, March 11 at the Lewis & Clark Community College, 5800 Godfrey Road. Email: <hamfest@k9ham.org>. Website: <www.k9ham.org>. Talk-in 145.230- (PL 79.7). VE exams.

KALAMAZOO TOWNSHIP, MICHIGAN — The Southern Michigan Amateur Radio Society will hold the **61st Annual Michigan Crossroads Hamfest & Radio Swap** from 8 a.m. to noon, Saturday, March 11 at the Wings Event Center, 3600 Vanrick Drive. Phone: (269) 815-8007. Email: <smarshamfest@gmail.com>. Website: <www.w8df.com/hamfest>. Talk-in 147.000+ (PL 94.8). VE exams.

PUYALLUP, WASHINGTON — The Mike & Key Amateur Radio Club will hold the **41st Annual Mike and Key Electronics Show & Swap Meet** from 9 a.m. to 3 p.m., Saturday March 11 at the Pavilion Exhibition Hall, Washington State Fairgrounds, 110 9th Avenue SW. Phone: (253) 631-3756. Email: <n7wa@arrl.net>. Website: <www.mikeandkey.org>. Talk-in 146.82- (PL 103.5). VE exams.

RAYNE, LOUISINA — The Acadiana DX Association will hold its **Hamfest & Swapmeet** from 8 a.m. to 2 p.m., Saturday, March 11 at the Rayne Civic Center, 210 Frog Festival Drive. Contact: James Romero, K5CNU, (337) 319-6414. Email: <k5cnu@att.net>. Website: <http://kn5grk.com>. Talk-in 145.410 (PL 123). VE exams.

TULLAHOMA, TENNESSEE — The Middle Tennessee Amateur Radio Society will hold the **MTARS Tullahoma Hamfest** from 8 a.m. to 2 p.m., Saturday, March 11 at the First United Methodist Church, 208 West Lauderdale Street. Contact: Larry Cagle, K4WLO, (251) 680-3250. Email-: <k4wlo@arrl.net>. Website: <www.mtars-ham.org>. Talk-in 146.700- (PL 114.8) or 443.950+ (PL 107.2). VE exams.

ELYRIA, OHIO — The Northern Ohio Amateur Radio Society will hold the **NOARS Winter Hamfest and Computer Show** from 9 a.m. to noon, Sunday, March 12 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: <winterhamfest@noars.net>. Website: <www.noars.net>. Talk-in 146.70- (PL 110.9).

FORT WALTON BEACH, FLORIDA — The Playground Amateur Radio Club will hold its **53rd Annual Hamfest** from 4-7 p.m., Friday, March 17 and from 8 a.m. to 2 p.m., Saturday, March 18

(Continued on page 92)

ham radio news

3Y0J On the Air From Bouvet

As we went to press in mid-February, the 3Y0J DXpedition team had landed on Bouvet Island and gotten several stations on the air. Team co-leader Ken Opskar, LA7GIA, reported to media officer Steve Hass, NA2J, that this is "the most extreme expedition I've been to," adding that "Activating Bouvet is not like activating an island in the Caribbean. It is really windy, cold and exhausting to bring equipment up here." Opskar added that the only way to get on shore was by floating 50 feet from the boat in survival suits while holding onto a line attached to a buoy; and that the equipment had to be floated in as well, then carried 800 feet up to the camp.

Early pileups were intense and Facebook was filled with reports of jamming and other bad on-air behavior making it difficult for hams to even hear the team's 100-watt signals. Bouvet Island is a dot of land in the far southern Atlantic Ocean, roughly halfway between South Africa and Antarctica. It is #2 on the DX most-wanted list (North Korea is #1).

Hams Respond to Turkish Earthquake

Early reports following the massive earthquake that rocked Turkey and Syria in early February indicate that ham radio operators there are actively involved in the emergency response efforts. At this writing, the death toll from the quake exceeded 11,000. According to the ARRL, IARU Region 1 (Europe, the Middle East and Africa) Emergency Communications Coordinator Greg Mosup, G0DUB, and others reported that most amateur communications related to the earthquake response in Turkey were on VHF, but that some Turkish transmissions were also heard on 28.540 MHz. According to the IARU Region 1 website, 3.777 and 7.092 MHz are also designated emergency frequencies in Turkey, and IARU Region 2 (the Americas) Emergency Coordinator CO2JC asked hams in the Americas at the time to protect these frequencies while also keeping an ear on them in case assistance can be provided to hams in Turkey. The ARRL report also noted that there is no information on any possible quake-related amateur communications in Syria, as there are very few hams active in the country at this time.

HRO Closes San Diego Store

Ham Radio Outlet has closed its store in San Diego, California. According to a post on its website, the building's landlord informed the company in late 2022 that its lease would not be renewed. "Since that time," said the announcement, "we have been searching the surrounding area for a new location. However, recent extreme increases in rent and non-business friendly policies by the state, county and city governments have made locating and affording a viable location all but impossible." The San Diego store closed permanently on February 25.

Winter Field Day Heats Up the Airwaves

Another Winter Field Day is in the books, the 16th annual running of the event held on the last weekend in January. The purpose of the activity, according to *Newsline*, is similar to that of ARRL Field Day in June, but with the added challenge of practicing portable emergency communication skills in generally less-friendly winter weather. New for this year were a mobile/stationary mobile entry category and a 100-watt power limit for all participants. In 2022, more than 2500 logs were submitted (including those from home stations contacting portable or mobile stations). As of a week and a half after the 2023 event, more than 1900 logs had been submitted from over 1100 locations, with additional logs being accepted through March 1. For more information, visit the WFD website at <www.winterfieldday.com>.

Youth DX Adventure Heading to Curacao Again

Moving ahead to summer, the Dave Kalter Memorial Youth DX Adventure program will again activate call sign PJ2Y from the Curacao QTH of Geoff Howard, PJ2T, this coming July. Participation is open to licensed hams between the ages of 12 and 17; a parent or guardian must also attend. Most trip-related expenses for participants are paid through donations to the YDXA program. The application deadline is May 1. Additional information and application forms are available at <http://qsl.net/n6jrl>.

DXpedition Boot Camp

Keep your ears open later this month for activity from VK9/Norfolk Island, site of the upcoming DXpedition Boot Camp. According to *Newsline*, budding DXpeditioners will get the opportunity to learn from and operate with more experienced ops from an exotic locale between March 17 and 31. The camp, coordinated by Chris Chapman, VK3QB, plans to have stations on the air from 160 through 6 meters, operating CW, SSB and FT8. There will also be an opportunity for a SOTA (Summits on the Air) activation from nearby Mt. Bates. The camp itself is free, but participants have to pay their own travel and lodging expenses. At press time, there was no word on the call sign(s) to be used. For more information as the time grows closer, visit <http://dxpeditionbootcamp.net>.

Morse Makes a Splash on the BBC

The continued popularity of Morse code among hams was the subject of two different programs recently on two different BBC stations in the United Kingdom. *Newsline* reports that the current affairs program "PM on BBC Radio 4" featured Long Island CW Club co-founder Howard Bernstein, WB2UZE, discussing the ongoing appeal of Morse and his club's instruction programs, which are available for free worldwide.

In addition, Mervyn Foster, G4KLE, a volunteer at the Radio Society of Great Britain's National Radio Centre, spoke with BBC Three Counties Radio morning host Andy Collins about the resurgence of interest in Morse in the UK, both within and beyond amateur radio. At press time, both interviews were available online (but it's uncertain how long they'll remain posted). Howard's is at <https://tinyurl.com/326n479a>, and Mervyn's is at <https://tinyurl.com/h9ny9dsp>.

HAARP Thanks Hams for Help With Asteroid-Bounce Experiment

The University of Alaska Fairbanks's High-Frequency Active Auroral Research Program (HAARP) has thanked amateur radio operators and amateur astronomers for help with its asteroid-bounce experiment in late December. Signals were sent up to an asteroid passing near Earth's orbit.

Over 300 reception reports were submitted to HAARP researchers, according to the ARRL. The goal was not two-way contacts as hams make off the Moon or streaking meteors, but rather efforts to study near-Earth objects and defend our planet from large asteroids with the potential to cause significant damage.

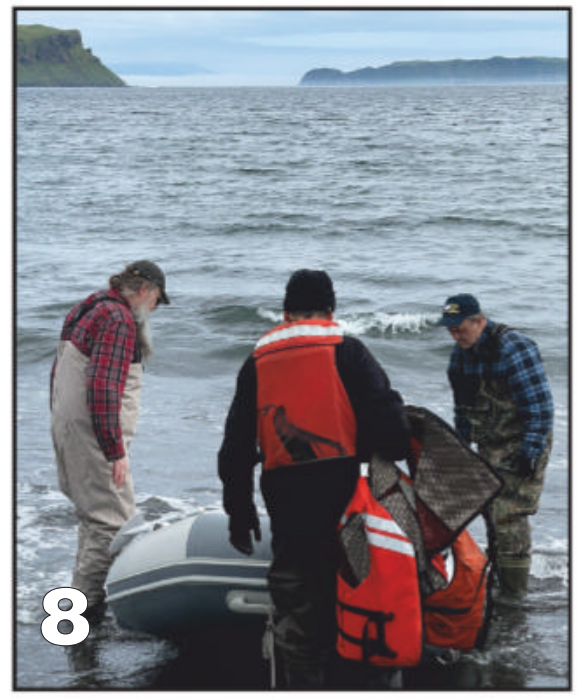
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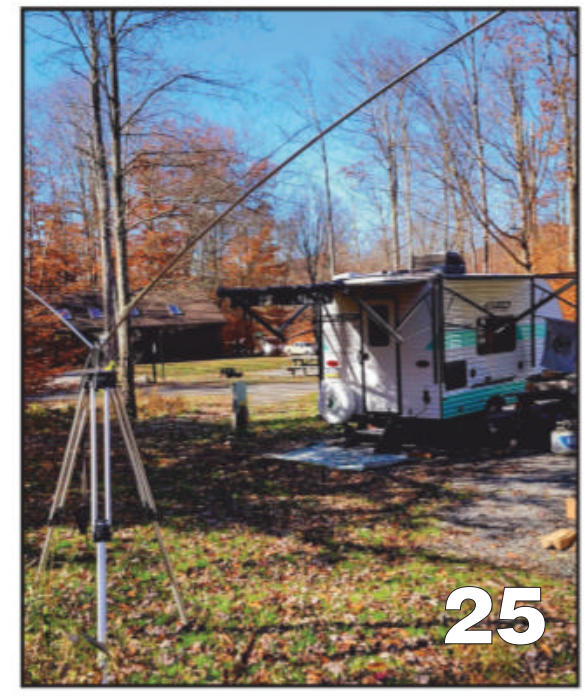
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ON THE COVER

Getting a beam's-eye view! Herb Krumich, K2LNS, of Bear Creek, Pennsylvania, snapped this photo from the 60-foot level of his tower as he lowered his 4-element 20-meter beam on a tram line. Details on page 78. (Cover photo by Herb Krumich, K2LNS)







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zero bias: a cq editorial

BY RICH MOSESON,* W2VU

Beyond the Radio

Recently, I had an experience that reminded me of a "hidden" benefit of ham radio that goes beyond the radio. I was in Florida with my wife and son (who's also a ham) to celebrate my mom's 100th (!) birthday. We didn't have time to do any ham radio stuff but we were able to do some bird- and butterfly-watching at a couple of the state's many nature preserves. My son, among other things, is an excellent wildlife photographer and has a lens on his camera that extends halfway to the moon. While walking through one of the preserves just before sunset, we encountered another photographer with his camera on a tripod and a lens that extended well beyond the moon!

We made our way over to find out what he was looking for and arrived in time to hear him saying something to another visitor about "the antennas on my truck." The other gentleman said he had seen them and asked, "Are you an amateur radio operator?" "Yes," the man with the big lens replied, "I'm (callsign)." "I'm a ham, too," said the second person, and introduced himself as well. After giving them a couple of minutes to tell each other about their ham radio interests, Dan and I decided to join the QSO. "We couldn't help overhearing you talking about amateur radio. We're both hams, too," and introduced ourselves. We all spent the next half hour (as it got progressively darker) talking about ham radio, nature photography, and why the man with the big lens had driven an hour and a half to this particular spot (he was looking for a bobcat mom and her cubs who had been sighted there recently). It turns out that when he isn't looking for bobcats, he's a professor at Florida International University and the faculty sponsor for the National Hurricane Center Amateur Radio Club, WX4HNC (The National Hurricane Center and its ham station are located on the FIU campus, and all clubs need a faculty sponsor). You never know who you're going to meet through ham radio.

Oh, and at my mom's birthday party, while most of the guests were her friends or neighbors, the list also included a ham friend of mine who I first met at age 15 in our high school radio club. We've stayed in touch ever since and make a point of getting together whenever I'm down there visiting my mom.

My main point here is that not all memorable ham radio contacts depend on the ionosphere or repeaters, or even radios. Ham radio brings together people of diverse backgrounds and interests, and even overlapping interests (such as birding and wildlife photography) who might not otherwise meet or get to know each other. And some of the friendships that originate in a ham club or on the air can last a lifetime. It is one of the lesser-appreciated benefits to our hobby. We talk a lot about ham radio's value in emergency communications, in promoting and supporting STEM (science, technology, engineering and math) careers, and in providing a "sandbox" for experimenting in electronics and RF engineering. But we don't talk as much about the person-to-person aspect of amateur radio and the bridges it creates that can take people from being strangers to immediate friends.

My main point here is that not all memorable ham radio contacts depend on the ionosphere or repeaters, or even radios. Ham radio brings together people of diverse backgrounds and interests, and even overlapping interests...who might not otherwise meet or get to know each other.

To me, one of the most interesting parts about the QSO described above is that such contacts are not at all uncommon among hams. As we were leaving the nature preserve (in the dark), my son said to me, "What are the chances of two hams randomly encountering two other hams in a place that has no connection to ham radio?" My response was, "Excellent. It's happened too many times to count." Over the years, I have gotten involved with many, many, interesting people and activities simply by virtue of being a ham, even if there was no radio in sight! These contacts can help with off-air networking as well. I know lots of people (myself included) who have advanced their careers through the contacts they've made in ham radio, both on and off the air.

So yes, let's promote amateur radio's value for advancing technology, providing emergency communications, and promoting international goodwill through the contacts we make on the air, but let's not forget the value of the contacts we make off the air as well. (And Happy Birthday again, Mom! I know you're reading this!)

In This Issue

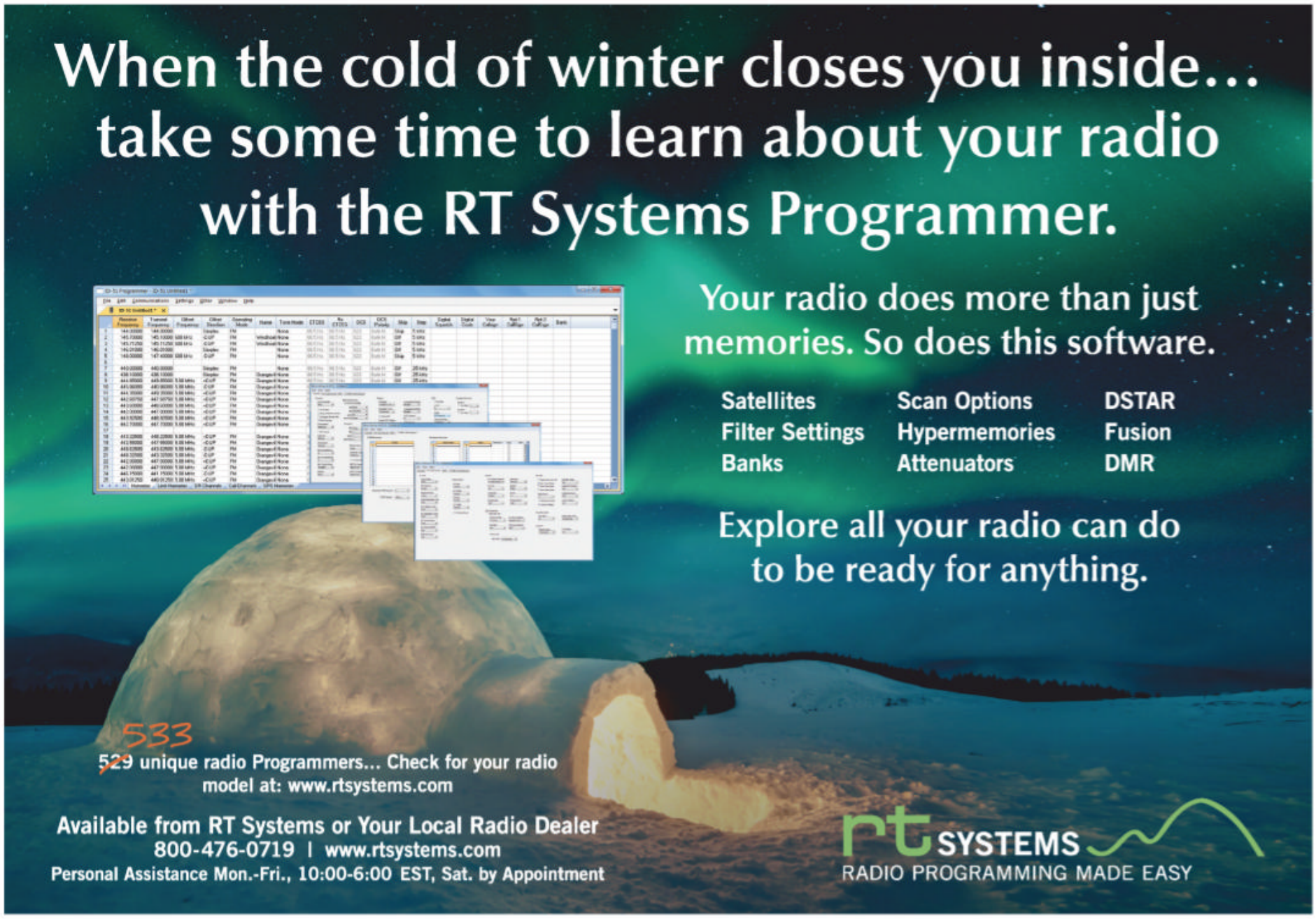
This month's *CQ* offers an eclectic mix of articles that showcase the breadth of our hobby while, at the same time, sticking close to our core interests of DX, contests, Morse code, and antennas. We start off with a DXpedition to Kiska Island in Alaska's Aleutians, halfway across the Pacific Ocean and part of the dividing line between the Pacific and the Bering Sea. As you'll read in the article, Kiska was one of two Aleutian islands occupied by Japan in World War II.

We've also got the results of the 2022 CQ World Wide RTTY DX Contest and a guide to ensuring you've got the right contest exchange copied; two antenna articles and a look at two antenna tuners; an introduction to Morse code "Instant Character Recognition" (ICR), and much more.

March heralds the arrival of equinoctial propagation on the HF bands, and VHF Editor N4DTF reminds us that it won't be long before sporadic-E season begins on 6 meters … and with a quickly rising sunspot cycle, there's no telling what magic the Magic Band may have in store for us this year. Enjoy the approach of spring warmth, and don't forget the CQWW WPX SSB Contest at the end of this month!

– 73, Rich, W2VU

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



news bytes

Host Sought for 2026 WRTC

The World Radiosport Team Championship Sanctioning Committee is seeking proposals for hosting the 2026 World Radiosport Team Championship (WRTC) event.

The WRTC is an on-site amateur radio competition, usually held every four years. Previous WRTCs — dating back to 1990 — have been held in the U.S. (three times), Slovenia, Finland, Brazil, Russia, and Germany. WRTC2022, delayed due to the COVID-19 pandemic, is scheduled to be held this summer in Bologna, Italy.

Teams of two operators representing a geographical region of the world come to the host site to compete using similar antennas and locations, overseen by on-site referees. According to the sanctioning committee, the WRTC competition has typically been held as a contest-within-a-contest coincident with the IARU World HF Championship to capitalize on the high activity of a popular worldwide operating event.

Groups interested in hosting WRTC2026 should submit a Letter of Intent, with a summary proposal. This should include the following items:

~ Committee organization, identifying each of the principals involved and any relevant organizational and amateur radio experience especially in contesting / radiosport.

~ Competition description, including planned number of teams, geographic location of operating sites, and competitor selection process.

~ Social aspects, including approximate schedule, travel, and housing arrangements for participants.

~ Financing, including an outline of the budget and fundraising approach. A detailed budget is not required at this time.

~ Expected assistance and involvement from local and regional amateur radio organizations and regulatory authorities.

~ Public exposure, including plans to publicize and promote the event locally and worldwide.

March 31 Deadline

Letters of Intent must be submitted no later than March 31, 2023 at 2359 UTC. The WRTC Sanctioning Committee will review all proposals received and will respond by April 30, 2023. Additional information may be requested.

It is the goal of the WRTC-SC to announce the venue for the WRTC2026 at the close of WRTC2022 in Bologna in July 2023. Letters of Intent should be submitted directly to the chairman of the WRTC Sanctioning Committee, Tine Brajnik, S50A, via email to <tine.brajnik@gmail.com>.

More information about WRTC is available at <https://wrtc.info>; specific info about this summer's competition may be found at <http://wrtc2022.it>.

BY BOB SCHENCK,* N2OO

K7K: DXpedition from the Edge of Alaska

BY ADRIAN CIUPERCA,# KO8SCA, WITH YURI SUSHKIN, N3QQ, AND HAL TURLEY, W8HC

This month, I have turned over the keyboard to Adrian, KO8SCA, with assists from Yuri, N3QQ, and Hal, W8HC, to tell the story of their recent DXpedition to Kiska Island, K7K. Their adventure was a special one, visiting a place that is extremely remote in the Aleutian Islands of Alaska. I hope that you will enjoy their story! – Bob, N2OO

"Trust your heart if the seas catch fire, live by love though the stars walk backward." – e.e. cummings

At the far western edge of the State of Alaska lies a group of islands, spread like a string of pearls spanning a distance greater than 1,000 miles. These are the Aleutian Islands.

* Email: <n2oo@comcast.net>
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For a few days during July 2022, a team of six operators sailed out into the Aleutians in what was a third DXpedition attempt to activate the rare IOTA group (IOTA NA-070, POTA K-0143) called Kiska Island, a desolate and inhospitable place within the Alaska Maritime National Wildlife Refuge.

The Aleutians

Alaska is such a large state and it is hard to comprehend some distances unless one uses geographic comparisons. So here is one: The distance from Alaska's eastern to western border is greater than the distance between New York and San Francisco. In fact, Kiska Island is closer to Tokyo than it is to San Francisco.

The Aleutian Islands consist of 72 islands born out of the volcanic eruptions 55 million years ago. They are located at the juncture of the northern edge of the warm waters of the Pacific Ocean and the southern reaches of the extremely cold and hostile waters of the Bering Sea, creating some of



A view of Kiska Island (All photos courtesy of the K7K team)

the most violent weather conditions in the Northern Hemisphere. Most of the far western Aleutian Islands, including Kiska, are uninhabited.

Kiska Island

The island is only 5 miles wide and 22 miles long. It is desolate and uninhabited, covered by volcanic sand and tall grass. There are no trees or animals except some rats that are said to have roamed the island since the first explorers brought them there on their sailing boats. At the far end of the island, there is a 4,000-foot-tall active volcano. The weather is harsh, with only eight clear days a year amidst an average of 250 days of rain, powerful winds, and 100 days of bitter cold darkness. That pretty much describes a place that probably should be avoided by humans.

Kiska's Role in WWII

Visiting Kiska Island requires close coordination with the U.S. Fish and Wildlife Service (FWS). If you plan an IOTA expedition to Alaska, you will need to contact U.S. FWS in Homer first and begin the coordination process. Many of Alaska's islands are managed by U.S. FWS and access to some have unique requirements. Access to Kiska is closed for general population visits. One of the reasons for such difficulty is because some of these islands, including Kiska, are littered with unexploded ordnance (UXO) ... remnants of World War II. The year 2022 marked 80 years from the start of the Aleutian campaign of WWII, also known as the "1,000-mile war," an event in history which was also commemorated by our K7K DXpedition.

During WWII, Japanese forces were eyeing the capture and occupation of Midway Island, a tiny speck of land and a U.S. possession in the Pacific. Midway served as an important refueling stop for the U.S. bombers intending to reach Japan. Militarily, Japanese forces needed a ruse in order to draw the U.S. Pacific Fleet away from Midway. The Aleutians Islands fit perfectly into that strategic scenario.

Luckily however, U.S. intelligence services had broken the Japanese naval codes. The Japanese plans were revealed and now known to the U.S. forces. Nevertheless, this remote region became a fiercely contested battleground with Japanese forces capturing two of the islands in the Aleutian archipelago — Attu and Kiska.

Some 6,800 Japanese soldiers occupied Kiska Island for nearly two years, and to survive they built multiple structures, resembling a small town … living quarters, underground tunnels, water towers, telegraph poles, unpaved roads, a submarine base, and multiple military installations. Some of these structures are still standing today.

In the end, the fiercest enemy of both the Japanese and Allied combatants fighting in the 1,000-mile-long Aleutian campaign was the weather. Following the Japanese loss and 2,300 casualties suffered during an intense 19-day battle at Attu that ended July 28, 1943, Allied forces shifted their attention to



Our boat, the April Lane, docked in Adak, Alaska.



Boat captain Rick



One of the World War II antiaircraft guns still in place on Kiska Island, along with unexploded ordnance that makes it mandatory to get special permission to land there.



Landing and departing the island were the most difficult moments of the DXpedition.

retaking Kiska. Fearing similar defeat, the Japanese commander at Kiska realized he was in a no-win position and took advantage of the weather. With dense fog and harsh winds blowing sideways, 5,000 Japanese troops boarded vessels and left Kiska Island undetected by Allied command. On August 15th, Allied U.S. and Canadian forces invaded the island still not aware that the enemy had left. Attacking from two sides of the island in dense fog, there were many servicemen killed or wounded by "friendly fire." All of the Aleutian Islands were now back in the hands of the U.S. Command.

IOTA

The Islands on the Air (IOTA) program was established in 1967 and aims to recognize and certify ham operators for contacting islands around the world. For IOTA purposes, open sea islands of the world are grouped in 1,200 references.

The starting point in the program is having confirmed the first 100 references and being awarded the IOTA 100 certificate. Improving the score is a steady pursuit, and can take many years of effort, making IOTA both challenging and rewarding.

Many of the world's islands are uninhabited and very remote, often requiring special permission to land on and operate from. These are all reasons why some IOTA references are rarely activated, and some perhaps for only a few days every five, 10, or even 20 years or so. More details about the IOTA program are available at <www.iota-world.org>.

Kiska Island — Third Time is the Charm

The 2022 K7K IOTA expedition was actually attempt number three to reach Kiska Island. In 2020, the pandemic curtailed our travel plans and forced the cancellation of the KL7RRC expedition after equipment and supplies had already been staged in Dutch Harbor, Alaska.

In 2021, one of the crew members of our chartered, prepaid vessel suffered a medical emergency prior to picking up our eight totes of gear at Dutch. The original plan called for team member Tim, NL8F, to help load the gear onto the boat and sail out to Adak Island (NA-039) where he would meet up with the other five members who would be flying into Adak from Anchorage. Tim was able to locate a vessel to take the totes to Adak and thought there was a good possibility we could locate another char-



Team members Alex, KL5CX; Adrian, KO8SCA; James, KB2FMH; Tim, NL8F; Yuri, N3QQ (team leader); and Hal, W8HC.

ter from there. Unfortunately, Murphy struck again and another vessel was not available ... BUT the KL7RRC team, consisting of Tim, NL8F; Walt, N6XG; Hal, W8HC; Rob, N7QT; and Yuri, N3QQ, made the most of their time as they operated for eight days from Adak Island. They logged over 10,300 QSOs with 102 different DXCC entities, many stations making their first-ever QSO with NA-039. During the operation, the group also experienced several great sporadic-E (E_S) openings on 6 meters with 820 QSOs in the log on the "magic band." Some of the members of the team left Adak Island hoping for another chance at elusive Kiska the following year.

In 2022, the K7K Kiska IOTA Expedition team was made up of six operators: Alex, KL5CX; Adrian, KO8SCA; Hal, W8HC; James, KB2FMH; Tim, NL8F; and Yuri, N3QQ. Yuri was the team leader and is a passionate and experienced DXpeditioner who has activated many rare IOTA entities. He has been the main organizer, proponent, and decision-maker in getting this tough project off the ground and his perseverance certainly paid off.

Tim, NL8F, a native Alaskan, was instrumental in finding the boat, the key to the success of our DXpedition. He is a mechanic by trade and owns a vessel repair business in Dutch Harbor. To say, "his mechanical repair skills came to



K7K tents and antennas

the rescue multiple times during our stay on Kiska," is an understatement!

Hal, W8HC, is a veteran DXpeditioner and INDEXA officer. His DXpedition experience is impressive, as he has been a member of many DXpeditions to top 20 entities. His experience was welcomed by our team and we all enjoyed listening to his stories from his past DXpeditions to some of the most remote places on Earth.

Alex, KL5CX (also born in Alaska), our youngest team member, works as a commercial pilot for one of the major airlines. His youthful energy was envied by the whole team. This was Alex's first DXpedition and others on the team are hopeful this will be the first of many in his future. Among other duties, he was assigned the difficult task of piloting the Zodiac inflatable landing boat during our excursions to and from the island. His skills were cheered by the entire team, especially when he was able to navigate the Zodiac in some very difficult conditions that we encountered.

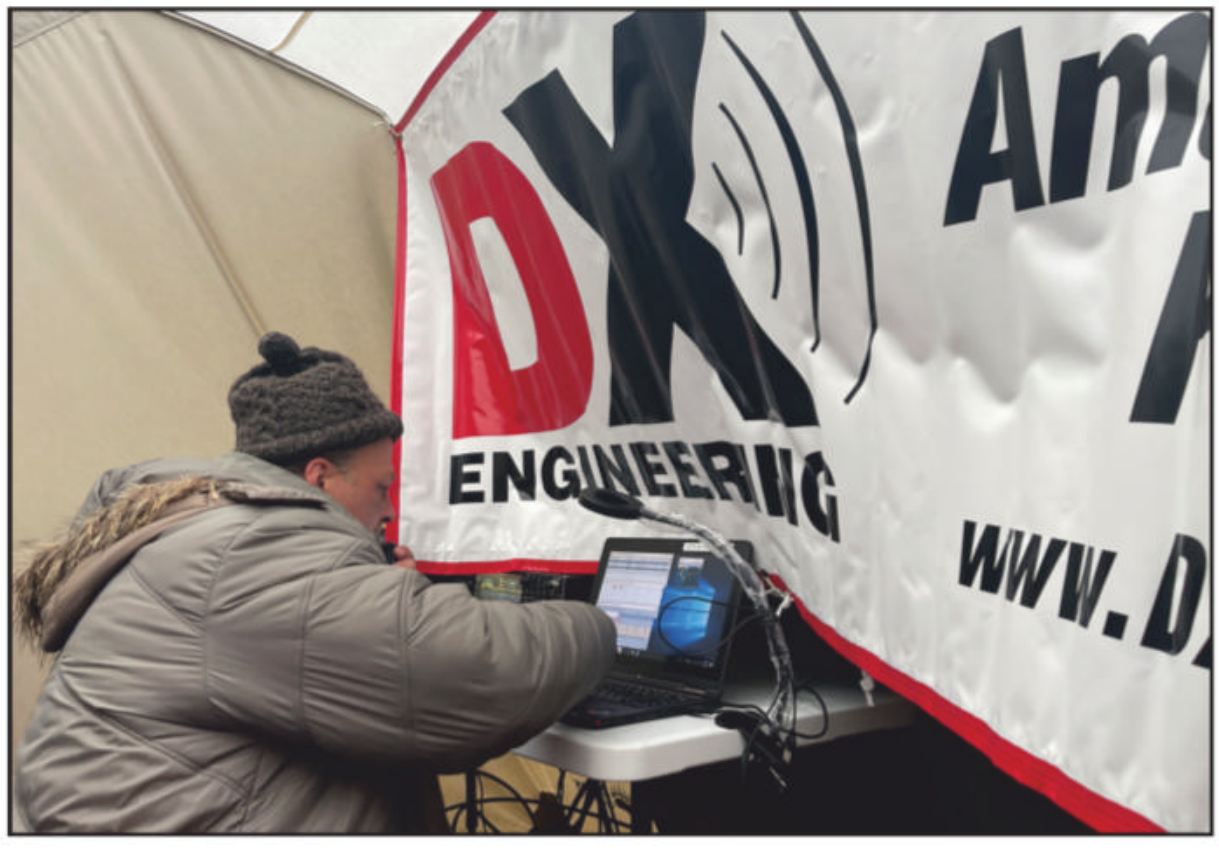
James, KB2FMH, is a passionate POTA (Parks on the Air) activator and one can often hear him on the air from one of the myriad of parks around the New York area. This was James' first DXpedition and one could easily see his excitement along the way. He was the first one to ask, "Where do we go next?" even before the K7K DXpedition had concluded. He would describe himself as someone who likes to talk and so he became the voice behind most of our SSB QSOs.

Adrian, KO8SCA (your author), notes that "K7K was DXpedition #29 for me. I love traveling and blending that with ham radio is the perfect recipe for a great trip. K7K was no exception to this rule. Furthermore, the tough environment encountered on Kiska allowed me to test some of the gear that I plan to bring in my upcoming 3YØJ DXpedition to Bouvet Island in January 2023."

Bringing two DXpedition first-timers, Alex and James, as members of K7K was a refreshing idea and the team was really excited about that. It is probably one of the most successful ways to bring younger people into our hobby and into DXpeditioning in general.



Hal, W8HC, preparing a meal.



Yuri, N3QQ, operating CW.

Our Vessel and Able Captain

Our DXpedition had a budget of about $50,000, most of which was used to pay for the boat, its captain, and fuel. Our chartered boat for the July 2022 K7K trip to Kiska Island was the "April Lane," a 56-foot fishing boat based out of Dutch Harbor, Alaska. Navigating the treacherous waters of the Bering Sea requires an appropriate boat and the 88-ton April Lane did the job perfectly.

Alaska king crab fishing season normally opens in the fall and runs through the early winter months, usually between October and January. This timeframe allowed us to find and secure this particular fishing boat for our trip in the month of July. Having a suitable vessel is one thing, but having someone who knows what they are doing with it is another. Fortunately for us, we had Captain Rick Fehst. Captain Rick, a jovial and experienced sailor of the Aleutians, entertained us with lots of stories and was a great companion during our voyage. We learned that his skills as a seaman and unique personal charm actually enabled him to become somewhat of a TV celebrity. Rick was one of the featured captains in Season 5 of the very successful "Deadliest Catch," a reality television series that started in 2005 on the Discovery Channel and has enjoyed an

extended run on the television for 18 seasons. If you are not familiar with the show, it follows crab fishermen in the Bering Sea during the Alaskan king crab and snow crab fishing seasons. Crab fishing is listed by Occupational Safety and Health Administration (OSHA) as the deadliest job in Alaska and the show gives the viewer a glimpse of the tough conditions in the Bering Sea and the intense physical labor associated with this type of job. Needless to say, our team felt quite comfortable and safe knowing that we had such a nautical veteran of some of the most treacherous waters on earth.

Rick had told us on the voyage out that he was looking forward to the possibility of going onshore at Kiska when we were there. He was quite familiar with the island from his time fishing the Aleutians. Obviously, he could not take time away from fishing work to go ashore. But he was especially interested in seeing the rusting military remnants from WWII, the Japanese mini-subs rusting on the beach, the sunken ship in Kiska Harbor, and the anti-aircraft guns placed strategically around the island. Unfortunately, between the weather conditions and our operating schedule, we were unable to send someone over to the April Lane anchored in the harbor and relieve Rick so he could make the 300-meter Zodiac trip to the island. Captain Rick will have to put this on his bucket list if he ever wants to go out into the Aleutian extremes in order to set foot on Kiska.

Preparing for Departure

All of the totes of gear that had been shipped to Adak in 2021 had been returned to Dutch Harbor through Tim's Alaskan shipping connections. Tim also provided warehouse space in his business to store all of the gear. The plan was basically the same as 2021 with Tim loading the vessel and traveling onboard the April Lane from Dutch to Adak where the other members of the team would be flying in to meet him. Tim asked if anyone from the team could possibly come to Dutch early and join him in all the preparations, ensuring everything was accounted for, in proper working order, and then help him load everything onto the boat. Hal volunteered to go up early to assist Tim had arranged his travel plans making the long flight to Dutch Harbor from Charleston, West Virginia and arriving on July 17th. Tim and Hal had three days to ensure everything was accounted for, functional, and ready to be loaded onto the boat. There were generators, tents,



James, KB2FMH, operating SSB.

tables, chairs, fuel, water (there is no drinkable water on Kiska), food, antennas, coax, cots, etc. Keep in mind that the six members of our team would be living on an uninhabited island for a week. We would be building a "city" on Kiska and we definitely did not want to forget anything! The nearest Wal-Mart was almost 1,400 miles away.

Time to Set Sail

Captain Rick and his two-member crew of Tim and Hal finished loading the boat in Dutch on July 21st with the first order of business to position the vessel at the fueling dock where Rick topped off the fuel tanks. By early afternoon, they were on their way to Adak Island, a three-day westward sail where they would pick up four additional members of the DXpedition team: Yuri, Alex, James, and Adrian. These additional four members were able to fly directly into Adak. Even though Adak Island has a population of about 50 people, it has an airport with a large runway allowing large jetliners to land on the island. Adak Island used to house a significant US military installation until about 20 years ago and that's the reason behind the existence of the large runway. Today, it is mostly a "ghost town" with abandoned buildings, many in states of disrepair due to the violent weather there. As you arrive at the airport and depart, you are greeted by a sign on the terminal, "Welcome to Adak, birthplace of Winds," a fitting tribute to a location that will regularly experience 120 mile-per-hour wind squalls!

The April Lane arrived late at night and as soon as we were boarded, each with our own gear and equipment, we were under way. Our voyage from Adak to Kiska was about 36 hours long and the six DXpedition members spent time discussing operating details and activating rare grids maritime mobile on 6 meters.

In retrospect, we all agreed that the boat and its captain were the key to our successful DXpedition.

The Equipment

We had five antennas installed right on the beach. That, of course, is the biggest advantage of operating from an island. And using mainly vertical antennas, light and easy to assemble, allowed us to hear signals from all directions and to repair them quickly. The 17-meter VDA provided by Walt, N6XG, was our workhorse, a simple antenna that really does wonders and which put a significant number of the QSOs in the log. The CrankIR that Tim took down and brought from his QTH proved to be extremely convenient as it allowed us to easily operate in multiple bands with its simple and reliable mechanics.

Of course, the weather was a factor in choosing our antennas. As expected, heavy winds forced us to make daily equipment repairs. We had cold, wind, and rain all the time and at the same time, except for one sunny day when we took pictures and explored the island.

(Continued on page 84)

Results of the 2022 CQWW RTTY DX Contest

BY CHRIS TATE,* N6WM

Recovering from pandemic travel restrictions, the emergence of solar cycle 25, and return of DX on the 10-meter band, along with additional improvements in propagation, helped ring in the 36th annual running of the CQ Worldwide RTTY DX contest.

Overall reports were of good conditions from most points around the world, with the exception of some stations in Asia that were affected by inclement weather. Participation was relatively unaffected by the easing of the pandemic; in fact, peak log submission was in 2020 at over 3,600 logs, but we were down a few hundred logs from last year at 3,190 logs. Many of the regular top players were back at their DX QTHs. Despite improved conditions, no records of note were broken in 2022, but the new Explorer category set some new baselines.

Above and beyond printing certificates and checking contest dates, the CQWW RTTY website is very comprehensive and full of interesting data and specifics. Check it out at <http://cqwwrtty.com> and look at results, records, resources, and more!

Let's take a deeper dive into the contest itself and see how it went!

Single-Op Categories

Single-Operator High Power (SOHP) All Band

Ed, P49X (op. WØYK), was back in Aruba after an extended pandemic QRX. He regained his SOHP world title. Ed bested LZ5R by over a million (mega) points to solidly maintain the top position. The top U.S. position was achieved by Randy, K5ZD, with a very respectable score of about 4.2 megapoints. There are serious competitors in all categories, but this one is of note, good performances from well-known contest stations like W7RN (op. WK6I) out west, and JH4UYB are a couple of stations that found themselves in the world top 10.

Single-Operator High Power All Band Assisted

The assisted category had a slightly different demographic, with the win going to Cyprus station P3X (op. 5B4AMM). In the U.S., Bud, AA3B, a powerhouse in contesting on all modes, was able to take the honors by besting challenger K1LZ (op. LU9ESD) by about half a megapoint.

Single-Operator Low Power All Band

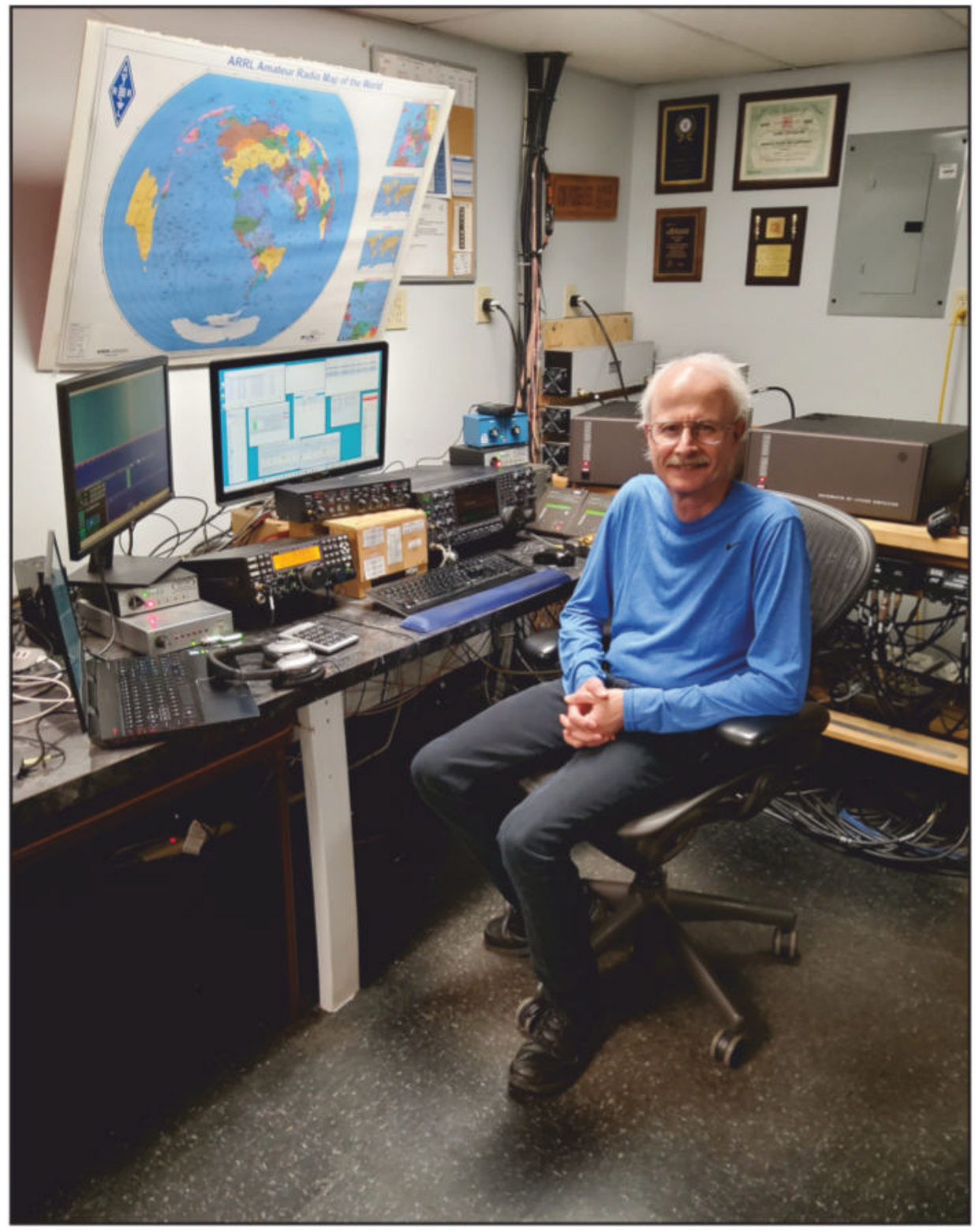
Yuri, VE3DZ, managed to edge out CX2DK by a half megapoint. ZF2WB (op. Mariano, LU8EOT) managed to best CR5O (op. CT7AGL)

Single-Operator Low Power Assisted All Band

TM3Z (op. F4DSK) managed to solidly win the top spot in Low Power by besting SV2AEL and JA6CGE, respectively. Don, AA5AU, took top honors in the U.S. with KI1G hot on his heels. That was a close one.

Single-Operator QRP All Band

It takes a special kind of patience to do a worldwide contest using QRP, but



Bud, AA3B, pauses from contesting to smile for the camera. (Courtesy of AA3B)

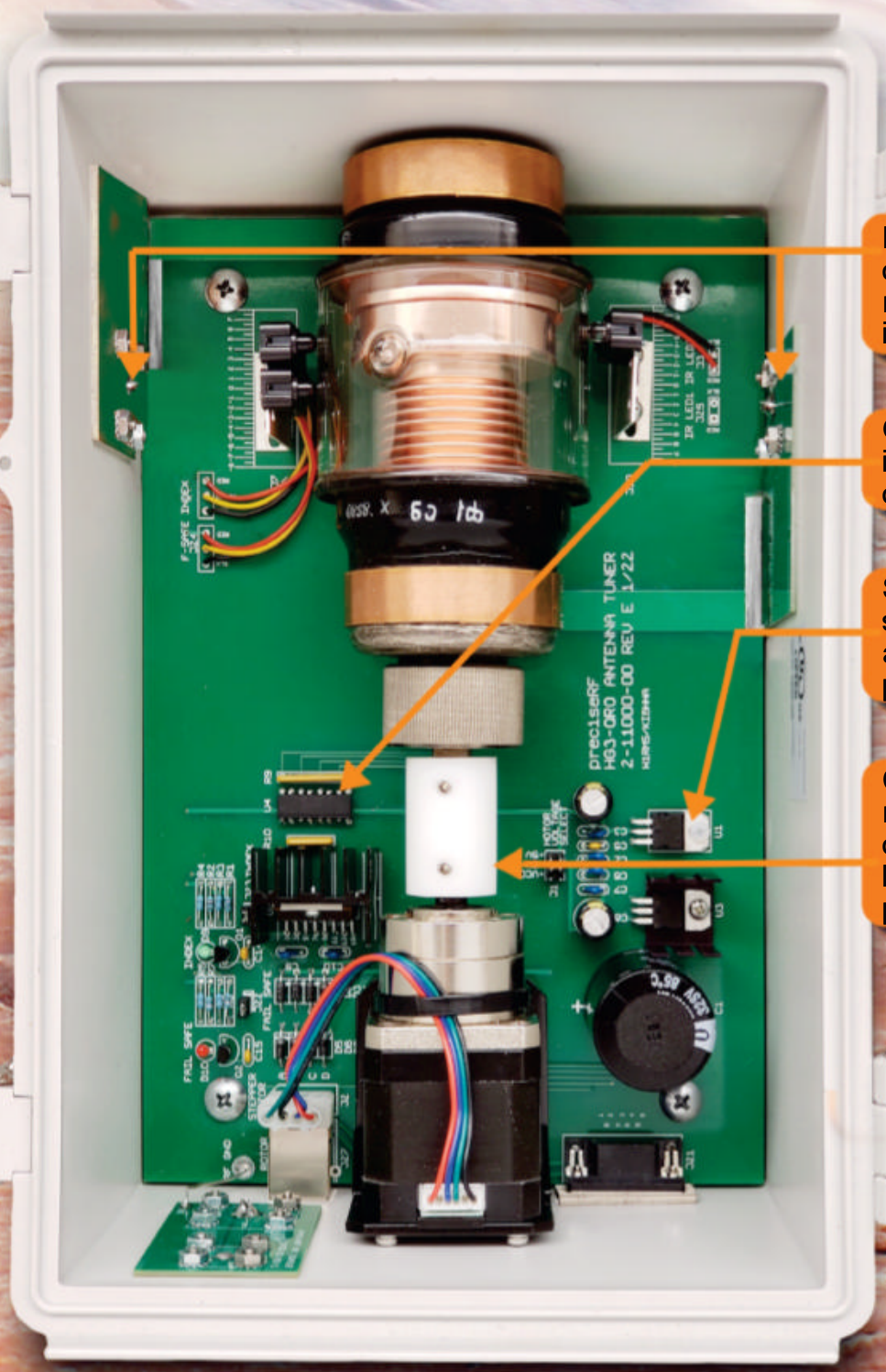
Email: <n6wm@largeradio.org>

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
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Dave, K2YG, persevered and took the world QRP title. His 375,000-point QRP effort was enough to beat the others in the top five that were all European stations. Congratulations, Dave!

Single-Operator QRP Assisted All Band

ON6NL turned in an impressive half-million-point score in the assisted QRP category, easily besting DL6ZBM and others. K2AL had the high score in the U.S.

Single-Operator Single-Band Categories

One of the great things about this worldwide RTTY DX contest is the plethora of categories that can be entered. The single-band categories give opportunities for titles that may be out of reach to some locations, or for some participants that are crunched for time. They are available in all three power levels as well as assisted or not. Sometimes there are some fierce battles with these and I encourage all readers to dive into the line scores and check them out.

Multi-Op Categories

Multi-Operator Single Transmitter High Power

The team at IQ4FC managed to narrowly beat an equally great effort by the Moravian Contest Group, OK5Z, in this very popular category. Competition is generally quite fierce and this battle did not disappoint.

Multi-Operator Single Transmitter Low Power

In an interesting turn of events, the KP2B team took top honors. They were originally slated to operate at WP3C but that operation was scuttled due to the effects of Hurricane Fiona. Jim, WP3A, loaned the team his KP2B station and relocated the operation to the U.S. Virgin Islands. Apparently, this worked out well as they enjoy being in the winners' circle with a solid megapoint-lead over the second-place team at EA8DED.

Multi-Operator Two Transmitter

The team at CR3DX solidly took this category with nearly double the score of the top U.S. team at K9CT, which managed to take first place in the U.S. and second place in the world. Of note is the up-and-coming NJ4P contest team run by WV4P, which settled into second place in the U.S., and fourth place overall. This new contest powerhouse station is really starting to make a dent out there. A great job by all.

Multi-Operator Multi-Transmitter

I have a sweet spot for the fun and camaraderie of Multi-

TOP SCORES

WORLD

SINGLE OPERATOR HIGH POWER ALL BAND

P49X (WØYK).....5,619,984
LZ5R (LZ5DB).....4,458,540
K5ZD.....4,273,200
PW2L (PY2MNL).....3,140,436
LN8W (LB8IB).....2,512,260

28 MHz
5W1SA.....174,070
W5PR.....81,730
WO4O.....75,786

21 MHz
OM2VL.....659,932
9A5X.....634,550
CR6T (CT1ESV).....512,141

14 MHz
N8OO.....527,823
KU2M.....384,122
MD7C (M5RIC).....344,201

7 MHz
4L2M.....153,549
OG4W (OH4KZM).....111,132
I5WNN.....84,537

3.5 MHz
YL2CI.....56,606
OK2SFP.....29,792
LZ5XQ.....22,572

LOW POWER ALL BAND

VE3DZ.....2,417,672
CX2DK.....1,800,201
ZF2WB (LU8EOT).....1,652,876
CR5O (CT7AJL).....1,425,060
GØMTN.....1,134,566

28 MHz
4M1W (YV1SW).....209,670
CX2AQ.....114,540
PU2WDX.....113,940

21 MHz
S5ØA.....310,707
PY2QT.....208,290
IR9D.....196,812

14 MHz
CO2AME.....339,888
PY2NY.....303,750
DL4FN.....216,986

7 MHz
OK1WCF.....363,474
DM6DX.....340,535
IKØREP.....144,958

3.5 MHz
E79D.....77,274
F5BEG.....66,150
WZ6ZZ.....49,452

SINGLE OPERATOR QRP ALL BAND

K2YG.....375,760
CT1BXT.....325,304
SP2UUU.....285,108
HG6C (HA6IAM).....241,080
EA1GT.....232,170

28 MHz
PP1WW.....111,562
TIØRC (TI2YO).....102,060
3G3R (XQ3SK).....24,320

21 MHz
JA6VZB.....49,896
KD9MS.....49,000
CO2AJ.....36,582

14 MHz
YU1NR.....74,445
PD8DX.....53,802
SV3IBQ.....51,170

7 MHz
ES2MC.....57,333
YO4BEW.....13,091
SV1CDN.....7,920

3.5 MHz
ON3DI.....29,302
SNØE (SO8OO).....9,504
HG5O (HA5OB).....3,164

ASSISTED HIGH POWER ALL BAND

P3X (5B4AMM).....5,823,924
AA3B.....5,452,090
IZ4BOY (IT9RGY).....5,243,463
K1LZ (LU9ESD).....4,929,804
SN7Q (SP7GIQ).....4,627,395

28 MHz
LT6M (LU8MHL).....458,134
LU7HN.....369,083
VK4SN.....120,768

21 MHz
HG1S (HA1DAE).....713,200
9A5Y (9A7DX).....677,200
CX7SS.....660,813

14 MHz
S53M (S51FB).....742,050
HG5D (HA8QZ).....621,680
YT3X.....593,110

7 MHz
S52X.....558,386
9A3K.....445,704
YU5R (YT2AAA).....427,094

3.5 MHz
HA1TJ.....160,928
S53X.....138,838
I4AVG.....109,560

ASSISTED LOW POWER ALL BAND

TM3Z (F4DSK).....3,610,698
SV2AEL.....1,495,350
JA6GCE.....1,330,755
SP2R.....1,227,534
YL1ZF.....1,204,330

28 MHz
AZ1D (LU1DX).....206,460
PY4XX.....83,268
4F3BZ.....76,518

21 MHz
ED7O (EA7EU).....361,257
EE5K (EA5DF).....307,648
JA6WFM.....194,688

14 MHz
IK6VXO.....477,118
T7ØA.....362,710
IT9XTP.....274,736

7 MHz
IK4ZIF.....189,336
G4N (G4ZVB).....144,643
YT9VM.....119,616

3.5 MHz
DF1MM.....74,880
S51ZJ.....67,968
S53NW.....49,472

SINGLE OPERATOR QRP ASSISTED ALL BAND

ON6NL.....596,520
DL6ZBN.....319,770
YU1LM.....201,188
JA4XHF/3.....144,918
K2AL.....94,800

28 MHz
EA5Y.....17,028
WB4OMM.....7,248
IT9RJE.....5,106

21 MHz
JM1NKT.....94,887
E7AA (E73AA).....54,514
YC1LJT.....28,908

14 MHz
OQ4B (ON4BHQ).....37,584
N8URE.....30,438
W7RY.....27,540

7 MHz
9A6TT.....8,360

3.5 MHz
OL6D (OK1DWQ).....21,805
SP3EMA.....14,736

MULTI-OPERATOR SINGLE TRANSMITTER HIGH POWER

IQ4FC.....5,815,600
OK5Z.....5,047,174
SP8R.....4,393,440
SZ1A.....3,763,900
NV9L.....3,313,125

MULTI-OPERATOR SINGLE TRANSMITTER LOW POWER

KP2B.....3,868,931
EA8DED.....2,882,547
IT9BLB.....2,683,868
IQ3RK.....2,154,300
LY5W.....1,987,335

MULTI-OPERATOR TWO TRANSMITTER

CR3DX.....13,848,120
K9CT.....6,869,018
EC2DX.....5,968,494
NJ4P.....5,589,675
IQ9RG.....5,514,602

MULTI-OPERATOR MULTI-TRANSMITTER

CR3W.....12,368,664
9A1A.....10,482,053
K1SFA.....6,166,216
DM4X.....3,947,364
N6WM.....3,796,002

EXPLORER SINGLE-OPERATOR

IV3RYP.....6,955
MØORY.....5,624

EXPLORER MULTI-TRANSMITTER

VE2CQ.....1,575,808
NA5NN.....478,946
W5NN.....193,200

ROOKIE HIGH POWER

EI6LA.....835,752
KD2UBH.....278,460
N3AML.....264,888
VA3OGG.....231,068
W9DCT.....211,671

ROOKIE LOW POWER

K3AK.....233,856
KI2D.....168,910
F4ITQ.....152,520
EA5JDN.....142,680
MØLKW.....140,292

CLASSIC HIGH POWER

RW1A.....1,274,511
YT3D.....1,161,303
KU1CW.....1,100,608
I4JED.....1,029,033
NG1M.....986,232

CLASSIC LOW POWER

ON4CT.....897,773
HH2AA (K6DTT).....875,538
D2UY.....774,613
KH6CJJ.....695,824
EA3CI.....684,080

YOUTH HIGH POWER

9A2ZI.....2,743,698
DM7XX.....2,437,018
9A1CAL (9A3LET).....41,870

YOUTH LOW POWER

EI8KW.....122,484
IU4FNO.....110,547
BD4VGZ.....76,752
E7ØAW.....74,692
SP8BRT.....5,513

UNITED STATES

SINGLE OPERATOR HIGH POWER ALL BAND

K5ZD.....4,273,200
W7RN (WK6I).....2,321,738
KØZR.....2,295,756
KU1CW.....1,100,608
W7YAQ.....1,060,665

28 MHz
W5PR.....81,730
WO4O.....75,786
AA5JF.....40,836

21 MHz
NT6X.....208,172
N7GP.....187,070

14 MHz
N8OO.....527,823
KU2M.....384,122
AI3Q.....142,128

7 MHz
KEØL.....12,462

3.5 MHz
WØZW.....7,280
K3RWN.....6,490
W3LL.....2,640

LOW POWER ALL BAND

NØUR.....569,322
AA8CA.....552,375
N7IR.....433,784
W1UE.....420,462
N9TF.....411,943

28 MHz
K4WI.....20,658
W8AKS.....11,275
W8JGU.....3,531
KD5ILA.....3,528

21 MHz
W1QK.....123,684
WA1FCN.....111,531
NY1E.....49,162

14 MHz
W4LC.....99,712
KB3AAY.....91,375
K8VT.....49,980

7 MHz
N8CWU.....52,767
WA3FAE.....52,392
W8TOM.....50,544

3.5 MHz
WZ6ZZ.....49,452

SINGLE OPERATOR QRP ALL BAND

K2YG.....375,760
W6QU (W8QZA).....111,666
WA3LXD.....87,236
AA5KD.....65,048
WDØBGZ.....26,660

28 MHz
WE6EZ.....16,254

21 MHz
KD9MS.....49,000

14 MHz
KO1H.....43,022
W1IE.....22,632
W4ER.....1,020

ASSISTED HIGH POWER ALL BAND

AA3B.....5,452,090
K1LZ (LU9ESD).....4,929,804
K3MM.....3,210,300
N3QE.....2,583,999
KØMD.....1,922,448

28 MHz
N6SS.....98,838
WØLSD.....15,209
KY7M.....2,911

21 MHz
K4EA.....454,140
WW4LL.....385,616
N7AT (K8IA).....349,475

14 MHz
W9ILY.....231,530

7 MHz
K9OM.....239,936

Visit Our Web Site

Multi contesting. The Multi-op crew at the Santana RRDXA Contest Team, CR3W, took top honors this year by besting a large team at K1SFA, who activated the K1TTT superstation for the event. Your author was a member of the N6WM team in W6, activating the N6RO superstation. Worldwide contesting from the U.S. West Coast is always a challenge, and the team did a good job settling into second place in the U.S.

Overlay Categories That Keep Things Interesting

These overlays give more opportunities for participants to compete. The overlay categories are comprised of Classic, Rookie, Youth, and Explorer, and are further subdivided into high- and low-power options. More information on these overlays can be found in the contest rules, as well as the <cqwwrtty.com> website.

Classic mode, in which operators are limited to a single radio and operate 24 hours, is becoming a very popular and competitive entry option.

Classic

Vladmir, RW1A, took the high-power top spot worldwide, but it was a close race with Serbian operator Brane,

TOP SCORES IN VERY ACTIVE ZONES

Zone 3

W7RN (WK6I)	2,321,738
KU1CW	1,210,968
W7YAQ	1,060,665
AJ6V	681,126
WQ6Q	482,090

Zone 4

*VE3DZ	2,417,672
AD5XD	993,960
WQ5L	794,313
VE3TW	666,391
WØMB	630,992

Zone 5

K5ZD	4,273,200
KØZR	2,295,756
NG1M	986,232
AE1P	981,848
AC8Y	835,052

Zone 14

LN8W (LB8IB)	2,512,260
GWØA (GW4SKA)	2,089,494
*CR5O (CT7AJL)	1,425,060
*GØMTN	1,134,566
*M5W (MØHMJ)	1,111,110

Zone 15

YT3D	1,161,303
I4JED	1,124,003
*IT9RBW	905,519
I1NVU	700,560
OM2VL	659,932

Zone 16

RW1A	1,288,687
EW8DX	826,529
RC5Z	476,320
*R3AQ	466,368
UA6CE	272,090

Zone 20

LZ5R (LZ5DB)	4,458,540
*TA7I	984,096
4Z5LY	803,136
*4X6FR	523,004
*LZ2ZY	400,920

Zone 25

JH4UYB	2,340,110
JA1OVD	982,928
JH7QXJ	762,604
HL2WA	638,362
JA7IC	599,242

**Low Power*

NA3M....83,570
KSØAA....9,960

3.5 MHz
W7MRF (KW7MM)....43,262

ASSISTED
LOW POWER ALL BAND
AA5AU....1,001,984
KI1G....958,760
KØKX....545,296
NØHJZ....512,820
W3KB....502,541

28 MHz
AB9YC....12,312
K5ND....2,720

21 MHz
N3UA....146,727
NM2K....84,863
W3IDT....10,230

14 MHz
KA4RRU....187,340
W2CG....86,100

7 MHz
K3JSJ....3,000

SINGLE OPERATOR
QRP ASSISTED ALL BAND
K2AL....94,800
K3HW....49,640
K6JS....22,082
K8ZT....16,830
K6CTA....2,520

28 MHz
WB4OMM....7,248

14 MHz
N8URE....30,438
W7RY....27,540
N4IJ....24,360

MULTI-OPERATOR
SINGLE TRANSMITTER
HIGH POWER
NV9L....3,313,125
K3AJ....2,806,610
WA7AN....2,569,450
K5RZA....2,394,288
AG4TT....2,334,960

MULTI-OPERATOR
SINGLE TRANSMITTER
LOW POWER
NY6DX....1,857,136
N4SS....1,053,032
WTØDX....591,890
K1RQ....127,971
N1SOH....46,904

MULTI-OPERATOR
TWO TRANSMITTER
K9CT....6,869,018
NJ4P....5,589,675
KT7E....2,225,356
K7BTW....2,123,280
NA4DA....2,096,508

MULTI-OPERATOR
MULTI-TRANSMITTER
K1SFA....6,166,216
N6WM....3,796,002
W3GH....2,948,378

EXPLORER
MULTI-TRANSMITTER
NA5NN....478,946
W5NN....193,200

ROOKIE
HIGH POWER
KD2UBH....278,460
N3AML....264,888
W9DCT....211,671

ROOKIE
LOW POWER
K3AK....233,856
KI2D....168,910
KC3SVR....109,817
KC3UDO....40,590
N3GT....34,220

CLASSIC
HIGH POWER
KU1CW....1,100,608
NG1M....986,232
AE1P....981,848
AC8Y....835,052
WQ5L....794,313

CLASSIC
LOW POWER
N7IR....433,784
W1UE....420,462
WD9CIR....259,096
W1HY....241,379
AC2RL....209,296

EUROPE

SINGLE OPERATOR
HIGH POWER ALL BAND
LZ5R (LZ5DB)....4,458,540
LN8W (LB8IB)....2,512,260
GWØA (GW4SKA)....2,089,494
RW1A....1,274,511
YT3D....1,161,303

28 MHz
DL3BQA....37,260
DK2WH....35,680
YT8A....27,370

21 MHz
OM2VL....659,932
9A5X....634,550
CR6T (CT1ESV)....512,141

14 MHz
MD7C (M5RIC)....344,201
IT9STX....287,400
SP8K....197,190

7 MHz
OG4W (OH4KZM)....111,132
I5WNN....84,537
SP2TQQ....45,425

3.5 MHz
YL2CI....56,606
OK2SFP....29,792
LZ5XQ....22,572

LOW POWER ALL BAND
CR5O (CT7AJL)....1,425,060
GØMTN....1,134,566
M5W (MØHMJ)....1,111,110
IT9RBW....905,519
ON4CT....897,773

28 MHz
EF7W (EC7KW)....33,575
EA7Z....30,294
IMØ/IK5AEQ....21,402

21 MHz
S5ØA....310,707
IR9D....196,812
G4ZOB....139,656

14 MHz
DL4FN....216,986
EU1DX....141,564
SOØA....110,432

7 MHz
OK1WCF....363,474
DM6DX....340,535
IKØREP....144,958

3.5 MHz
E79D....77,274
F5BEG....66,150
DL1AOB....39,957

SINGLE OPERATOR
QRP ALL BAND
CT1BXT....325,304
SP2UUU....285,108
HG6C (HA6IAM)....241,080
EA1GT (EA1GT/QRP)....232,170
YL3FW....216,756

28 MHz
TA1BM....9,805
M7V (MØVAA)....5,740
YO3DAC....3,366

21 MHz
SP4NKJ....32,619
OK1LV....5,040
IW2ODC....3,535

14 MHz
YU1NR....74,445
PD8DX....53,802
SV3IBQ....51,170

7 MHz
ES2MC....57,333
YO4BEW....13,091
SV1CDN....7,920

3.5 MHz
ON3DI....29,302
SNØE (SO8OO)....9,504
HG5O (HA5OB)....3,164

ASSISTED
HIGH POWER ALL BAND
IZ4BOY (IT9RGY)....5,243,463
SN7Q (SP7GIQ)....4,627,395
UR5MW....4,246,335
G7C (MØCKE)....3,618,227
OH1F (OH1TM)....3,284,820

28 MHz
G8X (G4FJK)....91,208
HG1G....33,440
I7CSB....33,259

21 MHz
HG1S (HA1DAE)....713,200
9A5Y (9A7DX)....677,200
9A5D (9A3SMS)....589,056

14 MHz
S53M (S51FB)....742,050
HG5D (HA8QZ)....621,680
YT3X....593,110

7 MHz
S52X....558,386
9A3K....445,704
YU5R (YT2AAA)....427,094

3.5 MHz
HA1TJ....160,928
S53X....138,838
I4AVG....109,560

ASSISTED
LOW POWER ALL BAND
TM3Z (F4DSK)....3,610,698
SV2AEL....1,495,350
SP2R....1,227,534
YL1ZF....1,204,330
ON5GQ....1,144,494

28 MHz
SV1JG....44,144
ES5RY....38,982
RW4W....33,969

21 MHz
ED7O (EA7EU)....361,257
EE5K (EA5DF)....307,648
MW9W....179,664

14 MHz
IK6VXO....477,118
T7ØA....362,710
IT9XTP....274,736

7 MHz
IK4ZIF....189,336
G4N (G4ZVB)....144,643
YT9VM....119,616

3.5 MHz
DF1MM....74,880
S51ZJ....67,968
S53NW....49,472

SINGLE OPERATOR
QRP ASSISTED ALL BAND
ON6NL....596,520
DL6ZBN....319,770
YU1LM....201,188
EA7Q....76,033
SP9RQH....48,720

28 MHz
EA5Y....17,028
IT9RJE....5,106
IZ8DFO....2,156

21 MHz
E7AA (E73AA)....54,514
G5N (GØSBN)....15,048

14 MHz
OQ4B (ON4BHQ)....37,584
9A1CRT (9A7RA)....2,277
IZ2QKG....1,914

7 MHz
9A6TT....8,360

3.5 MHz
OL6D (OK1DWQ)....21,805
SP3EMA....14,736

MULTI-OPERATOR
SINGLE TRANSMITTER
HIGH POWER
IQ4FC....5,815,600
OK5Z....5,047,174
SP8R....4,393,440
SZ1A....3,763,900
DP6A....3,220,700

MULTI-OPERATOR
SINGLE TRANSMITTER
LOW POWER
IT9BLB....2,683,868
IQ3RK....2,154,300
LY5W....1,987,335
9A7T....1,828,908
S51A....1,520,415

MULTI-OPERATOR
TWO TRANSMITTER
EC2DX....5,968,494
IQ9RG....5,514,602
PI4COM....5,400,014
S5ØW....5,280,956
DP7D....4,913,650

MULTI-OPERATOR
MULTI-TRANSMITTER
9A1A....10,482,053
DM4X....3,947,364
PI4CC....2,703,200
I3VRD....2,669,032
SP9KDA....417,768

EXPLORER
SINGLE-OPERATOR
IV3RYP....6,955
MØORY....5,624

ROOKIE
HIGH POWER
EI6LA....835,752
IV3JAG....24,236
DK5PH....19,039

ROOKIE
LOW POWER
F4ITQ....152,520
EA5JDN....142,680
MØLKW....140,292
DL9DX....120,139
IUØPVM....116,946

CLASSIC
HIGH POWER
RW1A....1,274,511
YT3D....1,161,303
I4JED....1,029,033
OZ11A....918,750
TM5T (F5VKT)....820,855

CLASSIC
LOW POWER
ON4CT....897,773
EA3CI....684,080
IK2BUF....558,744
IK1JJM....512,216
DL3SYA....508,174

YOUTH
HIGH POWER
9A2ZI....2,743,698
DM7XX....2,437,018
9A1CAL (9A3LET)....41,870

YOUTH
LOW POWER
EI8KW....122,484
IU4FNO....110,547
BD4VGZ....76,752
E7ØAW....74,692
SP8BRT....5,513



Ron, WV4P, shared this collage of his CQWW DX RTTY team behind the rapidly improving and growing NJ4P superstation.

BAND-BY-BAND BREAKDOWN—TOP ALL BAND SCORES

Number groups indicate: QSOs, Countries, Zones, US/VE on each band

WORLD

TOP SINGLE OPERATOR ALL BAND

Station	80	40	20	15	10
P49X	121/8/19/33	669/20/59/49	844/24/65/53	1001/20/63/51	751/19/41/49
LZ5R	324/10/45/15	563/21/65/38	1232/30/72/46	1016/28/74/51	171/20/43/12
K5ZD	284/13/38/48	642/18/63/50	1142/28/80/50	916/24/78/44	118/17/30/19
PW2L	6/4/2/5	234/16/43/34	489/20/53/46	677/22/66/47	825/19/67/47
LN8W	299/8/45/9	577/21/67/36	669/27/67/45	504/25/69/40	66/16/35/0

SINGLE OPERATOR ASSISTED ALL BAND

P3X	298/9/52/7	502/28/82/33	940/30/97/44	1176/29/90/47	341/22/56/8
AA3B	351/15/52/51	861/24/84/55	1113/30/93/54	855/27/88/49	195/19/44/25
IZ4BOY	311/11/57/147	95/31/98/47	898/31/92/55	791/33/96/51	197/27/64/24
K1LZ	373/14/53/47	705/24/80/50	922/31/95/51	790/28/90/50	166/18/47/30
SN7Q	367/13/54/20	699/28/90/45	856/31/88/48	737/33/100/46	147/25/55/5

MULTI-OPERATOR SINGLE TRANSMITTER

IQ4FC	231/14/57/19	877/31/100/51	960/34/104/55	843/33/105/55	185/27/73/17
OK5Z	276/14/58/21	771/30/100/51	719/32/99/51	826/34/108/53	118/27/68/20
SP8R	216/12/55/8	565/28/92/43	786/34/101/51	816/32/112/51	138/26/67/8
*KP2B	51/9/10/29	442/21/68/52	619/28/80/54	672/27/84/58	733/18/55/50
SZ1A	190/12/54/7	818/28/94/40	684/29/96/40	615/31/94/39	190/27/59/15

MULTI-OPERATOR TWO TRANSMITTER

CR3DX	348/13/51/38	1219/28/89/54	1548/32/93/52	1895/32/101/57	1005/25/80/47
K9CT	387/16/42/54	1024/28/86/55	1424/30/94/56	1203/33/99/54	240/21/45/44
EC2DX	369/13/56/24	1008/29/88/49	1175/30/94/54	1051/32/91/52	239/21/50/24
NJ4P	304/14/31/53	829/26/82/53	945/29/87/55	1097/29/97/55	406/23/65/36
IQ9RG	297/12/53/15	769/29/94/50	1103/32/89/50	1123/32/90/54	204/28/62/19

MULTI-OPERATOR MULTI-TRANSMITTER

CR3W	427/12/54/30	1104/30/96/54	1456/30/94/53	1638/33/101/57	746/29/80/39
9A1A	827/15/63/22	1515/31/102/49	1606/36/108/54	1255/34/108/54	368/25/71/15
K1SFA	423/16/51/51	926/24/79/55	1311/30/93/53	926/29/98/55	379/19/41/45
DM4X	448/10/55/19	697/28/92/42	867/32/97/52	355/30/75/44	248/26/62/20
N6WM	366/11/14/54	761/28/66/54	805/30/76/52	1078/28/81/56	426/19/30/42

USA

SINGLE OPERATOR ALL BAND

Station	80	40	20	15	10
K5ZD	284/13/38/48	642/18/63/50	1142/28/80/50	916/24/78/44	118/17/30/19
W7RN	233/8/9/46	592/22/43/53	744/21/52/52	837/26/58/51	326/14/18/41
KØZR	206/7/20/47	548/21/64/49	796/22/67/44	413/22/69/33	109/15/23/19
KU1CW	61/9/9/28	439/25/59/50	287/23/43/44	495/25/52/50	92/17/21/29
W7YAQ	99/6/5/36	233/22/32/42	324/22/48/48	393/26/61/41	170/15/24/37

SINGLE OPERATOR ASSISTED ALL BAND

AA3B	351/15/52/51	861/24/84/55	1113/30/93/54	855/27/88/49	195/19/44/25
K1LZ	373/14/53/47	705/24/80/50	922/31/95/51	790/28/90/50	166/18/47/30
K3MM	279/12/41/46	603/25/83/50	665/29/87/52	492/28/82/44	178/19/46/31
N3QE	264/12/41/47	618/22/73/54	612/23/79/55	406/25/80/30	83/17/28/21
KØMD	170/11/21/43	433/17/51/52	754/26/76/51	478/24/73/22	106/17/29/15

MULTI-OPERATOR SINGLE TRANSMITTER

NV9L	148/10/28/36	427/23/70/48	746/29/82/51	805/26/82/42	176/22/43/33
K3AJ	179/11/29/43	435/24/75/49	747/26/81/48	539/27/87/43	89/19/30/18
WA7AN	172/11/13/49	590/27/67/54	623/30/82/55	681/27/83/58	121/19/35/40
K5RZA	118/10/10/42	469/25/69/53	614/29/75/54	801/26/80/54	84/21/44/32
AG4TT	152/10/24/41	448/19/60/50	872/23/78/49	335/25/76/33	104/17/46/13

MULTI-OPERATOR TWO TRANSMITTER

K9CT	387/16/42/54	1024/28/86/55	1424/30/94/56	1203/33/99/54	240/21/45/44
NJ4P	304/14/31/53	829/26/82/53	945/29/87/55	1097/29/97/55	406/23/65/36
KT7E	135/6/5/41	525/25/52/49	664/26/63/50	717/27/65/49	329/13/22/39
K7BTW	255/9/8/50	564/26/48/51	717/27/58/54	686/23/67/50	258/12/20/37
NA4DA	37/8/10/19	370/18/59/50	562/23/69/48	789/23/67/46	193/18/42/16

MULTI-OPERATOR MULTI-TRANSMITTER

K1SFA	423/16/51/51	926/24/79/55	1311/30/93/53	926/29/98/55	379/19/41/45
N6WM	366/11/14/54	761/28/66/54	805/30/76/52	1078/28/81/56	426/19/30/42
W3GH	333/11/35/48	915/22/72/54	858/25/78/49	415/21/67/33	159/13/22/28

YT3D.* Alex, KU1CW, was hot on the tail of YT3D claiming the first-place spot in the U.S. Dirk, ON4CT, takes top low-power honors in a very tight race with the HH2AA remote station operated by Alan, K6DTT.

Rookie

A big high-power score out of Irish rookie Rafal, EI6LA, who had been licensed just shy of a year before the contest, was enough to win this overlay. In North America, basically a four-way race was won by Erik, KD2UBH, in New York, who returned to ham radio in 2020. In the low-power arena, Steve, K3AK, managed to best second place Sebastian, KI2D, by almost double the score. Great job to all the Rookies and welcome to CQWW RTTY contesting.

Youth

It's fantastic that we offer a category for younger operators to enjoy some competitive radiosport. There was a solid battle for first place, which was won by Ivan, 9A2ZI. But Robert, DM7XX, did a great job keeping pace and put up a good fight and secured second place in an exciting race.

Explorer Category

The new Explorer category had a couple of entries. This category recognizes innovation in station design, operating strategies, and technology and was put in place to allow experimentation in a contest environment. The most common application has been a distributed multi-op in which several contesters get together from their home stations to produce a multi-op effort.

The three-person team at VE2CQ was able to do this very effectively and produce a respectable score of over a mega-

*(*YT3D is the winner of this category, in accordance with CQ policy following Russia's invasion of Ukraine,)*

EUROPE
SINGLE OPERATOR ALL BAND

Station	80	40	20	15	10
LZ5R	324/10/45/15	563/21/65/38	1232/30/72/46	1016/28/74/51	171/20/43/12
LN8W	299/8/45/9	577/21/67/36	669/27/67/45	504/25/69/40	66/16/35/0
GWØA	246/7/44/8	491/17/67/36	525/26/70/43	430/26/83/45	55/15/30/2
*CR5O	43/4/20/0	247/10/48/24	609/19/65/40	667/21/63/40	73/9/27/0
RW1A	148/8/37/3	279/24/61/32	308/19/45/33	453/27/67/35	82/19/33/0

SINGLE OPERATOR ASSISTED ALL BAND

IZ4BOY	311/11/57/14	795/31/98/47	898/31/92/55	791/33/96/51	197/27/64/24
SN7Q	367/13/54/20	699/28/90/45	856/31/88/48	737/33/100/46	147/25/55/5
UR5MW	279/6/48/6	809/26/85/31	1072/28/89/37	1091/29/91/38	151/23/51/3
G7C	347/11/51/21	740/22/72/37	868/31/88/48	631/25/79/46	90/14/39/5
*TM3Z	306/10/54/24	802/29/95/47	573/33/101/54	359/31/96/48	100/24/52/16

MULTI-OPERATOR SINGLE TRANSMITTER

IQ4FC	231/14/57/19	877/31/100/51	960/34/104/55	843/33/105/55	185/27/73/17
OK5Z	276/14/58/21	771/30/100/51	719/32/99/51	826/34/108/53	118/27/68/20
SP8R	216/12/55/8	565/28/92/43	786/34/101/51	816/32/112/51	138/26/67/8
SZ1A	190/12/54/7	818/28/94/40	684/29/96/40	615/31/94/39	190/27/59/15
DP6A	314/16/60/23	441/29/94/46	761/32/101/51	330/31/97/47	75/22/49/2

MULTI-OPERATOR TWO TRANSMITTER

EC2DX	369/13/56/24	1008/29/88/49	1175/30/94/54	1051/32/91/52	239/21/50/24
IQ9RG	297/12/53/15	769/29/94/50	1103/32/89/50	1123/32/90/54	204/28/62/19
PI4COM	421/10/55/13	847/31/97/45	983/33/105/54	799/31/93/49	143/20/48/10
S5ØW	446/11/52/18	866/30/87/45	1081/32/93/52	864/31/86/51	129/24/56/15
DP7D	371/10/55/15	833/29/93/47	807/31/94/49	763/31/92/47	200/25/69/8

MULTI-OPERATOR MULTI-TRANSMITTER

9A1A	827/15/63/22	1515/31/102/49	1606/36/108/54	1255/34/108/54	368/25/71/15
DM4X	448/10/55/19	697/28/92/42	867/32/97/52	355/30/75/44	248/26/62/20
PI4CC	311/7/42/8	550/19/63/17	761/30/82/49	492/27/82/39	157/23/53/4
I3VRD	256/7/44/3	577/25/77/39	627/27/89/44	543/30/81/42	83/21/35/4
SP9KDA	102/6/34/3	167/11/41/7	234/17/50/22	117/19/46/23	20/14/16/0

**Low Power*

CLUB SCORES

UNITED STATES

Club	# Entrants	Score
Potomac Valley Radio Club	62	24,121,156
Yankee Clipper Contest Club	29	22,496,076
Frankford Radio Club	37	19,119,816
Northern California Contest Club	29	15,613,242
Society Of Midwest Contesters	35	15,578,655
Minnesota Wireless Assn.	53	12,714,316
Willamette Valley DX Club	17	8,551,821
Arizona Outlaws Contest Club	24	7,990,305
Florida Contest Group	8	3,429,125
DFW Contest Group	12	3,165,798
Skyview Radio Society	5	3,076,755
Tennessee Contest Group	14	2,675,532
Central Texas DX And Contest Club	4	2,571,698
Northeast Maryland Amateur Radio Contest Society	12	1,838,940
Swamp Fox Contest Group	7	1,663,949
South East Contest Club	11	1,633,683
Kentucky Contest Group	8	1,488,829
CTRI Contest Group	4	1,316,414
Alabama Contest Group	9	1,269,823
Niagara Frontier Radiosport	8	1,160,871
Grand Mesa Contesters Of Colorado	7	1,155,617
Hudson Valley Contesters And DXers	4	1,113,773
Spokane DX Association	6	1,093,741
Southern California Contest Club	11	1,022,347
Carolina DX Association	5	650,517
Metro DX Club	4	467,992
Western Washington DX Club	7	444,111
Mad River Radio Club	4	217,988
North Coast Contesters	4	128,946

DX

Bavarian Contest Club	101	51,493,817
Italian Contest Club	95	42,108,139
Interest Group RTTY	28	22,522,975
Rhein Ruhr DX Association	44	20,309,680
Croatian Contest Club	11	17,194,385
EA Contest Club	25	12,915,638
Ukrainian Contest Club	9	12,213,605
Araucaria DX Group	17	12,147,380
Contest Club Ontario	19	8,776,317
Contest Club Finland	7	7,686,794
Contest Club Serbia	8	4,285,352
Radio Amateur Association Of Western Greece	4	4,073,622
Slovenia Contest Club	9	4,060,486
Clipperton DX Club	6	3,870,359
RTTY Contesters Of Japan	13	3,764,755
YB-Land Dxing Passion Is	89	3,424,405
LA Contest Club	5	3,398,988
599 Contest Club	6	3,045,441
Okayama DX Club	6	2,476,692
Belarus Contest Club	4	2,307,147
Siam DX Group	5	2,172,540
Cabreuva DX	11	1,909,141
Rio DX Group	15	1,685,092
SP DX Club	13	1,637,901
Latvian Contest Club	4	1,564,614
5NNDXCC	17	1,555,932
LU Contest Group	10	1,511,558
Thracian Rose Club	10	1,391,874
GMDX Group	4	1,309,644
Orca DX And Contest Club	7	1,175,454
Russian Contest Club	4	1,028,306
Danish DX Group	6	964,838
Czech Contest Club	5	958,654
VK Contest Club	6	948,484
Russian Digital Radio Club	10	929,061
SK5AA Vasteras Radioklubb	4	907,346
Contest Club Belgium	8	730,521
YB Land DX Club	12	575,324
Radioclubul Radu Bratu	4	552,536
7A DX-Contest Club	13	336,182
World Wide Young Contesters	4	308,236
Grupo DXXE	5	184,933
ARCK	4	178,555
YB6 DX Community	4	173,042
CDR Group	4	90,827
Oldhouseradioclub	6	60,739
Radio Club Eternautas	4	60,422
Orari Lokal Kediri	4	32,673

Club scores with **4 or more** entries.

point. We would love to hear more from operators producing efforts in the category. It keeps things fresh and interesting. The full explorer rules can be found at the main CQWW contest website <https://cqww.com/explorer.htm>.

Plaque Sponsorship

Plaque sponsorship is a great way to recognize local or zone competitions and efforts. Rich, N1IXF, can be very helpful in assisting your selection of a plaque to sponsor. The entire CQWW RTTY management team appreciates these invaluable sponsorship opportunities. Look at the plaque winners tables, and if there is a category or region you would like to sponsor, let us know or contact N1IXF directly <n1ixf@att.net>.

In Closing

On behalf of the CQWW RTTY contesting team, we would like to congratulate all winners and participants. With band conditions improving rapidly, and pandemic restrictions waning, the next running in September 2023 should prove another fun and interesting event for all.

73 and looking forward to working you in the next one.

– Chris, N6WM; Ed, WØYK; & Rich, N1IXF

(Scores on page 102)

2022 CQWW RTTY TROPHY WINNERS AND DONORS

SINGLE OPERATOR HIGH POWER UNASSISTED

World: Sponsored by Yankee Clipper Contest Club, Winner: **P49X (op: Ed Muns, WØYK)**
Europe: Sponsored by ARI – Italian Radioamateur Association in memory of Franco Fanti, I4LCF, Winner: **LZ5R (op: Milen Dimov, LZ5DB)** New Bulgaria & Zone 20 Record
North America (All): Sponsored by Dick Wilson, K6LRN & Carolyn Wilson, K6TKD, Winner: **Randy Thompson, K5ZD**
USA: Sponsored by Kevin Rowett, K6TD, Winner: **W7RN (op: Jeff Stai, WK6I)**
USA – 7th Call Area: Sponsored by Hank Lonberg, KR7X, Winner: **Alex Tkatch, KU1CW**
South America: Sponsored by John Lockhart, WØDC, Winner: **PW2L (op: Wanderly Ferreira Gomes, PY2MNL)**
Asia: Sponsored by Hajime Kato, JO1RUR, Winner: **Masa Okano, JH4UYB**
Japan: Sponsored by Hajime Kato, JO1RUR, Winner: **Taisuke Kishi, JA1OVD**

SINGLE OPERATOR LOW POWER UNASSISTED

World: Sponsored by Rich Cady, N1IXF, Winner: **Yuri Onipko, VE3DZ** New Canada (Ontario) Record
Europe: Sponsored by Jeff Demers, N1SNB, Winner: **CR5O (op: Helder Mendes, CT7AJL)**
USA: Sponsored by Scott Wright, KØMD, Winner: **Jim Lageson, NØUR**

SINGLE OPERATOR QRP UNASSISTED

World: Sponsored by Kevin der Kinderen, N4TT, Winner: **Dave Barr, K2YG**
USA/Canada/Mexico High Score: Sponsored by Kevin der Kinderen, N4TT, Winner: **W6QU (op: Bill Parker, W8QZA)**

SINGLE OPERATOR ASSISTED HIGH POWER

World: Sponsored by IGRY – Interest Group RTTY, Winner: **P3X (op: Sergiy Rebrov, 5B4AMM)**
Europe: Sponsored by Dimitri Cosson, F4DSK, Winner: **IZ4BOY (op: Gabry Iuliani, IT9RGY)** New Italy Record
North America (All): Sponsored by John Webster, NN1SS, Winner: **Bud Trench, AA3B**
USA: Sponsored by Bud Governale, W3LL, Winner: **K1LZ (op: Emmanuel Siebert, LU9ESD)**
Asia: Sponsored by Lakshman "Lucky" Bijanki, VU2LBW, Winner: **Harumi Kukita, JR4OZR**

SINGLE OPERATOR ASSISTED LOW POWER

World: Sponsored In Memory of Jim Barron, WB5AAA, **Winner: TM3Z (op: Dimitri Cosson, F4DSK)**
Europe: Sponsored by Pat Moyer, W3RGA, Winner: **Savvas Pavlidis, SV2AEL** New Greece Record
South America: Sponsored by Pat Moyer, W3RGA, Winner: **L73H (op: Luis Rogelio Galina, LU4HK)**

SINGLE OPERATOR SINGLE BAND

World 28 MHz High Power: Sponsored by Shelley Parker, KØMKL, Winner: **Atsuo Sakuma, 5W1SA** New Samoa & Zone 32 Record
World 28 MHz Assisted High Power: Sponsored by Los Idóneos, Winner: **LT6M (op: Sebastian Galeazzi, LU8MHL)**
World 21 MHz High Power: Sponsored by Steve "Sid" Caesar, NH7C, Winner: **Laszlo Vegh, OM2VL** New Slovakia Record
World 21 MHz Assisted High Power: Sponsored by Los Idóneos, Winner: **HG1S (op: Zugo Tibor, HA1DAE)** New Hungary Record
World 14 MHz High Power: Sponsored by Standa Kostal, OK7W, Winner: **Victor Petcherkin, N8OO**
North America 14 MHz Low Power: Sponsored by Patrick W. Soileau, ND5C, Winner: **Amed Santana Gonzalez, CO2AME** New NA & Zone 8 Record
World 7 MHz High Power: Sponsored by John Webster, NN1SS, Winner: **Mamuka Kordzakhia, 4L2M** New Georgia Record
Europe 7 MHz Low Power: Sponsored by John Webster, NN1SS, Winner: **Martin Bohadlo, OK1WCF** New Europe & Zone 15 Record

OVERLAY CATEGORY

Rookie – Europe: Sponsored by Bavarian Contest Club, Winner: **Rafal Lukawiecki, EI6LA**
Youth – World: Sponsored by IARU Region 1 Youth Working Group, Winner: **Ivan Zivcic, 9A2ZI**
Youth – Europe: Sponsored by IARU Region 1 Youth Working Group, Winner: **Robert Stieber, DM7XX**
Youth – Africa: Sponsored by IARU Region 1 Youth Working Group, Winner: **No Entrant**
Youth – North America (All): Sponsored by Youth On The Air Camp Americas, Winner: **No Entrant**
Youth – South America: Sponsored by Tim Duffy, K3LR, Winner: **No Entrant**
Youth – Asia: Sponsored by Tim Duffy, K3LR, Winner: **Jian'ang Zhu, BD4VGZ**
Youth – Oceania: Sponsored by Tim Duffy, K3LR, Winner: **No Entrant**

MULTI-OPERATOR, SINGLE-TRANSMITTER HIGH POWER

World: Sponsored by PL259 Contest Club courtesy of K6TD, Winner: **IQ4FC (ops: I4EWH, I4IFL, IK4DCW, IK4HVR, IK4MGP, IK4MGX, IU4OMO, IW3FVZ, IW3GST, IZ4NIC)**
USA: Sponsored by Neal Campbell, K3NC, Winner: **NV9L (ops: NV9L, WB9Z)** New W9 Record

MULTI-OPERATOR, SINGLE-TRANSMITTER LOW POWER

USA: Sponsored by 599 DX Association, Winner: **NY6DX (ops: K2XR, NY6DX)** New W2 Record
Africa: Sponsored by Bavarian Contest Club, Winner: **EA8DED (ops: OH2PQ, OH9GIT, YL2KF, OH2BP)**

MULTI-OPERTATOR, MULTI-TWO

World: Sponsored by Ed Muns, WØYK, Winner: **CR3DX (ops: CT3EN, CT3DZ, IC8SQS, OM2KW, OM3RG, OM3RM)** New Madeira Islands Record

MULTI-OPERATOR, MULTI-TRANSMITTER

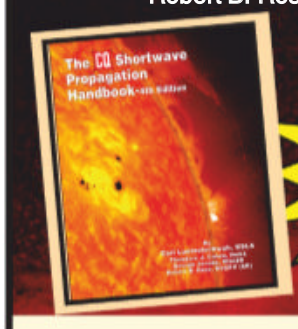
World: Sponsored by Mike Trowbridge, KA4RRU, Winner: **CR3W (ops: DK4QT, DJ7JC, DL6TK, DJ8NK, DF7EE, DM2RM, DJ9RR)**
USA: Sponsored by Brian Moran, N9ADG, **Winner: K1SFA @ K1TTT (ops: W1TO, K1SFA, WA2BOT, K2IW, K1MK, WT2P, K1NZ, K5TRP, KJØD, K1TTT)**
USA – Zone 3 High Score: Sponsored by Livermore Amateur Radio Group Endeavors (K6LRG), Winner: **N6WM @ N6RO (ops: N6WM, N6RO, K3EST, K6AW, DL9DRA, WU6P, KK6PXT)** New W6 Record

CLUB COMPETITION

World: Sponsored by Potomac Valley Radio Club, Winner: **Bavarian Contest Club**
USA: Sponsored by Northern California Contest Club, Winner: **Potomac Valley Radio Club**

(Plaque sponsors as of publication date. Additional plaques may be sponsored. NA plaques may now be sponsored as "All NA" (K, VE, & other) or "Non-K/VE NA")

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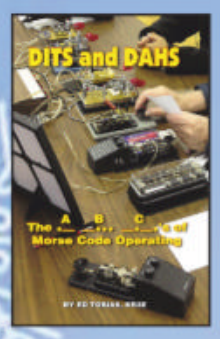
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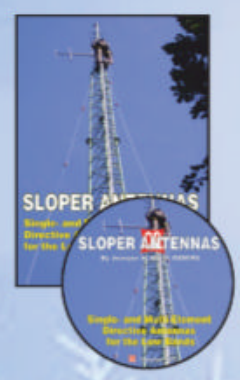
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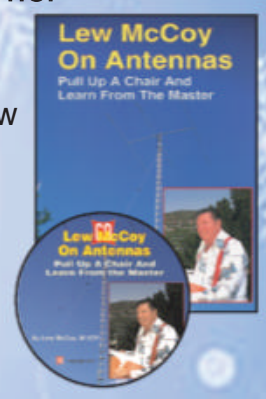
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Going Portable with Scanners and Ham Radio Handhelds

BY KLAUS SPIES,* WB9YBM

If going portable near home with either your scanner or ham handie-talkie (HT), it's as easy as clipping the radio and maybe a spare battery to your belt and that's it. If you realize later that you need a battery charger or other accessory, you're close enough to home to conveniently take care of whatever you missed the first time you walked out the door.

It's not so easy when you're going a bit farther from home — like a day's outing, Field Day, hamfest, or vacation — since we can't conveniently return home to grab what we forgot. How do we ensure we take along everything we need without missing anything?

The easiest thing to do is create a checklist — ensure it covers *every*thing you'll need. Relying only on one's memory is not always that reliable, especially when under the stress of planning and packing for a trip.

If you've got enough spare nooks and crannies available in your luggage, you might not need much more than a checklist. Just be aware that there are sensitive items like the keyboard on the front of the radio and inflexible gain antennas that will most likely require padding and should probably be packed between some soft items — between the shirts, for example.

Personally, I prefer having my radio equipment in its own carrying case. That way I don't need to rely on finding spare room in an uncertain source — plus this approach will make it easier to just grab and go when I'm not taking along luggage like during a day trip. There are a few options for this: Some of the places selling electronic components for the home hobbyist also sell generic carrying cases for test equipment. The hard foam inside of these carrying cases can be custom tailored by the user for any equipment they want to carry. These cases are pretty rugged,



Photo A. It's a good idea to lay out all of your gear on a table before buying a carrying bag (or case) to see how much space you'll need. This photo shows the author's portable scanner and accessories.

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look professional, and are customizable. If you think your handheld will be exposed to rough service like a DXpedition, this approach is worth considering, although due to the expense this option might be considered overkill for less severe use. For a gentler approach, my go-to method is to visit a photography supply store. It will have a variety of nice-looking carrying cases for cameras and camera equipment in multiple sizes, making it easy to select a carrying bag of the right capacity. These cases come complete with carrying handles, are made from several different materials including vinyl and fake or real leather, and have at least a modicum of built-in padding. The price range can vary quite a bit, depending upon size and quality. For average use, the cheap end of the spectrum will work although if you'd like something that lasts longer without showing wear and tear or you'd like to show off with something fancier, the higher end approach (possibly all leather) might be worth considering. Even the fancier photo bags come with a caveat: If it looks too fancy and is left in plain sight, it might be seen as tempting by would-be thieves.

Before buying a carrying case, I'd suggest laying out everything you need to take along on the kitchen table to get an idea of how big of a case you need (*Photos A* and *B*). It's better to go slightly larger than needed instead of getting the bare minimum. This will allow for additional padding to be inserted (should you think it necessary), and of course inevitably there will always be a few items that get added as an afterthought (like a spare note pad or pen). This will also allow for certain safety: Batteries need to be stored in a way that, should they shift during transport, metal objects (like a gain antenna) will not cause a short of the terminals. A spare pocket in the case dedicated to batteries would be the safest option instead of storing these in the main compartment (I've also clipped them to the carrying handle, although there they need watching so they don't accidentally get knocked off).

While a scanner will stand reasonably well on its own, this is not the case with a ham HT when it's used with a speaker-microphone. While using a speaker-mic is not mandatory, I like to use one especially during longer contacts as the HT will get warm. First of all, this will allow better air circulation around the radio, and secondly, I'm not adding body heat to a radio that's already generating its own heat. Since this requires some type of mount, I decided to make

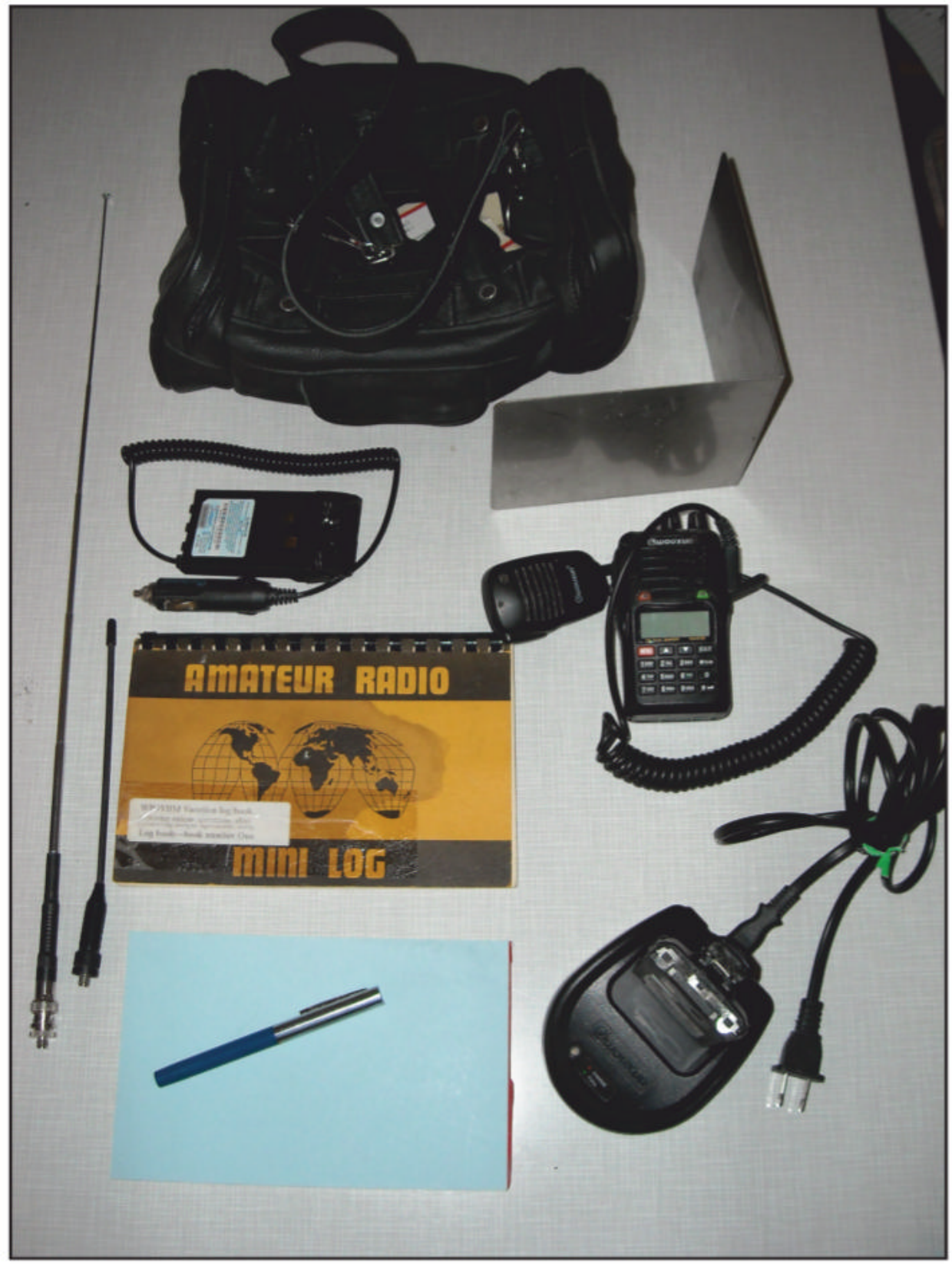


Photo B. The author has a separate bag for his portable ham gear, including a mini-logbook for keeping track of contacts while away from a logging computer.

We stock the rugged 1KW transistor and parts for the 2M and 88-108MHz amplifier designs. We also stock the NXP MRF101 LDMOS transistors.

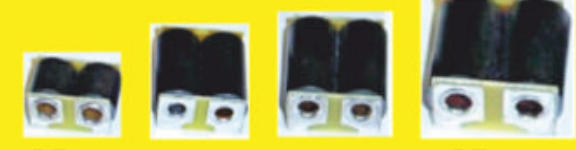
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use of the belt clip by taking a piece of scrap sheet metal and putting a bend in it — this also makes for convenient bookends in my radio room. Scrap sheet metal can be found at work (depending upon where you work) by rummaging through scrap in the machine shop, or at a heating / air-conditioning place that has scrap metal in their shop (*Photo C*). This stand, though, is needed only if you're operating with the antenna on the radio in order to maintain vertical polarization. On the other hand, if you're taking along a magnetic mount either one with an antenna already on it or a mag mount with a BNC connector that will accept almost any scanner or H.T. antenna used on your radio (*Photo D*), this stand will not be needed. As an alternative — if you're concerned about scratching your car's paint or the effect of repeatedly slamming a car door on coax cable — the window mount in *Photo E* might be an option.

Speaking of using antennas not installed directly on the radio itself: In the majority of applications using the antenna on the radio itself works reasonably well. On the other hand, if you're using your radio equipment while at the family picnic and are lounging near your car — maybe even using your car battery as your power supply, — there are definite advantages to using a mobile antenna — or at least using your radio's antenna on a mag-mount base on the car (preferably on the roof) to make use of the car's ground-plane.

Conclusion

The objective here has been to make portable work as painless as possible: Having everything easily transportable while minimizing the risk of missing a vital piece of equipment. Not only does this make operating easier but will also (hopefully!) minimize any negative experiences during radio operation *and*, in so doing, also minimizes the chances of upsetting traveling companions by imposing any "radio headaches" on them! Happy operating!



Photo C. A bent piece of scrap sheet metal can serve as a lightweight and portable stand for a handheld, especially when using it with a speaker-mic.



Photo D. A magnetic mount with a BNC connector can accommodate just about any antenna that also works with your handheld radio.



Photo E. An antenna window mount can come in handy if you're concerned about a magnet mount scratching the paint on your car's roof or trunk lid.

Quick setup and teardown, along with reliable power, are essential elements of a portable HF station, whether for emergency / disaster use or for just plain fun, such as Parks On The Air activations. K3SKS updates us on improvements that he and his wife have made in their mobile setup since he first wrote about it last January.

Persistent Practice Produces Positive POTA Progress

One Ham's Journey in Portable Operations Continues

BY STEVEN K. SMITH,* K3SKS

This is a follow up to my article, "One Ham's Journey in Portable Operations," that appeared in the January 2022 edition of *CQ* magazine. The initial article's intent was to explain the need for continuous practice and improvement of portable operations so that, in the event of an actual emergency, you, your equipment, and your operating practices will have the best chance for success.

Since that article appeared, my wife, Judy, KC3JAS, has 71 new POTA (Parks On The Air) park activations, made 10,928 POTA QSOs in three different states, and I continue my role as the station engineer / pack mule. Four main areas in our operation have been improved this past year; batteries, headphone system, equipment packaging, and a small camper. Here's an update.



Photo A. The new power pack consists of three Bioenno 15-Ah LFP batteries.

Batteries

Initially, we used a 70-Amp-hour (Ah) deep draw marine battery as the primary power source for the Kenwood TS-590SG transceiver. Using a new battery, KC3JAS could operate for 4 hours running 100 watts on SSB making 60-100 QSOs per hour when the bands were agreeable. One mistake we made was to run the battery until the radio would drop out on transmit (TX), then do a quick change to the Bioenno 15-Ah LFP battery, using power pole connectors.

One adverse consequence of discharging the lead-acid battery to less than the recommended 50%, we learned after replacing one after a year, was the battery's capacity after recharge would decrease over time and the battery swap had to be made earlier in the activation. Discharging a lead-acid battery should not exceed 50% of its Ah rating, which greatly reduces the effective capacity and usefulness of a lead-acid battery as an emergency power source.

Since we already had a Bioenno 15-Ah LFP battery as a backup, I opted to replace the lead-acid battery with two more of the same batteries, giving us three in total (*Photo A*). What this enables us to do is discharge the initial battery until it has supplied 15 Ah, performing real-time measurement with a PowerWerx Power Monitor, then quickly swap out the battery with a fully charged one. With three batteries, we carry 9 hours of pretty heavy-duty SSB capacity, and if we have access to 120-volts AC (camping, picnic pavilion, or generator), the first discharged battery can be recharged before it is needed while the second one is running, making the third battery a redundant backup.

If the 70-Ah lead-acid battery is limited to 50% discharge, the safe avail-

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able capacity is 35 Ah, whereas the three Bioenno 15-Ah LFP batteries can safely supply 45 Ah at about half the total weight of the lead-acid battery. Seems like a no-brainer decision, but in my defense, I am considered to be a bit "frugal" (three Bioenno 15-Ah LFP batteries cost about $450, the lead-acid battery ran about $125) and thought I might have been able to get away exceeding the recommended operating parameters of a lead-acid battery. Once again, Mother Nature won.

Headphone System

Judy uses Heil Pro 7 headphones for her activations and has some hearing loss in one of her ears. Although the Pro 7 has a left side balance adjustment, this proved ineffective to supply the sound levels she requires for good, balanced audio. To address this problem, I added a PreSonus HP4 4-channel headphone amplifier with a TalentCell Rechargeable 12-volt 6,000-mAh / 5-volt 12,000-mAh DC output lithium-ion battery pack (*Figure 1*). The small battery pack was selected so that no peripheral equipment would consume power from the primary radio battery.

In addition to providing independent adjustable left and right audio levels to the headphones, a second operator can plug their headset into the amplifier to monitor the audio from the radio. This works great for two operator contact / logging functions on Field Day.

Equipment Packaging

Photo B shows our packed-up equipment from the setup in the original article. While Station 1 is packaged very efficiently, individual components (radio, battery, headphones, headphone amplifier, amplifier battery, foot switch, logging computer, etc.) need to be unpacked, placed on a table, and interconnected — then disconnected and repacked when we go QRT.

This results in several potential problems; connection errors, connection wear, especially the radio power connection, cable wear due to repeated winding and securing, and the sense of urgency KC3JAS has when we are setting up.

To improve on our setup and teardown process, Station 1 has been repackaged using a Gator 19-inch rack container. Equipment is mounted on the rack tray, with fixed intercon-



Figure 1. Headphone amplifier connection diagram



Photo B. Two portable HF stations, three antennas, as described in January 2022 article.

nection wiring and a minimum of external connections at the front and back of the open rack. The connection diagrams (*Photos C* and *D*) show the necessary connections that need to be made (red circles) during setup and teardown.

The transceiver is secured to the rack tray using the mobile bracket supplied by Kenwood and the stereo amplifier, and wiring harnesses are secured to the tray using Velcro® pads for easy removal, if needed. A sliding drawer is included in the rack to hold notebooks, pens, and reference information (band plan, considerate operator frequencies, etc.).

The battery is to be placed beside the rack and connected using the Power-Pole connections. Not placing the battery inside the rack was done to keep the weight lower (completed rack weight is 45.7 pounds) and to make it easier to change the battery. All batteries and chargers fit nicely in a repurposed CPAP machine bag shown in *Photo A*.

Setup requires placing the rack on a table and removing the front and back covers. At the side of the rack, the Bioenno battery connects to the radio, the antenna is connected to the rear of the TS-590SG and the small battery pack is plugged into the headphone

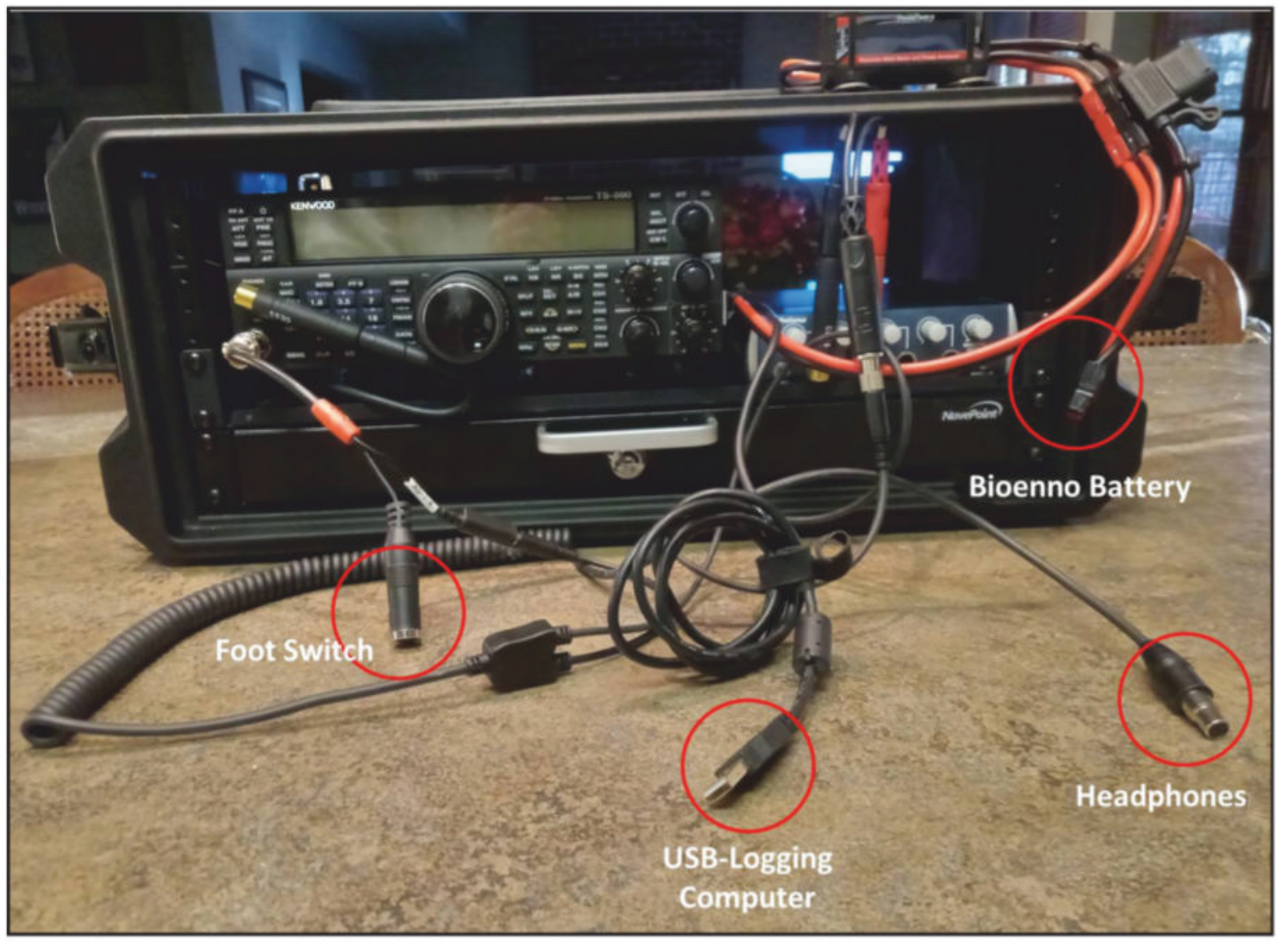


Photo C. Station 1 repackaged in a 19-inch Gator case, with circles showing the minimal number of external connections required.

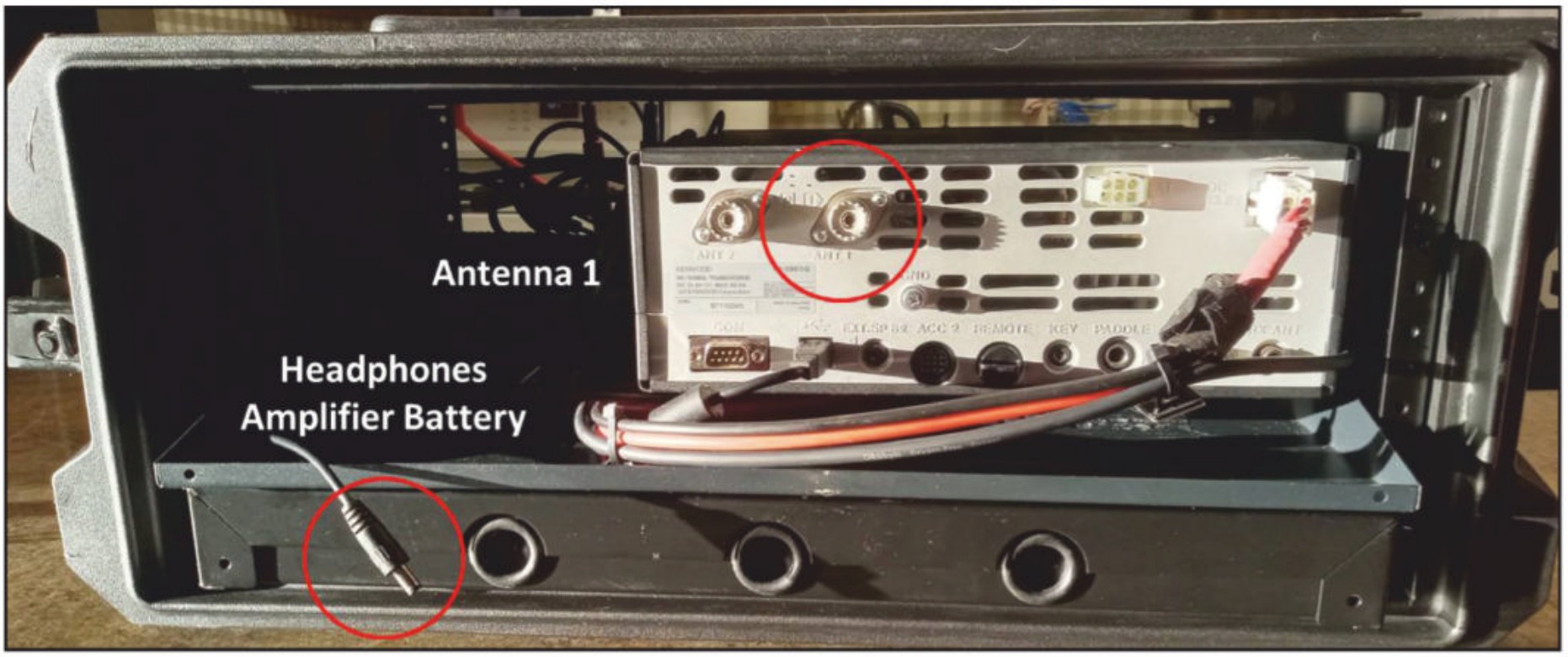


Photo D. Rear view of the Gator case, again with interconnections circled.



Photo E. POTA activation at Parker Dam State Park, Pennsylvania.

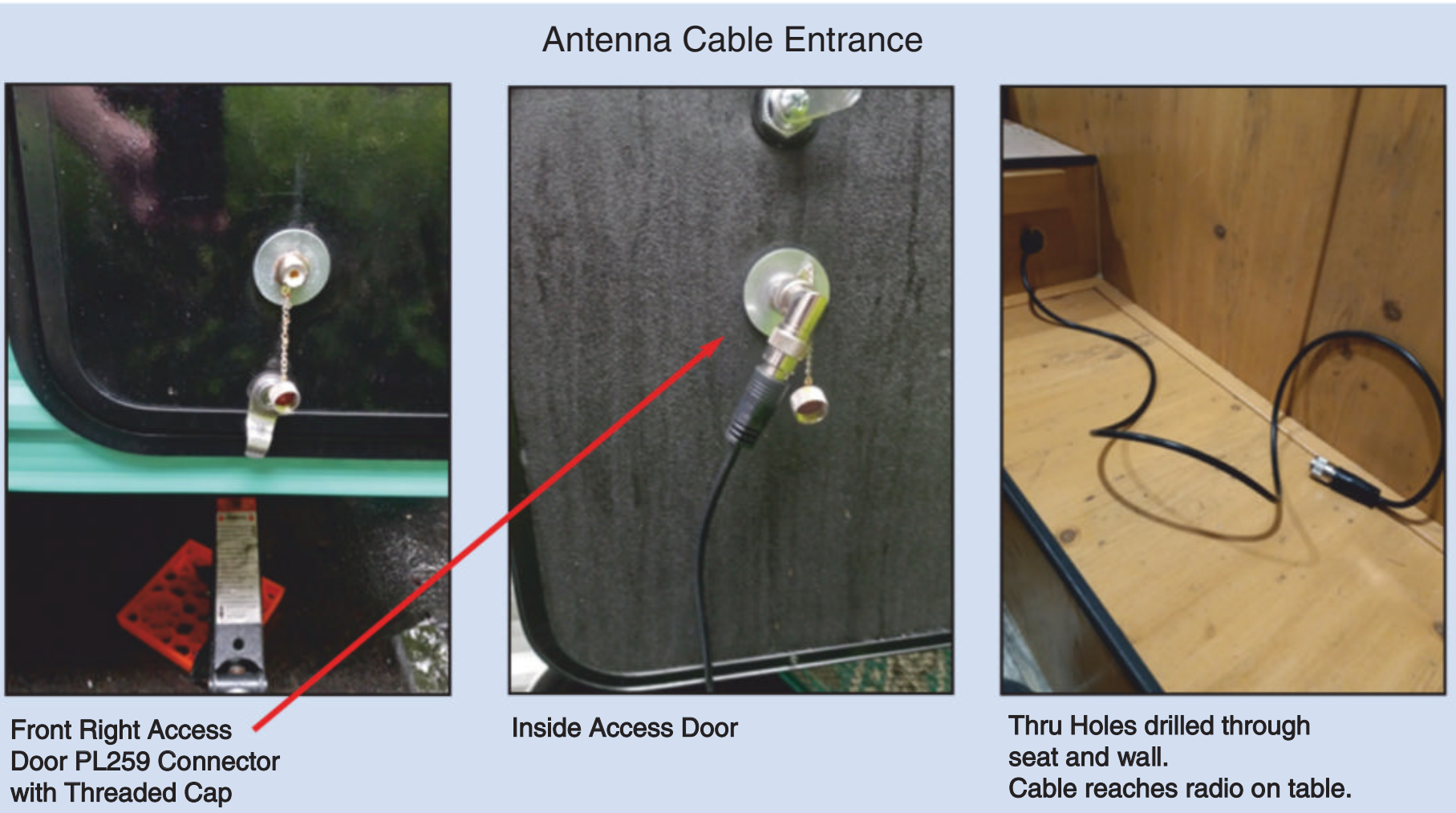


Photo F. Routing the feedline from the outside antenna into the dinette area of the camper.



Photo G. Power cable into dinette area terminates in a PowerWerx DC connector.

amplifier power connector in the rear and set inside the rack. The front connections are for the foot switch, the headphones, and the USB cable to the logging computer and then we're ready for power up.

Camper

The most significant change to our POTA activations was the addition of a small "couple's camper" so we could extend our daytime operations to overnight trips in the state parks. The camper specification was for a unit that could be towed with our existing vehicle, could sustain standalone operation ("boondocking") for two nights, and have all the comforts of home. We didn't bust our fannies for over 50 years to rough it.

The Sun Set 16BH (*Photo E*) ideally suited our needs. After I set up the camper for inside operating by tapping into the two on-board batteries, using the existing fuse panel, and an outside connection for our antennas that brings the feedline into the dinette area in the camper (*Photos F* and *G*), we were ready to go.

To Be Continued

I thought about closing with a "Conclusion" section, but if you truly are serious about continuing to improve your systems, you never reach a conclusion; you just keep getting better and better. Looking forward, I think my big challenge this year is going to be antenna setup improvements. I am pretty sure, once KC3JAS uses her new rig setup and is ready almost in the blink of an eye, I had better have the antenna ready to go at about the same time or I'm going to hear about it. It could be a long summer.

– 73, K3SKS

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CQ CLASSIC

The More Things Change …



It's said that the more things change, the more they stay the same. That is certainly true of one aspect of ham radio — DXing and DXpeditioning. Over the last several months, our DX column has been featuring DXpeditions to various parts of the globe, and January's cover story was on a DXpedition to the Vatican. So, when we took a look back exactly 50 years to what *CQ* was reporting on in March 1973, what else would we find but a DXpedition? This one was to Mt. Athos, a place more remote in time than in distance. So, without further ado, here is this month's CQ Classic, "SY1MA: Mt. Athos DXpedition," from the March 1973 issue of *CQ,* for you to see what details of DXing have and haven't changed in 50 years. – *W2VU*

SY1MA: Mt. Athos DXpedition



BY VINCENT S. DANIELS,* WB4USR/SVØWJJ

As is usual with anything I do, the trip got off to a late start from Athens on the night of October 12, 1972, on our way to the first amateur radio operation from Mount Athos. Mount Athos has been recognized as a new amateur country, and is probably the last one that will be found in Europe. After catching a couple of hours of sleep in the Greek city of Salonica, we set out over the twisty road to coastal village Uranopolis, a small village port which provides the only route to Mount Athos. Our arrival at the village, behind schedule of course, occurred just as the small boat to Mount Athos was about to leave. With all haste we loaded the 1500 watt Honda generator, the Yaesu FT 101, antennas and all the other paraphernalia onto the skiff and jumped aboard.

Our first sight of the monks of Mount Athos came to us on board this small shuttleboat. Bearded, dressed in black robes and with ages of wisdom written on their faces, the monks cast a majestic image. The little boat wound its way along the coast, stopping at each monastery along the way to pick up or discharge passengers, food, mail, or whatever.

After docking in Dafni, the port village of Mount Athos, we passed under the wary eye of the customs official and made our way to the 1950, (give or take a few years), Mercedes 4-wheel-drive diesel bus which is the only mechanized public transportation in the country. It resembled a left over WW II armored personnel carrier. We should have known right then that to turn back would be the smart thing, but I was never one for letting evil omens bother me. For instance, the fact that the DXpedition started operating on Friday the 13th had no effect on my morale whatsoever. After some amount of discussion we loaded the gear aboard the bus and started our trip over the mountain ridge to the administrative center of Mount Athos, the monastic village of Karyes. The "road" was no more than a wide donkey trail, gutted by rain and always precariously close to the edge of a cliff, which dropped directly into the sea. Din, SV1DB, got seasick—on the bus—not on the boat, but we held on and made it over the mountain, and finally descended into the village of Karyes.

Upon exiting the bus, we entered the Middle Ages. Modern times do not exist in Mount Athos. There are practically no vehicles, no motors, no noise, no electricity. All cooking is done on large wood burning stoves, such as the one in the inn in which we stayed. Oil lamps supply light during the night time hours, and everyone is usually sound asleep by 8 P.M.

One other very noticeable item is lacking from Mount Athos: females! The country is a mans' world and females are not allowed to enter its boundaries. The rule is not

Mount Athos, The Holy Mountain

Mount Athos is a small religious country which occupies a peninsula on the northern coast of Greece. Since the time of the Byzantine empire in the 10th Century, Mount Athos has enjoyed self government and the area is administered by a Greek Orthodox monastic council, and this autonomous form of rule has been officially recognized by the Greek government since 1926. The population of Mount Athos is composed almost entirely of monks and religious hermits, of whom most live in the 20 monasteries and 12 hermitages which grace the coastline and mountains of Mount Athos.



The weather was bad as we welcomed Bill to Mount Athos. It would get worse.



We went searching the mountain for a suitable QTH. Notice the FB weather.



Bill and Din pause at the new SY1MA QTH high in the clouds of Mount Athos.



Our first attempt at a tent, with Din hammering, did not fare so well through the thunder storms.



The generator gave problems, but thanks to SV1DB and SVOWJJ things were soon back in order.



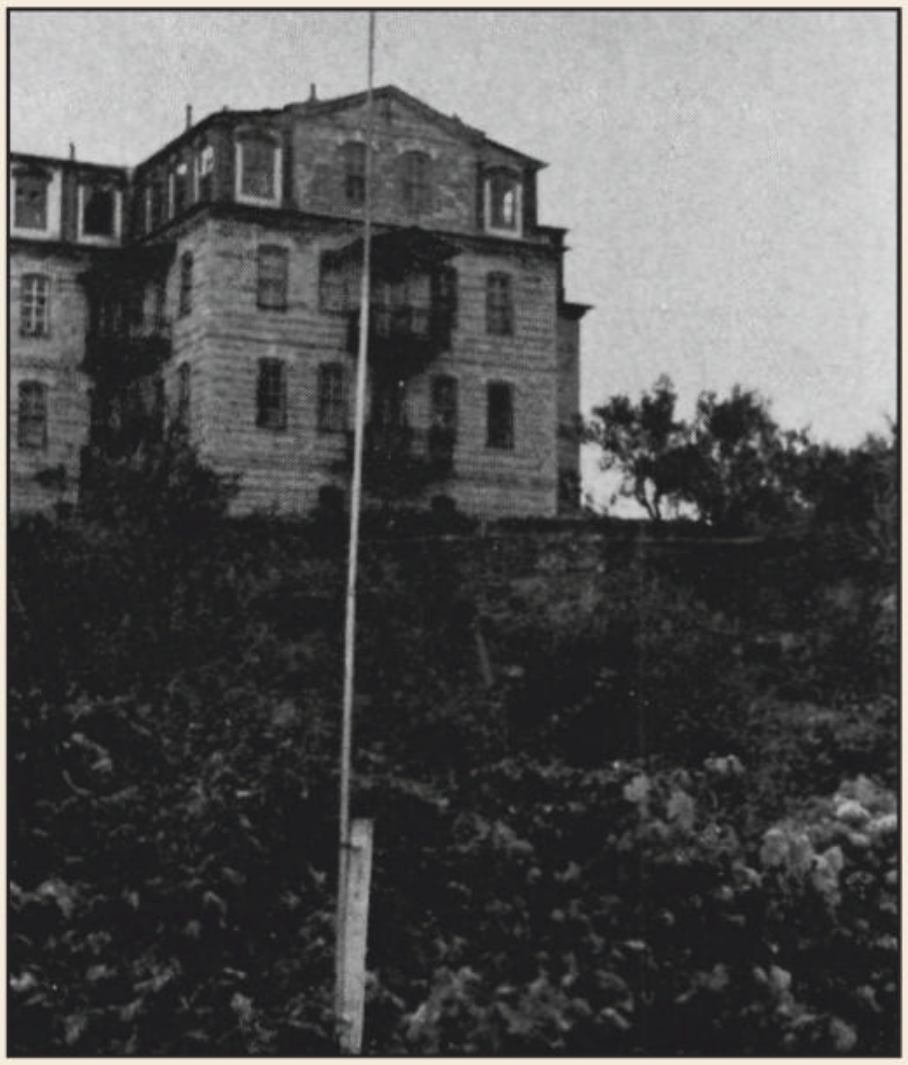
Dampened in body, but not in spirit, Vince and Bill operate SY1MA from within their plastic tent.



Roads were washed out; mule train was the only way out over the mountains.



After 1500 QSO's opening up a new DX CC country, the DXpeditioners depart from Dafni.



Our first antenna location was too low to be very good, and the generator and QSO noise disturbed the very rigid living conditions of the monks. The building in the background is one of the many monasteries in Karyes.

limited to the human species—no female animals are permitted to enter into the male sanctuary of Mount Athos. So do not count on a contact from here for the YL-DXCC.

After settling in the local inn, we took care of the administrative chores and got right to setting up the generator. We converted the inn to our operation center, and installed our antennas—three verticals—in the back yard garden. We rented two beds upstairs, prepared everything, turned on the generator and went to work on 20 m. The pileup was great and JAs and locals were pounding in. We took turns working and even managed a few Ws before the band went dead at about 2000 hours. We felt defeated. Either propagation or our QTH was miserable. We went to bed with hopes of a better day in the morning. One of the problems did improve the next day—propagation was better. But then another problem came up, and at about 1200 hours we were told we would have to shut down because we were disturbing the very strict regimen of the monks with our QSO, and generator. By this time Bill, SW0WII/WA6BWB, had arrived with a second FT-101, and we were ready for the pileups, but we needed a new QTH far from the monasteries.

The weather the next morning was terrible: cold and verging on rain, but this couldn't deter us because we're hard core DX'ers. We took the 8 A.M. bus up the mountain as high as it went and then hoofed it to the top of the ridge. We walked through the clouds on the way up, but we did manage to find a fantastic location on the edge of a cliff, with a tree right there to facilitate the building of a tent. (You may be asking yourself right now where we managed to come up with tent material. Simple! We brought a 15 meter roll of $1\frac{1}{2}$ meter wide, double ply, heavy duty plastic.) We started construction of a plastic tent strung over the branches. Bill, an ex-Boy Scout called it a "faceria," meaning, "it ain't gonna work," and we saw just how true this statement was when, two minutes later, we were hit with a ferocious thunder storm. Our plastic tent became an above ground pool, then collapsed, getting us soaked to the skin, but fortunately the equipment was dry. Under Bill's expert guidance we started anew. By suspending a large branch between two trees, and draping the plastic over this support, a secure tent was completed. Folding the plastic on the uphill side back around under us for a floor, we managed to construct a good sized, sturdy, and reasonably dry tent. The rain continued, but we couldn't get any wetter so we continued to work installing antennas, positioning the generator, and improving on the usability of our temporary home.

At noon we were back on the air, soaking wet, freezing cold and nearly starving. Din and I hung our clothes on wires inside the tent to dry, but Bill just kept his clothes on. As usual his Boy Scout know-how prevailed, and when his clothes had dried from his body heat, ours were still wet and cold, so finally we followed suit, and suited up. We operated for twelve solid hours on the 15th until finally the band went dead, and we weren't too far from that state ourselves. Breaking down whatever gear was inside the tent, we packed it in plastic bags, but left the antennas and the generator outside. At 11:30 P.M. we started down the side of the ridge for the town. Try to imagine walking on a donkey path down a mountain, with only two cheap flashlights, in the middle of a fog and with rain falling all around you, and add to all this the fact that the place you are looking for has no lights to guide you in, and you will have some idea of our discomfort when we realized we were lost.

But through some miracle—it is a holy land, remember—we did eventually find our way back to Karyes for a few hours sleep before boarding the 0800 bus back to Dafni. This was our plan at any rate. We would take the bus to the top of the mountain, have it wait while we gathered our gear, and then ride it in to Dafni. That was our plan. The fact that the road between the towns was washed out tended to wash out our plans as well. We were stranded in Karyes and we had to be back to work the next morning. What could we do. Simple! We would hire mules to take us over the mountain.

Angelos, the local mule owner is quite a nice fellow, and he owns four sturdy mules which we hired, with him as guide, for only $6.00 each. With no other mode of transportation available, the price was a steal so we accepted it, and climbed on the mules. Up at the QTH we found the tent still intact and the gear dry, so we loaded everything up on the beasts of burden and started over the mountain. After about three hours of riding we reached Dafni and had a wonderful bowl of hot bean soup, our first hot food in over 36 hours, and with it some local retsina wine. A feast!

Mount Athos had been conquered: over 1,500 QSO's. And we look forward to many future DXpeditions to this new country now that it has been opened to the world of amateur radio.

Here's a VHF/UHF (and maybe a piece of HF) antenna you can build with most parts readily available at your typical hardware / big-box store. Depending on how you build it, it can be mounted permanently or easily broken down for use in portable / remote locations.

A Collapsible Tri-Band Antenna for 6 Meters, 2 Meters, and 70 Centimeters with a 10-Meter Option

BY BOB HERKLOTZ,* K4HRK

This is an easy-to-build tri-band fan antenna with excellent performance on our most popular VHF / UHF bands. It has horizontal elements for 6 meters and vertical elements for 2 meters and 70 centimeters (*Photo A*). It's fabricated with 14-gauge THNN wire and electrical PVC tubing to support the wire. Also, a 10-meter option can be easily added.

The antenna breaks down into 2-foot-plus sections for easy transport to the field (*Photo B*) or can be permanently mounted, either suspended from a tree or mounted to a mast. A 1:1 balun and PL-259 connector are built into a quarter-wave standoff to separate the coax from the lower vertical element.

This antenna can also be configured for other bands without the 2-meter / 70-centimeter elements, such as a 6- and 10-meter horizontal fan dipole with radials 90° apart.

The electrical PVC is a good supporting structure for the radiating elements and doesn't affect performance. Other electrical PVC benefits include a good strength-to-weight ratio, junction boxes, ultraviolet protection, good blending with the environment, and it's easily replaceable if the antenna is damaged. In addition, the PVC will insulate the elements from wet tree branches. This antenna does require an A/B switch, patch box, or duplexer if you're using two radios for the different bands.

The Build Procedure

Begin by purchasing the supplies in the accompanying parts list. Then refer to *Photo C* for the following steps:

** 1142 Roseland Drive*
Columbia, TN 38401
Email: <robherk@gmail.com>

~ Drill a 1-3/8-inch hole centered in the bottom of the Carlon hex box and a 7/8-inch hole centered in the box cover and de-burr the holes. Hole saws are best for this job. Clamp the work securely to prevent the pieces from spinning and causing injury.

~ Knock out two of the box "knockouts" where the horizontal wires will exit the box, or just drill a clearance hole though the knockouts for the wires to pass though.

~ Solder the horizontal and vertical elements and the feed coax to their



Photo A. The 6-meter / 2-meter / 70-centimeter antenna suspended



Photo B. The 10-meter / 6-meter / 2-meter / 70-centimeter antenna field ready

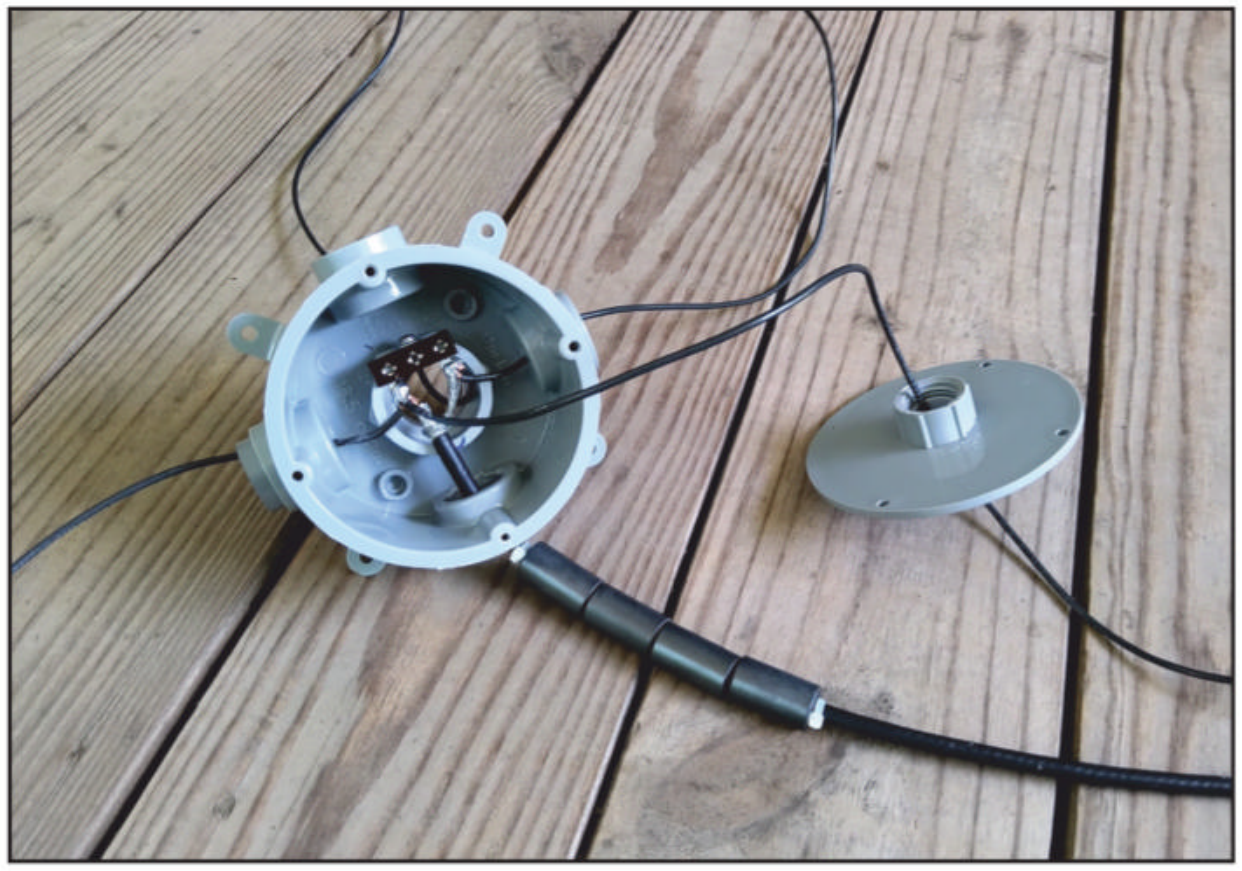


Photo C. The antenna junction box and balun detail

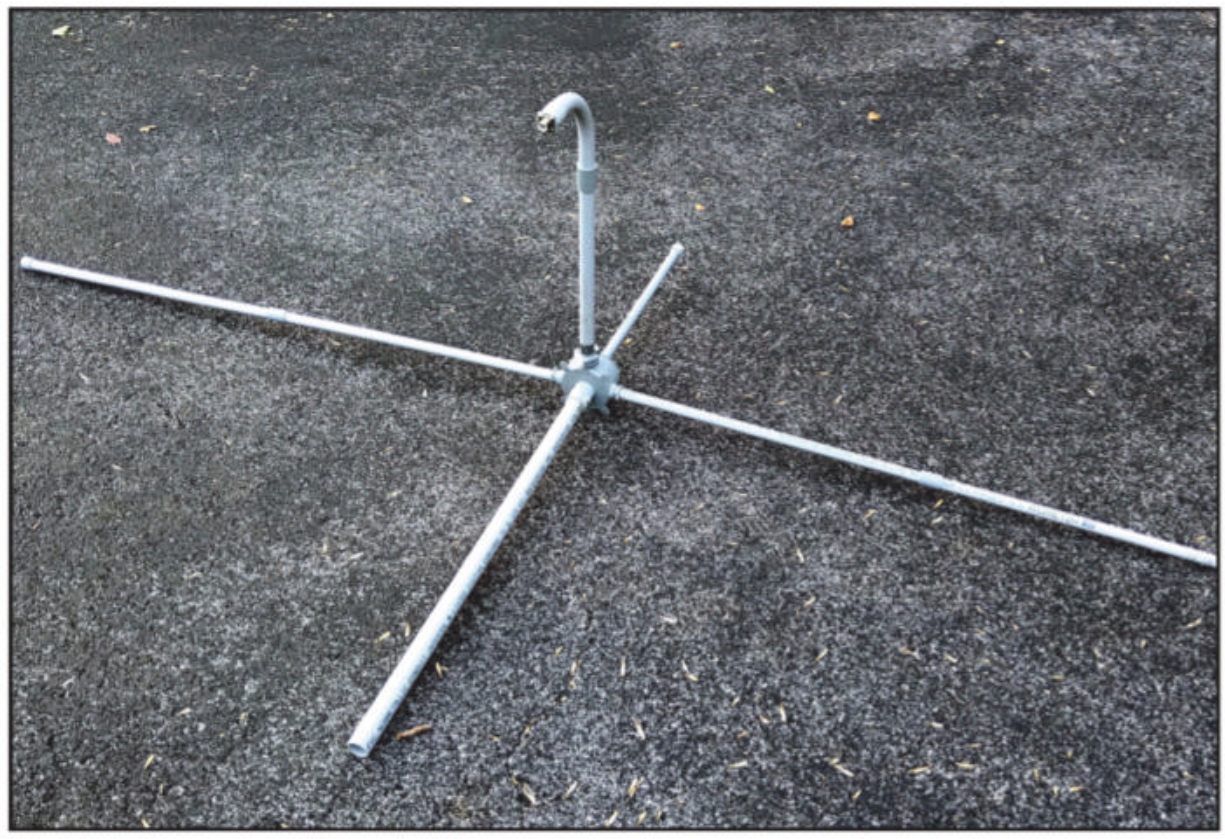


Photo D. The assembled antenna with the standoff

respective solder lugs on the terminal strip as shown in *Photo B*. A larger soldering gun will work best here. Keep in mind; this is a horizontal / vertical fan dipole, so position the wires and coax accordingly.

Note: the terminal strip is mounted on the adaptor before mounting the assembly in the box.

~ Knock out the box hole 90° from the horizontal elements where the coax will pass though.

~ Mount the half-inch male terminal adaptor into the top of the box cover and thread the half-inch female terminal adaptor onto the threads exiting the bottom of the cover. Tighten securely.

~ Cut a half-inch off the nut end of the 1-inch male terminal adaptor. There should be about a half inch of material remaining from the shoulder to the end of the nut. Position the terminal strip flat against the nut end of the adaptor as shown in *Photo B*, spot the hole and drill a 3/32-inch pilot hole for the #6 screw.

~ Slide the bottom 2-meter / 70-centimeter wire though the adaptor, then mount the terminal strip with the attached elements to the adaptor.

~ Mount the adaptor into the hole at the bottom of the box, sliding and pulling the wires and coax though its respective ports in the box and cover when lowering into position. Screw the 1-inch female terminal adaptor onto the threads exiting the box and tighten securely.

To Glue or Not to Glue …

If you're using this antenna for portable or field deployment, you'll want easy assembly and takedown, so use PVC adhesive to glue only those pieces specified in the steps below. If this is a base station antenna, glue all the PVC pieces during assembly. This will bond the joints, resulting in no wobble and more security.

~ Apply PVC cement to two of the 3/4-inch to half-inch tubing reducers supplied with the box and push them tightly into the box holes from which the 6-meter radials exit.

~ Secure the cover to the box with the supplied rubber seal and screws.

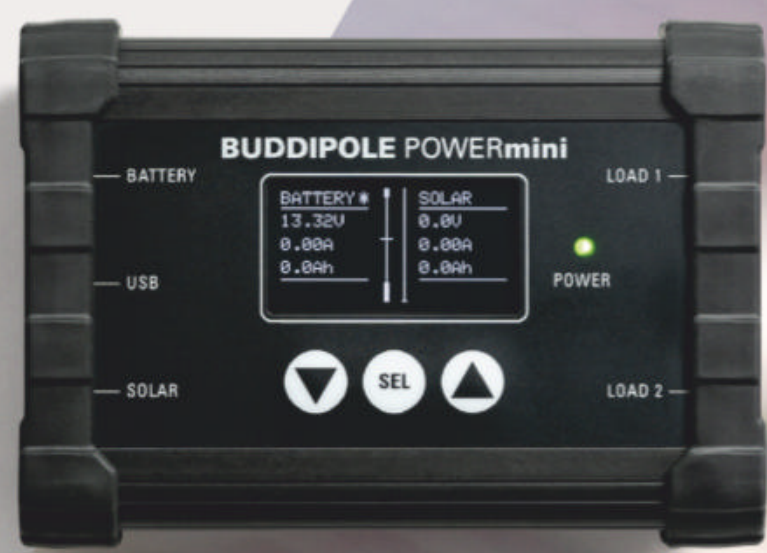
~ Slide the four ferrite cores onto the coax. Butt them against the box port opening and capture them in that loca-

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tion with a plastic wire tie at the other end. This completes the box build.

Building the Balun, 2-Meter / 70-Centimeter Standoff and Connector Assembly

Note: Refer to *Photos D* and *E* for the standoff build.

~ Apply PVC cement to the joints and slide the straight 3/4-inch PVC tubing over the coax and push it into the box.



Photo E. The SO-239 connector mounted on the standoff

~ Apply cement to the end of this tubing and push on the 3/4-inch coupling, then glue and push the 90° radius tubing into the coupling, taking care to align the vertical portion of the bend facing the ground when the antenna is mounted.

~ Apply cement and push a 3/4-inch to half-inch adaptor into the 90° bend hole.

~ Trim the coax exiting the adaptor about an inch from the adaptor. Strip the coax and separate the shield and center conductor, then solder the leads to the SO-239 bulkhead connector.

~ Push the coax and connector into the adaptor and align the holes with the adaptor "ears."

~ Spot and drill pilot holes for the #4 sheet metal screws, then secure the connector.

~ Seal the connector where it mates the adaptor with RTV or weatherproof caulking.

~ Remove any kinks or bends in the wire elements and push two of the 6-meter and the 2-meter / 70-centimeter PVC support tubes into their respective element sockets. Then slide on the half-inch couplings and the other 6-meter PVC tubes.

Note: if this is a base station build and you don't need a "breakdown" antenna, you can just use one appropriate length tube on each side. This completes the initial build.

Tuning Procedure

~ Remove the vertical and end horizontal tubes and use a VNA (vector network analyzer) or antenna analyzer to trim your elements for 1:1 SWR on the part of the bands where you want the best resonance. I settled for the middle of each band. If you're a CW and digital fan, consider the lower end of the bands. Trim about a half-inch each time and a quar-



Photo F. The mast-mounted 6-meter / 2-meter / 70-centimeter tri-bander

ter-inch when you get closer. It's better to trim just a little each time than to add wire if you've missed your mark.

~ As you tune, the other tuned band elements may detune slightly, so check for this. This did not happen for me. Also, the tuned elements are shorter than typical dipole lengths. I attribute that to the PVC and the insulation on the wires.

~ The vertical elements may also be cut for other bands, such as 222 MHz, marine, or the aviation band.

~ When the elements are tuned, trim the PVC tubing to match the element lengths and glue on the caps. Don't glue the caps if you're extending the PVC tubes for other bands (see below). Also, don't trim the lower vertical 1-inch tubing if this antenna will be mounted on a mast. You'll want vertical clearance between the mast and mounting hardware and the element.

Other Band Builds

If you build this antenna with 6-meter horizontal elements, these elements can be easily extended for 10 meters. Just add a "Molex"-type quick disconnect at the end of the 6-meter elements, with a mating disconnect on the 10-meter "extension" wire. Add a set of PVC couplings and tubes to accommodate the additional length and you've changed bands. Be sure to tune the elements with the connectors in place. The 10-meter elements will droop, approaching an inverted-V, but performance won't be affected. Consider using PVC cement when assembling these elements for a secure connection.

If you don't need the 2-meter or 70-centimeter bands, consider using separate 6- and 10-meter horizontal elements mounted on the box, 90° apart. You won't need the coax offset and top vertical tube, so use the bottom vertical tube for the coax feed and capture the ferrite there. Follow the procedure listed above for mounting the SO-239 connector at the bottom of the tube, but use both a 1-inch and 3/4-inch reducer in tandem to accept the connector.

Mounting the Antenna

This antenna can be mounted on a mast (*Photo F*) or suspended (*Photo A*). If mast mounted, use the mounting kit in the parts list. Be sure to use enough separation between the metal hardware and the lower vertical element (if used).

If the antenna is suspended (*Photo A*) and the vertical elements are used, mount the tubing clamp (in the parts list) on the standoff about 1 inch from the box, thread and tie the lifting line though the hole in the clamp and raise the antenna with the coax attached to the desired height. The clamp will probably need to slide laterally on the standoff, depending on the weight of the coax. Adjust the clamp to balance the antenna so the vertical elements are truly vertical, then capture the clamp with tape or wire ties on the tubing. A heavy-duty wire tie can substitute for the clamp. With the antenna suspended, the coax can be used to orient the antenna.

If the antenna is suspended without the vertical elements, standoff and tubing clamp, the mounting "ears" on the box

can be used to fabricate a cross support point — no balancing necessary.

Performance

Using my VNA, these are my standing wave ratios on different bands:

~ 10 meters – 1:1 center of band and 6:1 at the edges
~ 6 meters – 1:1 center of the band and 9:1 at the edges
~ 2 meters – 3:1 flat across the band
~ 70 centimeters – 1:1 flat across the band

Propagation is excellent on 10 meters, 2 meters, and 70 centimeters, hitting all the local repeaters with full quieting on 2/70 and QSLs and beacon contacts all over the globe on 10 meters. I'm sure propagation is comparable on 6 meters, but the band was closed whenever I tested. I did hit beacons 67 and 53 miles away, so I know the 6-meter elements radiate.

You should find this antenna is easy to build, portable, versatile, and a good performer with many band options. With both mast and tree mounting capability, it will serve you well in both a base and field environment.

Parts List

Note: All PVC parts are standard electrical (gray) tubing, fittings, wire, and screws are available at most hardware stores. Also, wire and tubing lengths are longer than needed to allow for tuning.

Carlon 3/4-inch PVC junction box, type X, with cover and reducers, model #E970CDE-CTN, Home Depot
1/2-inch male terminal adaptor
1/2-inch female terminal adaptor
1-inch male terminal adaptor
1-inch female terminal adaptor
2 lug terminal strip
1 pc. #6 stainless steel sheet metal screw, 3/8-inch long
14-gauge THNN wire: 2-meter elements – 2 pcs., 21 inches long; 6-meter elements – 2 pcs, 26 inches long
4 pcs. 1/2-inch tubing, 26 inches long
1 pc. 1/2-inch tubing, 22 inches long
2 pcs. 1/2-inch standard coupling
1 pc. 3/4-inch electrical PVC tubing, 16.5 inches long
1 pc. 1-inch electrical PVC tubing, 32 inches long
3 pcs. standard end cap
1 pc. 1-inch standard end cap
1 pc. 3/4-inch electrical PVC 90° elbow, standard radius with belled end
1 pc. 3/4-inch standard coupling
SO-239 chassis coax connector
4 pcs. ferrite sleeves, #FB43-5621, Digi-Key #1934-2643625102-ND
4 pcs. #4 stainless steel sheet metal screws, 3/8-inch long
RG8X coax, 32 inches long
3.4-inch Tubing snap strap
Miscellaneous: wire ties, caulk, PVC cement, 3/4-inch PVC support strap — Carlon E978ECR or similar, Slinkdsco double antenna mast clamp (2 sets, Amazon — If you mast-mount this antenna).

If you build the 10-meter extension elements:
14-gauge THNN wire: 2 pcs. 46 inches long
2 pcs. 1/2-inch tubing, 46 inches long
2 pcs. 1/2-inch standard coupling



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N2EWS wraps up his tale of getting back on the air after a many-year absence, and operating from an antenna-restricted housing development.

The Continuing Anticlimactic Adventures of the Perverted V (Part 3)

BY NICHOLAS PETRELEY,* N2EWS

This is Part 3 of a story that started with an antenna I call a "Perverted V." It is a freakishly disfigured inverted-V in which the center is only 20 feet high, attached to a flagpole in the corner of the yard. The two legs of the antenna are at right angles to each other, and one leg bends at the corner of the fence and runs a bit parallel to the other leg (*Photo A*). Not ideal, to say the least, but so far it has fooled the homeowners' association (HOA).

As promised in the previous installment, let me tell you about the weird behavior with and without the 4:1 balun. I attached coax directly to the 450-ohm ladder line. It worked fine. When I added the 4:1 balun, it didn't tune very well, which is odd, since a 4:1 balun is recommended for this kind of antenna.

My setup was configured like this:

Transceiver -> Tuner -> Diamond SX-100 power meter -> Antenna

I changed the coax patch cords for an entirely different reason, but inadvertently changed the setup to:

Transceiver -> Power Meter -> Tuner -> Antenna

Suddenly I couldn't get a reasonable SWR on any of the bands. So, I added the recommended 4:1 balun, and everything works fine. It's almost as if putting the power meter between the tuner and the antenna tricked the tuner into working without the balun. I have a feeling that's not a good thing.

Speaking of tuners, I didn't have much luck with the eBay sourced automatic antenna tuners I tried. This time, however, I purchased a new MFJ-939Y automatic antenna tuner from Gigaparts. This tuner knocks my socks off and makes them dance around the room. The first time I transmitted, it went clickety-clickety-click-ping, and the SWR is 1:1 or close. I changed bands to a spot I visited previously, and ping, it's 1:1 again. As God is my witness, I shall never go manual tuning again.

However, I'm still stuck with my insufficient "Perverted V" antenna. Short of building a magnetic loop, the "Perverted V" is all that will prevent my HOA from complaining.

But I accidentally discovered a way to get around its limitations, at least when it comes to reception. When I connect this abomination of an antenna to a $30 RTL-SDR software-defined radio USB dongle and listen to ham bands via the SDR-Sharp software on the computer, signals come through very clearly. Software-defined radio seems to overcome some of the limitations of my antenna. So, I decided to bite the bullet and shell out what it takes to upgrade to a hybrid transceiver that includes an



Photo A. The "Perverted V" as seen from the front yard. Looks like the flag needs replacing.

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Photo B. My station with the SDR radio installed.

SDR. It won't make my transmitted signal any stronger, but it should help with what I receive.

The Yaesu FTDX10 goes for more than I want to pay, but I commit and snag the FTDX10 from DX Engineering (*Photo B*). The FTDX10 has a DVI output and USB ports for a keyboard and mouse. A unidirectional DVI to HDMI cable should work very well to operate the rig using my PC monitor. If you get such a cable, make sure it's unidirectional. You don't want HDMI sending things in the other direction as it is wont to do.

If you don't want to mess with a cable and a keyboard and mouse for the FTDX10, Ham Radio Deluxe lets you operate your rig from your computer and its keyboard and mouse. In fact, allow me a couple nitpicks with the FTDX10 as compared to Ham Radio Deluxe. I have a USB switch that lets you use one keyboard and mouse for multiple devices. You can't do that with the FTDX10. It doesn't know how to deal with the USB switch. I need to dedicate a keyboard and mouse to the rig. Furthermore, you can't change frequencies on the FTDX10 with the mouse scroll wheel.

In contrast, Ham Radio Deluxe is a PC application, so there's no need for a USB switch. And the interface lets you increase and decrease the frequency with the mouse scroll wheel.

So, Yaesu, if you're listening (or, rather, reading), how about updating the firmware to allow a USB switch, and make it possible to tune with the mouse scroll wheel?

Speaking of tuning, the frequency tuning method on the FTDX10 is one area where I immediately miss my previous (non-SDR) IC-7410. With the IC-7410, I press one button and tune in 1-kHz steps. Press it again, and I'm back to fine tuning. People transmit on an even 1-kHz frequency so often that I find that feature to be extremely useful. From what I understand, with the IC-7300, you touch the kHz section of the display, and you tune in 1-kHz steps. Touch it again, and you go back to the default. Same feature, different activation / deactivation methods.

The FTDX10 works almost the same way. Almost. You touch the kHz section on the display, and it tunes in 1-kHz steps. Then it goes back to the default tuning steps after you stop tuning around. I want to set it on or off. I don't want it switching off on its own. Worse, my fat fingers often hit the outer dial while tuning the 1-kHz steps (there are two tuning dials on the rig — the main dial and an outer ring). Touching the ring cancels the 1-kHz steps.

I dig deeper into the Yaesu settings and, lo and behold, I see that I can set the rig so that when I press the STEP/MCH button, it tunes 1 kHz at a time using the outer ring. I can still use the main dial for finer tuning. That's a game changer for me. In case you have a different preference, you can configure the button to change the outer tuning ring to a variety of different steps, up to 10 kHz.

In the end, I'm very pleased with the FTDX10. I can pull signals out from under the noise, especially when I invoke the digital noise reduction button.

So how is my new gear for transmitting? I still don't get great signal reports. But I can check into various nets and almost always get heard. And remember, I logged only three FT8 contacts over the entire Field Day weekend with my former gear. With these shiny new items, I've logged over 300 contacts using FT8 at 10 watts, including 40+ countries. Now, whether the difference is the equipment or it not being Field Day is anyone's guess. But I'm one happy camper now.

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Learning Morse code is one thing, but learning to copy comfortably — hearing whole words instead of individual characters — is something else entirely. WØFN has tips on upping your skill level by learning "sound shapes" to make CW QSOs a pleasure.

Learning Morse Code Instant Character Recognition (ICR)

BY TOM WEAVER,* WØFN

Instant Character Recognition requires knowing your Morse code ABC's. That's all. Morse code comprehension isn't complicated, but it does takes time, diligence, and study. By comprehension, I mean listening to Morse code, not writing letter-by-letter, then reading it later to see what was said.

Have someone quickly spell a common 4- or 5-letter word out loud to you. Like HELLO or GREEN. Did you recognize each letter? Did you "get" the word? Was it difficult? Probably not. You've experienced Instant Character Recognition and "word building" because you already have ICR with the spoken alphabet.

Did understanding a spelled word require a special technique? Nope — all it took was knowing your ABC's and a little spelling. When Morse code sounds are synonymous with their spoken letter sounds, you've achieved ICR. However, truly knowing your Morse code ABC's isn't like "remembering" them, it isn't decoding them, and it isn't a conscious process; they are too slow.

Your subconscious handles spoken letter ICR. You aren't "remembering" or consciously "decoding" spoken letters; you know them. You could think of it as having 26 finely tuned high-Q receptors that automatically "resonate" to the sound of one spoken letter each. These tuned sound receptors free your conscious mind to focus on what's being spelled instead of needing to work on recognition. Spoken letter recognition feels effortless, allowing you to build words, "go with the flow," and follow the train of thought as sentences are being spelled. Morse code ICR will feel the same.

Building and recognizing words as you listen to Morse code letters arriving in rapid succession creates a sudden need for 26 tuned high-Q receptors. It surprises students who feel confident they know the alphabet because they've been decoding dits and dahs successfully. Individual character practice will remain foundational throughout the ICR learning journey — that's why we continue to practice alphabetic ICR with ever-shorter recognition times even as we begin learning new skills. However, word building presents a much more rapid-fire recognition challenge — the necessity to deal with "character flow."

Building Words and Recognizing Cars

My group of childhood friends decided to get good at identifying as many makes and models of cars as possible. To improve my "make & model" recognition skills and (hopeful-

* Email: <tom.w0fn@gmail.com>

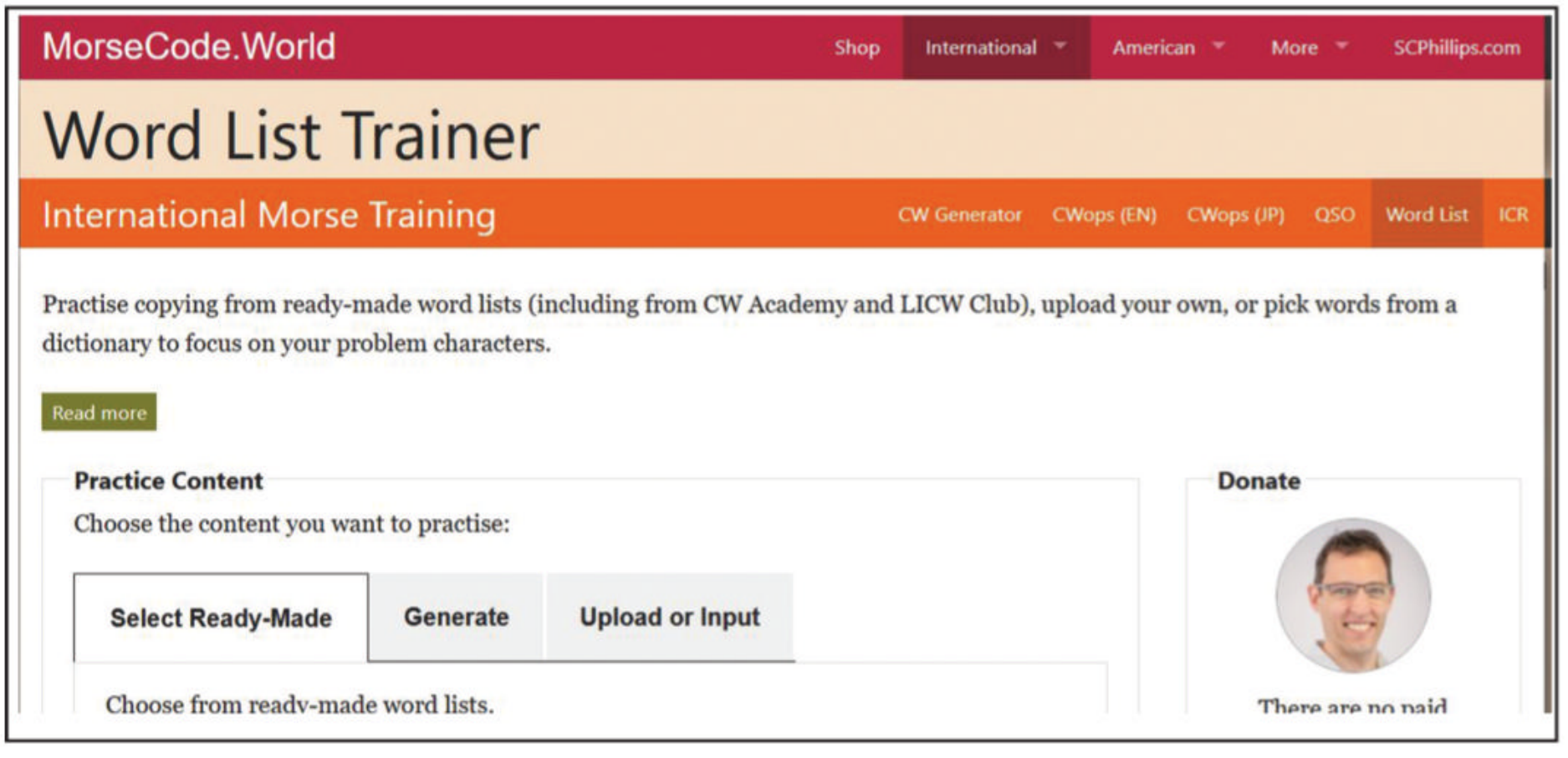


Photo A. The Word List Trainer at MorseCode.world is a good tool for learning instant character recognition.

ly) impress my friends, I studied parked cars and many magazine pictures of cars, one at a time.

Eventually, we were standing beside busy streets competing with each other as we tried to identify as many cars as possible as they whizzed by. Cars were moving fast and each one I missed really bothered me. There were some makes and models I wasn't very good with, so I focused extra hard on those in an all-out effort to win the game. At that age, it was very important to win. I kept losing — no fun!

I finally realized by concentrating on one car to ensure I got it, I missed even seeing other cars that were right behind it. I began to think that perhaps I should closely "glance" at every car as they went by and not visually follow any one car down the road. I clearly remember that risky feeling when I abandoned "trying to make sure." I decided I had to accept the ones that got past me and just see what happened. Hmmm — I started winning the game!

Tools for Practicing ICR

So, how to practice ICR? I like using *Word List Trainer* (<https://tinyurl.com/3dw6knmk> and *Photo A*) to build sound-to-letter associations. Select A-Z, make the Board and Text visible, and set the Character Speed between 25 and 35 words per minute (wpm).

Click on each letter in any order you wish or in groups of five letters and listen very carefully to each sound rhythm: Its unique and characteristic Morse code "sound shape." Rinse and repeat in three to four 5- to 10-minute sessions per day. Also click on each letter several times in a row and focus on associating that sound to that letter. Faster character speeds make hearing "sound shapes" easier. Look at the letter, click the letter, hear the code, and speak the letter. Your goal isn't to "decode," it's to make the Morse sound *be* the letter in your mind — just like the spoken letter. You're creating 26 high-Q sound receptors, and that takes time, patience, and practice. Speaking the letter immediately after hearing its code sound helps create those tuned receptors.

NOTE: If you're a beginner and you'd like to double your fun by learning Morse code twice, that's easy! Start with a slow character speed of 10-12 wpm. Then later when you're ready to learn Morse code again, set the character speed between 25 and 35 wpm and learn the alphabet a second time — by "sound shapes" instead of by dits and dahs. Be warned though; escaping from counting dits and dahs once you've learned it that way is tough. Creating high-Q sound receptors as you listen at fast character speeds, and then slowing down later is easier than learning by counting dits and dahs at 10-12 wpm and then trying to speed up.

After studying Morse code letter sounds via many short practice sessions per day for at least a week, add recognition into the game. Set Morse Count = 1, Enable "Repeat," enable "Random," enable "Speech" in Show and Say After, and set the Recognition Time between 1000-1500 ms (1 to 1.5 seconds). Click "Play" and try to "Beat the Computer" by speaking the letter before the computer does. Keep it fun and keep your practice sessions under 10-15 minutes.

You always want to miss some — adjust the Recognition Time up or down to stay in or near the "Learning Zone" where you miss about 40% and get about 60%. Missing isn't failure in this game; it's essential practice. You won't become proficient at recovering instantly from missing if you don't practice it. Recognition and non-recognition are two sides of the same coin; ICR with Morse code requires mastery (and acceptance) of both outcomes.

As you improve, drive your letter Recognition Time down – to 100 ms or less. Spend extra time on troublesome characters. Even a few slow-to-recognize letters can derail your comprehension. As you improve and Recognition Time shortens, you're transitioning from slow conscious "decoding" to the faster and nearly effortless recognition enabled by your newly created 26 tuned sound receptors. Be patient. Their "tuning" will continue to improve with time and practice!

On-Air Practice

Get on the air as soon as you know the alphabet reasonably well (assuming you have your amateur radio license) and have practiced enough with numbers to recognize most of them. Get an HF radio, a straight key, or a dual lever paddle, and put up a simple wire antenna. Being on the air supercharges the ICR learning process. In fact, achieving ICR without being on the air is virtually



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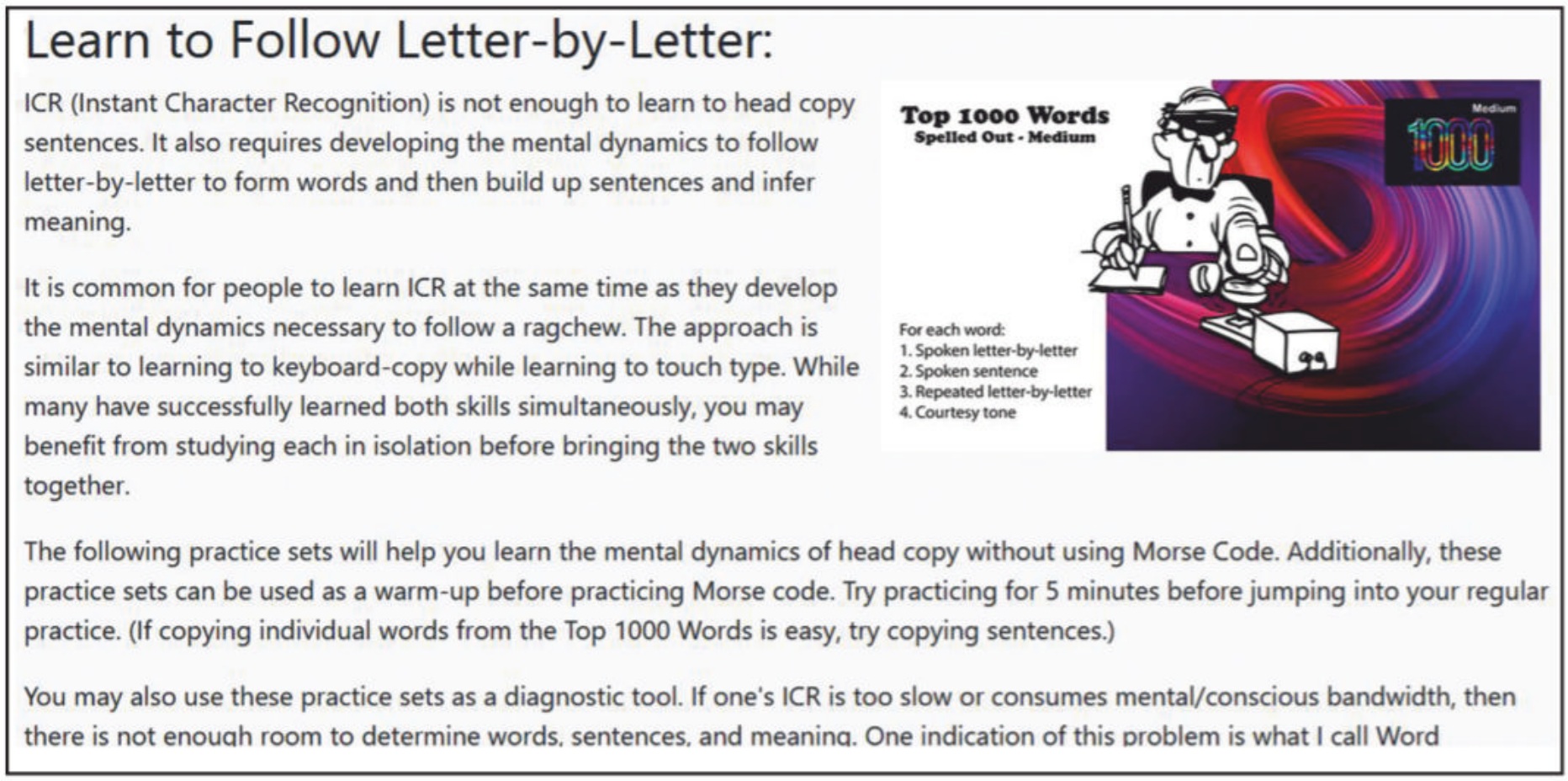


Photo B. The Letter-by-Letter section of the morsecode.ninja webpage discusses the next steps in Morse code "head copy," whole words and sentences.

impossible. As Glenn Norman, W4YES, says, "don't wait to get good to get on the air, get on the air to get good." Find a code buddy at or near your level and schedule regular on-air QSOs. Laugh about mistakes and mess up together with reckless abandon. As Dr. Seuss would say, "If you never did you should. These things are fun, and fun is good."

Variability plays an important role in mastering complex skills. Being on the air exposes you to a variety of Morse code signals at different speeds and tempos. Some good, some bad, but all are good practice. Don't worry about mistakes or not understanding what's being sent to you in a QSO; resist the temptation to write letter-by-letter — that eliminates comprehension. Just close your eyes and listen; you'll get better, and nobody cares about mistakes. Don't be the only one who cares; it will really hold you back.

Achieving Morse code ICR will begin to feel like someone is spelling words to you in English. The temptation to jump into word practice once you think you know the Morse code alphabet and leave letter-by-letter practice behind is strong. That's OK — go ahead and give it a try. You'll soon learn that word and phrase practice quickly reveal poorly tuned sound receptors and weak sound-to-letter associations. Continue working on your alphabetic ICR every day. Be patient with yourself; get on the air, and practice consistently with several short 10- to15-minute sessions per day. Keep it fun, no self-judgement allowed.

So, the initial value of word practice is a quick check on the strength of your "alphabetic ICR" skill level. Being unable to comprehend 4- or 5-letter words as letters arrive indicates "decoding," a slow and laborious conscious process. Words longer than three letters will be very difficult, and short phrases will make your head explode. You may think you know the Morse code alphabet, but you really don't. Building words as letters arrive and following a train of thought require finely tuned "high Q" Morse code sound receptors that bypass the need for conscious recognition.

See <https://tinyurl.com/2hebb46a> (*Photo B*) to see what I mean about listening to spelled-out words, phrases, and sentences. Major thanks to Stephen Phillips for creating Morsecode.world and to Kurt Zoglmann for creating Morsecode.ninja. Sincere appreciation to both of you!

The path to ICR requires building new high-Q sound receptors and/or strong sound-to-letter associations every day in addition to practicing with words and phrases and being on the air.

As you approach alphabetic and numeric ICR, your conscious mind is freed from recognition duties and on-air QSOs become more fun and less scary. Your mind will build words as the letters arrive and follow trains of thought. It begins to feel like a spoken language. ICR is a foundational skill that benefits all aspects of the art; it frees you to experience and enjoy the gratification of communicating with Morse code around the world. Sending conversational CW will feel like musical instrument mastery; it's addictive, rhythmic, and very gratifying.

Morse code comprehension using ICR on the air with other CW operators and soon-to-be friends around the world can occasionally put you "in the flow;" an amazing feeling normally reserved for world-class athletes and musicians. That rare feeling is something you permit to happen; you can't make it happen. When it does, it feels spooky it's so effortless.

Additional Resources

The Long Island CW Club <https://longislandcwclub.org> and CWops <https://cwops.org> are both great places to learn Morse code. CWops offers the well-known CW Academy and the Long Island CW Club is a large welcoming community that offers approximately 70 open classes on every aspect of ham radio and Morse code imaginable. The Long Island CW Club hosts an Introduction to ICR class by Glenn, W4YES, and me on Wednesday evenings, with perhaps other ICR classes to come in 2023. If you're a member of the Long Island CW Club, stop by sometime; we'd enjoy seeing you.

Achieving instant character recognition with Morse code is worth the effort. It's simpler than you think, it's a remarkably rewarding learning journey, and it's a great cognitive exercise.

the listening post

BY GERRY DEXTER

RFE/RL in the News

Editor's note: Gerry has been under the weather recently and was not able to complete this month's column, so we're filling in with a relevant news item and one set of loggings that crossed our desk and didn't go directly to Gerry. We hope he'll be back at the Listening Post (and keyboard) by next month. – W2VU

RadioFreeEurope
RadioLiberty

The war in Ukraine and Russia's attempts to limit objective news from reaching its citizens have brought renewed media attention to Radio Free Europe and Radio Liberty (RFE/RL). The two stations are operated by the U.S. Agency for Global Media (formerly the U.S. Information Agency) but are guaranteed editorial independence by law.

Recent RFE/RL efforts to reach listeners in Russia, Ukraine and other areas with news andinformation have been the subject of reports on CBS News's "60 Minutes" (January 1), the *New York Times* (January 24) and *RadioWorld* (January 12). The *RadioWorld* story was about the opening of new RFE/RL offices and studios in Vilnius, Lithuania and Riga, Latvia, after being forced to suspend its operations in Moscow and Minsk, Belarus. The *Times* and "60 Minutes" stories focused on the resurgence in interest in Radio Free Europe and its programming aimed at Russia and former Soviet republics.

Curiously, and perhaps in a sign of the times, however, none of the reports paid much if any attention to the "radio" part of Radio Free Europe. The focus was almost exclusively on RFE's internet streams, which seems counterintuitive, considering the ability of hostile governments to block internet access and control what is available to their citizens. Blocking radio waves is much more difficult, although jamming is a long-standing tradition in Russia and elsewhere.

Even more curiously, even the RFE/RL website makes it difficult to find the stations' on-air broadcast schedules. We had to go to <http://short-wave.info> to find RFE/RL's shortwave frequencies … which are: 5880, 7475, 9490, 9940, 11965, 12045, 12105, and 15490 kHz.

Listener Logs

Our only loggings for this month come from Allen McBroom, AG5ND, of Starkville, Mississippi, whose reports to Gerry were routed through the CQ email server. We apologize to our regular reporters for not having access to their loggings for this month. Here's what Allen has been hearing:

ALGERIA — Radio Algerienne on 15410 at 1841. Man talking in Arabic, lots of QRN, making it difficult to hear.

CUBA — Radio Havana on 15140 at 1831. Man talking in Spanish.

UNITED STATES — Supreme Master TV heard on 15770 at 1842, broadcast from WRMI in Florida. Woman talking in English about "large animal people" and veganism.

**c/o CQ magazine*



math's notes

BY IRWIN MATH,* WA2NDM

Simple Testers (Continued)

As a continuation of last month's topic, we will once again present a couple of simple, easy-to-build, circuits that we have used from time to time.

Before proceeding, however, I want to point out some facts about the RF power meter we described last month. You may remember that to calibrate the unit, we applied a 10-volt DC signal to calibrate 1 watt of power at full scale of the meter on the device. A 1-watt CW RF signal is composed of a 20-volt peak-to-peak sine wave voltage or "V_{pp}". After it passes through the rectifier diode, which cuts it in half, the result is a 10-volt pp signal or "V_{pp}". This must then be further converted to "V_{rms}" (by multiplying it by the square root of 2 or 0.7071), which now truly represents 1 watt and can be used for conventional power conversions. Therefore the 7.071-volts DC that remains is what actually corresponds to 1 watt (across 50 ohms) and that is what the meter is reading. Note that we did not include the forward diode voltage drop (about 0.25 volts) at this point as it's low enough to ignore for now.

When you calibrate the meter to read full scale, it will actually be displaying 7.071 volts, which you have adjusted to "100" on the meter with the calibration control so the meter reads 1 watt (but without the diode drop which we ignored). So far, so good. Now, however, let's see what happens when the input power decreases to, say, a quarter watt. The V_{rms} value also decreases, as does the meter reading. The V_{rms} reading for quarter watt is about 3.54 volts, so you would assume that the meter would read a quarter of the scale, but it doesn't.

Why?

Because in both cases we ignored the forward voltage of the diode. As the input power gets lower and lower, the forward voltage drop of the diode becomes a more and more significant factor in the DC reading and the accuracy of the meter gets worse and worse, so at lower power levels, the diode drop really has to be considered. As you lower the value of your DC calibrating voltage (V_{rms}), you will see the error caused by this and how this affects the readings. Therefore, if you need more exact readings, you should always calculate the actual V_{rms} voltage at the specific power level you are interested in and then readjust the meter reading accordingly (including the diode drop). My sincere apologies to those who have (or intend to) question all of this. Now on to the rest of the column.

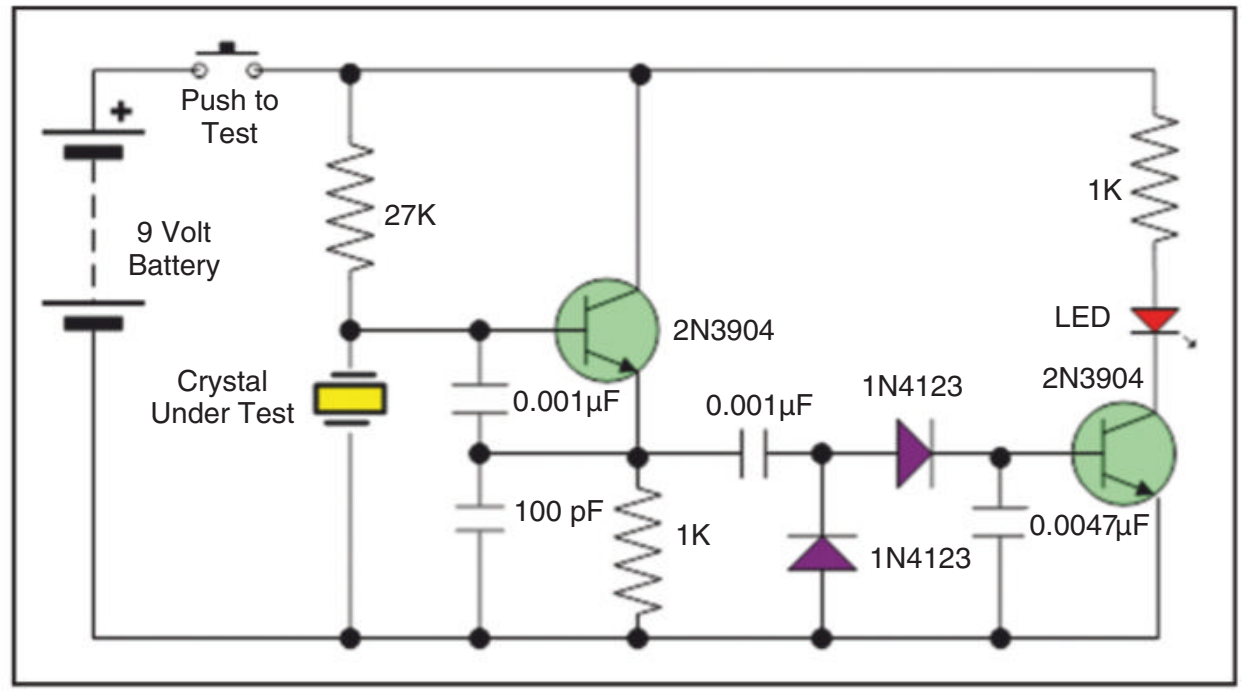


Figure 1. Quartz crystal tester

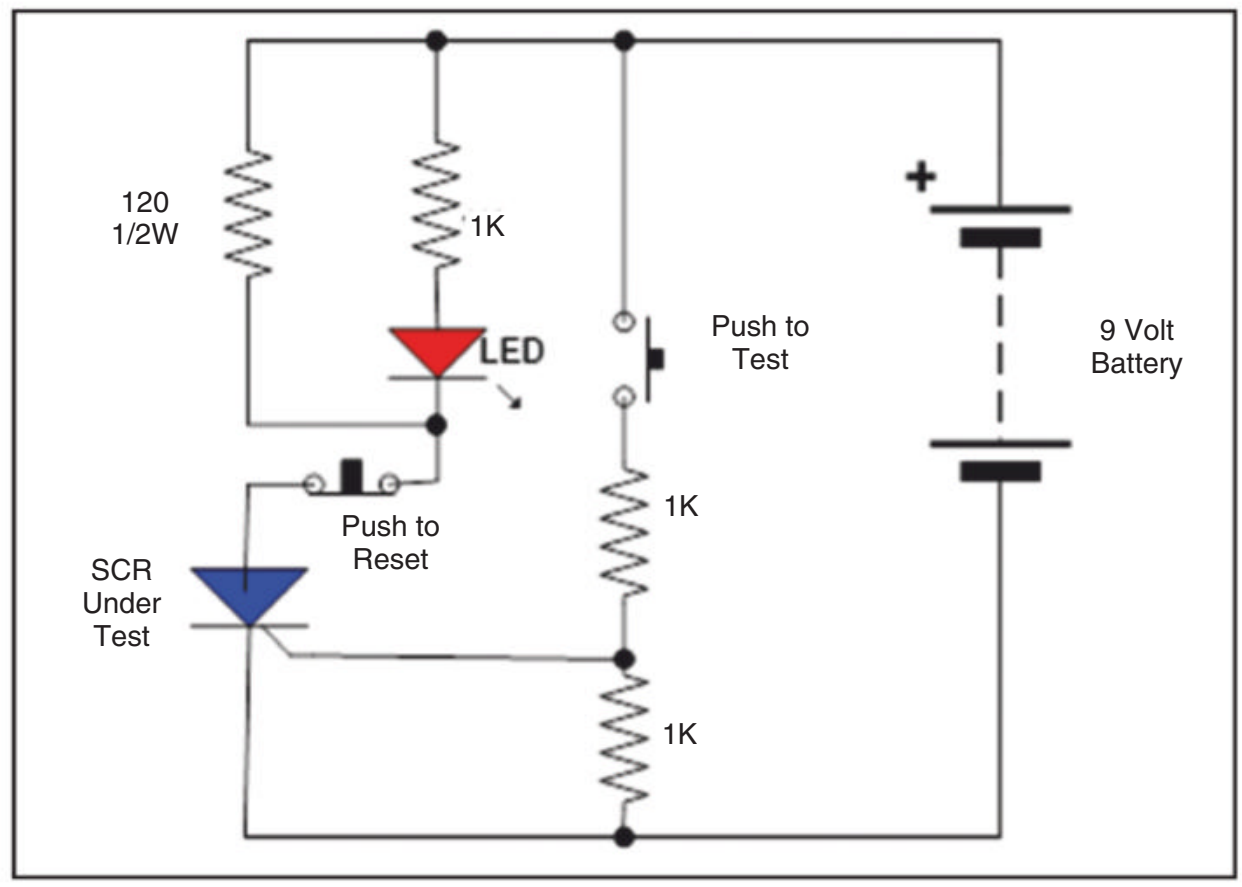


Figure 2. SCR / Triac tester

Crystal Tester

First, *Figure 1* is a simple crystal tester for those "old timers" and QRP operators who still use them. I remember that, in the past, there were literally bins full of these crystals in the surplus houses I frequented in New York City. In those days, Novices were required to be crystal-controlled and with the modification of surplus WWII transmitters and receivers that were popular at the time, these were what was used.

As you can see, the circuit is basically an untuned Colpitts oscillator that oscillates at the frequency of the crys-

*c/o CQ magazine

tal being tested. It will work with most quartz crystals from around 1 MHz to as high as 30 MHz or so. The RF produced in the emitter circuit of the actual oscillator stage is then rectified by a diode doubler, which then drives a second transistor that will turn on an LED to indicate that the crystal is working. If you happen to have a frequency counter with a high impedance probe available, you can also check the actual frequency of the crystal by measuring it across the 1K emitter resistor of the oscillator. Power is from a 9-volt battery and the push-button assures long battery life. Although the transistors and diodes labeled on the schematic are commonly available, they are not too critical and similar equivalents may be used. However, you may have to change the bias resistor in the oscillator.

Figure 2 shows a tester that is normally not too common. It is used to test SCRs (silicon-controlled rectifiers) or Triacs and will be useful for those working with these devices. This circuit tests a device by actually switching it to light an LED.

In operation, the device to be tested is connected as shown and if it is OK, the LED will not light at first. When the push-to-test button is pressed, however, the voltage applied to the gate will trigger (and latch) the device and the LED will go on and once lit, it will stay on. When the push-to-reset button is pressed, the voltage to the device will be interrupted and the LED will turn off. If these actions occur, then the device is OK. However, if the LED comes on when the SCR or Triac is first connected, before the push-to-test test button is pressed, then it is shorted and defective. Since operation of this tester is with a 9-volt battery, when the SCR or Triac is conducting, approximately 100 ma will be drawn from the battery so do not keep it on for too long or the battery life will suffer. When the LED is off, however, there will be no significant drain. Note that this tester will require a minimum so-called "holding current" to operate properly in this circuit, but it should be fine for the popular C106 and equivalent series devices.

I hope these two testers will be of interest to some. In the future, I will try to come up with additional devices of this type that may interest you. I also appreciate the kind comments sent by the experimenters in our midst who used some of the test equipment I have presented in the past.

– Regards, Irwin, WA2NDM



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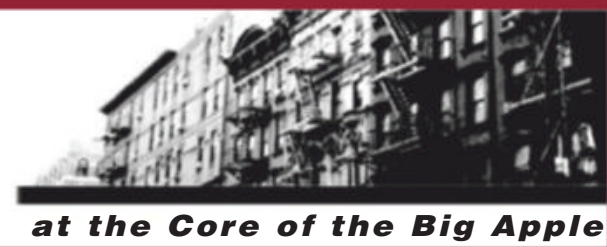


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emergency communications

BY JOHN FERGUSON,* K3PFW

My (New) Station

The QTH here has been undergoing renovation for the last two-plus years. Finally, in the last months we have been able to get some of the "pretty work" done to please the XYL, and now I get to start on the rehab / rebuild of my station. This will be the third iteration of the process over the 30-plus years that I've lived here, and I'm incorporating some lessons learned from the previous efforts. The rebuilds to date have been cumulative, building on what was there before. Three additional antennas are being contemplated for this rebuild, and a possible larger antenna project in six months or so. Other than those items, no major changes or additions are planned. In keeping with my desire to cause you, the readers, to think a bit; I'm going to use the opportunity of rebuilding the station to drag you along and share my decision-making process. Maybe some of the issues here will help you make your own decisions down the road as you work through building your station.

First and foremost, this column is about emergency and disaster communication and if your station cannot be safely operated under most weather conditions, you're probably not going to be much help during weather-related disasters. But you say, "oh, but I have to disconnect my antennas during a thunderstorm."

No, you don't!

If you have proper grounding and surge protection and install it correctly, you should be able to safely operate under all but the most severe weather conditions. Do you think that public safety agencies, law enforcement, and the military stop operating during nasty weather? Again, with proper design and installation, safe operating will prevail. The ARRL publishes an excellent book, *Grounding and Bonding for the Amateur Radio Operator*, which is available through its bookstore <https://tinyurl.com/4sd9j5n3>. Common sense on your part must prevail, however. It is you and you alone who is ultimately responsible for your safety, and the safety of those around you.

Starting Outside

The process of rehabbing my station started with a survey and inspection of the external parts of the station: Antennas, tower, pole, feedlines, etc. I listed all the items I looked at, with a brief note as to the condition of each and whether a repair or replacement was necessary. The list was relatively short for replacement, and only a couple of items needed repair. Then, I did a careful inspection of the external grounding, where some issues were noted. There was definitely some "wear and tear" from Mother Nature. Then, Bill Saunders, N3ID, came by with his net-



Photo A. Former windmill tower. All joints bolted like a large erector set. (All photos by K3PFW)

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

work analyzer and we checked antennas and feedlines. I was pleasantly surprised that there were few issues. The analyzer showed that all the antennas were resonant about where they should be. The testing was done at the output end of the surge protectors, which kept the outside of the coax grounded. We found that if we were checking from the end of the feedline to the antenna, particularly the wire antennas, our hand capacitance and movement of the feedline caused changes in the displayed data of the analyzer.

Then onto the physical inspection of the surge protection for the feedlines, which checked out OK. All installations will require periodic maintenance. Unfortunately, I have not been as diligent as I should have been over the last several years. Although nothing major or unsafe was found, given a few more years, that might not have been the case. When was the last time you gave the external part of your station a careful and thorough inspection? This is something you shouldn't put off.

The primary feature of the antenna farm is a former 80-foot windmill tower with a nice high-frequency (HF) tri-band beam. Twenty feet of 2-inch pipe out of the rotor supports the beam and a commercial 2-meter antenna that's at an elevation of 100 feet (*Photo A*). Each leg of the tower is tied to a 10-foot ground rod where some issues were found during the inspection, probably the result of overzealous yard mowing, and will be reworked. Reworking the beam and 2-meter antenna on the tower will be left to a contractor. Climbing, let alone working after I get up there, is not currently something I want to consider.

At the base of the tower is an enclosure that provides protection for connections between the coax from the antennas and the coax to the station. These cables run underground through conduit to the surge protection enclosure (*Photo C*) on the wall of the house outside the room where the shack is. Breaking feedlines at the base of the tower allows for testing to isolate where issues might be and is certainly a help when working on the antennas themselves. You might think running your feedlines, control lines, etc., through conduit is overkill. After all, there's coax rated for direct burial, isn't there? My philosophy is to dig once and add an extra empty conduit to the run. Conduit is cheap compared to labor and equipment rental, even if you are doing it yourself. Replacement when needed is quick and easy. Expansion of facilities is a snap.

There is also a 32-foot pole with a pipe extension, done somewhat like a ship's mast (*Photo B*), that supports one end of an OCF (off-center-fed) dipole at 50 feet; the other end is supported by the tower. A tri-band U/VHF vertical adorns the top. The "conduit" from the pole to the surge protection enclosure is 1-inch vinyl pipe. It's cheap and easy to work with. A B&W folded dipole (all band) is hung at approximately 30 feet between trees behind the house.

From the surge protection enclosure, jumpers are run to the antenna patch panel in the closet adjacent to the station (*Photo D*). Just back from its trip to the shop for refurbishing, labels will be added to identify the antennas. Jumpers to the individual pieces of equipment will go through the wall, with a nice cover plate for the hole, and into the concealed wiring trough of the station desk. A clean, neat, and uncluttered look gets points from the XYL. The closet, after all, is where she stores her office supplies.

The desk is also homebrew; the material was an anniversary gift when the second station was being assembled. Existing equipment will be added as it is cleaned and checked out in the shop. I'm taking this rebuild step by step, one level at a time, trying to avoid mistakes and oversights.

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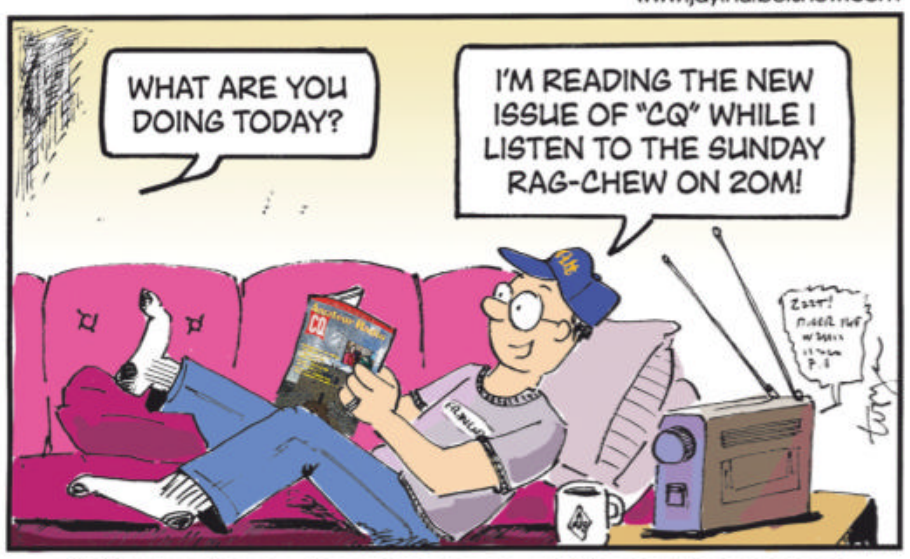
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SPURIOUS SIGNALS

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Photo B. Pole and extension with "backstays" like a ship mast.

Surge protection on feedlines and attention to grounding has been a major consideration here from rebuild two. Note I say "surge protection," not "lightning arrestor." Lightning, the visible bolt that we see, is an ionized column of air, literally a conductor, with thousands of amperes flowing through it. Current flow produces magnetic lines of force around the "conductor" which propagate outward. Lines of magnetic force cutting across a conductor induce a voltage proportional to the strength of the magnetic field. Your antenna, wire, beam, vertical, etc., can have enough voltage induced to cause arcing from the center conductor to the shell of a PL-259, or SO-239, the common male and female coax connectors we use. So, do you really want to disconnect your coax and lay it on the floor? Better you throw it out of the window. I have seen unterminated connectors on antenna patch panels flash over during lightning storms. It's both fascinating and scary. Again, the ARRL's *Grounding and Bonding for the Amateur Radio Operator* is an excellent starting point for learning how to ground your station. You will be well advised to read that first.

How Will You Use Your Station?

Once you put together your station, what are you going to do with it? What is your style of operating? Do you need to monitor multiple frequencies at the same time, or is a simple one-antenna, one-transceiver setup more your style. Operating

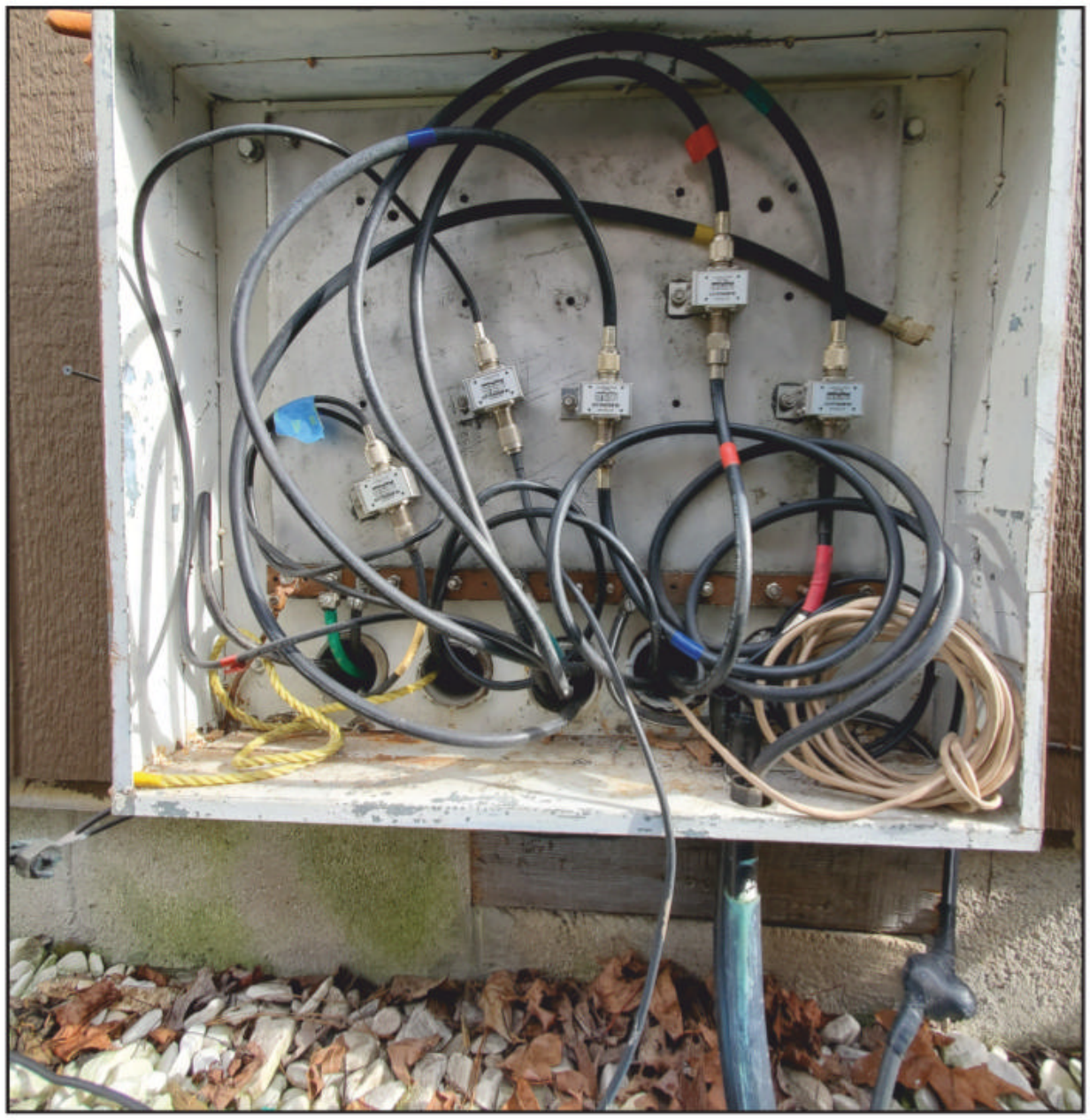


Photo C. Surge protection panel with cover removed.



Photo D. Antenna patch panel makes swapping antennas and rigs easy.

under disaster conditions puts an added strain on you, the operator. Think about what would make things easier for you. Comfortable placement of equipment will reduce fatigue.

Considering what I do, what I like to do, and what I've learned about operating from the home QTH led to the comment at the beginning of this article of adding more antennas. Three new antennas are being considered. Number one is an inverted-L for 160 meters, which is a band I have wanted to get back onto for a while. The inverted-L design is the most cost-effective way to get on 160 meters as it's relatively simple to make, and will fit on smaller real estate. A weatherproof "auto tuner" at the feed point makes matching "automatic" and will allow use on other bands, too. The inverted-L will replace the missing doublet that formerly ran from the top of the pipe extension on the pole to a tree on the other edge of the property. That will return to what was the original design, the two "backstays" balancing two antennas running in the opposite direction, providing a more robust structure, with a symmetrical support. Also, there is some interesting work on using groundwave for digital to link emergency operations facilities. This will provide a test antenna for trying that.

Number two will be a low-gain, dual-band vertical placed not too high for local repeater use. There are at least seven repeaters within 16 miles of the QTH. Being in Delaware, coastal ducting is a fact of life; fine if you want to talk to Connecticut with your handheld (HT) and a rubber duck antenna. I'm trying to reduce incoming interference, and not interfere with distant repeaters. The low height of the dual-band VHF antenna will put it at approximately 6 feet, sort of like a mobile in your side yard.

Number three will be a magnetic receiving loop to try and beat the increasing noise floor we live in with our modern society. The ability of this type of antenna to reject manmade noise is incredible. We installed one about two years ago at WS3EOC, the amateur radio station at the Sussex County Emergency Operations Center. Signals nearly unreadable on the transmitting antenna were "Q5" on the loop. Most of the noise comes from the multitude of energy-efficient outdoor lighting at that location.

Power for the station equipment will be provided by a modest 20-amp DC supply through a West Mountain PWRgate, which maintains the charge on two 100-amp-hour sealed lead-acid batteries, immediately switching over on a power failure. I'm old school and lead-acid technology is a bit more forgiving of mistreatment than lithium products. Weight in this situation is not a concern. The batteries are housed in polyethylene battery boxes for safety, both accidental contact with exposed terminals and acid spills, which shouldn't occur, but if they do, will be contained within the boxes. This is the same system that was used in the previous rebuild of the station. The 20-amp supply is sufficient as this is a single-operator station. The 600-watt linear amplifier will be line powered.

I'm looking forward to getting back on the air; it's been a while. Progress is important. It takes time, effort, and resources, but in the end, there is a better and safer station for you that enhances your operating style.

I also look forward to the questions and comments you, the readers, send in. Use the K3PFW email address at the bottom of the first page of the article.

kit building

BY JOE EISENBERG,* K0NEB

Ham Radio Solutions CW Hotline: A March Forward

When learning Morse code, the most common tools used are a simple code practice oscillator and a straight key. In these pages I have shown many of these, from very simple kits such as the Four State QRP Group SSCPO kit up to the very complex Morserino32. This time we take a look at a simple code practice kit to build that offers some interesting features.

The Ham Radio Solutions CW Hotline is a code practice kit that allows the builder to choose between a built-in straight key or a paddle. The CW Hotline also gives the option of plugging in a straight key or paddle so it leaves the door open to using either type of key. There are also outputs that connect to an external audio amplifier, which is helpful in teaching code classes, as well as a keying output. The keying output allows this kit to key most solid-state CW rigs.

What makes this kit even more interesting is that it has networking capabilities. The CW Hotline can connect to another CW Hotline on the same Wi-Fi network using its built-in Wi-Fi and has the capability of participating in one-on-one or group code practice via the web. The CW Hotline is powered by normal 5-volts DC USB power, which can be supplied by most inexpensive USB cellphone chargers or USB power banks. The supplied cable plugs into the USB Micro jack on the back. It allows two different Wi-Fi configurations to be set in it to allow, for example, connection to your home Wi-Fi network, or your cell phone's Wi-Fi "tethering" function.

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

Building the CW Hotline

Building the CW Hotline is relatively easy. The low parts count makes for assembly time of about an hour or so. Be sure to mount all parts carefully. A method I found helpful in dealing



All parts, including the plastic case, for the CW Hotline kit.

2023-2024 calendars



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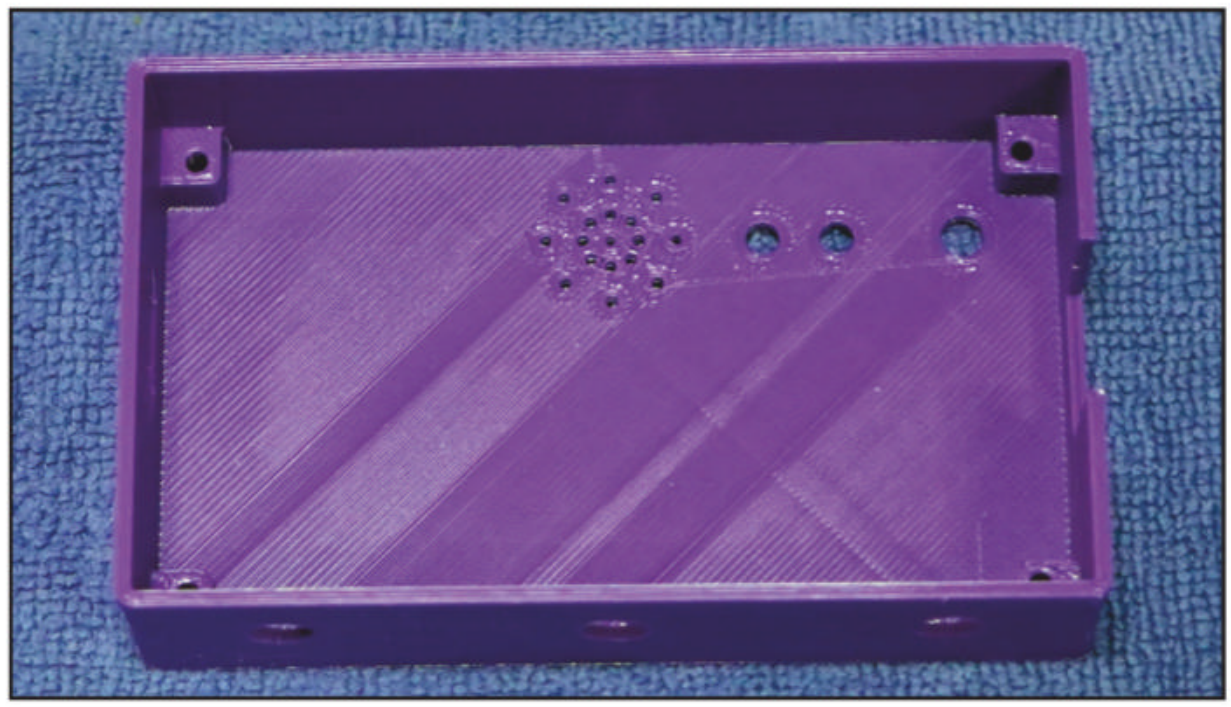
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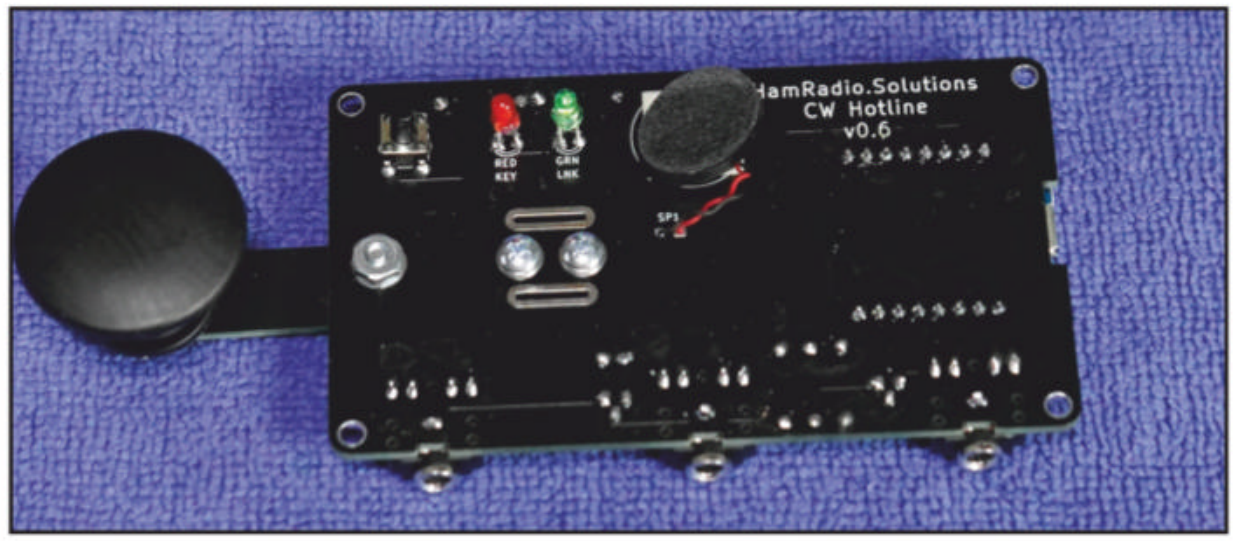
with the three jacks is to simply to solder the center pin of the jack on each one. Then, using a finger underneath a jack, I reheat that center pin while pressing on the jack until I feel it settle into place flush with the PC board. Once I am satisfied that each jack is flush with the board, I solder the remaining four back pins on each jack. It is very important to be sure that the jacks are flush so that the case fits properly.

Care must also be taken when soldering the rows of pins that connect to the Wi-Fi board to ensure that they are all perpendicular to the main board. There are many methods to achieve this. One method that I have seen success with is to solder just one pin on each, then reheat it while holding any unheated pins and moving it until it is straight. Once both rows of pins are straight, you can test it by placing the Wi-Fi board over the pins to see if it fits correctly. It is a lot easier to make position adjustments at that point than it is after all the pins are soldered. Some have had success using a small solderless protoboard placed over the pins and pressed onto them to hold them straight and parallel.

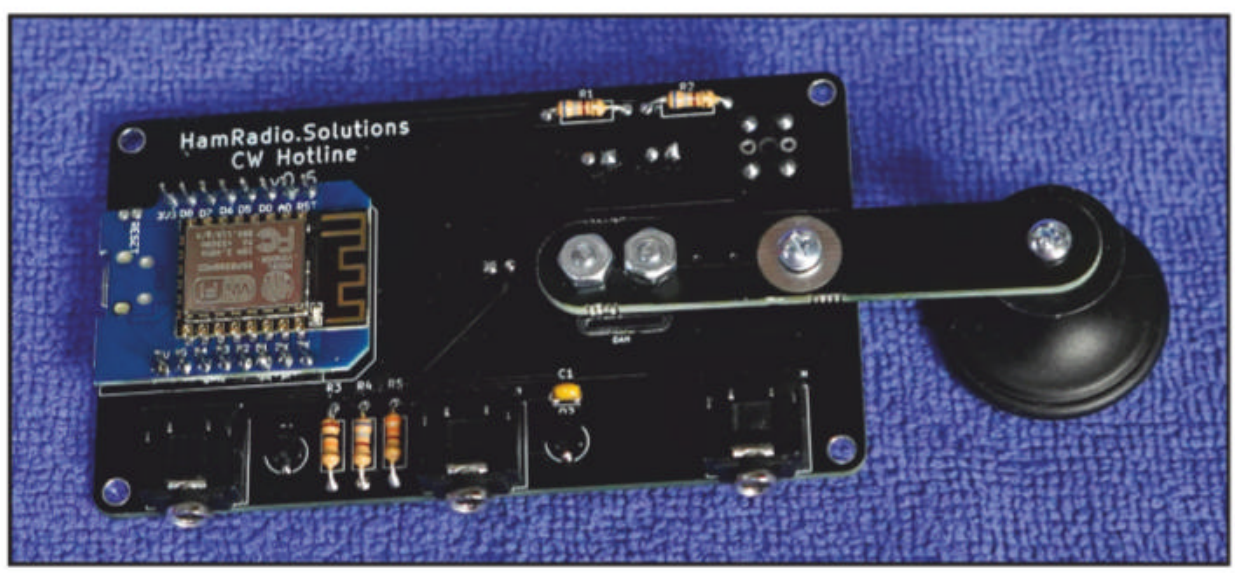
The included plastic case requires careful drilling, using a PDF file template that can be downloaded, printed, and taped to the plastic case. There is another option for the case, and that is to 3-D print a case using the STL files linked to on the web page of the CW Hotline kit. I used the W7HLO design, with which — if the case is printed exactly to size — the snap-on lid for the bottom of the black supplied case fits perfectly on the bottom of the completed 3-D printed case. The result is a case in which the holes fit exactly and the



The 3-D printed main part of the case fits exactly the same as the supplied case, without having to drill any holes. There is an option to print either with or without the opening for the key / paddles. The built-in keying choices are optional with any key or paddle being also able to plug into the CW Hotline directly.



The top of the finished CW hotline includes the two status LEDs as well as the control button.



The bottom of the board holds the jacks as well and most of the other components, including the pre-assembled Wi-Fi board.

W6SAI HF Antenna Handbook

by Bill Orr, W6SAI



One of amateur radio's most respected authors, Bill Orr, W6SAI, shared his many years of knowledge and experience with us in *The W6SAI HF Antenna Handbook.* This 184-pg paperback is jam-packed with dozens of inexpensive, practical antenna projects that work! Discover the available resources and tools that will make your future antenna installations easy to build and give world-class results. Whether you're a seasoned antenna enthusiast or a beginner, there's something of interest in this book for you!

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The finished CW Hotline in the 3-D printed case is assembled with the straight key option. A paddle still can be plugged in to the kit as well.

case fits the kit. The kit comes with a front panel label sticker that can be used with either the supplied case or a 3-D printed one.

Configuration

Once completed, the configuration of the kit is done by connecting it directly to a computer via USB and then going to the CW Hotline web page and following the steps in the operation manual. Configuration consists of setting the parameters, including the Wi-Fi access, by filling in blanks on the web page. Once completed, you can save those to your kit. Each kit comes with its own passcode that gives access to the website. Do not lose this code. It is on a sticker in the box as well as inside the case. The website also allows you to join different channels to talk with others using CW. An interesting feature of the CW Hotline is the ability to use a second kit to connect to the CW key input of your rig and remotely key your radio. This is a very important reason to not divulge the passcode that is supplied with your kit as it also provides security for your remote keying option.

You can order the CW Hotline kit for $55 including USA shipping from Ham Radio Solutions at <https://hamradio.solutions>. The Super Simple CPO kit mentioned in the beginning of this column is available from the Four State QRP Group at <www.4sqrp.com>. The Morserino32 is also still available at <www.morserino.info>.

With hamfest season getting under way, it is time to remember to register for Ozarkcon to be held in Branson, Missouri, on March 31/April 1st. Ozarkcon is put on by the Four State QRP Group. There will be a live kit-building experience at which we will be assembling the Four States QRP surface-mount dummy load kit. We will offer both the solder paste and direct soldering methods of dealing with the surface-mount parts. I also plan on attending the Green Country Hamfest in Claremore, Oklahoma; the Shriners Hambash in Kansas City, and the International DX Convention in Visalia, California for my very first time. All of these events are in April.

– Until next time, 73 de KØNEB

the ham notebook

TEXT AND PHOTOS BY WAYNE YOSHIDA*, KH6WZ

Let's Get Back to Normal



Photo A. CES® is one of the most interesting and exciting tradeshows and conventions for consumer electronics technology. (Courtesy of Consumer Technology Association)

As I write this installment of "The Ham Notebook," I am hunkered down in my home office trying to keep warm and hoping my shingled roof stays in place. It is windy and raining outside. We do need the rain since most of the southwest U.S. has been in a severe drought for the last several years.

My day-job company continues its temporary COVID-inspired, hybrid work-from-home / work-from-office policy to minimize contact and yet increase collaboration by meeting in person on certain days. If this sounds a bit strange, I agree. But I suppose it is better to be safe than sorry.

We are beginning to slowly get back to allowing local (no international) business travel, so this is a good sign of things getting back to normal.

My mind is wandering, as I think about my recent business trip to CES® 2023 in Las Vegas (*Photo A*). The Consumer Electronic Show is said to be "… the most influential tech event in the world — the proving ground for breakthrough technologies and global innovators." Too bad there are no ham radio displays at CES.

But I did have booth duty showcasing my day job's company's parts (*Photo B*). And yes, some ham radio transceivers use parts from the company I work for.

Meanwhile, when I finally had some time to walk around the exhibits, I noticed some very interesting things as well as some things that I thought were almost totally useless, and I often asked myself, "why would anyone want something like that?" several times.

In addition to the latest products for home entertainment electronics, computing, computer networking, gaming, and eSports, there were plenty of other places where "electronics" entered into places previously not known for electronics applications.

I recall CES when the "next greatest thing" was computer gaming. Multiple buildings (not booths) were devoted to one company's video games.

This seems to have shifted, and the big thing at CES this year was artificial intelligence (AI) and autonomous vehicles. Those products reminded me of many science fiction

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Linkedin: www.linkedin.com/in/wayneTyoshida



Photo B. An interactive display showing various RF, switching, and timing components for hybrid and electric vehicles at CES. (Photos B-O by KH6WZ)



Photo D. The Lightyear solar car has a range of over 620 miles between charges. It is in production and available in Europe. The car on display is not a protype or concept vehicle. It is a customer's car, on loan for the show.



Photo C. A robot cat available from a company called Elephant Robotics. No need to feed it or clean the litter box. But it is too strange for me.

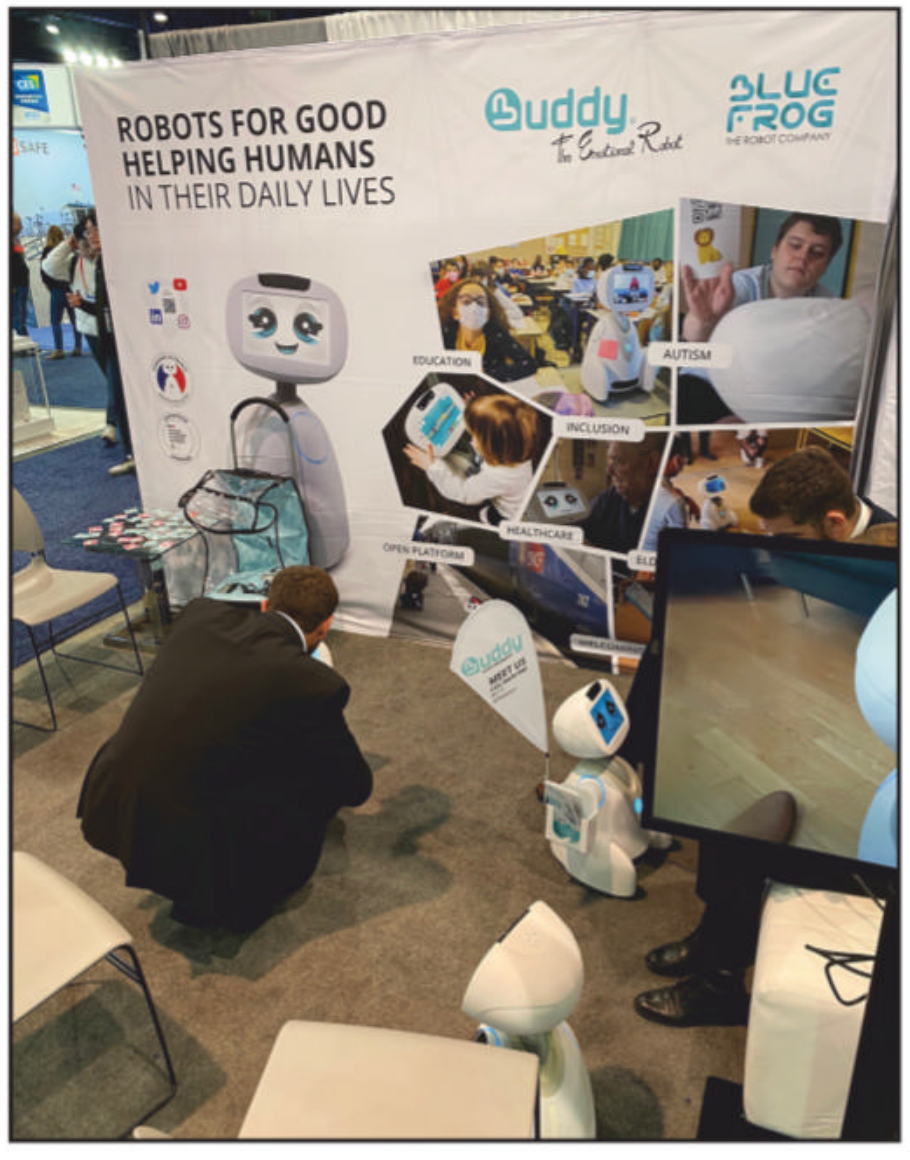


Photo E. "Buddy, the Emotional Robot" is deployed in thousands of schools in France. It is an "emotional AI companion" from Blue Frog Robotics.



Photo F. One of the Indy Autonomous Challenge race cars. Looks just like an "ordinary" race car, but if you look closely, there is no driver seat (see sidebar for more).



Photo G. If you go to your local ham radio convention, you will be tempted to open your wallet and spend some money on something.



Photo H. All ham conventions are great places to socialize with other human beings with similar interests.



Photo I. If you time things right, you might be lucky enough to see some live, on-the-air demonstrations, like this one in which Clint Bradford, K6LCS, shows everyone how easy it is to make satellite contacts.

stories and movies, and a "Twilight Zone" episode or two, like the 1959 episode called "The Brain Center at Whipple's," in which machines replaced humans in a manufacturing plant. You can see some of these items in *Photos C*, *D*, *E*, and *F*.

Back on track for this column, and blending the CES experience with ham radio products, I am glad there is not too much "glitz" and "useless gadgetry" in the products we use to communicate.

"Our" Conventions and Trade Shows

For ham radio equipment, our biggest shows include the Dayton Hamvention® in the U.S., the JAIA Ham Fair in Japan, and *Friedrichshafen* International Amateur Radio Exhibition in Germany.

There are a ton of ham radio conventions in the U.S., but



Photo J. One of the main reasons I like going to ham radio conventions is the swapmeet aspect. I have found very useful and often difficult to find parts and gadgets over the years.



Photo K. Hands-on learning events, like learn to solder and build-a-thons, are another great feature of many ham radio shows.



Photo L. It is always great to see examples of CQ magazine's history, represented by antique original magazines from the past.



Photo M. Where else can you see a real Collins service van, fully restored and equipped with working vintage Collins gear?



Photo N. One excellent side benefit of going to in-person ham radio events is learning from other hams. Here is an example of this "guerilla technique" as applied to learning new things. Brian Yee, W6BY, was selling some items at a recent radio gathering. Although I did not see anything that interested me, I did notice how he mounted an HF antenna to the back of his Toyota Prius.

here are some of my favorites, in random order: Orlando HamCation, Dayton Hamvention, Ham-Com in Dallas (*Ham-Com is no longer being run. –ed.*), and Pacificon, which is also the ARRL Pacific Division convention. There are many other events that I have heard about and are on my list to go to someday.

These gatherings are excellent ways to meet others, to learn new things and to see the latest products from the equipment manufacturers and dealers. Many events include a swap meet (flea market) so you can participate as a seller as well as a buyer of new and used gear of all kinds. You can see what you are missing in *Photos G-N*.

After over two years of limited travel and human-to-human contact, I am glad to experience the beginnings of getting back to normal. Although I am an introvert by nature and enjoy solitude, I also miss seeing my friends and making new ones, as well as traveling to other places to do things.

I am looking forward to traveling and visiting and learning and doing new things in my ham radio — as well as my other — worlds and personal interests.

– 73, Wayne, KH6WZ

References

~ Twilight Zone episode 153, "The Brain Center at Whipple's"
<https://tinyurl.com/2p95k6rd>
~ Clint Bradford, K6LCS, Amateur Radio Satellite Mentor
<http://k6lcs.com/Home.html>
~ Visit the *CQ* website to see Hamfests and Events announcements in your area.
<https://tinyurl.com/47986enj>
~ Dayton Hamvention® (USA)
<https://hamvention.org>
~ *Friedrichshafen* International Amateur Radio Exhibition (Germany)
<www.hamradio-friedrichshafen.com>
~ Ham Fair (Japan, 2022 information)
<https://tinyurl.com/3j4zwvz5>

The Indy Autonomous Challenge (IAC)

Although not directly related to ham radio, the Indy Autonomous Challenge (IAC) is a great opportunity for career development for university students around the world. Certainly, ham radio's hands-on experience with electronics and building and integrating hardware can be an asset and possible advantage to any college curriculum.

A primary goal of the IAC is to advance the technology for fully autonomous vehicles and advanced driver-assistance systems (ADAS). The Science, Technology, Engineering and Math (STEM) competition is to program the autonomous-modified racecars and compete in a series of increasingly challenging competitions.

In other words, the competition is not to build a race car, but to program the software to run the vehicle. It looks like an excellent opportunity for students to experience real-world hands-on practice to collaborate, design, and achieve a goal.

Each self-driving vehicle is capable of speeds of over 170 mph and is based on a Dallara AV-21 Indy Lights chassis, equipped with a 2-liter, inline 4-cylinder, turbocharged engine. A small supercomputer occupies the driver cockpit (*Photo O*).

The autonomous system electronics includes the following:

LIDAR: Three sensors to judge distance between other vehicles and obstacles on the track.

RADAR: Three systems used to calculate relative position and speed of other cars and obstacles.

Cameras: Six cameras allow the remote "drivers" to visually see other cars and the track.

GPS: Four systems, with accuracy to 1 or 2 centimeters.

The cars also include various other sensors for real-time feedback on all aspects of the vehicle condition such as tire temperature, engine data, and other telemetry.

The 2023 IAC winner was team PoliMOVE from *Politecnico di Milano* (Italy), and the University of Alabama, reaching maximum speeds of 180 mph, a new racetrack autonomous speed world record.

More information, as well as videos on this unique and exciting opportunity can be found on the IAC website <www.indyautonomouschallenge.com>.



Photo O. The driver cockpit in an Indy Autonomous Challenge (IAC) racecar is filled with electronics. There is no room (nor need) for a human driver.

gordo's short circuits

BY GORDON WEST, * WB6NOA

Two HF Tuner Considerations

Comet / NCG CAT-300 and LDG Z-100A

For those high-frequency operators looking for increased compact manual antenna tuner performance, I tested the new Comet / NCG Company CAT-300 manual tuner, with great success.

Increased RF output performance is achieved from a slightly larger internal inductance coil, along with large(er) high(er) quality variable capacitors. The Comet CAT-300 can easily handle up to 300 watts, once you tune it up at a more reasonable level, like 50 watts. Don't tune on high power CW and rotate the inductance click-click switch on *any* manual tuner. This could arc the coil contacts.

First tune up on RECEIVE! Yes, *listen* for your rig's background band noise to increase at resonance.

Step one is to set the inductance switch to the band you wish to tune, again listening for your transceiver's background noise to slightly increase. Now quickly rotate both TR and X variable capacitor knobs for maximum receiver noise, and work them back and forth rapidly to get the most white noise possible. This puts you close to resonance. All this done on receive.

Then, find a nearby clear frequency, give your callsign on transmit SSB, and say "FOOOUUUUURRRRRR" while watching the SWR needle to take a big dip, and power output needle jump up, as you final-adjust both capacitor knobs for minimum SWR and max power out. Then, give your callsign, release push-to-talk on the mic, and write down the knob settings for that band. Do each band with this technique that the pros use. Remember, first tune on RECEIVE.

Small tuners this size can handle impedance loads from 10 ohms through 600 ohms, but for me, anything over 4:1 SWR requires more antenna work, even though the tuner can handle this. Any antenna that is so far off resonance will create return currents on the coax braid, and the last thing you want from any manual tuner is returned RF, just inches away from your operating position and smiling face.

You can fool your rig into thinking that a match has been found, but a mismatched antenna can pose an RF hazard in your shack from the coax, with power first going out and up to the antenna, and then reflected energy coming back down to the tuner on the braid of the coax.

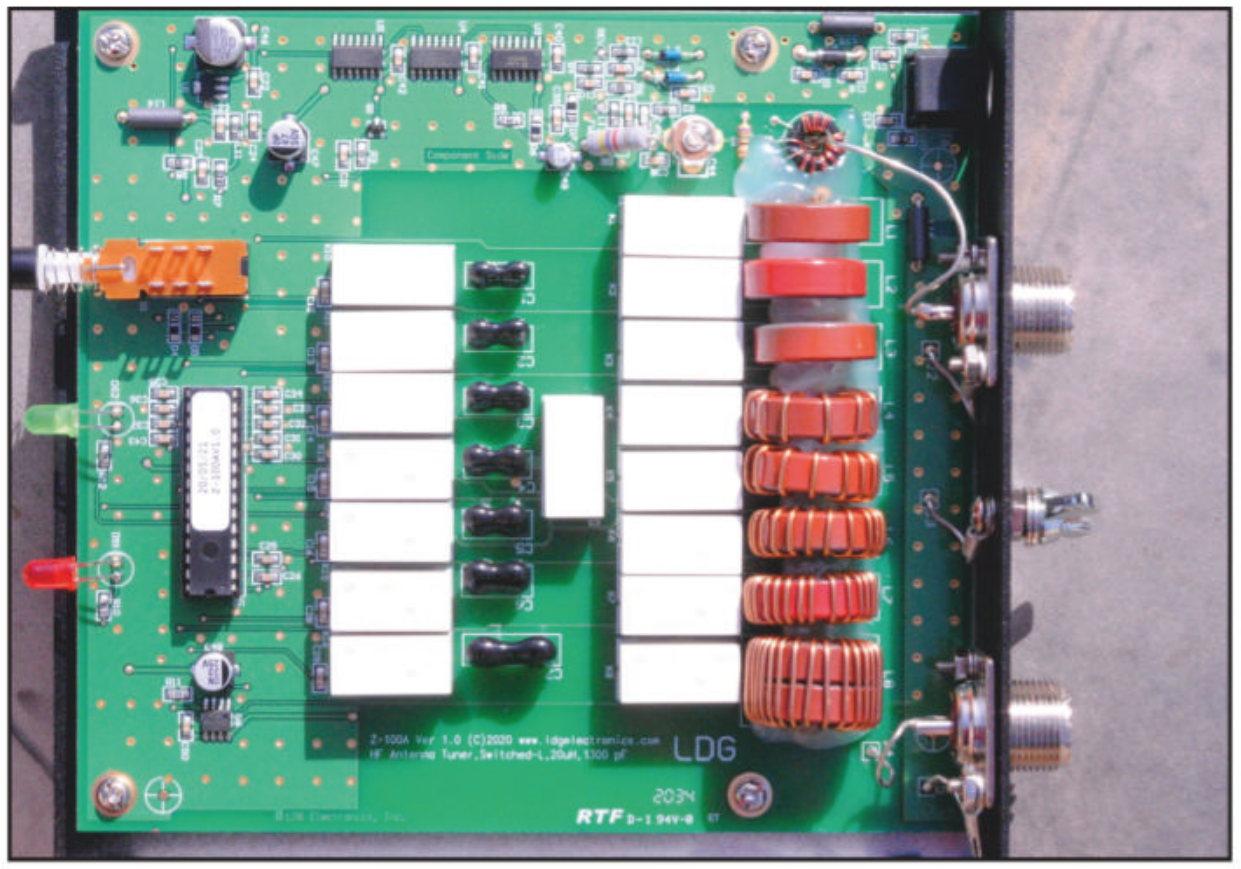


The Comet CAT-300 manual tuner easily tunes from 1.8 to 29.9 MHz and all in between.

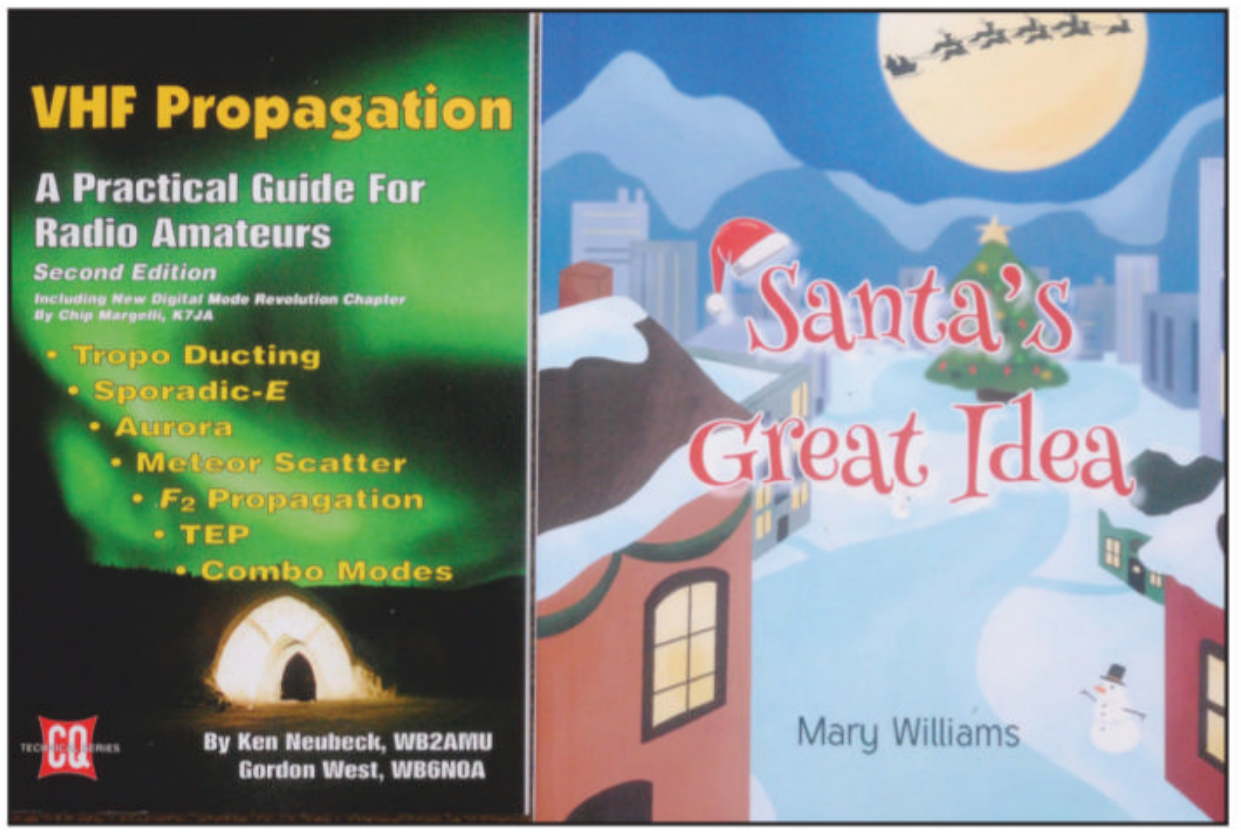


The LDG Z-100A has a coax output only to a balanced antenna system..

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



Self-latching relays keep the LDG tuned with no power needed to keep them set.



Two great books for ham radio operators.

A band selector switch gets you set for 160 through 6 meters, and will easily tune 60 meters and any 5-MHz channel on the 7-MHz band setting; plus my 4-MHz Coast Guard NTIA channels on the 3.8-MHz band setting. So for MARS, CAP, and authorized users of government channels, this tuner can handle it.

The tuner has a large cross needle SWR meter, backlit with LEDs. The meter has a white background seen during the day, with black needles. Easy to see in ambient light, but backlit at night, the background goes to dark grey, with black needles nearly unseen, keeps us guessing what the power and SWR are without a closer look.

The PEP average button gives the operator a good feel for working power output and drive levels for voice and digital operation. It also has a two-position push switch for two different antenna selections for the two antenna jacks on the rear.

For more information, visit <www.natcommgroup.com>. The CAT-300 is about $250 at ham stores.

LDG Autotuner

For automatic tuners, when going mountaintop portable, the LDG Z-100A has a unique function of battery-saving latching relays. This feature minimizes the need to have the automatic tuner constantly ON, drawing current, after you tune up. Once the auto tuner finds resonance, you can drop the 12 volts and the relays stay latched for full power out on your portable rig. Save battery power on the peak.

The Z-100A has a 50-ohm coax cable input and output and tunes dipoles that are not quite resonant for their own perfect match. Off-center-fed 80- through 10-meter dipoles, 10-ohms Z to 400-ohms Z, were easily auto-tuned with a typical tune-up time of 1 or 2 seconds.

But this is not a longwire waterproof reactance-feed tuner for loading up a cactus or a rain gutter. This tuner sits by the portable or home rig, and with the correct rig custom LDG cable kit, tunes up automatically in a flash, great for Summits On The Air ops. But the antenna you are using up on the peak must be "balanced" with a common center feed point — this will help minimize return currents on the coax.

LDG offers its own pre-assembled radio-specific cable kits, with matching plugs for most manufacturers' ham rigs. The Z-100A can also be tuned by a push button on the tuner itself if you have a rig for which LDG doesn't have a matching cable kit.

An SWR LED on the tuner lets you know the tuner has matched the antenna you are tuning.

The tuner will memorize up to 2,000 tune ups, and it can return to a tuned position within milliseconds.

If your SOTA and POTA (Parks On The Air) HF gear does not have a *built-in* tuner, the LDG Z-100A will give you that perfect match! Plus, it's made in the USA.

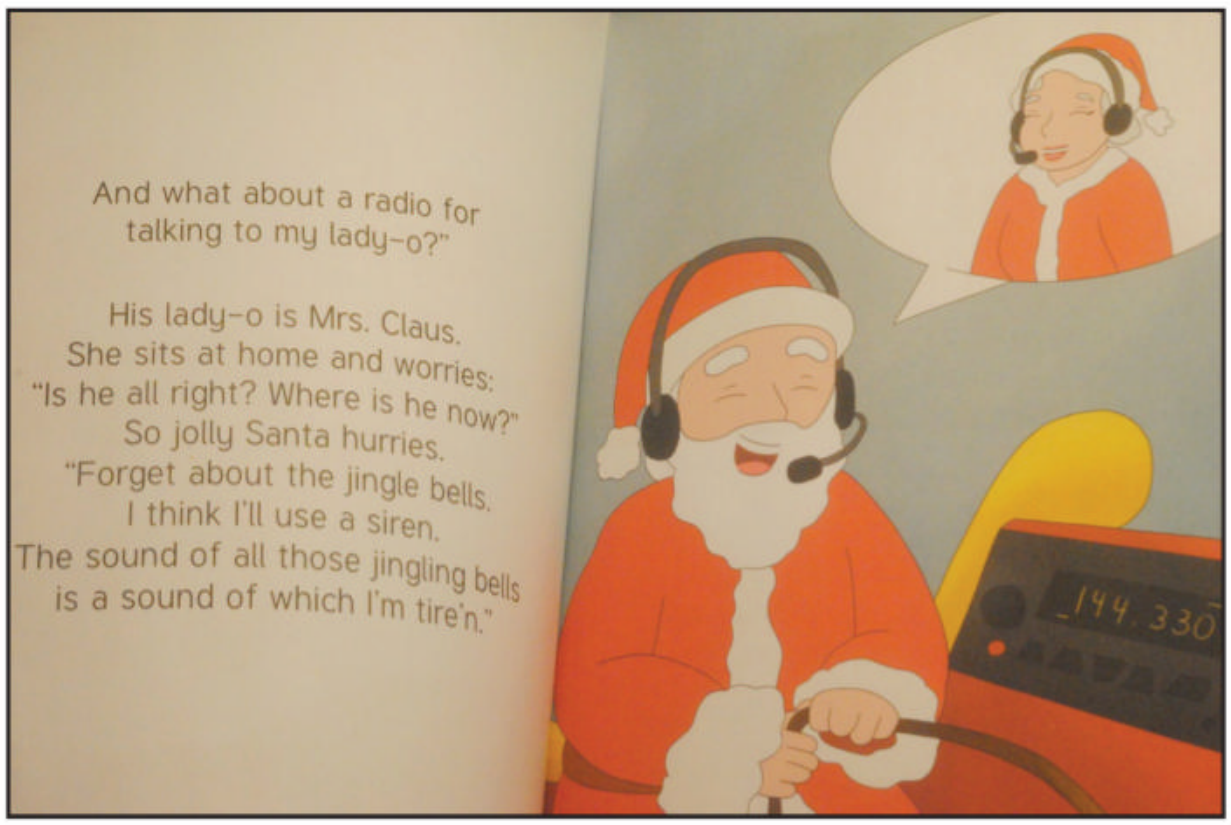
Learn more at <https://ldgelectronics.com>. It retails for $199 at ham dealers.

Second Edition Of Our CQ VHF Propagation Book

Six meter legend Ken Neubeck, WB2AMU, "Mr. 6-Meter Magic Band," has worked up for *CQ* magazine the second edition of our book on VHF / UHF propagation, with my updated chapters on how to work tropospheric ducting, and fun with sporadic-E (E_S).

Ken continues to include charts, graphs, and photos, and his fun writing style leads to a greater understanding on how exactly VHF and UHF radio waves many times go well beyond line of sight! Ken writes with a smile.

Added to our second edition is famed DXer Chip Margelli, K7JA, with a full



A children's book about Santa and his radio.

chapter on working digital modes, like FT8, from 6 meters on up. Who would believe moon bounce reception on a single Yagi on 2 meters would be possible in the Q65 and MSK144 weak signal digital modes? Chip tells all.

Our new book is sized 6- x 9-inches, 148 illustrated pages, and ships direct from the publisher, our own CQ Communications! It's $21.95 plus shipping, phone (516) 681-2922, or visit <www.cq-amateur-radio.com>.

With Solar Cycle 25 looking great for 6-meter skywave as conditions continue to improve, learn some new tricks in working E_S openings, hours before the rest of the local hams know the band is opening. And when 6 meters goes short, jump up to 2 meters, and enjoy short-lived skywave contacts up to 1,000 miles away.

Speaking of books ... If you have very young children who you want to introduce to wireless radio, a child's hardback book shows, in rhyme, how Ham Operator Santa, during this past holiday season, stays on course, giving Rudolph some time off, with an HT and other modern electronics in his sleigh, and comms with Mrs. Claus. But alas, his elves ran down the batteries, so Rudolph gets back in action!

Written by Mary Williams, AB6CZ, it's called *Santa's Great Idea*, at most bookstores, Newman Springs Publishing.

Sea Water Nearby? A Big River Nearby?

Most maritime ship chandleries are ultra knowledgeable on used boating things like cleats, anchors, sailboat masts, sails, engines, switch panels, mooring chains, and generators, but not so tuned in to radio stuff, like long-range marine single-sideband (SSB) radios.

Many mariners throw in the marine electronics and SSB radio with the boat they are selling, and the new owners usually scrap out these big bulky boxes at the navigation station for the more modern satellite communications systems.

Luckily, the crystal-controlled dynamotor tube medium frequency 2- to 4-MHz AM rigs are long gone. Now showing up are these "big clunker" 2 MHz to 29.9 MHz marine radios for pennies on the dollar.

Even though the marine high-frequency radios are pre-channelized for ITU upper-sideband (USB) marine frequencies, they can be front panel switched to the open tuning RX mode for upper *and* lower sideband, from 2 MHz to near 30 MHz, in tuning steps down to 0.1 kHz.

Instead of a smooth dialing VHF knob, they have a big knob that goes click-click-click in the selected tuning steps or use the keypad for dialing in any ham channel.

Nearly all the marine / ham transceivers use common 12-volts DC, they are synthesized with solid-state circuitry, 150-watts output, and provisions for automatic external long-wire antenna couplers.

Icom America continues to be the leading manufacturer of marine SSB synthesized rigs, and many solo ham sailors have an Icom marine SSB rig that will play on HF ham bands as well as ship-to-ship and Coast Guard marine channels legally with a ship station marine radio license.

The Icom M700s, M800s, and M802 are showing up at boater swap meets and used gear markets, and make excellent ham rigs, Some sellers think they are just a big CB radio, and will literally give them away.

SEA and SGC rigs are also seen going for a couple hundred bucks with



VHF Propagation

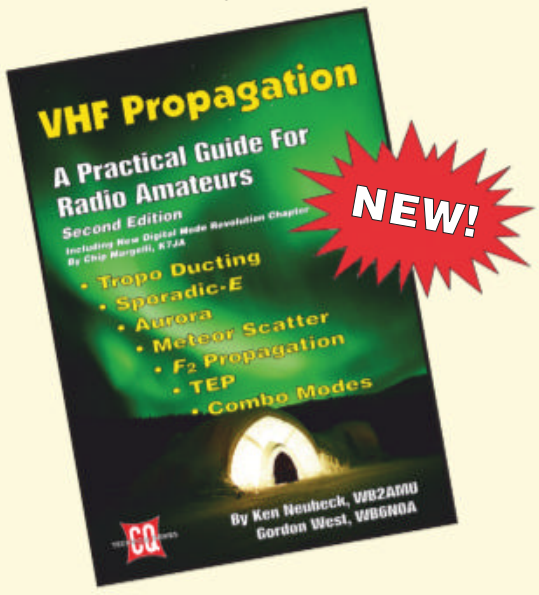
A Practical Guide for Radio Amateurs

Second Edition

By Ken Neubeck, WB2AMU, Gordon West, WB6NOA

With New Digital Mode Revolution Chapter

By Chip Margelli, K7JA



New from CQ–the ***VHF Propagation Handbook–Second Edition,*** written by three of Amateur Radio's well-known authors: WB2AMU, WB6NOA and K7JA!

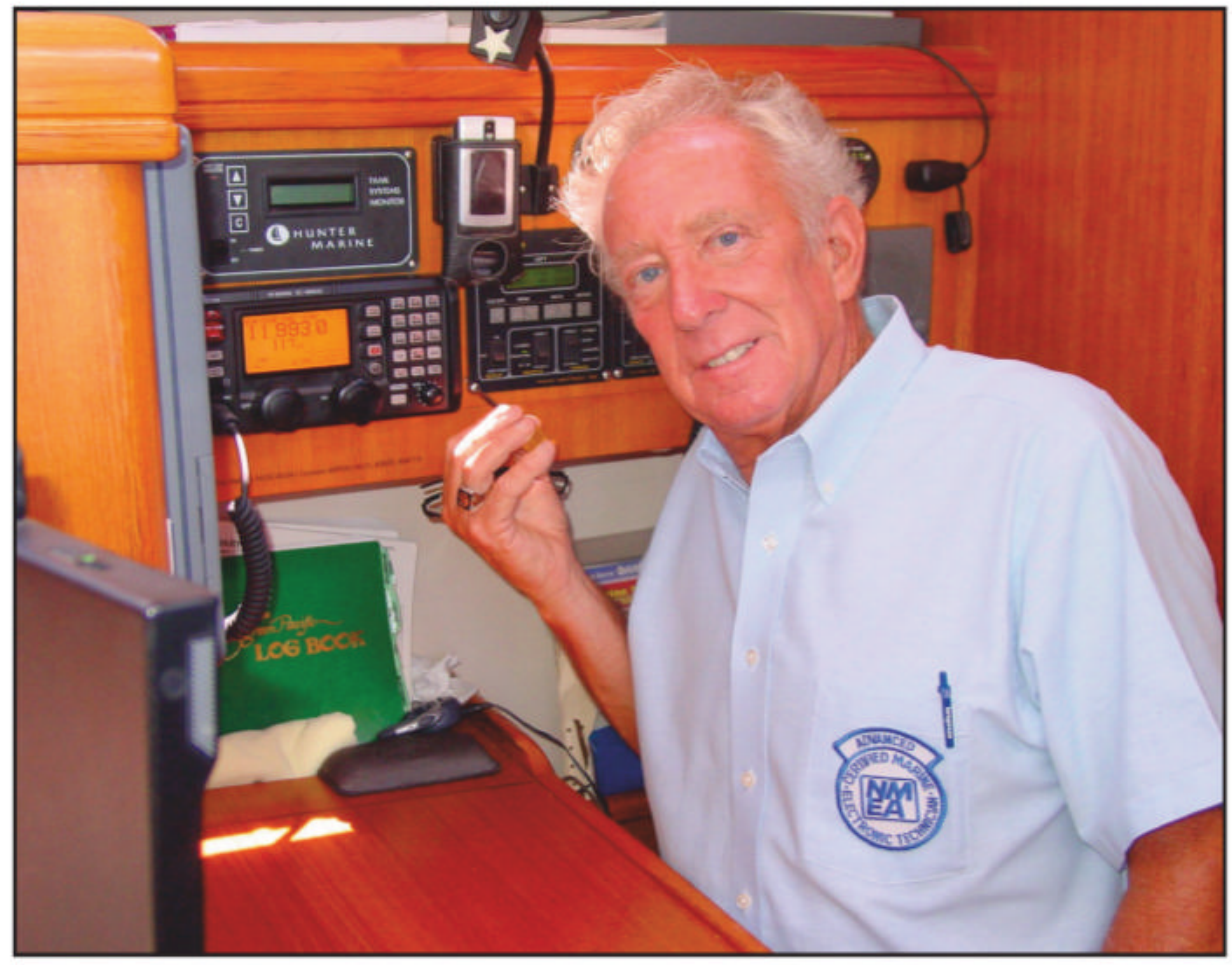
Just about all radio amateurs in the United States, as well as those in many other areas of the world, have access to VHF radio frequencies, regardless of their license class. And, the propagation modes that are often seen on these frequencies make for some pretty incredible operating conditions.

You will find a wealth of information within this book – beginning with Chapter 1: *Introduction to the Troposphere and Ionosphere* to Chapter 12: *New Digital Mode Revolution in VHF+ DXing.* Chapter 12 will bring you up-to-speed on the revolution in tools and techniques for VHF+ DXing. This new found-knowledge will certainly add to your enjoyment of the hobby!

This 6 X 9, 148 page paperback is only **$21.95**

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All marine SSB radios can also receive and transmit on ham bands.



Gordo's portable SSB pack with a marine SSB on bottom working 14.300-MHz USB.

a matching external antenna tuner for a little extra ... like $50. Even a Kenwood TKM-707 marine SSB was seen at the local boater swap meet, going for $250, including the matching long-wire antenna tuner.

All these rigs usually transmit outside the marine bands with no internal modifications needed. Some will tune ham bands on receive, but won't transmit until you read the manual, or call the factory, for the front panel "TX unlock" procedure. (73# ... 2 mode TX ...) They all unlock for ham.

These marine radios must NOT be used to transmit on ITU maritime radio channels ashore — *monitor only*. However, licensed hams may use any type of commercial radios on our ham bands.

So, if you have boat shops selling used gear and marine electronics, there likely will be some of the "big CBs" sitting on their shelf, looking for a new ham radio home.

mf/lf operating: Life Below the AM Broadcast Band

BY JOHN LANGRIDGE, * KB5NJD

Let's Review Some of the Basics of MF and LF Amateur Radio!

Plus … an Update on Murphy at W3TS and a New World Record on 2200 Meters

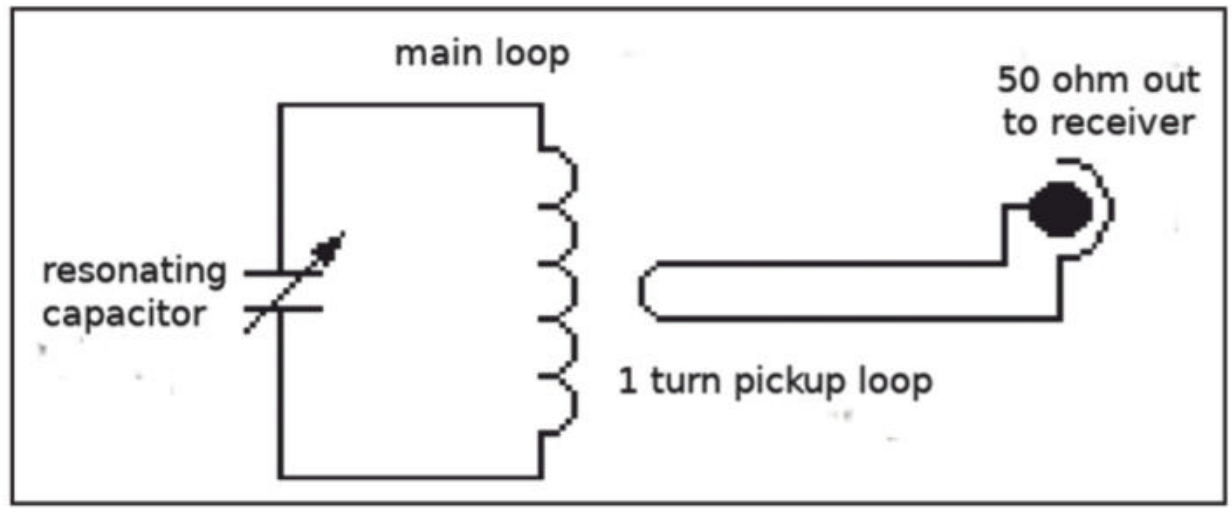
In April 2017 when I wrote my first *CQ* column about 630 and 2200 meters, even before amateurs had spectrum access, it was a daunting task to prioritize just what topics were most important to present first. At the time, rumors from conversations with FCC staff in the Office of Engineering and Technology suggested that the bands would be opening under Part-97 rules sometime in fall 2017. Time was short so a lot of information was presented in those first few articles so that operators not already on the air as Part-5 experimental stations could be ready for the inaugural season.

Now that nearly six years have elapsed, it's probably a good time to rehash some of those early topics associated with station-building for both bands. As I write this article, there have been recent online discussions that suggest a new crop of prospective operators is beginning to seriously consider the possibilities of their own activity on 630 and 2200 meters. A few updates may help avoid reinventing the wheel.

The very first thing I would recommend to a prospective operator is to submit your obligatory notification to the Utilities Technology Council (UTC)[1] that you intend to operate on 630 or 2200 meters or both. The agreement with the UTC stated that amateurs' intent on operating on these bands would submit notification 30 days prior to beginning their operation from a location. You only have to complete the process once for each operating location. As far as I am concerned, and as it's written, you are not prohibited from submitting notification for as many sites as you want. I've submitted notification for almost 100 locations from which I have either operated already or might one day.

Within the 30-day period following notification, UTC can raise an objection regarding operation at the location over concerns with proximity to power line carrier (PLC) systems used for power transmission, switching and monitoring. It's important to note that this matter only covers power transmission lines that contain PLC signals, not power delivery to your home so smart meters and other communications technologies that use power lines will not prohibit your operation from a regulatory standpoint. Those services have no protections afforded them, but they might generate noise that complicates your operation. If your antenna is closer than 1 kilometer to an active PLC system, UTC can raise an objection to your operation.

The good news is that several engineers that have worked with these systems have come forward over the last 10 years indicating that, in general, there are no active PLC systems above 300 kHz in the lower-48 states at this



The resonant receive loop design described by VE7SL is common for both small transmit and receive loops in use today. Resonating the loop is simple, by way of a variable capacitor. At KB5NJD, I also include a relay that allows me to select a secondary capacitor bank for 2200 meters in addition to a separate relay across the capacitor that detunes the resonant circuit while I am transmitting in order to avoid high voltage circulating in the loop due to near-field radiation of the transmit antenna. (Courtesy of VE7SL)



Here are the replacement standoff insulators that had been in use for just a few months before failing. The arcing appears worse than what was reported from the previous incident. Mike notes that thinner insulation on the RG8X used for the dipole feeder as well as the Marconi vertical element are likely the cause of this most recent failure. (Courtesy of W3TS)

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Plastic standoff insulators now replace the metallic insulators. A clamp holds the end of the insulator to the mast while the coax is tie-wrapped to the other end. These insulators only maintain spacing and do not have to support the weight as the main support is at the top of the mast. (Courtesy of W3TS)

time. This bodes well for 630 meters but could still be problematic for some 2200-meter operators below that frequency boundary. In fact, one prominent and long-time experimental operator on 2200 meters located in the Northeast was notified that an objection was raised for his activity on 2200 meters under Part-97 rules even after operating on the band at higher power levels for years prior with no problems under Part-5 experimental rules. I suspect that this situation was a clerical error with record keeping but the station in question chose to "do other things" rather than pursue the matter further. Don't let this scenario keep you awake at night. Make your notification with the understanding that it is very unlikely there will be issues. Very few have actually claimed to have been prohibited from operating from their desired location.

This first step is also important because by submitting notification for your site, you prohibit future coordination of these frequencies for PLC use within 1 kilometer. You might be helping someone else in the future even if you have no intention of operating on these bands in the near term.

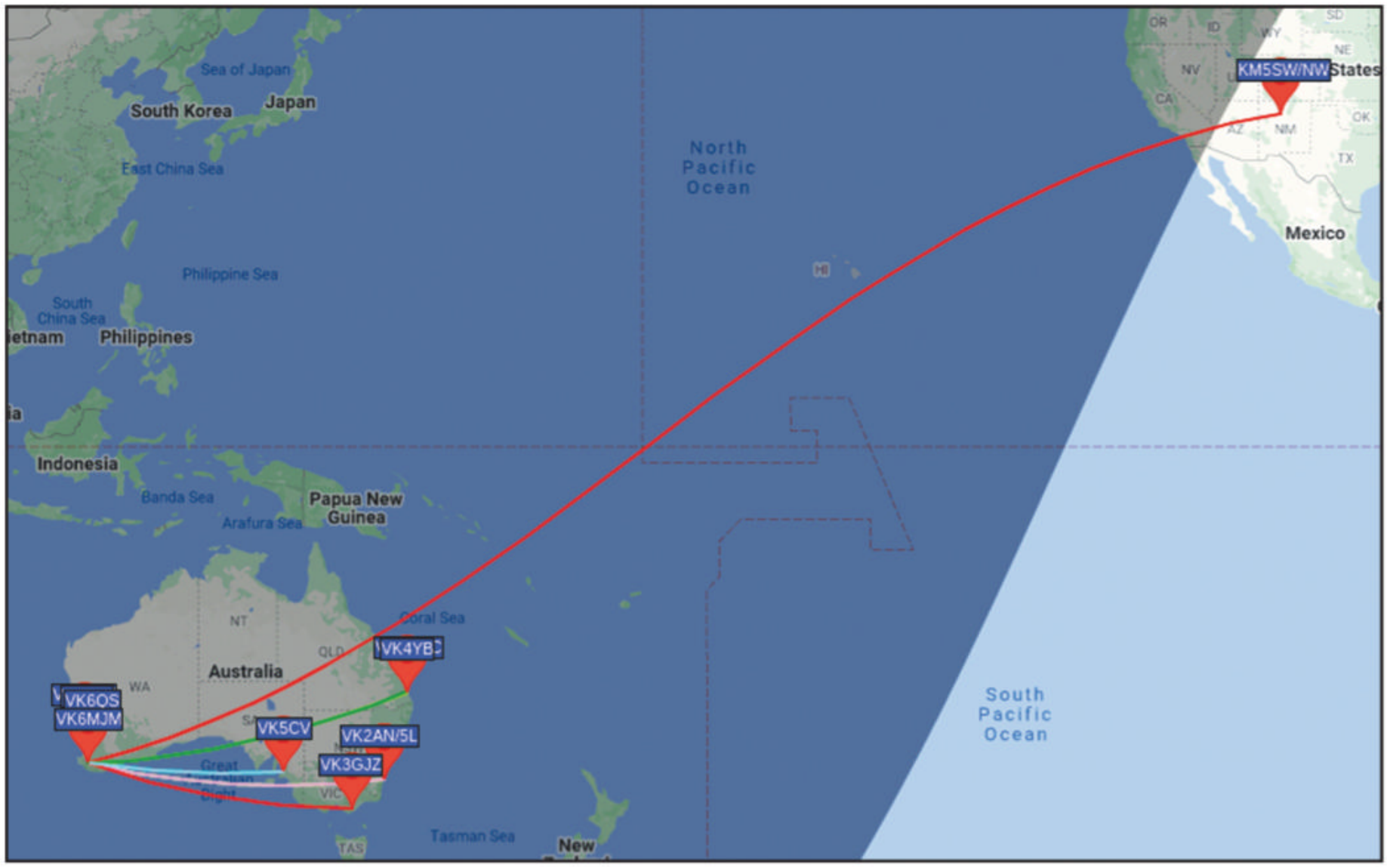
I mentioned a few paragraphs back that existing power infrastructure and general "noisemakers" from the neighborhood could make listening a challenge so evaluating your receive capabilities is a very good thing to do early in this process during the 30-day period following your UTC notification. After all, if you are unable to hear others because of local noise, making two-way contacts may be a problem. Listening with existing HF antennas is one strategy but likely will not offer the level of performance necessary for success on these bands due to poor impedance matching at frequencies for which the antenna was not designed. Those stations with existing low-band receive antenna systems will find these tests more revealing. If using broadcast-band filtering, don't forget to remove it from the receive chain. That has happened more than once to operators who were evaluating their systems.

For those without existing low-band receive antenna systems, a rotatable multi-turn loop that has been resonated on the band of choice can offer considerable performance. The receive loop that I use at my station, which is remotely switchable for 630 and 2200 meters, is probably my best receive antenna out of the six that I regularly use on the low bands. There are many versions of this loop found on the internet but the one I use was originally based on a description[2] by Steve McDonald, VE7SL, of Mayne, British Columbia, Canada. It uses multiple turns on a frame and is then resonated by a capacitor for the band of interest. A pickup wire loop mounted adjacent to the multiple turns of the antenna wire connects to the coax. At my stations I went a step further, adding a step-up transformer between the pickup loop and the coax, allowing a bit more signal down the feed line from better impedance matching as well as a bit of additional common mode protection due to isolated windings.

This last statement deserves a bit more discussion in broader terms. It's very commonly heard that people try receive antennas on 630 or 2200 meters (or even 160 meters) only to report that they did not see any improvement in receive performance. A red flag always goes up when I hear someone say this because it probably says something about their station grounding configuration and component isolation. It is so easy to completely ruin an otherwise perfectly good receive system because of poor grounding and isolation. There is a much greater awareness of the impact of ground loops these days because of the proliferation of digital modes and interfaces between computers, external sound devices, and transceivers.

Ground currents flowing on the shields of coax and other interconnects can become part of the antenna system, masking desired directivity, and making the receive passband sound like noise that can never be nulled. Because of this, I use isolation transformers between receive antenna feed lines and the receive antenna signal buss. Because the receive antenna ports on most transceivers are not isolated from transceiver ground, loops can occur, so I also use isolation transformers between the feed line and the receive-only ports of my transceivers. In all, I probably have 20 isolation transformers in my receive antenna system and while this may seem excessive, all of my receive antennas retain their directivity and are effective.

So how are these transformers built? Very simply put, transformers used here are made with Type-75 binocular cores with five turns on the primary and five turns on the secondary. Of course, a variety of other split-winding options can also be found on the internet. Be careful when mounting transformers in metal boxes, however, because these are *isolation* transformers and should not connect to a common ground on the enclosure. Instead, only one side (primary or secondary — you choose) should connect to the enclosure while the other side should have a floating shield. There are many varieties of chassis connectors that are outfitted with insulation to accomplish ground isolation. If you hate dealing with connectors, an alternative approach is to directly solder the transformer to coaxial pigtails with some type of strain relief in the enclosure, avoiding the need for additional ground-isolated connectors in the receive antenna chain. Mouser



The 16,164-kilometer (10,064-mile) path between VK6MJM and KM5SW was particularly challenging due to a significant amount of distance that the signal had to traverse over land early in the trip. (Courtesy of VK6HP)

and Digikey both carry ground-isolated BNC connectors.

Many modern transceivers work on these bands "out of the box," receiving well and generating a low-level signal much like a signal generator with all of the features of transmit / receive switching built in. This month we will stick to a discussion on receiving, exploring transmitting options next time. The Kenwood 590SG / 890 / 990 lines have native receive at 630 and 2200 meters, meaning that the receivers perform similarly to how one might expect them to perform at higher, more traditional amateur frequencies. These offer far better performance than a general coverage receiver contained in many older transceivers, in my opinion. A broadcast attenuator is jumper-selectable but the location of that jumper seems to vary by serial number so keep that in mind if you decide to make that modification. Details are available from the in-depth manuals on the Kenwood site.

Other transceivers like those from Elecraft also work very well when optioned for operation below 160 meters with respect to band-pass filtering. Several transceivers from Icom are also reported to be very good performers, although I am not certain that all of them have been firmware-modified at this point to generate signals below 160 meters. Those questions should be directed to their respective manufacturers. The Icom 7300 seems to be a favorite of many. Perhaps someday a definitive side-by-side evaluation of all of the current transceivers can be undertaken. In general, transceivers with general coverage receivers tend to perform poorly with respect to sensitivity below the AM broadcast band. Just because a transceiver says it will tune to 50 or 100 kHz does not mean that it will work well there, particularly when coupled to a poor receive antenna, so keep that in mind.

Vintage gear is not uncommon, particularly on CW. Use with digital modes, however, tends to be a bit more difficult, if even impossible, due to frequency resolution, stability, and accuracy. I think many of us have been spoiled by seemingly unlimited DSP capabilities available with modern transceivers that make many otherwise impossible low-power QSOs from the past become reality. If you are using a vintage receiver, patience and a robust receive antenna will offer you the best possibility for success. This may seem obvious but there have been individuals who have complained about not hearing anything, only to report that their receive antenna was an 11-meter CB "ground plane." That's a true story. Dumb luck antennas do exist but they are usually the exception and not the rule.

We will delve deeper into generating a signal as well as transmitting antennas, what works best, and approaches to implementing existing antennas on 630 and 2200 meters in coming columns.

Did the Antenna Repair "Hold" at W3TS?

In last quarter's column, I reported on a visit from Murphy at the station of Mike Michael, W3TS, of Halifax, Pennsylvania. Since the 1990s, Mike has used 40- and 80-meter dipoles that are insulated from his tower as a T-top Marconi vertical on 160 meters and 630 meters as well when the band opened to amateurs. It worked fine until the late summer of 2022 when arcing became a problem. Mike repaired the system that had worked well on 630 meters for several years and on 160 meters for much longer. Sadly, the fix



Sunset at the remote VK6MJM outpost. (Courtesy of VK6HP)

did *not* continue to work and Mike was forced to climb the tower again in late November to replace the work he had done just months earlier.

Mike attributes the arcing this time to thinner outer insulation on the RG8X coax that he is using to feed the dipoles and subsequently functioning as the vertical element on 160 and 630 meters. Since he could not really control the insulation thickness, his repair involved removing the twin lead stand-off assemblies that had been in place for so long, replacing them with a more robust insulator material that should be hard pressed to fail from arcing again. I will report back if these new stand-off insulators fail by some other method. As stated in the previous column, be careful assuming that what has worked in the past will continue to work into perpetuity. Stuff ages and breaks down, like all of us, and the quality of replacements may not be up to the standards of the past. As they say: They don't make 'em like they used to!

New World Record on 2200 Meters

Beginning in 2022, the Western Australian Low Frequency Experimenter's Group (WALFEG), affiliated with the Wireless Institute of Australia (WIA), began operating a remote digital-mode beacon on 2200 meters with the callsign VK6MJM. Peter Hall, VK6HP, of Manjimup, Western Australia, reported in April that the reclamation of an abandoned non-directional beacon (NDB) used for aviation had been a success and the site showed some promise for evaluating long-haul openings on both 630 and 2200 meters.

Initially, 630 meters was the target band, resulting in over 5,000 WSPR reports within the JA, VK, and ZL corridor. The system proved to work well, so plans were made during the Southern Hemisphere winter of 2022 to make modifications so that 2200 meters could also be explored. The modified system was first tested on the air in September, using both WSPR and FST4W-300, the latter being the FST4 beacon variant that uses a 5-minute transmission. Results were mixed with reports around Australia and as far away as Japan. However, the final goal is to be heard in North America or Europe.

November 2022 brought more testing at the remote site using 2200 meters FST4W-300 and while transitioning to summer propagation in the Southern Hemisphere, the Northern Hemisphere was becoming quieter as summer thunderstorms began to subside. A lucky break was found on November 21, 2022 when Paul Johnson, KM5SW, of Jemez Springs, New Mexico, reported the VK6MJM beacon three times at -36, -37, and -37 dB S/N at 1320, 1350, and 1405 UTC, respectively. It was reported a few hours later by Alex Lesnichy, R7NT, of Tagnarog, Russia, that the 16,164-kilometer (10,044 miles) path was the longest recorded 2200-meter reception between Oceania and North America ever reported. Alex is the keeper of the "Around the World on LF" (AWLF) record site which was not accessible at the time that this article was prepared.

Peter noted that the record was accomplished using just 0.8-watt EIRP despite the WSPR data that indicated 1.0-watt EIRP. Peter rushed to leave the site before dark where travel can be treacherous on severely compromised roads, so the entry was an error. Congrats to all involved and hopefully this is just the beginning of amazing things from this remote outpost on 2200 meters.

That's all for this month. If you have questions or comments, please contact me by email at <KB5NJD@gmail.com>.

Notes:

1. UTC Notification: <https://tinyurl.com/4fs2m6eu>
2. VE7SL: <https://tinyurl.com/mr38c2n7>

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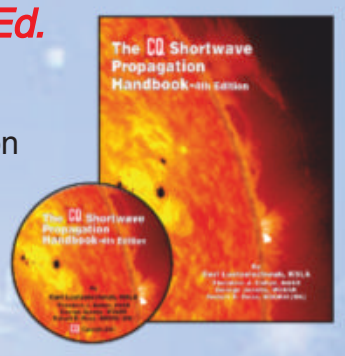


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ham radio explorer

BY ANTHONY A. LUSCRE*, K8ZT

Multiple Radio Activities with One Starting Point

Two-for-one … I love it when activities complement each other, like that well-planned trip that accomplishes multiple errands in the shortest time and the least amount of driving. It is often called "... killing two birds with one stone." Solving two or more problems with a single action. There are so many aspects of amateur radio to explore that start with one project and accomplish multiple ends.

Sound Card Modes

Many new radio communication modes have been developed in recent years. Most of these can be lumped into the *sound card modes* (SCM) category. They depend on various tones for transmission via radio. FT8 and FT4 (*Photo A*) are part of the WSJT-X suite. WSJT-X also includes other SCMs used for specific activities such as meteor scatter and EME (Earth-Moon-Earth) contacts.

Typically, there are four parts to a station capable of SCM communication: a radio capable of SSB transceive, a sound card interface, a computer, and appropriate software (*Figure 1*). For most purposes, the radio acts the same as it would during SSB transmissions, sending and receiving signals with multiple tones and amplitudes.

The sound card is simply a way to take the incoming audio of the radio's receiver and input it into the computer's incoming audio channel (often referred to as a microphone or recorder input). Conversely, the sound card takes the encoded audio output of the computer and feeds it into the radio's microphone jack to be sent out by the radio's transmitter. The "magic" of these modes actually takes place, not in the sound card, but in the software running on the computer. These programs encode information inputted via a computer keyboard (or recorded macros) into an audio signal to be sent to the radio via the sound card. On receive, the software decodes the incoming audio signals from the radio via the sound card and converts them into the text we can read on the display monitor.

A Sound Card-Equipped Radio is the Starting Point

Many current radios have built-in sound card interfaces. You can easily add an external sound card interface for radios that do not have one built-in. Several popular commercial models of interfaces are under $200 (*Table 1*).

Once you have a radio with a built-in sound card or external interface with cabling, you are ready for many new modes and projects. Follow these steps to get started with a Microsoft Windows™ computer:

1. If your radio requires driver software for the computer interface, install the current version of that software before connecting your radio to the computer with an interface cable — see the manual for information on drivers and check the manufacturer's website for driver software. After installing, note the Com port that the radio interface has been given in Device Manager.
2. If you are using an external sound card, attach all cables to the radio and USB cable from the interface to your computer.
3. You should see a new sound card in your list (probably with the word CODEC in the name).
4. You will need to set the mode to DATA or USB, depending on your specific radio model.
5. You may also have to make changes to the radio's settings — turn off DSP and DNR, set filter to widest setting, etc. These settings may vary, depending on the specific SCM you are running. There are a lot of how-to videos for different radio models on the internet and YouTube.
6. Install software for the specific SCMs that you want to run.

Install Sound Card Mode Software Programs

You can add dozens of new modes to your amateur radio repertoire by choos-

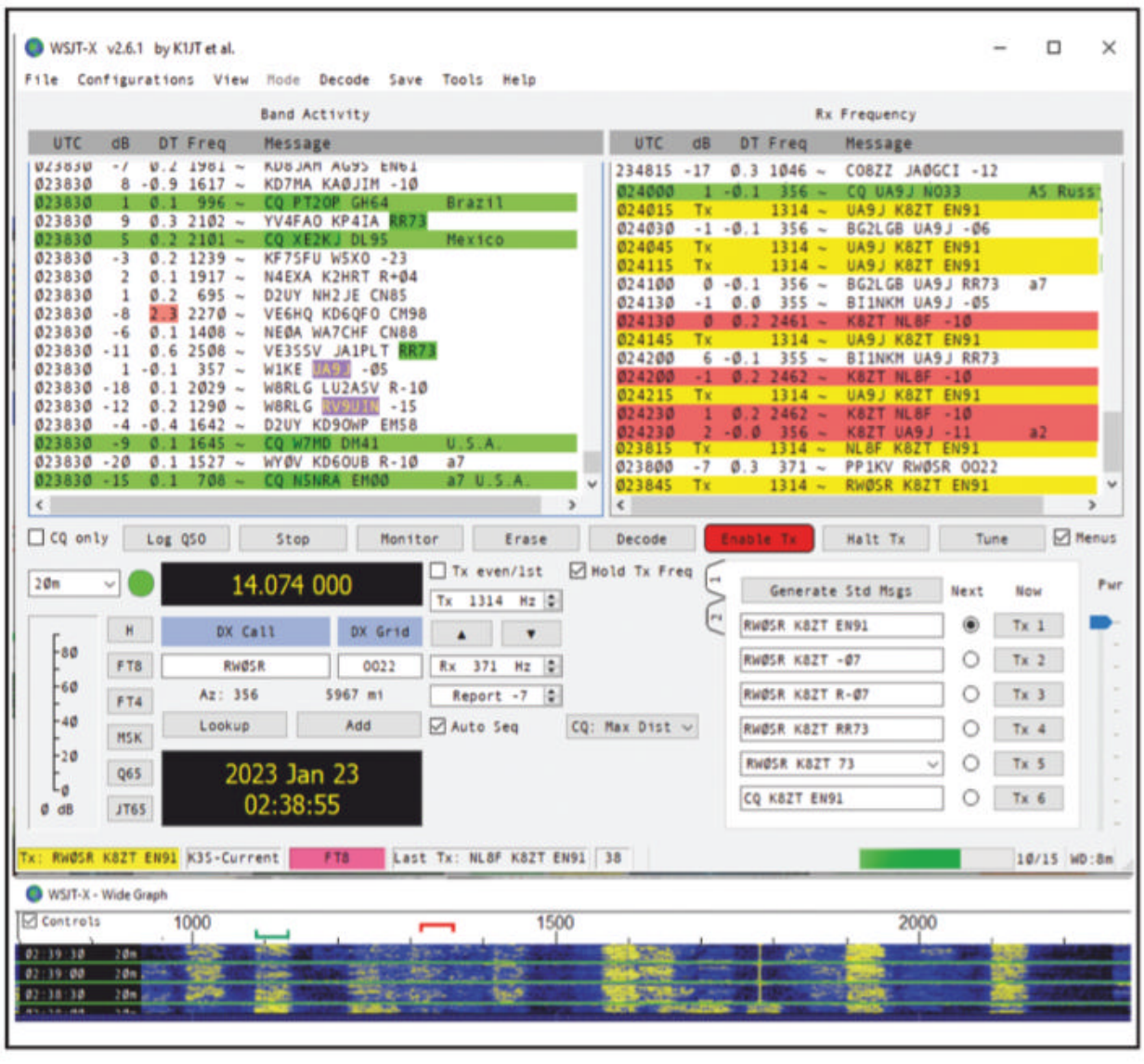


Photo A. Author working Asiatic Russia and Alaska with 5 watts on popular sound card mode FT8.

Email: <k8zt@arrl.net>, website <www.k8zt.com>

ing different software. Two of the most popular modes are FT8 and FT4. These are part of the **WSJT-X Suite** (for more information, see my slideshow <tiny.cc/ft8ft4>). WSJT-X can also provide you many other weak-signal modes for meteor scatter, EME, etc. Installing **FLDIGI** software <www.w1hkj.com> gives you a large number of SCMs, including PSK (and its many versions), Hellschreiber, DominoEX, etc., plus sound card versions of RTTY, CW, and WEFAX. There are a number of other programs with SCM, including Ham Radio Deluxe's "Digital Master, formerly DM-780, an all-purpose ham radio digital modes communications package."

An Additional Step to Run Winlink, VARA AC, etc.

Pactor, a mode popular a few years ago for digital communication and email forwarding, required a rather expensive hardware modem. Much of Pactor activity has been replaced by VARA, a high-performance HF software-based modem based on OFDM modulation. If you would like to run Winlink or other related modes, you will need to install the EA5HVK weak-signal software which can be found at <https://rosmodem.wordpress.com>. There is a lot of information on the software at the site, which I will not be able to cover in this article. After downloading and installing, you will need to register your software and pay a small registration fee.

Even More

Just like in the late-night TV commercials — "wait, there is even more!" Once you have your radio and sound card interfaced, you can easily record on-air audio with your favorite software, transmit SSB exchanges in contests as macros, and more. We have just scratched the surface of current SCMs, and new ones are always on the horizon, so this month's exploration can continue indefinitely.

That's it for this month. If you are interested in some of my recent ham radio presentations to radio clubs via Zoom, visit <tiny.cc/k8zt-p>. Remember, I am always looking for information on your new activities, ideas for future columns, and feedback from this column, so please email me at <k8zt@arrl.net>.

Table 1. A chart showing some common commercial sound card interfaces. (Table by author)

Sound Card Interfaces	
Manufacturer	Model
Tigertronics	Signalink
Digirig	Digirig Mobile
MFJ	MFJ-1204
DigiLink	Nano
Xggcomms	Digimode-4-(Manufacturer)
RigExpert	TI-3000
ZLP Electronics	DigiMaster MiniProSC
Master Communication	DRA Series
Yaesu	SCU-17 USB Interface

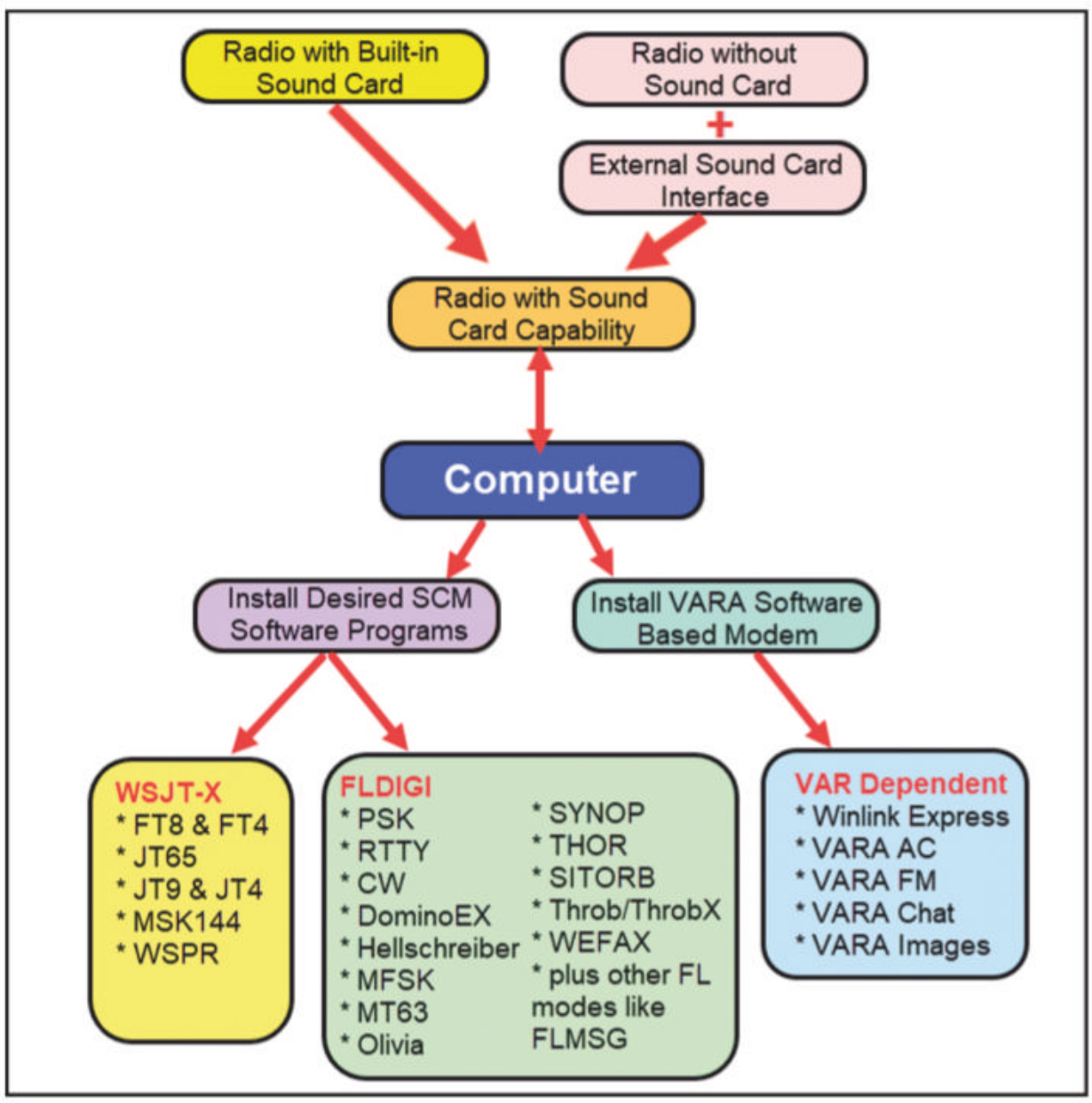


Figure 1. An overview of what you can do with sound card modes, a properly configured radio, a computer, and some software.

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digital connection

BY DON ROTOLO,* N2IRZ

Boxing Days

TARPN Nodes and Their Containers

I've written many times about the TARPN packet networking project <tarpn.net>, and this month we'll have another look at a related project. I presume that most *CQ* readers know enough about packet to know whether they'd enjoy it or not, so there's no attempt here at conversion. After all, CW enthusiasts don't do it because it's state of the art, but because they find it fun. As it is with packet. Its value as a learning tool cannot be overstated and the chat feature in TARPN Home is a fun way to unite the local packet community.

If you want to gain traction in the promotion of (something), it is often a good idea to minimize the level of effort required to get started. Efforts for most anything include publicity, funding, sourcing bits and pieces, clear instructions on what to do and how to do it, as well as a support system for when things go cattywampus [*this is a new word for me –ed*].

TARPN has seen a reasonable level of success by focusing on these points and delivering reasonably good and readily available "products." But one of the key elements, as I've learned through my efforts in Atlanta, is having an effective advocate and promoter. From first hearing about a project to visiting someone to see things in action to active participation, there needs to be a central contact where anyone and everyone can find out what they need to know.

Another key element is making the important components available, ideally at a reasonable price, or at least identifying a reliable source. A Raspberry Pi is a full-blown computer and can be purchased for approximately $55, serving as the core of a TARPN node. Well, since the pandemic they're harder to find, but not impossibly so. The TARPN software is free, installation and configuration are mostly automated and very well documented. The NinoTNC is a very capable

*c/o CQ magazine
Email : <N2IRZ@cq-amateur-radio.com>



Photo A. A prototype TaddBox, designed to hold a complete three-port TARPN node (less antennas, of course). On top is the Raspberry Pi computer, and below are three radios and their associated KISS TNCs. There are some parts missing here, such as cables, power supply and backup battery (these sit on the very bottom shelf), and the Pi power supply and fuse box.



Photo B. Using a CNC router makes easy-to-assemble joints like this a trivial matter. Tightening the screw makes a strong joint that can easily be disassembled if needed.

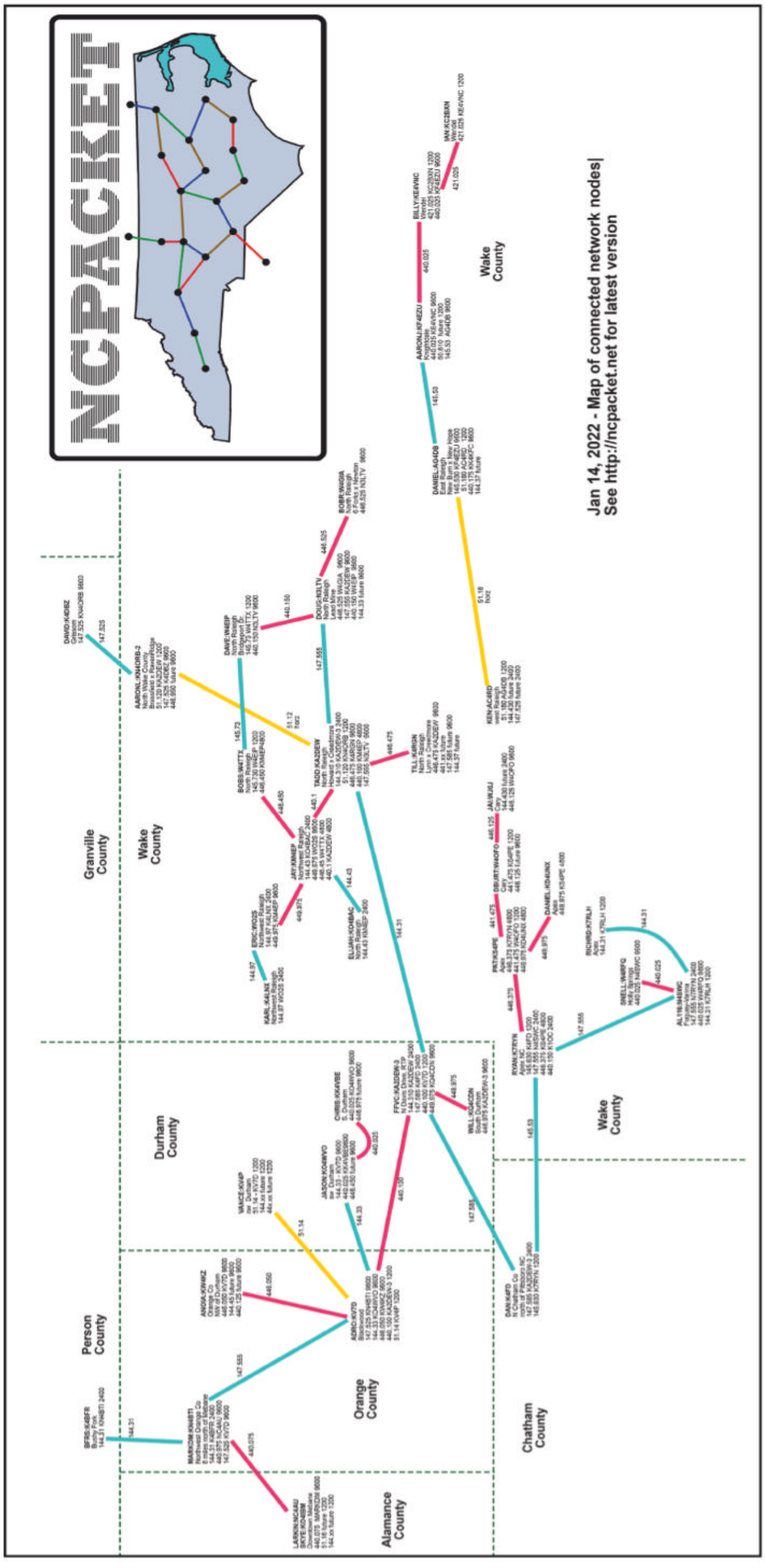


Figure 1. The North Carolina TARPN network as of mid-January 2023. The latest version of the network map can be found at <ncpacket.net>. (Courtesy of Tadd Torborg, KA2DEW)

KISS Modem that can be had as a kit for about $45, and a pre-assembled SMT version is in the works. Having these key components readily available from reliable sources eases the burden on the potential participant. The rest of the various parts are much the same: Some from DigiKey or Mouser, some off Amazon, and so on.

Once you get all this stuff, you must put it somewhere. Leaving it all strewn about on a shelf or table is inviting catastrophe: There are many bits and pieces that can and will throw sparks and smoke if something conductive hits them just right. While the TARPN builder pages show some examples of simple plywood or wooden IKEA boxes that have been used, I wanted something a little better.

The goals for building the TARPN node enclosure included a reasonable cost, extremely easy assembly, shippable in a USPS Priority Mail Flat Rate® Medium Box, durability, room for a three-port node with radios, TNCs, the Raspberry Pi, and power for everything. As it turns out, shipping is about a third of the cost, since half-inch plywood isn't light as a feather, and lumber prices are higher now than almost ever. One can certainly build a box, but this one is fairly ideal for the purpose.

My purpose this month is not to create a market for these boxes. Frankly, it isn't a business I want to be in. Instead, I want to document what it is, offering the G-Code and part outlines so almost anyone can make their own if they so desire (write me if you are interested). In an ideal world, someone with access to a CNC router would start a small business and supply the world — with my blessings.

Aye, there's the rub: A CNC router. Not everyone has one in their basement. But if you search around, this is a standard fixture — as common as a table saw — in virtually every makerspace around. And, not sure you've noticed, there are a lot of makerspaces around.

One box can be cut from a 24-inch square of half-inch plywood, and the three shelves and Pi support from another 24-inch square of quarter-inch plywood with a bit left over. The 9- x 9-inch top cover can be either half-inch (recommended), or quarter-inch ply-

Photo C. The major parts of the TaddBox are cut from a 24-inch square of half-inch plywood using a CNC router. Note the brackets that are cut from the insides of the bottom and one side, saving material, weight, and cost.

wood if you want to use the leftover from the shelves. Assembly uses screwdrivers and an optional hammer-like object — in case something needs persuasion. The box is strong enough to support me (200 pounds) but reasonably lightweight, and disassembles and knocks down flat quickly and easily for shipping or storage.

We start with two sides, a bottom and a top. These form a box, held together with #8 machine screws and nuts as seen in the photos. We insert the Pi supports into the top and hold them in place with wood screws. The shelves slide into the machined slots, as does the Pi support plate, all held in by friction. The top cover is hinged, protecting the Raspberry Pi and some of the power supply items from falling objects yet allowing easy access. There's room in the back for cables.

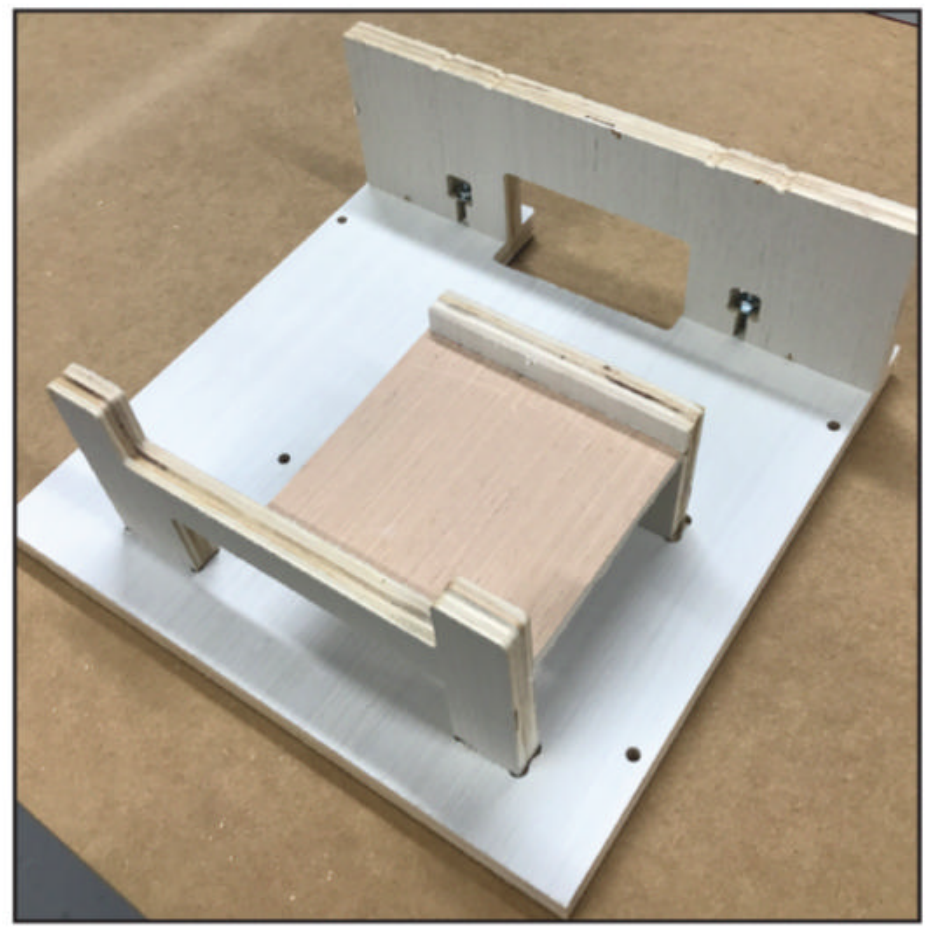


Photo D. A close-up of the top, showing the details of the shelf for the Raspberry Pi and the rear bracket for the hinged cover. The Pi support brackets are set into routed pockets on the top, then held in place with a wood screw from beneath. The front bracket supports the front of the hinged cover and provides a place for installing the Node Control Panel from Larry, W8NP. This is a prototype — I anticipate moving things around a little to gain further efficiencies.

Everything is readily accessible. Disconnect the antenna cables and power supply cord and the whole thing is portable. At about 15 x 10 x 10 inches, the enclosure fits in smaller spaces. The open shelf design allows for heat dissipation. For use in high humidity, or for aesthetics, it can be painted. By the time you read this in early March, I expect that the TARPN builder pages will explain how to get one of these enclosures if you decide not to build one yourself.

Hamvention

Before we close for this issue, some brief comments on Hamvention®. Held in Xenia, Ohio it is the largest gathering of radio amateurs in the world. This year it will run from Friday May 19th through Sunday May 21st. If you haven't made plans to attend, or especially if you've never been, you should try this year if you can. Certainly, if you're within driving distance (which, for me, is about 10 hours), but even if you have to fly in to Dayton (DAY), Cincinnati (CVG), or even Columbus (CMH), it is worth the trip. Find a hotel now, as they tend to fill up around now. It's not unusual to stay 20 or 30 miles away — traffic is rarely an issue (unlike in Atlanta) so travel times are reasonable. I'm staying in Fairborn, Ohio, just 10 miles away and right around the corner from the Wright-Patterson Air Force Museum. Indeed, the museum alone is a day's effort, and really worth it.

The Hamvention flea market takes more than a day to thoroughly examine, and the several hundred organizations and vendors (many with "show specials") could easily consume the rest of your time and cash. Food galore — almost none of it healthy [*but delicious –ed.*] — and a virtual guarantee of rain and/or thunderstorms — bring your rain gear. A small backpack is a great idea.

It is true: If you can't find one at Hamvention, it doesn't exist. And, if you seek bargains — and who doesn't — that's what you'll find. The educational value alone (hey, what's this thing?) is worth the entire expense. I don't care who you are, I guarantee there will be at least one thing at Hamvention that you don't know what it is. And sometimes, the seller doesn't know, but *you* do — the makings of a supreme bargain indeed.

That's all I have this time. As you may have guessed, I'll be at Hamvention. You can find me in my bright yellow FRC Robot Inspector cap, poking around the bargain bins and looking for things to write about.

By the way, if you have any suggestions for that, let me know. *– Until next time, 73 de N2IRZ*

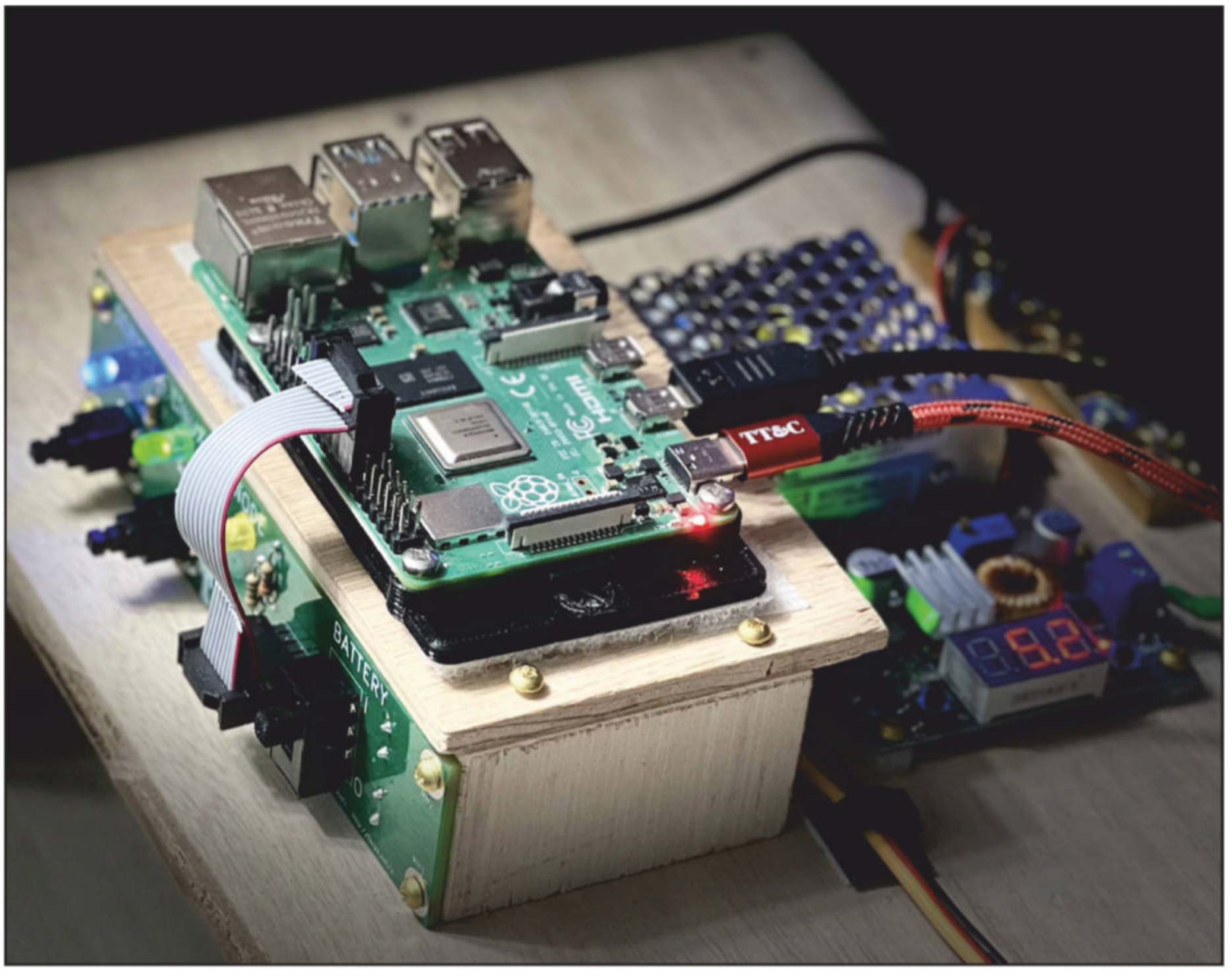


Photo E. An early prototype showing the equipment that is mounted to the top: Raspberry Pi, Node Control Board, Pi power supply, and DC-DC converter. The fuses and some other bits are beneath the Pi. (Courtesy of Tadd Torborg, KA2DEW)

learning curve

BY RON OCHU, KOØZ

Activating Grids

It's still wintertime and it's cold and rainy as I compose this article. I'm taking a short break from working the WRTC (World Radiosport Team Championship) stations and the Congo TN8K DXpedition to compose my thoughts for this March article. The higher solar flux, along with nice A and K indices, makes taking time away from my transceiver to write just a bit harder. And just think, Solar Cycle 25 is ramping up and we have many more years of increased ionospheric activity which translates into long-distance (DX) contacts. Also on the brighter side, when you read this, it will be transitioning from winter to spring, so it's time to start planning outdoor ham radio activities.

Would You Consider?

May I suggest seriously considering participating in an upcoming VHF (very high frequency) contest or two? There are many of them sponsored by CQ and the ARRL. In June, there is the ARRL VHF contest. CQ's VHF contest is in mid-July. September is another ARRL VHF contest, followed by yet another in January. Various VHF groups and societies sponsor VHF and higher *sprints*. Sprints are shorter duration contests usually conducted on weeknights. They can be a lot of fun to participate in, but weekend contests tend to bring out more activity.

VHF Contests, You Say?

Newly minted ham radio operators participating in VHF contests? Are you serious? Perhaps, as a newcomer to ham radio and to ham radio contesting (radiosport), your VHF contesting "arsenal" consists of a dual-band handi-talkie (HT) and a rubber duck antenna. You don't have a multiband VHF / UHF (ultra high frequency) multimode (SSB and CW) transceiver and directional antennas. Not yet anyway. So, mister *CQ* writer, try that one on for size.

Okay, let's try!

Commitment

The first thing we need to do is to check out the rules for the VHF contests to get a feel for the "lay of the land." Are you aware some VHF contests have a category designated just for FM (frequency modulation) in addition to single sideband (SSB) and digital? Other important considerations include: When is the contest? What is the contest exchange (information exchanged in a contact; see below)? What category should my friends and I enter? Categories include fixed (operating from your location), rover (driving to various grids), single operator, multi operator, etc.

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

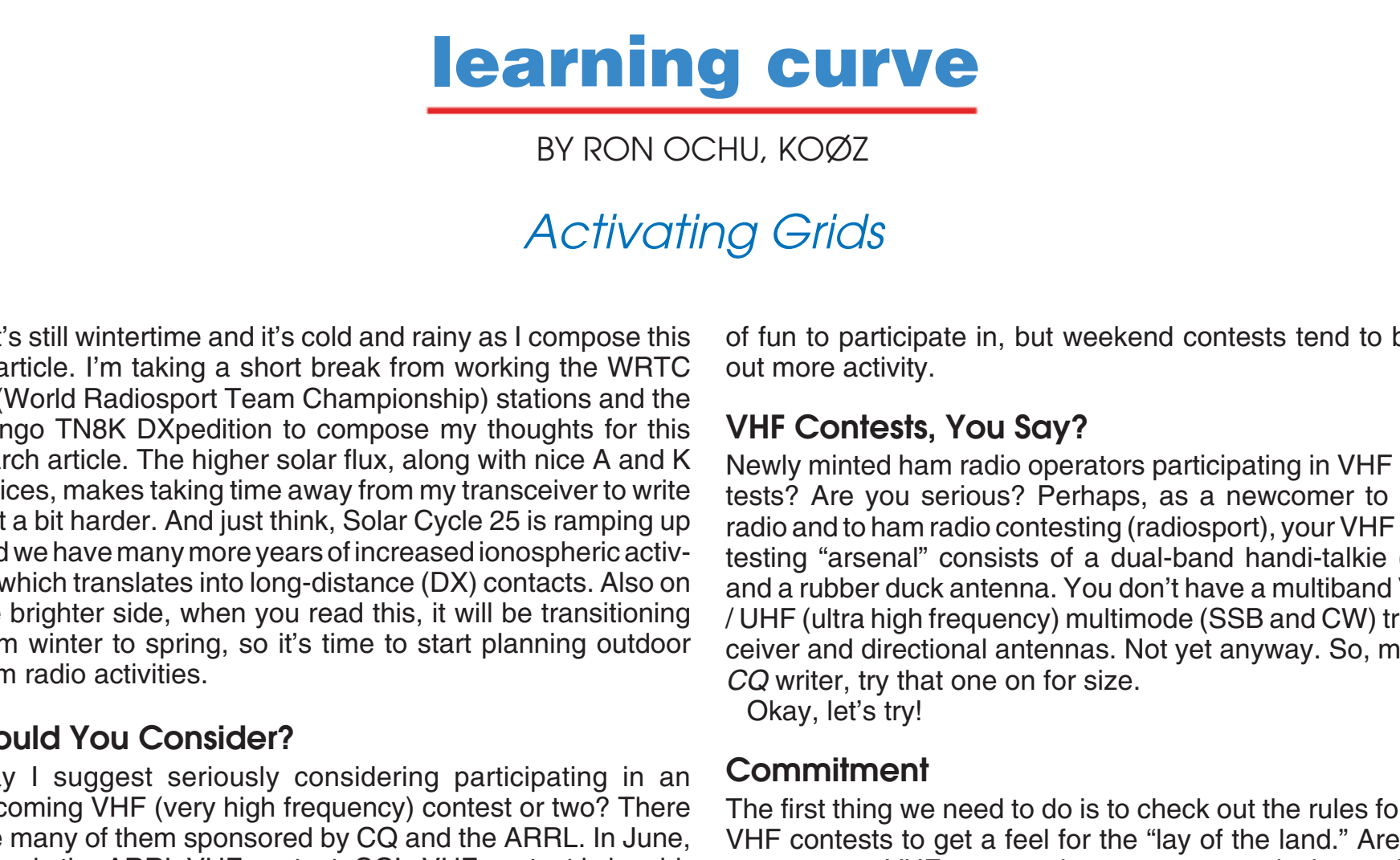


Photo A. Screenshot of four grid squares: EM48, EM58, EM49, EM59. Going to where four grid squares come together can make for a fun VHF DXpedition and a nice way to accumulate multiplier points. (Photos by KOØZ, except as noted)

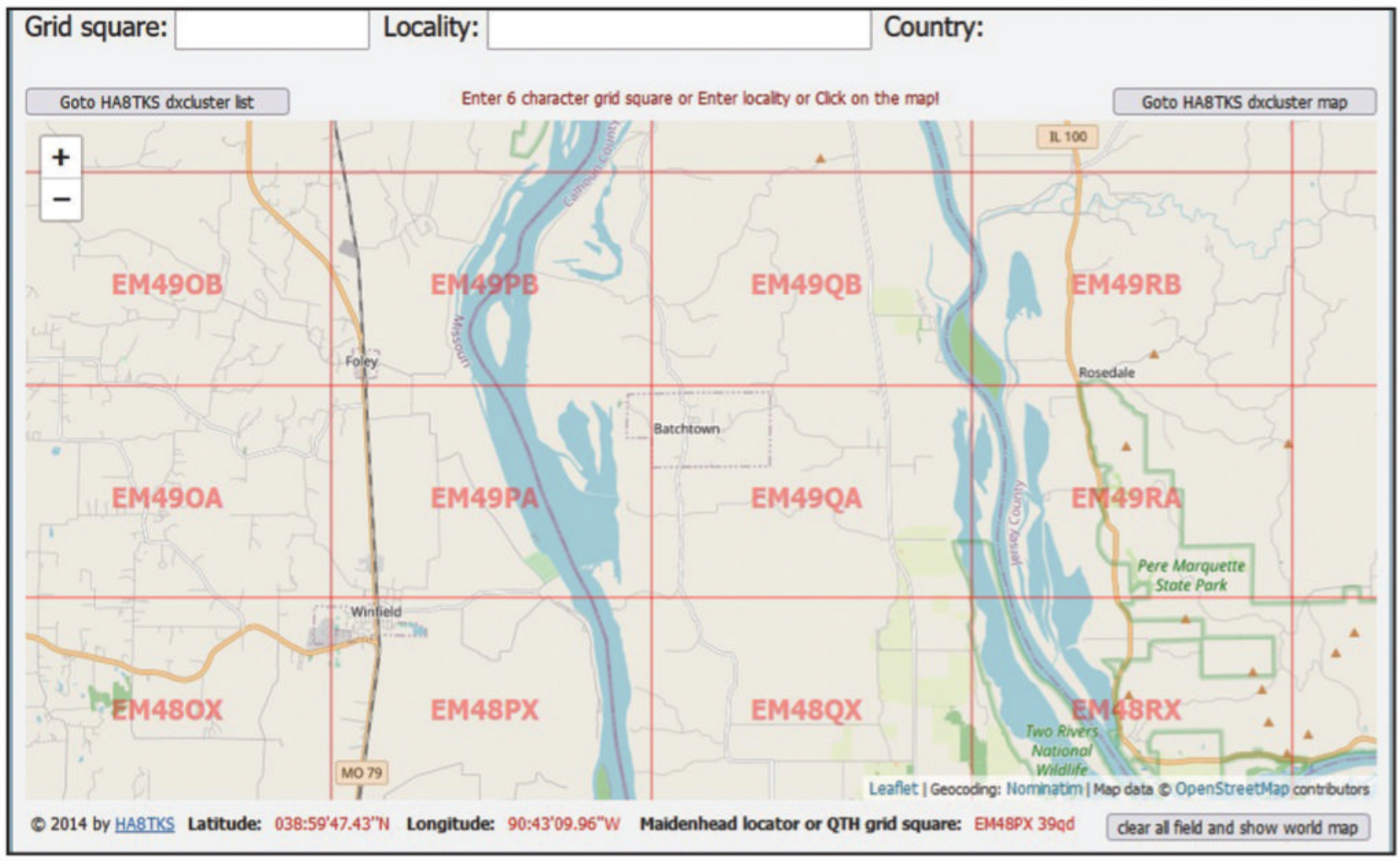


Photo B. Screenshot of grid squares EM49pa and EM48px. Where these two grids come together is a short drive for Herbert, AF4JF; Ron, KOØZ; and Harry, WAØCNS. A mile either north or south puts us in one or the other grid squares. Not as much of a challenge to overcome for VHF contacts, but it is a great way to get "radioactive" and to have fun doing it.



Photo C. Army Corps of Engineers Mississippi River Lock and Dam 25 is in grid square EM49pa and just a mile or south of that location, we are in the next grid square EM48px. It's a great place to start the contest. It's also a great place to see bald eagles during the winter time.

The next item of business is to get a few friends in on the idea. You don't have to feel like you are trying to take on the whole radiosport community and win the big prize (which generally is nothing more than a plaque and bragging rights). Maybe the closing scene of *Butch Cassidy and The Sundance Kid,* facing down the entire Bolivian army, may be coming to mind. Why not start off among friends and see what happens? Contesters are always looking for more participants. Finally, commit yourselves to participating in one of the contests. Even if it's only for a few hours on just one afternoon. I'll bet you'll be surprised as to how much fun you and your friends can have in a single afternoon.

Grid Squares and Exchanges

Baseball has diamonds, football has a gridiron, soccer has a pitch, and VHF/UHF contests are played on grid squares. What is a grid square? The entire world is divided into grid squares. Grid squares in the Maidenhead Locator System are actually rectangles, approximately 70 x 100 miles (*Photo A*). There are a number of good grid square websites. One of my favorites is the HA8TKS website <https://tinyurl.com/yw7vm8rw>. This website allows you to



Photo D. A tow boat on the Mississippi River near Lock and Dam 25. Actually, tow boats push barges rather than tow them.

focus on the grid squares near your location (QTH).

Grid squares have a two-letter designator along with two numerals. For example, my QTH of St. Peters, Missouri is located in grid square EM48. HA8TKS's website even narrows the resolution down to an additional two letters, so my QTH is EM48qs. The extra letters can prove to be useful for refining azimuth headings between grids. Major roads and towns are included with this computer-generated grid square map. For determining my grid square while I am out and about, I use my Android cell phone and free apps such as Ham GPS, Easy QTH Locator, and QTH Locator.

Most grid square calculating programs allow users to not only find their exact location in the Maidenhead Locator System, but will also calculate the azimuth (beam heading) and distance to another grid location, a very useful feature… especially when figuring out location headings and distances using directional antennas and a compass.

VHF/UHF contests require your on-the-air exchange to include callsigns



Photo E. My dual-band loop antenna with magnetic mount. This antenna has a single feedpoint, and it covers 2 meters and 70 centimeters. It is horizontally polarized.



Photo F. Harry, WAØCNS, in his rover van. Note his roof-mounted 144- , 222- and 440-MHz Yagis. Harry uses a rotor to aim his Yagis when he is stationary. (Photo by Herbert Ullmann, AF4JF)

and grid square location. For example, I may be contacting Herbert, AF4JF, on the air and my report may sound like, "AF4JF this is KOØZ in EM48qs, do you copy?" Herbert then would reply with his callsign and grid square.

Do Be a Square

Since childhood, we've heard, "don't be square, join the fun." In this case, I suggest you *do* become a square by finding your grid square along with neighboring ones and plan your "grid square attack." Depending on time available, level of expertise, and equipment, I suggest you look at two adjoining grid squares. If you want to go "hog wild," look at the corners where four grid squares meet. Activating two grid squares is less labor intensive than four squares and would be a good place to start; especially as a beginner to VHF-and-above contests and you lack free time.

When looking at grid squares, look for public roads, open fields, and high locations such as hilltops, etc. Check the contest rules for minimum distances. For instance, in many contests, stations within the same grid cannot be closer than 1-kilometer (km) apart. One kilometer is not far, It's only 0.62 miles. If I am in another adjoining grid square, I still use that 1-km rule if I am close to another rover (a station operating from multiple locations). HTs with rubber ducks can easily cover that short distance. In the ARRL September VHF contest, I used my Kenwood three-band HT for 222 MHz. Sure, most serious contesters use SSB or CW (Morse Code) on 222 MHz, but FM is allowed. Even if you and a few pals only have dual-band HTs, why not go to two nearby grids and activate them for points? It's all part of the grid plan attack.



Photo G. Harry Haeusser's, 1.2-GHz loop Yagi antennas along with some of his microwave gear on recent contest outing. (AF4JF Photo)



Photo H. Herbert Ullmann, AF4JF's, rover setup in a high location in grid square EM47 overlooking the Ozark foothills. (AF4JF Photo)

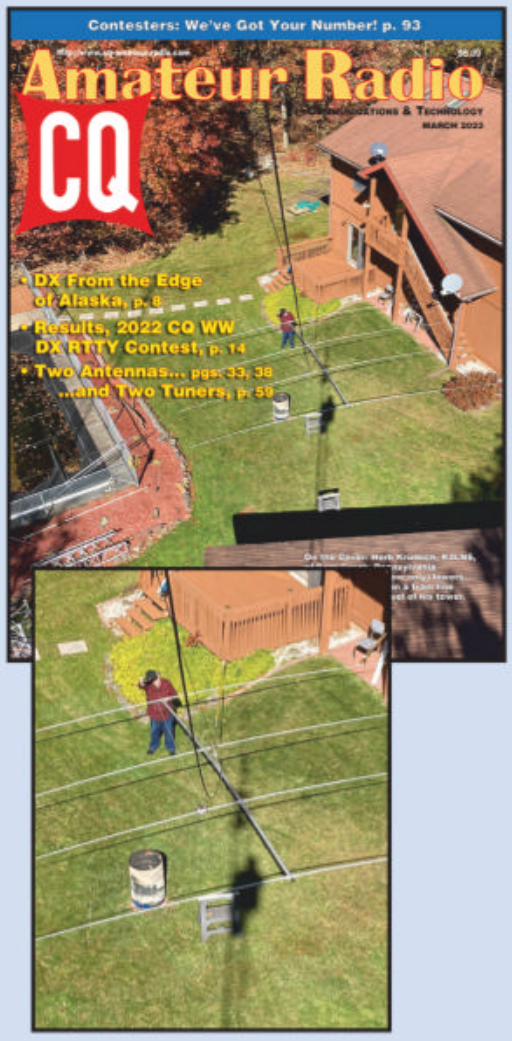
Our Plan

Rather than give a lot of scenarios, let me give you a brief overview of our grid square plan of attack in the ARRL September VHF contest. Herbert Ullmann, AF4JF; Harry Haeusser, WAØCNS; and your editor Ron, KOØZ, decided to spend a fun Saturday afternoon near Winfield, Missouri (grid square EM49). About a mile to the south is the border of grid square EM48 (*Photo B*). This is mostly farmland with gravel roads, but it is flat and there are spots along the road to pull over and operate.

Army Corps of Engineers Mississippi River Lock and Dam 25 is nearby (*Photos C* and *D*), which was a perfect setting for us to get on the air. Keep in mind, our intent is not to be "big guns" (highly competitive stations) in the contest, rather it is our attempt to have fun, to get out of the house for a little while, to activate a few grids, and to see if we can drum up some on-the-air activity other than just among ourselves.

Beforehand, AF4JF worked out the operating logistics. We met at Lock and Dam #25 in grid square EM49. Our plan was for each of us to be a rover and to activate grid squares EM49 and EM48. Harry and Herbert drove 1 km away and we worked each other on 144.200, 222.100, and 432.100 MHz in EM49. Next, Herbert and I drove a few kilometers to grid square EM48 where we both worked Harry. Harry joined me in EM48 and Herbert went to where Harry was in EM49. We worked each other again. Now it was my turn to go to EM49 so Harry and Herbert could work me from EM48 to EM49. You get the idea. Although Harry and Herbert had 222-MHz radios capable of SSB and CW, they could also operate FM. The entire

On the Cover ...



"When I took this picture from 60 feet," wrote Herb Krumich, K2LNS, "I never realized that a shadow of the tower with me on it was present." And the shadow is all you can see of Herb in our cover photo, as he lowers his 4-element 20-meter beam on a tram line to a friend on the ground. Herb lives in Bear Creek, Pennsylvania, outside Wilkes Barre in the Pocono Mountains, where he is more active on VHF/UHF and microwaves than on the HF bands.

Licensed since 1958, Herb – often operating with friend Andy Furlong, WA2FGK – is a longtime VHFer, active on ten bands from 50 MHz to 10 GHz, taking advantage of his 2100-foot elevation to work VHF/UHF contests as well as EME (Earth-Moon-Earth). According to Herb, his QTH was selected first for ham radio benefits, and then his home was built there. The tower whose shadow is seen in the photo is just one of six, supporting antennas for HF, 6 and 2 meters; 222, 432 and 903 MHz; as well as 1.2, 2.3, 3.4, 5 and 10 GHz. He also has a rover setup with gear for 50 MHz through 10 GHz. Herb is also treasurer of the Murgas Amateur Radio Club in Wikles Barre. More info and photos (lots of photos!) may be found on the QRZ.com pages for both K2LNS and WA2FGK. (*Cover photo by Herb Krumich, K2LNS*)



Photo I. Herbert Ullmann, AF4JF, taking aim with his 1.2-GHz Yagi.



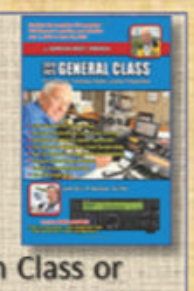
Photo J. Check out this multiband rover antenna setup at a Central States VHF Society conference.

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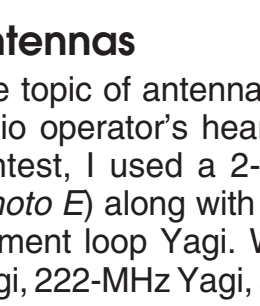
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time, I used my Kenwood HT to activate 222.100 MHz. It fit the bill nicely. Basically, we made sure that all three of us worked each other on 2 and 1.25 meters, as well as on 70 and 23 centimeters.

Scoring

Most, if not all, VHF-and-above contests award higher point values for higher frequencies. For example, the ARRL January VHF contest awards 1 point for each complete 50- or 144-MHz QSO, two points for every complete 222- or 432-MHz QSO, four points for each complete 902- or 1296-MHz QSO and 8 points for each 2.3-GHz and higher QSO. Harry and Herbert brought 10-GHz stations with them. Unfortunately, my 10-GHz station was down for repairs. Grid squares count as multipliers; therefore, the more grids worked, the higher the score. We operated from two grids. We could have done more, but our goal was to simply get on the air and experiment with various antennas. This was my first contest as a rover and I scored over 700 points. Not too shabby, considering we were only contacting each other and having fun while doing it. Harry and Herbert had higher scores because they operated 10 GHz. Other competitive rovers in the contest made tens of thousands of points. They, too, had a lot of fun, but they rack up a lot of miles and they are constantly on the go. We decided to take a much more "laid back" approach.

Antennas

The topic of antennas is near and dear to almost every ham radio operator's heart. For the September 2022 ARRL VHF contest, I used a 2-meter and 70-centimeter loop antenna (*Photo E*) along with a 7-element 70-centimeter Yagi and 24-element loop Yagi. WAØCNS used a roof-mounted 2-meter Yagi, 222-MHz Yagi, a 70-centimeter Yagi (*Photo F*). He keeps his 23-centimeter Yagi inside his van until he is ready to use it after making contacts on the lower bands (*Photo G*). AF4JF uses a roof-mounted 2-meter, 70-centimeter horizontally polarized omni-directional antenna. In addition, he sets up his antennas for 1.2, 2.4, and 3.5 GHz as well as 10 and 24 GHz.

Don't Get Bit (Actually, Do…)

Antennas are fun. Higher frequencies translate into smaller antenna element lengths. Microwave bands allow radio amateurs to experiment with very-high-gain antennas that few HF operators have enough real estate on which to erect them. However, don't let the allure of higher gain antennas impede you from dipping your big toe into the world of VHF/UHF contesting. Simple rubber duck antennas and dual-band HTs are enough to get in on a lot of the fun. Although I used my HT only on 222 MHz, all of us could have limited ourselves to HTs and made fewer points. However, we do have transverters and this contest gave us a fun opportunity to try them out.

I must caution you. Beware, after dipping your big toe to test out the water a few times, you and your ham radio buddies may be pleasantly surprised, and you'll want to get more involved, you'll be bit and the need for longer distances and more grid squares will come calling. Soon, directional antennas and weekend roving trips will be in the offing! Check out the photo of a rover's antennas at a Central States VHF Society conference (*Photo J*). Until then, why not break out the HTs, mobile rigs, and vertically polarized antennas and activate a few neighboring grid squares. You'll be glad that you did! It will be fun to recount over the air and at ham radio club meetings the successes and near successes of each trip. You may just inspire others to join in on the fun. Success breeds success! Thank you for reading *CQ* and I hope to hear you on the air. *– 73, Ron, KOØZ*

vhf plus

BY TRENT FLEMING,* N4DTF

Six-Meter E_s Season Approaches

Well, this is my March column, and I always try to make a point to promote 6-meter activity. Traditionally, in the Northern Hemisphere, our strongest opportunities on 6 meters come from Sporadic-E (E_s) propagation, from April through July. But as each sunspot cycle strengthens, we begin to see opportunities for other types of propagation, including F_2 on 6 meters. Recently, some impressive propagation has been reported, which is perhaps a combination of various methods, and you may expect this to continue through most of 2023. Recently, there has been a thread on the FFMA (Fred Fish Memorial Award) email group about various modes of propagation, and I thought you would find it interesting as well. I asked Frank Donovan, W3LPL, noted contester and all-around knowledgeable ham, to comment about the types of 6-meter propagation, and he offered the following, including a link to a very nice treatment of one particular mode, Trans-Equatorial Propagation (TEP):

W3LPL Says:

The F_2 ionospheric region and the E layer support multiple modes of ionospheric propagation enabling 6-meter DX contacts between many areas of the world.

F_2 region

~ mid-latitude and equatorial single and multi-hop F_2 propagation
~ TEP
~ oblique-TEP propagation

E layer

~ single-hop E_s propagation to Bermuda and the northern Caribbean
~ multi-hop mid-latitude E_s propagation to most of the same hemisphere
~ single-hop E_s coupled to TEP and mid-latitude F_2 propagation

Sporadic-E Propagation Coupled into TEP

Very long distance 6-meter contacts crossing into and across the equatorial region usually involve E_s coupled into TEP at one or both ends of the propagation path. TEP propagation is mostly north-south and oblique-TEP propagates *either within or across* the equatorial region.

It is often difficult to identify which types of propagation contributed to our DX QSOs. We can make reasonably informed judgements about the most likely propagation modes by applying basic knowledge of how 6-meter DX propagation modes vary with:

~ time of day
~ season of the year
~ solar activity, especially as measured by the 2800-MHz solar flux index
~ F_2 and E_s properties along the entire propagation path

Until 20 years ago, the holy grail of 6-meter DXing was mid-latitude and trans-equatorial F_2 propagation mostly from November through February during the 12 to 24 months closest to solar maximum of the three strong solar cycles (19, 21, and 22) from 1957 through 2002.



Photo A. Ken, K2ET, houses his mobile shack in his electric vehicle (EV) and, as you can see, is prepared for everything. (Courtesy of K2ET)

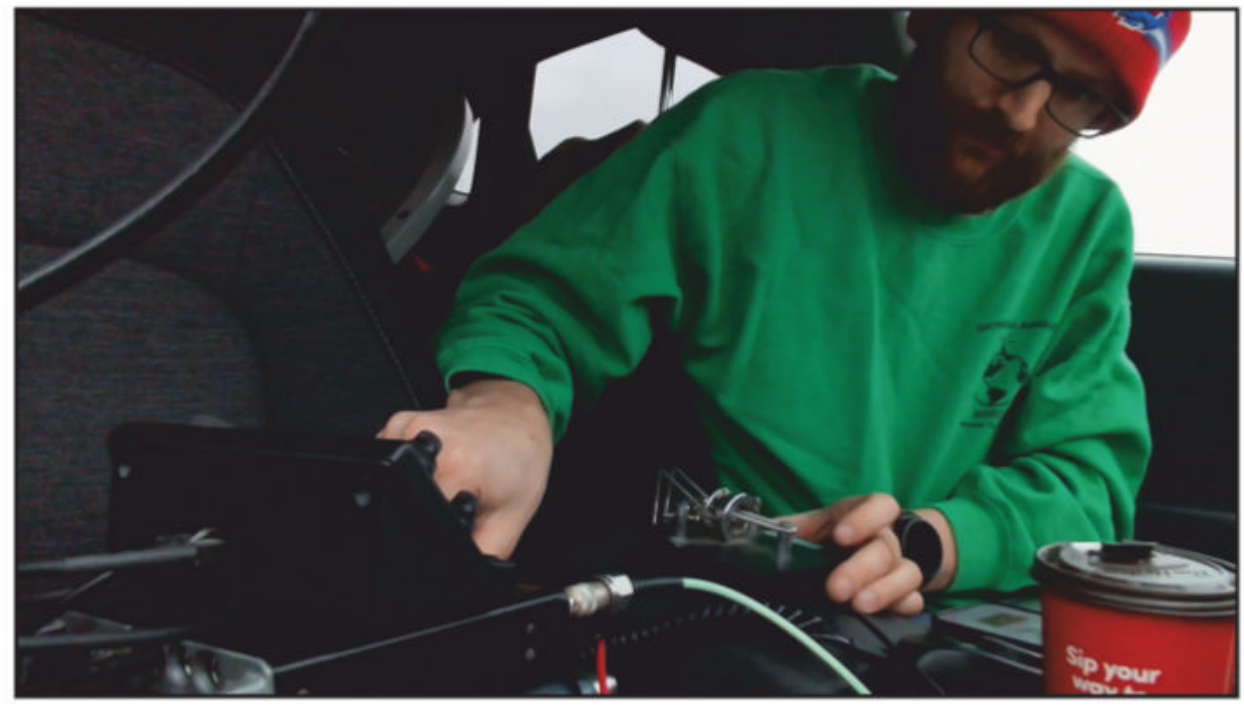


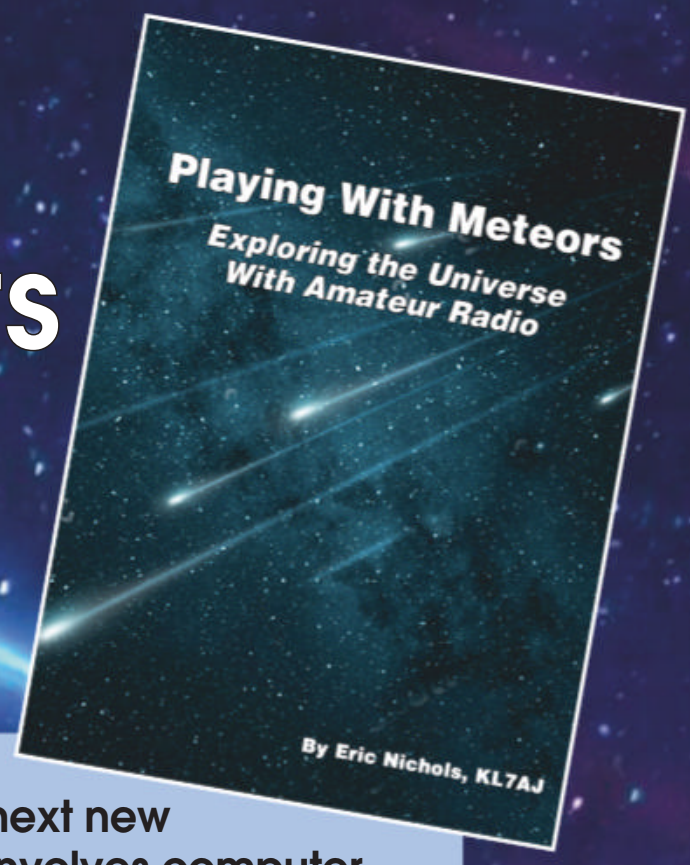
Photo B. Ken, K2ET, working stations as a rover during the ARRL January VHF Contest from the comfort of his EV. (Courtesy of K2ET)

* <n4dtf@cq-amateur-radio.com>

Playing With Meteors

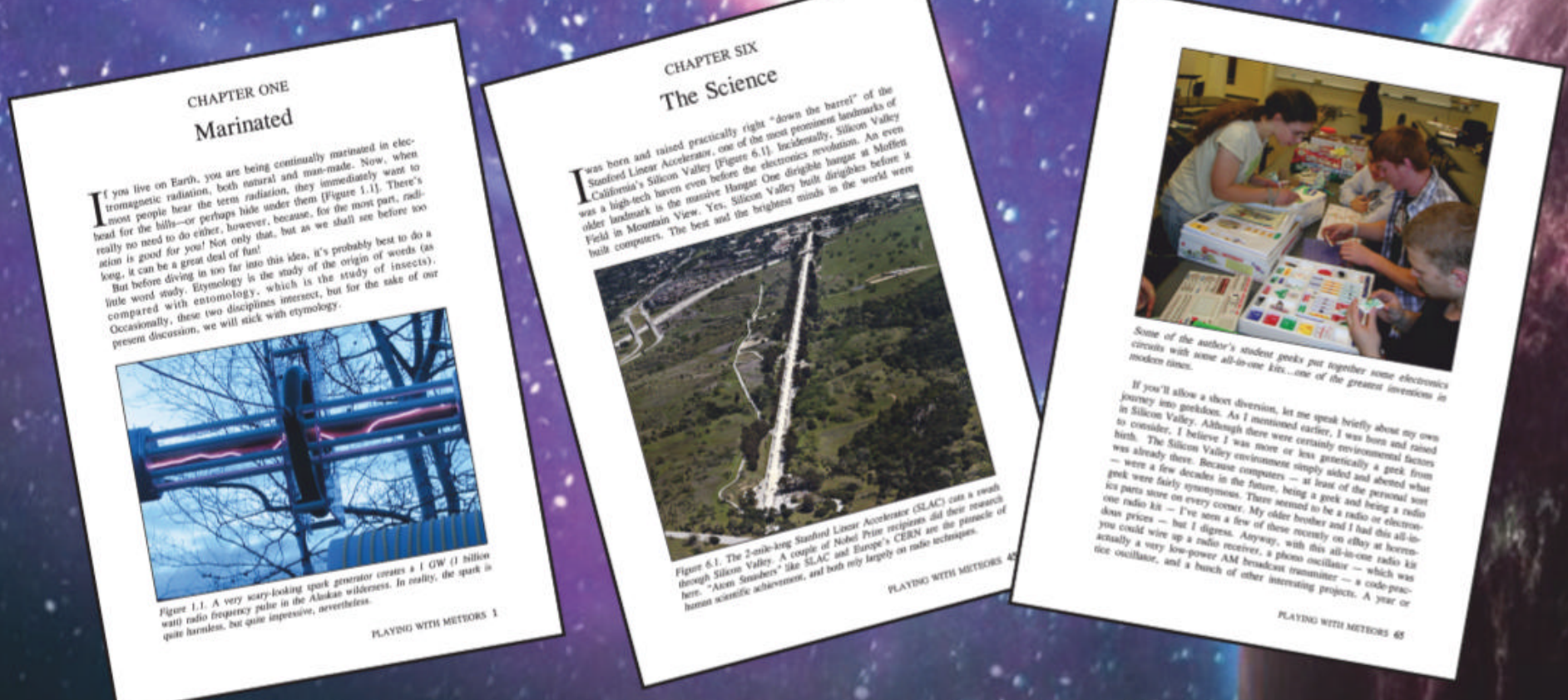
Exploring the Universe With Amateur Radio

By Eric Nichols KL7AJ



Wouldn't it be a blast to be a master of technology rather than to be at its mercy? Or better yet, to actually create the next new thing? While it's true that a lot of what we consider high-tech involves computer technology, an equal or greater part of the next new thing is going to involve wireless, also known as radio. In fact, our entire universe is connected by radio, and the entire universe is the radio amateur's sandbox.

In *Playing With Meteors*, author Eric Nichols takes you on a tour of the opportunities that amateur radio can bring you, and how you can leverage the knowledge you gain in "hobby radio" to a career in hi-tech, or just to being smarter than your "smart devices" (and maybe even some of your friends).



CHAPTER ONE

Marinated

If you live on Earth, you are being continually marinated in electromagnetic radiation, both natural and man-made. Now, when most people hear the term radiation, they immediately want to head for the hills—or perhaps hide under them [Figure 1.1]. There's really no need to do either, however, because, for the most part, radiation is good for you! Not only that, but as we shall see before too long, it can be a great deal of fun!

But before diving in too far into this idea, it's probably best to do a little word study. Etymology is the study of the origin of words (as compared with entomology, which is the study of insects). Occasionally, these two disciplines intersect, but for the sake of our present discussion, we will stick with etymology.

Figure 1.1. A very scary-looking spark generator creates a 1 GW (1 billion watt) radio frequency pulse in the Alaskan wilderness. In reality, the spark is quite harmless, but quite impressive, nevertheless.

PLAYING WITH METEORS 1

CHAPTER SIX

The Science

I was born and raised practically right "down the barrel" of the Stanford Linear Accelerator, one of the most prominent landmarks of California's Silicon Valley [Figure 6.1]. Incidentally, Silicon Valley was a high-tech haven even before the electronics revolution. An even older landmark is the massive Hangar One dirigible hangar at Moffett Field in Mountain View. Yes, Silicon Valley built dirigibles before it built computers. The best and the brightest minds in the world were

Figure 6.1. The 2-mile-long Stanford Linear Accelerator (SLAC) cuts a swath through Silicon Valley. A couple of Nobel Prize recipients did their research here. "Atom Smashers" like SLAC and Europe's CERN are the pinnacle of human scientific achievement, and both rely largely on radio techniques.

PLAYING WITH METEORS 45

Some of the author's student geeks put together some electronics circuits with some all-in-one kits…one of the greatest inventions in modern times.

If you'll allow a short diversion, let me speak briefly about my own journey into geekdom. As I mentioned earlier, I was born and raised in Silicon Valley. Although there were certainly environmental factors to consider, I believe I was more or less genetically a geek from birth. The Silicon Valley environment simply aided and abetted what was already there. Because computers — at least of the personal sort — were a few decades in the future, being a geek and being a radio geek were fairly synonymous. There seemed to be a radio or electronics parts store on every corner. My older brother and I had this all-in-one radio kit — I've seen a few of these recently on eBay at horrendous prices — but I digress. Anyway, with this all-in-one radio kit you could wire up a radio receiver, a phone oscillator — which was actually a very low-power AM broadcast transmitter — a code-practice oscillator, and a bunch of other interesting projects. A year or

PLAYING WITH METEORS 65

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Current solar cycle 25 has already recorded the strongest sunspot activity since 2002 and might develop sunspot activity similar to that which caused frequent mid-latitude and trans-equatorial F_2 propagation from November 2001 through February 2002.

F_2 mid-latitude propagation almost completely disappeared after February 2002, but 6-meter mid-latitude DXers began to capitalize on multi-hop E_s, and E_s coupled into TEP and oblique-TEP, making it possible for hundreds of 6-meter DXers to achieve 6-meter DXCC despite weak sunspot activity. In addition, the-weak signal performance and popularity of FT8 enabled 6-meter DXers to thrive without much help from sunspots.

While mid-latitude 6-meter F_2 propagation occurs for just a few months during just a few years of strong solar cycles, a form of F_2 propagation known as TEP occurs throughout the entire 11-year period of every solar cycle. A phenomenon in the F_2 region known as the *trans-equatorial ionization anomaly* occurs every day and often enhances the maximum usable frequency (MUF) of F_2 propagation that crosses the equatorial region, sometimes causing the TEP MUF to exceed 50 MHz, even when sunspot activity is very low. During strong solar cycles, the MUF of many very long-distance propagation paths exceeds 50 MHZ even without TEP ionization enhancement and E_s coupled into TEP is usually not needed.

TEP reflects from the parts of the ionosphere located from approximately 15° to as far as 25° north and south of the geomagnetic equator. In the Western Hemisphere, this ranges to the northerly enhanced F_2 ionization zone mostly over Venezuela and the southerly enhanced F_2 ionization zone mostly over northern Argentina and southern Brazil.

TEP-related propagation from mid-latitudes of North America to equatorial South America and Africa is usually via E_s coupled to the northerly enhanced F_2 ionization zone then propagating to the ground without propagating to the southerly enhanced F_2 ionization zone.

TEP usually has a weak seasonal peak in September and October and a somewhat stronger seasonal peak during April and May. During stronger solar cycles, TEP can occur during any month of the year and has a very strong peak in April and May.

See K6MIO's excellent article on 6-meter TEP, oblique-TEP, TEP-related, and mid-latitude E_s coupling to TEP begins on page 66 at: <https://tinyurl.com/26auem6n> (*Thank you, Frank, for this helpful guide to 6-meter propagation! –ed.*)

Before you worry too much about the mode of propagation, make sure you are listening and calling on 6 meters to take advantage of any openings. My standard habit is to keep a radio on 6-meter phone anytime I am in the shack (which is also my office). I generally monitor 50.125 MHz for starters, but remember that officially, 50.110 MHz is the DX calling frequency, so it is worth a listen and call occasionally there as well. I currently have a three-element beam up, so I get fairly broad coverage, but if you have more elements, and thus a more directional antenna, you may want to use a loop antenna for listening to ensure you don't miss an opening in a particular direction. Many of us locally will call or text one another if we see an opening, and the alerts from DXmaps.com are useful in identifying openings.

CW is another popular mode for 6 meters, so monitoring the CW segment is also advisable. Finally, the many digital modes available to us through WSJT-X have significantly expanded the depth of openings, and the length of the season, by allowing more contacts to be made even when conditions are marginal. Six meters is not for everyone, but many of us live and die with band openings, closings, or propagation changes. Please send along your experiences dur-



Tony, KG9OV's, comfortable environs inside his van. (Courtesy of KG9OV)



KG9OV's mobile roving van. (Courtesy of KG9OV)



The author's temporary shack that he used for the ARRL's January VHF contest while his shack, home office, and workshop are currently being remodeled. (Photo by N4DTF)

ing the upcoming E_s season, and good luck on the Magic Band!

ARRL January VHF Contest

As I write this, the ARRL January VHF Contest has just ended. I'm seeing reports ranging from dismal conditions — that was the case for me in EM55 — to outstanding. Location, times available to be on the air, and local weather conditions all played a role. In my case, it was a last-minute decision to participate, as I have dismantled my shack in an attempt to create a much better space for my shack, office, and workshop. More on that later. But I got my 9100 hooked up, and had 6 meters, 2 meters, and 432 MHz available. I made no contacts on 6 meters, two on 2 meters, and none on 432 MHz for a total operating time of approximately 4 hours.

I wanted to share the adventures of a couple of rovers, those brave souls — especially in the north during January — who ventured out into the elements to give us a chance at multiple grids and bands, while we stayed inside our comfy shacks.

Ken, K2ET, made his first rove in an electric vehicle (EV), putting nine bands on the air (*Photos A* and *B*). His excellent write up on the planning and execution of his rove is found at <www.k2et.net>.

Tony, KG9OV, made a solid effort in the Midwest, and you can check out *Photos C* and *D* for images of his mobile setup and antennas.

Finally, one of my two contacts was with Steve, AG4V, who is a regular rover out of the Memphis area into the mid EM grids around the MidSouth. Always great to hear Steve on the air.

In the Shack at N4DTF

As previously mentioned, I am reworking my combination office, hamshack, and workshop. It's too early for pictures, but I will give you some insight into my thoughts and planning. The space in question is a typical two-car garage, roughly 25 x 25 feet square. My effort here is to improve and enhance the use of each of my three areas.

First, the office. I have plenty of space for my work, and thanks to a concerted effort to reduce paper, I need less and less storage space. In addition, while I still do a lot of live speaking engagements, I'm receiving more requests for video presentations, and it seems like almost every conference call these days is a video call. So, I'm adding better video and sound capabilities as well as a backdrop to improve the professionalism of the scene projected.

On the workbench side, my workspaces are currently too scattered, so I plan to implement a solid bench space along most of the two walls to provide better access to various tools and test equipment, and more counter space to work on. This includes everything from a drill press to electronic test equipment to a reloading bench. Finally, with the ham shack, I needed more space to have proper access to a high frequency (HF) rig, a VHF and above setup, and a boat anchor station comprised of a Hallicrafters Cyclone, HT-41 amplifier, and SX-101a receiver. This will be accomplished with a larger desktop — 70 x 30 inches instead of 48 x 24 inches — and some shelving. One of my main goals here is to open the back of the operating desk for easy access to cables and connections. So, the desk will come out perpendicular from the wall, under a window, which has the appropriate pass-through connections, and be fully accessible in an "alley" bordered by bookcases. One of the first steps I've taken is to put all my existing benches and tables on wheels, to allow for easier arrangement, and possibly moving them again, because who doesn't eventually decide they need to change things up? *Photo E* shows my temporary operating position on a folding table for the VHF contest. The SX-101a is there for moral support. Or because I don't have anywhere else to put it right now.

That's all for this month. Please stay in touch and let me know about your on-air activities and ham shack projects.

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We set up four tents on the island but on the third night, we had an aggressive storm with winds over 35 miles per hour, which completely destroyed one tent. We then had to install a backup tent that was brought along "just in case."

The tiny volcanic sand particles blown by the wind often ended up inside our reliable Furman 8-killowatt power generator, causing it to stop. Fortunately, Tim's keen mechanical skills always came to the rescue and he would quickly have the generator back in service and our stations once again QRV. We also had a small Honda 2-kilowatt generator as a backup but we didn't need to use it much.

The Icom and Elecraft radios were used mainly for CW and SSB operating. The SunSDR2PRO transceivers did a great job running the FT8 pileups.

Antennas:
17-meter VDA
CrankIR multiband vertical from SteppIR
Spiderpole 40/30-meter vertical
Hustler 6BTV vertical
Cushcraft R7000 vertical

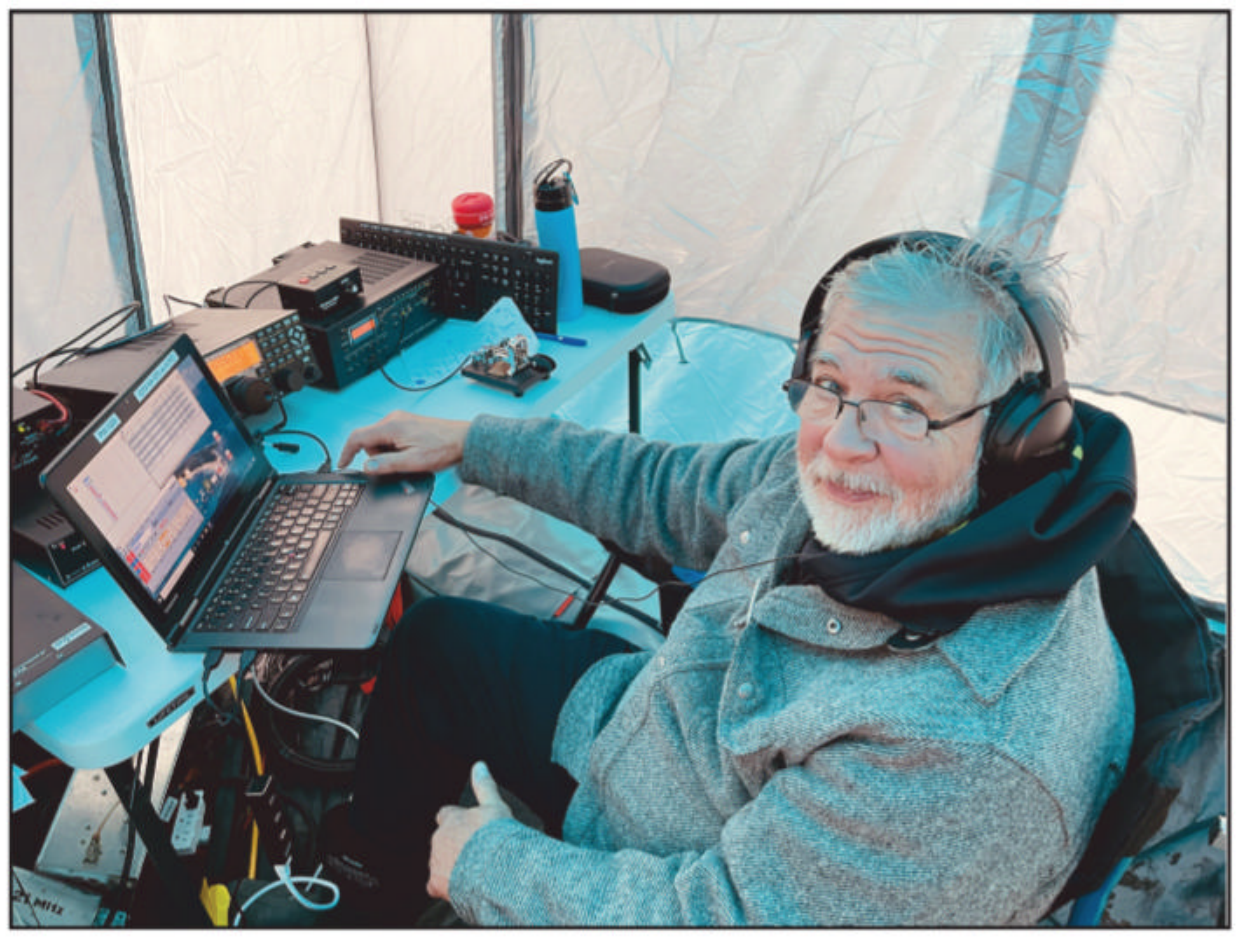
Radios:
1 X Icom IC-7610
1 X Elecraft K3S
3 X SunSDR2Pro

Amplifiers:
1 X Expert 1.3 kilowatts
2 X Juma PA-1000 1 kilowatt
1 X Ameritron ALS 600S

Gas powered generators:
1 X Honda 2 kilowatts
1 x Furman 220V 8 kilowatts



Adrian, KO8SCA, operating CW.



Hal, W8HC, operating CW.

Life on the Island

Of course, most of our time was spent operating and we tried to keep three stations operational at all times, with one on each mode: CW, phone, and FT8. There were many times, especially as we were trying to work Europe, that it was nearly impossible with phone and we would switch to FT8. Outside of operating, time was spent working on the antennas, securing the tents, sightseeing at this incredible island, and eating.

There were cases of Mountain House "Adventure Meals" that are basically a meal in a pouch ... just add hot water, stir, reseal the pouch, and wait a few minutes. They were actually pretty good!

Yuri and James had arranged to bring an assortment of meats — from headcheese to sausages and "tushenka" (broiled canned meat with spaghetti)

But we were in for a nice treat one late afternoon when Captain Rick radioed over to us asking Alex to bring the Zodiac out to April Lane. He said he had dinner ready for us. And indeed he did. Rick had prepared a near gourmet meal in the be boat's galley and Alex returned to the beach as we anxiously pulled in the skiff so we could help take this Grub Hub-on-steroids meal for the K7K team to savor. Rick cooked us "home" fried chicken, scalloped potatoes, fresh salad and, for dessert, homemade chocolate cake with vanilla frosting. He also sent over a half gallon of milk and a "Black Box" of Chardonnay wine. Needless to say, our QSO rate went to zero while the

team convened on the beach to enjoy our first and only "home-cooked" meal on Kiska.

The Hardest Part

Captain Rick kept a close eye on the weather reports he received onboard the boat and would radio us with news of any impending storms and strong winds. We had already lost the one tent and we didn't have any "spares."

The day before we were to depart, Rick radioed us and said the weather forecast for Kiska included a bad storm coming later that night but would be clearing up mid-morning. He said the weather would be good for about six hours, then another storm front would follow. That evening and night the winds and rain became pretty intense. At several times during the night, Hal said he was afraid the operating tent with him and Tim inside felt like it was going to blow away.

In the morning, there was no sign of the "break" Captain Rick described but the team began the task of tearing down K7K city, stations and antennas, and taking everything to the beach. The breakers on the beach were running about 3 feet so would have to wait to ferry our stuff out into the harbor and back onto the April Lane. We didn't keep count, but I would guess that getting everything onto and off Kiska Island required about 20 trips in the Zodiac.

By late morning, just as the weather forecast predicted, the winds calmed, the rains stopped and the sun actually came out, so we proceeded to take advantage of this "window" and start taking everything back to the boat. Alex once again was the designated Zodiac driver and did a fantastic job piloting the skiff off the beach and beyond the breakers. Most of us did get wet making the crossing. We also had a few occasions when Tim had to work his magic on the 5-horsepower outboard motor. There were some tense moments that had us holding our breaths when the motor would stop in the middle of the harbor and Alex would have to get the paddle out and manually paddle back to the boat or shore to bring the motor back to life. It seems that the black volcanic sand was finding its way into the motor's cooling water system, causing it to shut down. But finally, after nearly four hours of loading and unloading the Zodiac, we had everything off the island, back on the boat, and loaded into the eight totes lashed to the April Lane's afterdeck. All of us were dog tired but happy to be safely onboard. Clean, dry clothes were the first order of business once on the April Lane.

Lessons Learned

There is no doubt we took too much food with us. In truth, we probably had enough to sustain us for a month or longer. It

5 Band WAZ

As of January 15, 2023
2439 stations have attained at least the 150 Zone level, and 1112 stations have attained the 200 Zone level.

As of January 15, 2023
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
IT9GSF	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
K3LR	199	23
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
RW0LT	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
AB4IQ	198	23, 26
DL6JZ	198	1, 31
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
JA1QJI	198	2 on 80M & 10M
JA3GN	198	2 on 80M & 40M
JA7MSQ	198	2 on 80M & 10M
JH1BNC	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
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
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
W8CZN	2432	12/17/2022	194
IWØHQE	2433	01/12/1900	169
N6ZN	2434	01/02/2023	191
WB4QOC	2435	01/02/2023	180
I1YDT	2436	01/03/2023	170
WA5YOM	2437	01/05/2023	153
IT9GSF	2438	01/07/2023	199
4J6D	2439	01/14/2023	154

Updates to the 5BWAZ list of stations:

Callsign	5BWAZ #	Date	# Zones
KB8VAO	2084	11/3/2018	182
W3/NH7C	1885	11/14/2014	200
JA1QJI	1988	4/21/2018	198
AA8SW	2371	5/11/2022	165
IK5ZUK	1908	6/8/2015	197
IK8YTA	1382	3/17/2004	185
IU8FRE	2201	4/9/2020	175
IK8GYS	1617	11/22/2008	156

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

5BWAZ #	Callsign	Date	All 200 #
1885	W3/NH7C	12/16/2022	1112

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).**

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
W1CU.....269
VE7IG.....254
HAØDU.....253
OM3JW.....253
W6OAT.....252
HA5WA.....250
IK1GPG.....245
OK1ADM.....245
K8SIX.....240
HA1RW.....239
VE3XN.....239
I6T.....230
K8OOK.....229
N8PR.....229
HA5AGS.....228
9A5CY.....227
K9YC.....227
VE3ZZ.....226
KØDEQ.....221
WI8A.....219
HA1AG.....218
JN3SAC.....217
WA5VGI.....216
HA9PP.....213
IV3GOW.....211
W4UM.....210
N4MM.....208
OK1AOV.....208
F6HMJ.....206
KF8UN.....205
OM2VL.....205
K1NU.....204
K1NV.....204
VE7SMP.....204
RW4NH.....203
HB9AAA.....200
N5KE.....200
W3LL.....199
NIØC.....196
ON4CAS.....194
HB9DDZ.....193
N4NX.....192
HA1ZH.....190
BA4DW.....188
K2AU.....187
K8YTO.....186
WO7R.....185
N3RC.....184
W9RPM.....184
K2SHZ.....182
KJ6P.....180
W6XK.....180
W5ODD.....177
NØFW.....176
WA9PIE.....176
HB9BOS.....175
NKØS.....175

SSB

W1CU.....249
W4ABW.....202
VE7SMP.....201
KØDEQ.....198
W4UM.....198
JN3SAC.....192
N4MM.....189
WA5VGI.....189
W3LL.....187
NØFW.....176
DL3DXX.....175

CW

W1CU.....254
HA5WA.....234
DL6KVA.....233
KØDEQ.....214
JN3SAC.....211
DL3DXX.....210
DL2DXA.....209
W4UM.....201
OK1AOV.....198
WA5VGI.....197
NIØC.....196
HB9DZZ.....189
N4MM.....186
OK2PO.....184
N4NX.....177
N7WO.....175

Digital

W1CU.....206
JN3SAC.....178
HA5WA.....177
KØDEQ.....175

The CQ DX Field Award Program

Digital Endorsement

JN3SAC.....178

SSB Endorsement

JN3SAC.....192

Mixed Endorsement

JN3SAC.....217

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.

The WPX Program

CW

4075 .....WA1LAD
4076.....KG7YU

SSB

4461 .....KY4KP
4462.....VE2HTC

Mixed

4538.....K6DSP
4539 .....W2TI
4540 .....KQ4ADO
4541 .....W5MBG
4542 .....W2RLK
4543 .....N3JIM
4544 .....DL8MRE
4545 .....OH7CBC
4546.....AD2BO
4547 .....KD5DDV
4548 .....IW1PVT
4549.....IUØRBE
4550.....NU4H

Digital

1873 .....WA1LAD
1874.....K6DSP
1875 .....JJ1NRX
1876 .....JJ1SZA
1877.....7N4EXO
1878 .....JK1VXE
1879 .....W5MBG
1880 .....K4JIP
1881 .....W2RLK
1882 .....N3JIM
1883 .....DL8MRE
1884 .....IW1PVT
1885.....IUØRBE
1886.....NU4H
1887 .....K6FXZ

CW: 400: WA1LAD, KG7YU. **600:** F5VHQ. **2000:** WA6KHK.

SSB: 550: WR7X. **650:** WA1LAD. **700:** W5UJ. **850:** IZ4DPV. **900:** W8KSC. **1000:** DL8MRE. **1100:** F5VHQ. **1950:** WA6KHK.

Mixed: 450: K6DSP. **500:** N3JIM. **550:** NR6AM. **600:** OH7CBC. **650:** W2RLK. **700:** KQ4ADO, NU4H. **900:** KF8QL, W1DNP, N4SV, W8KSC. **950:** WB8LEM. **1000:** DL8MRE, N2TC, AD2BO. **1050:** JHØEYA, N1HO. **1100:** N6DSC. **1200:** WA1LAD, KM4VI. **1250:** IZ4DPV. **1300:** N4DJT. **1550:** JK1VXE, KC1UX. **1600:** WR7X. **1650:** MØHIH. **1700:** N8IK. **2250:** F5VHQ. **2500:** WA6KHK.

Digital: 350: W5MBG, K4JIP, KD5DDV, IUØRBE. **400:** JJ1NRX, IW1PVT. **450:** K6DSP, NR6AM, WB8LEM. **500:** N3JIM. **550:** WA1LAD, W2RLK. **650:** IZ4DPV. **700:** KQ4ADO, NU4H. **800:** N4SV, N1HO. **850:** KF8QL. **900:** W1DNP. **950:** N2TC. **1050:** JHØEYA. **1100:** N6DSC. **1150:** KM4VI. **1200:** JK1VXE, N4DJT. **1300:** N8IK. **1450:** MØHIH. **1500:** WR7X, KC1UX. **1600:** F5VHQ.

160 Meters: WA1LAD
80 Meters: WA1LAD, N4SV, AD2BO
40 Meters: WA1LAD, NR6AM, N4SV, W8KSC, JHØEYA, N3JIM, AD2BO
30 Meters: W1DNP, N1HO
20 Meters: WA1LAD, JJ1SZA, JK1VXE, KG7YU, W8KSC, JHØEYA, N3JIM, DL8MRE, AD2BO
17 Meters: N4DJT
15 Meters: WA1LAD, K6DSP, W1DNP, W8KSC, AD2BO, KM4VI, N4DJT
12 Meters: N8IK
10 Meters: WA1LAD, KQ4ADO, N2TC, N8IK, N4DJT

Asia: JJ1NRX, 7N4EXO, JK1VXE, DL8MRE, OH7CBC, N1HO
Europe: WA1LAD, W1DNP, JJ1SZA, N4SV, JK1VKE, KQ4ADO, JHØEYA, W2RLK, DL8MRE, OH7CBC, AD2BO, IW1PVT, IUØRBE, NU4H
Oceania: MØHIH, IZ4DPV, WR7X, JK1VXE
North America: WA1LAD, K6DSP, W2TI, JK1VXE, KG7YU, W8KSC, KQ4ADO, W5MBG, K4JIP, JHØEYA, W2RLK, N3JIM, KY4KP, AD2BO, N1HO, KD5DDV, NU4H, K6FXZ
South America: N1HO, N4DJT

Digital Bar: N6PEQ

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.

was like this with some of our other gear and supplies as well. I think this is a natural approach — you are going on a DXpedition and if you think you need four of one thing, you will take eight. You need 20 gallons of drinking water and you take 60, etc. The "I'd rather have too much than too little" philosophy looms large in DXpeditioning. And nothing drives this point home more than when a team member himself loads, unloads, ferries, and sets up a DXpedition camp like we did at Kiska. It makes you realize maybe next time, we

The WAZ Program

SINGLE BAND WAZ

6 Meter

202 .....KB8VAO, 25 Zones
203 .....IK8YTA, 33 Zones
204 .....FG8OJ, 30 Zones

10 Meter CW

225 .....DF2RG

10 Meter Digital

4 .....DF2RG

12 Meter CW

113 .....DF2RG

12 Meter Digital

8 .....DF2RG

12 Meter SSB

61 .....DF2RG

15 Meter CW

384 .....DF2RG

15 Meter Digital

15 .....JR2TRI

17 Meter CW

139 .....DF2RG

17 Meter Digital

31 .....DF2RG

17 Meter SSBl

70 .....DF2RG

20 Meter CW

690 .....DF2RG

20 Meter Digital

61 .....DF2RG

30 Meter CW

173 .....DF2RG

30 Meter Digital

22 .....K3FRK
23 .....DF2RG

40 Meter CW

340 .....DF2RG

40 Meter Digital

28 .....JA4FCV
29 .....DF2RG

40 Meter SSB

126 .....DF2RG

160 Meters

702 .....N4QS
703 .....MMØEAX
704 .....RQ7L
705 .....SP2EWQ

ALL BAND WAZ

CW

1221 .....W3/NH7C
1222 .....EU3A
1223 .....DQ1P
1224 .....N6ZN
1225 .....IK8YTA
1226 .....I1YDT
1227 .....IT9GSF
1228 .....DF2RG
1229 .....W8PE

Digital

414 .....JR2TRI
415 .....W3/NH7C
416 .....WA1AAA
417 .....JK1TCV
418 .....JH5BKC
419 .....DL2RPN
420 .....K7QA
421 .....IK8YTA
422 .....DF2RG
423 .....HP2NG
424 .....HP1AT

Mixed

10365 .....W8CZN
10366 .....JR2TRI
10367 .....K4EEK
10368 .....WA1AAA
10369 .....NY1V
10370 .....JK1TCV
10371 .....IV3BLE
10372 .....K1BDC
10373 .....DL2RPN
10374 .....NT9E
10375 .....IK8WCP
10376 .....K7QA
10377 .....N6ZN
10378 .....WB4QOC
10379 .....IK8YTA
10380 .....DS5VTG
10381 .....WA5YOM
10382 .....IN3THU
10383 .....HP2NG
10384 .....AP2TN
10385 .....EA4CWW
10386 .....IUØHDC
10387 .....WØNBC

SSB

5548 .....ON8AH
5549 .....W3/NH7C
5550 .....WO2C

RTTY

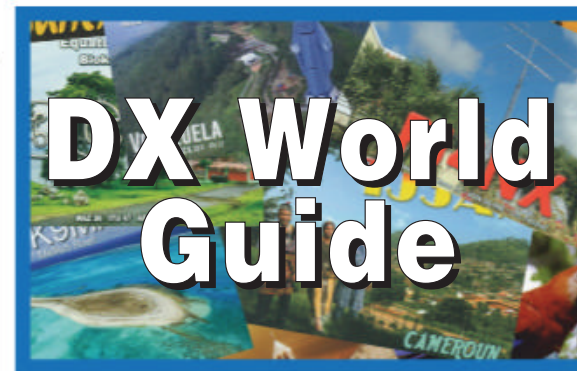
317 .....DF2RG
318 .....4J6D

Satellite

42 .....W5CBF, 27 Zones
43 .....S57NML, 32 Zones
44 .....JK2XXK, 25 Zones
45 .....4J6D, 25 Zones

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).**



4th Edition!

By Franz Langner, DJ9ZB



Known throughout the DX and DXpedition world as a meticulous and tireless operator, Franz Langner, DJ9ZB, is also noted as one of the most knowledgeable individuals in Amateur Radio in terms of documenting DXCC entities.

This is the fourth edition of his series of books bearing the title *DX World Guide*. It was first published in Germany in 1988 and followed by a second edition, also in Germany in 1977. The third edition, published in the U.S.A in 2012 was the first to use color throughout. This 380-page, fourth edition, also 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!

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should take a little bit less food and backup gear / equipment. I think we made a lot of extra work for ourselves carrying around “dead weight” we did not use.

Statistics

K7K concluded with nearly 12,000 QSOs in the log and the statistics below speak for themselves. Because of proximity and the advertising we received in Japan about our DXpedition and its 80-year Aleutian Campaign anniversary, the Japanese stations, as expected, were prevalent in our log. Europe was, of course, the hardest to work from our location but we were able to contact many European IOTA enthusiasts.

Being far from inhabited places, there was no RF noise and that allowed us to hear better than we were being heard. But being so far up north, the propagation was not as good as in the lower latitudes and we encountered many periods of time

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. Visit <https://tinyurl.com/mrxuvwvv> for current listings.

MIXED

9676.....9A2AA	4763.....KW9A	3151 .....NXØI	2465.....N6PM	1945 .....N5KAE	1484.....FG4NO	1217.....AB1QB	1032.....DG5LAC	758 .....N4JJS
8663.....9A2NA	4757.....I2MQP	3099.....N6FX	2420.....WA6KHK	1828 .....K7LV	1480.....K4JKB	1204 .....VA2IG	1023.....N4WQH	757.....WB3D
8196 .....W1CU	4703.....IK2ILH	3077 .....K1PL	2400 .....N7ZO	1824 .....WF7T	1462 .....AC7JM	1201 .....K9BO	1016.....W9QL	736 .....JA3MAT
8188.....K2VV	4668.....JH8BOE	3028 .....IK2DZN	2391 .....WO7R	1821.....PY5FB	1462 .....DL4CW	1167 .....WA9PIE	1012 .....NØVVV	711.....AG1T
7059.....EA2IA	4574 .....JN3SAC	2992.....W2YR	2391.....IZØFUW	1746.....K6UXO	1447.....K3XA	1153 .....N3CAL	1010 .....VE3RZ	695 .....W8WDW
6955.....KF2O	4461.....K1BV	2987 .....AG4W	2386.....JH1QKG	1741.....N6PEQ	1422 .....I2VGW	1148.....SP8HKT	1007.....AA4QE	682 .....AI8P
6139.....KØDEQ	4423 .....N1RR	2968.....AB1OC	2356.....NE6I	1711 .....NS3L	1408.....NH6T	1141 .....4F3BZ	1006 .....NØRQV	678 .....WE8L
5908 .....ON4APU	4417.....WD9DZV	2963 .....N3RC	2225 .....JH1APK	1707.....K4WY	1398.....ES4RLH	1137.....YO5BRZ	1000 .....WB6IZG	674.....N5JED
5859 .....ON4CAS	4342 ....WB2YQH	2697 .....AK7O	2203.....KI1U	1684 .....W1FNB	1361.....VA3VF	1136 .....KO9V	999.....N3DF	661 .....AL4Y
5715 .....S53EO	4298 .....VE3XN	2651.....HK3W	2176 .....V51YJ	1672 .....WU9D	1333 .....AF4T	1116 .....YU7FW	995.....PU2GTA	633.....TI5LUA
5597.....N4NO	4241.....N6QQ	2642.....AA8R	2159.....VA7CRZ	1667.....AD3Y	1322 .....AA4FU	1112 .....N6MM	966.....W6WF	621 .....K4HDW
5511 .....N8BJQ	4215.....W3LL	2616 .....9A2GA	2133.....KØKG	1643 .....SV1DPI	1301 ....KB9OWD	1107.....PY2MC	953 .....JP1KHY	616 .....AC6BW
5482 .....VE1YX	4201.....YO9HP	2591 .....IK2RPE	2113.....W2FKF	1639.....N7QU	1301.....K1DX	1100 ....WA3GOS	919.....ON7MIC	605.....IW2FLB
5453 .....YU1AB	3818.....K9UQN	2589 .....DG7RO	2056.....NKØS	1616 .....TA1L	1301 .....KM5VI	1109 .....KE8FMJ	908 .....N2YU	
5409 .....N6JV	3793 .....AB1J	2583.....PA2TMS	2046.....YO8CRU	1590.....JF1LMB	1299.....JA6JYM	1088 .....NJ4Z	889 .....WU1U	
5387 .....W9OP	3538 .....9A4W	2583.....AE5B	2016.....N2WK	1570 .....PY5VC	1295.....NIØC	1084 .....KG4JSZ	866 .....K2KJ	
5215.....I5RFD	3459.....W9IL	2550 .....K6ND	1995 .....JR3UIC	1568 .....N3AIU	1280.....WF1H	1069.....IZ4MJP	857.....R1AV	
5172.....W9OO	3130.....SV1EDY	2457 .....K5UR	1972 .....K3CWF	1547.....KC1UX	1260.....UR6LEY	1058 .....N6DBF	835.....K6RAH	
5018.....WA5VGI	3109.....W6XK	2538.....K4HB	1955 .....NIØC	1524 ....NH6T/W4	1219 .....K6HRT	1036.....DL5KW	803 .....AB1Q	

SSB

7045 .....OZ5EV	3184 .....N1RR	2576 .....AA1VX	2129.....AE5B	1646 .....VE7SMP	1258 .....N1KC	1031 .....K4CN	854 .....K6HRT	700 .....JA1PLL
6334.....9A2NA	3174 .....I3ZSX	2568.....SM6DHU	2113.....W2FKF	1641 .....AE9DX	1222 .....YF1AR	1031 .....IK8OZP	833 .....DK8MCT	694 .....KG4HUF
6145.....K2VV	3172.....YO9HP	2515.....W9IL	2112.....WD9DZV	1622.....K5CX	1187 .....IZ1JLG	1022 .....NW3H	808 .....UR6LEY	690.....W6PN
5404 .....VE1YX	3141 .....DL8AAV	2483 .....AG4W	2094.....I8LEL	1611 .....W2ME	1183.....KI1U	1012 .....KU4BP	802 .....N6OU	684 .....KO9V
5149.....KF2O	3139 .....N8BJQ	2451.....EA3GHZ	2093.....W2WC	1587.....N3XX	1151.....W6XK	1006 .....NJ4Z	801 .....K3XA	675 .....F1MQJ
4916.....EA2IA	3108.....I4CSP	2443 .....JN3SAC	2084 .....K5UR	1550 .....IK2RPE	1150 .....VE6BMX	1004.....K4HB	766 .....I2VGW	655.....VA3VF
4410.....I2MQP	3104 .....WA5VGI	2335 .....KG1E	2076 .....K2XF	1449 .....N5KAE	1146 .....SQ7B	1004 .....WA5UA	763 .....K4JKB	647 .....YB8NT
4192.....KØDEQ	3067.....N6QQ	2327 .....K1PL	2048.....W4QNW	1442 .....DG7RO	1136 .....K3CWF	978 .....EA7HY	758.....IV3GOW	640 .....UA9YF
3723.....I8KCI	2990 .....KF7RU	2326 .....CX6BZ	1955 .....EA3NP	1389.....NKØS	1112.....NH6T	957.....W9QL	724.....WF1H	637.....K5WAF
3681 .....N4NO	2984 .....KI7AO	2209.....IK2QPR	1935.....SV1EOS	1386.....HK3W	1098 .....K4CN	934 .....PY5VC	724 .....W3TZ	630.....W6US
3585 .....SV3AQR	2946 .....PT7ZT	2201 .....NQ3A	1884.....WA6KHK	1386 .....IK4HPU	1096 .....JA7HYS	931 .....YB1AR	717 .....KØDAN	624 .....K6KZM
3535.....KW9A	2903 .....IN3QCI	2200.....N6FX	1879.....K3IXD	1371.....VE6BF	1093 .....N6MM	929.....NS3L	717 .....N3JON	606 .....KJ4BIX
3456 .....W9OO	2857.....4X6DK	2198.....AB1OC	1848.....AB5C	1338 .....NE6I	1089 .....IZ8FFA	919.....KA5EYH	714.....YB2TJV	604 .....GØBPK
3416.....W3LL	2650 .....IK2DZN	2183 .....NXØI	1825 .....KQ8D	1334.....EA3EQT	1089 .....IT9ABN	893.....W9RPM	713 .....JH1APK	
3348.....CT1AHU	2595.....EA1JG	2155.....K9UQN	1812 .....K6ND	1264.....N6PEQ	1042 .....IZØBNR	889 .....N3AIU	710 .....WA9PIE	
3274 .....YU7BCD	2582.....PA2TMS	2131 .....N3RC	1699.....W2YR	1262 .....K7LV	1032.....DG5LAC	875.....K7SAM	700 .....N4FNB	

CW

7543.....WA2HZR	4164 .....WA5VGI	3031 .....EA7AAW	2357 .....W9HR	1708 .....NIØC	1421 .....KN1CBR	992 .....F5PBL	821.....HB9DAX	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	1672.....W2YR	1342 .....VE6BMX	962 .....K7LV	752 .....K6HRT	608.....W9RPM
5392.....EA2IA	3804 .....W9OO	2915 .....KA7T	2203 .....NXØI	1633.....W6XK	1235 .....JH1APK	944.....AB1OC	743 .....JA5NSR	600 .....NY4G
5311 .....N6JV	3773.....KW9A	2811 .....OZ5UR	2022 .....AF5CC	1620 .....DG7RO	1220 .....AA4FU	908.....NH6T	738 .....NH6T/W4	600 .....IK2SGV
5261.....KF2O	3647 .....N1RR	2679.....W9IL	1998 .....K5UR	1595.....PY5FB	1210 .....DL4CW	897.....HK3W	732 .....SQ7B	
5160 .....N4NO	3504 .....YU7BCD	2548 .....EA2CIN	1973 .....N3RC	1555 .....K1PL	1196 .....N3AIU	891 .....DK8MCT	727.....JF1LMB	
5013.....W8IQ	3462.....K9UQN	2531 .....I2MQP	1905.....WA6KHK	1508.....W6XK	1098.....LU5OM	890 .....NS3L	722 .....WA9PIE	
4916.....IZ3ETU	3279.....IØNNY	2497.....W3LL	1832.....N4YB	1483 .....VE1YX	1088.....AE5B	889 .....N3AIU	720 .....K4CN	
4914 .....KØDEQ	3220.....WD9DZV	2490.....N6FX	1762 .....K6ND	1480.....WO3Z	1062.....K3XA	864.....YO5BRZ	652 .....IK2DZN	
4886 .....I3FIY	3214.....SM6DHU	2477.....VE6BF	1744 .....NE6I	1458 .....AG4W	1036.....DL5KW	848 .....PY5VC	636.....NKØS	
4769 .....N8BJQ	3041.....YO9HP	2424.....W2WC	1727.....K6UXO	1443.....WA2VQV	997.....N6PEQ	822 .....N5KAE	629.....IV3GOW	

DIGITAL

3347 .....KØDEQ	2251 .....EA2IA	1759 .....N7ZO	1426.....AB1OC	1108 .....KE8FMJ	1002.....NØRQV	866 .....SQ7B	750 .....ON7MIC	636.....W9RPM
3137.....KF2O	2242.....HK3W	1727.....W2YR	1378 .....K3CWF	1093 .....KI1U	992.....N3DF	862 .....JP1KHY	750 .....NH6T/W4	611 .....KO9V
2996.....W3LL	2345 .....WA5VGI	1704 .....IK2DZN	1353 .....K1PL	1091.....VA3VF	992.....K9UQN	855.....R1AV	681 .....PY5VC	600 .....ADØFL
2978 .....N8BJQ	2308 .....N6PM	1638 .....N1RR	1333 .....W1FNB	1089 .....AC7JM	983.....PU2GTA	812.....UR6LEY	680 .....K2KJ	
2929.....WD9DZV	2217.....YO9HP	1643 .....N3RC	1308.....NKØS	1060 .....AF4T	966 .....NS3L	811 .....WF1H	672 .....K9AAN	
2628.....W6XK	1836 .....AG4W	1501W2/JR1AQN	1227 .....ES4RLH	1054.....KW9A	947 .....I2VGW	810 .....N3CAL	670.....IV3GOW	
2558.....NT2A	1818 .....W1EQ	1500 .....JH1APK	1189.....JF1LMB	1051 .....KH6SAT	917 .....K7LV	800 .....WA3GOS	668.....KA5EYH	
2518 .....K2YYY	1811 .....NXØI	1459.....KC1UX	1149.....W9IL	1047 .....RW4WZ	881 .....NE6I	783 .....YB1AR	654 .....JA3MAT	
2345 .....WA5VGI	1790 .....JN3SAC	1461 .....WU9D	1112.....AB1QB	1009 ....GUØSUP	870 .....WB6IZG	758 .....N4JJS	640 .....WA9ONY	

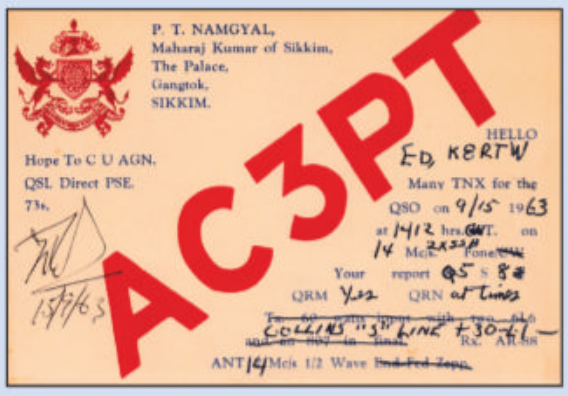
REMOTE OPERATION

CW	MIXED	SSB	DIGITAL
7277 .....K9QVB	4026 .....N1RR	2953 .....N1RR	671 .....N1RR
3292 .....N1RR			

QSL of the Month: AC3PT – King of Sikkim



Here is the second installment in our new "QSLs of the Month" series, provided by Tom Roscoe, K8CX, of <www.Hamgallery.com>. Tom provides the backstories as well as the card images. We hope you enjoy seeing some very cool QSLs from the past!
– N2OO



Palden T. Namgyal, AC3PT, The Palace, Gangtok, The Himalayan Kingdom of Sikkim. This was a super rare, now deleted, DXCC entity. (QSL courtesy K8CX Ham Gallery)

Palden T. Namgyal was born in 1923 and died of cancer in 1982. In 1949 Sikkim was an independent kingdom, and Palden was the country's Maharaj Kumar, or king. He was the 12th and last official king of Sikkim. At the age of 6, he was a convent student; from 8 to 11 he studied to be ordained in the monkhood. In 1963, the king married Hope Cooke, a 23-year-old American debutante. This wedding brought much attention to Sikkim.

In 1975, Sikkim joined the Union of India, becoming its 22nd union state. There were clashes between Indian troops (who had already been in the country) and the Sikkim Royal Palace Guard.

That same year, Palden came to the U.S. to undergo cancer surgery. Due to complications from the surgery, he expired in New York City at the age of 52. His son from his first marriage was named the 13th Chogyal (king), but the position no longer has any official authority as Sikkim is now part of India.

– 73, Tom, K8CX

when propagation was marginal or nonexistent, perhaps caused by disturbances across the polar path.

QSOs: 11,676
First QSO: 28-Jul-2022 07:37
Last QSO: 31-Jul-2022 09:08
Countries: 95
Unique callsigns: 5,205
CW: 3,605 (30.9%)
FT8: 6,218 (53.3%)
SSB: 1,853 (15.9%)

North America: 36.1%
South America: 0.7%
Europe: 17.2%
Africa: 0.2%
Asia: 44.3%
Oceania: 1.5%

Conclusion:

We thank all the sponsors: Individuals, clubs, and companies that supported us! Special thanks to U.S. FWS in Alaska! And our QRZ page <https://tinyurl.com/yazp423j> has a myriad of interesting details and pictures.

DXpeditions to the difficult area of the globe are not easy to plan or to execute. There is always the unknown element that could take you by surprise or the force of nature that men cannot tame. And there are many small details that need to fit together like the gears inside a clock to make a DXpedition a success.

And although we are relying on technology to help us, in the end it is the team of PEOPLE put together by the team leaders, the DXpedition team, who works together in unison, each member bringing to the table his or her unique skills that gets the desired end result: The sound of the pileups from a rare DX entity.

And when things don't work out as planned, you have to persevere as there is no failure except in no longer trying.

Looking Ahead

Here are some of the articles we're working on for upcoming issues of *CQ*:

- SSB Results: 2022 CQ WW DX Contest
- A Skeleton Slot Antenna for HF Through 432 MHz
- Profile: Carolina DX Association
- The Bramham Balun

Plus…

- Ye Olde Octopus Curve Tracer
- Cyrillic Morse Code

And of course…

- Professor Heisseluft!

Do you have a hobby radio story to tell? A new circuit you've designed? An operating adventure? *CQ* covers the entire radio hobby. See our writers' guidelines on the CQ website at <http://bit.ly/2qBFOdU>.



awards

BY STEVE MOLO,* KI4KWR

CQ's Own USA Counties Award – USA-CA

Hope everyone who attended the Orlando Hamcation® a few weeks back enjoyed seeing the new amateur radio equipment coming in 2023 and checking out that dream station they want. This month, I want to cover a CQ award that may not get the exposure or activation that it did many years ago. The USA Counties Award, or USA-CA, is one that I know about but finding a station on the opposite end working on the same award is not going to happen unless some stars align and it magically happens. Or you hook up with one of the groups / nets that's focused on helping county hunters achieve their goals. Good Luck!

The USA-CA award program sponsored by *CQ* magazine is issued for confirmed two-way radio contacts with a specified numbers of U.S. counties under rules and conditions hereafter stated. This award is not just a once and done unless you only want to earn one of the seven available classes. Did I say seven classes? Yep, seven, with the first being 500 counties and the top being all counties — 3,077 as of this writing — that county-hunters refer to as, "the whole ball of wax." At the 2,000-counties and above levels, you need to work all 50 states, while the initial 500 counties worked may be in any number of states.

Would there be any award without conditions or restrictions to make it a challenge? The award does apply to any licensed operator in the world so no worries, my fellow EU and JAs, you can achieve this award.

Something about the CQ awards is their management … every award is very well managed with very few problems ever heard or emailed to me. When I do receive an inquiry, it is passed along to the relevant award manager and gets handled in a timely manner. Rules and procedures for the award are on the CQ website at <https://tinyurl.com/ycxdmha7>, and are reproduced below with a link for a complete list of counties by state, too … enjoy.



Complete Rules — The CQ USA Counties Award (USA-CA) Program

A. Award Classes

The USA Counties Award is issued in seven different classes, each a separate achievement as endorsed on the basic certificate by use of special seals for higher classes. Also, special endorsements are made for all one band or mode operations, subject to the rules.

Class	Counties Required	States Required
USA-500	500	Any
USA-1000	1,000	25
USA-1500	1,500	45
USA-2000	2,000	50
USA-2500	2,500	50
USA-3000	3,000	50
USA-3077	ALL	50

*Email: <KI4KWR@cq-amateur-radio.com>

B. Conditions

1. USA-CA is available to all licensed amateurs everywhere in the world and is issued to them as individuals for all county contacts made, regardless of calls held, operating QTHs, or dates. Special USA-CA awards are also available to shortwave listeners (SWLs) on a heard basis.

2. All contacts must be confirmed by QSL, and such QSLs must be in the applicant's possession for identification by certification officials. Electronic verifications from sources approved by CQ are acceptable. A list of acceptable online sources may be found at <https://tinyurl.com/yyzjzwur>. (*As of now, the only electronic confirmations acceptable for USA-CA are from eQSL.com. – ed.*)

3. Any QSL card or other confirmation found to be altered in any way disqualifies the applicant.

4. QSOs via repeaters, satellites, and phone patches are not valid for USA-CA. QSOs using remote station technology are permitted, provided that all contacts are made over a direct RF path between the remote station and the station contacted.

5. So-called "team" contacts, wherein one person acknowledges a signal report and another returns a signal report,

while both amateur callsigns are logged, are not valid for USA-CA. Acceptable contact may be made with only one station at a time.

C. County Identity

1. Unless otherwise indicated on QSL cards or in an electronic confirmation database, the QTH printed on cards or entered an electronic confirmation database profile will determine county identity.

2. If no county name is provided by the contacted station, an online city and ZIP code search may be conducted to determine the county of contact.

3. For mobile and portable operations, county information stated on confirmations is the only acceptable proof of county identity.

4. In the case of cities, parks, or reservations not within counties proper, applicants may claim any one of the adjoining counties for credit (once).

D. Administration of USA-CA Program

1. The USA-CA program is administered by a CQ staff member acting as USA-CA Custodian, and all applications and related correspondence should be sent directly to this person's QTH.

2. Decisions of the Custodian in administering these rules and their interpretation, including future amendments, are final.

E. Record Book and Bookkeeping

1. The scope of the USA-CA Award makes it mandatory that applications be submitted in a specific format. Contacts must be arranged alphabetically by state and then alphabetically by county within each state. Information provided for each contact must include callsign, date of contact, band and mode, in that order. Computer-generated lists must be in a tabular format with separate columns for each field listed above.

2. A completed USA-CA Record Book (as available) or computer-generated listing of qualifying contacts constitutes the medium of basic application and becomes the property of CQ for record purposes. On subsequent applications for either higher classes or for special endorsements, the applicant may use additional Record Books to list required data, or he or she may make up alphabetical lists conforming to requirements.

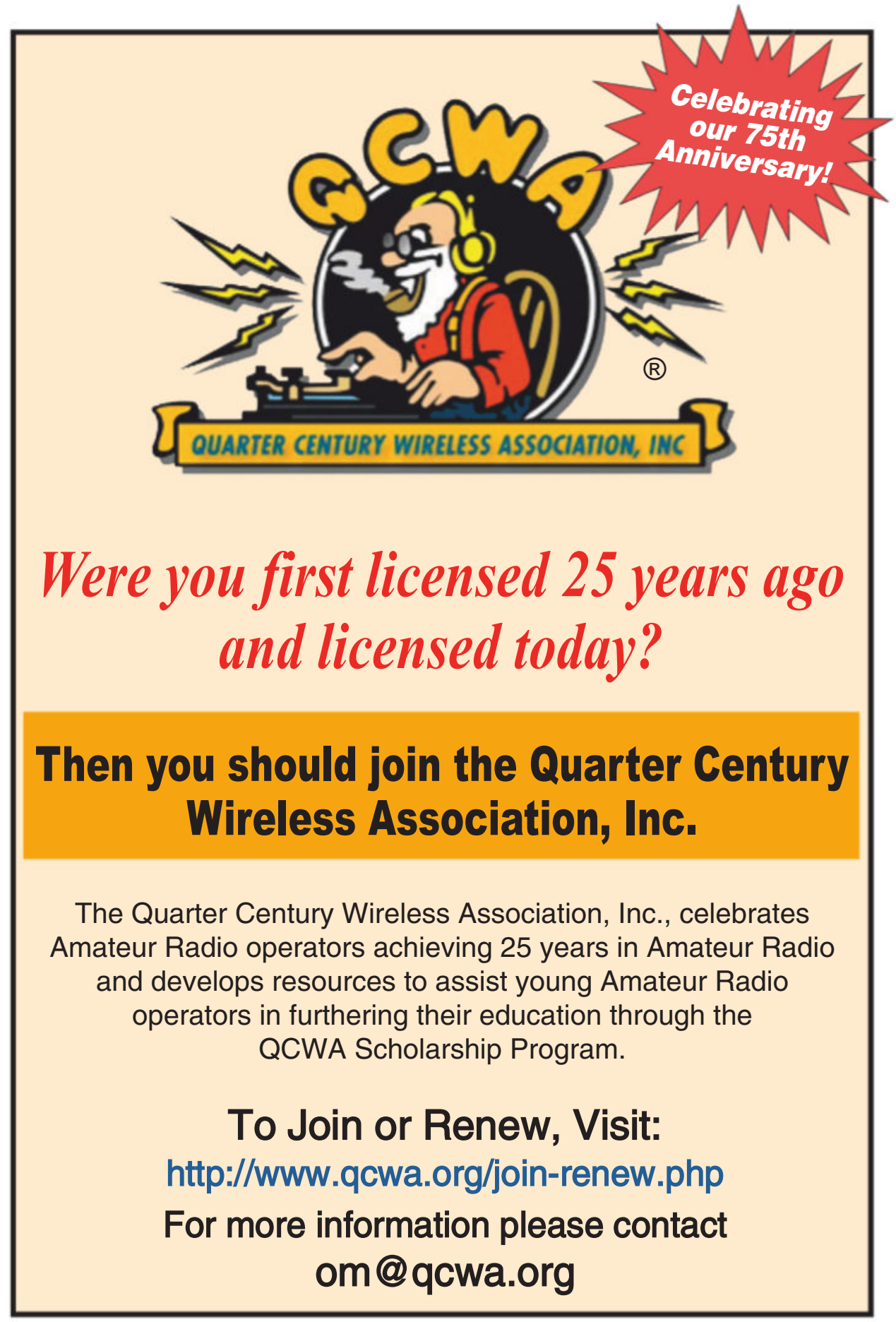
3. Record Books are not currently in print, but existing copies will be accepted for all applications. At such time that Record Books may again become available, these rules will be updated and notification will be published in *CQ* magazine.

F. Application

1. Make Record Book or computer-generated list entries necessary for county identity and enter other log data necessary to satisfy any special endorsements (band / mode) requested.

2. Have two licensed amateurs (General Class or higher) or an official of a national-level radio organization or affiliated club certify that QSL cards or acceptable electronic confirmations for all contacts as listed have been seen. The USA-CA Custodian reserves the right to request any specific cards (or other confirmations) to satisfy any doubt whatsoever. In such cases, the applicant should send sufficient postage for the return of cards by registered mail.

3. Send the original completed Record Book (not a copy) or computer-generated listing, along with certification forms and handling fee to Brian Bird, NXØX, 4567 Caribou Lake Road, Duluth, MN 55811-9607. Fee is $6.00 U.S. for *CQ* subscribers (subscribers must include a copy of a recent CQ mailing label), and $12.00 U.S. for non-subscribers. Applicants outside the United States must include an additional $6.00



U.S. for postage if a certificate is requested. For later applications for higher class seals, send Record Book or self-prepared list per rules and $1.25 U.S. For application for later special endorsements (band / mode) where certificates must be returned for endorsement, send certificate and $1.25 U.S. for handling charges ($6 U.S. for stations outside the United States). Note: At the time any USA-CA Award certificate is being processed, there are no charges other than the basic fee, regardless of the number of endorsements or seals; likewise, one may skip lower classes of USA-CA and get higher classes without losing any lower awards credits or paying any fee for them. Fees may be paid by check or money order payable to Brian Bird, or via PayPal. Applicants qualifying for the USA-CA All Counties Award (3,077 counties) have the option to purchase a plaque. Contact the award custodian for details.

4. Computer-generated contact lists, certification and witness documents must be sent on paper or by email, along with the appropriate fee, to the Award Custodian (address above), not to the CQ offices. Emailed applications may include an attached file in spreadsheet or other tabular format. and must include a listing of all claimed contacts, in alphabetical order by state, and by county within each state.

The USA-CA Award Program is sponsored by *CQ* - The Radio Amateur's Journal, P.O. Box 1206, Sayville, NY 11782. Questions? Send email to Brian Bird, NXØX, USA-CA Award Manager at <nx0x@aol.com>.

Links of Interest for this Award:

Printable state-by-state county maps of the United States: <https://tinyurl.com/y59morxq>

U.S. Counties with maps: <https://tinyurl.com/bdf3pb6j>

MARAC – Mobile Amateur Radio Awards Club, the preeminent county hunters' organization: <http://marac.org>

The County Hunter Web: <http://countyhunterweb.org>

County Hunter Dot Com: <www.countyhunter.com>

USA-CA Trivia

~ The USA-CA award was inaugurated by CQ in May 1961.

~ The first award custodian was Clif Evans, K6BX

~ *CQ*'s Awards column (the one you are reading now) originated in July 1961, as the USA-CA column, written by K6BX. The USA-CA column transitioned to today's more broadly based Awards column in July 1967.

announcements *(from page 2)*

at the Northwest Florida Fairgrounds, 1958 Lewis Turner Boulevard. Phone: (850) 359-9186. Email: <hamfest@w4zbb.org>. Website: <www.w4bzz.org>.

ALBUQUERQUE, NEW MEXICO — The Rock Mountain Ham Radio will hold the **New Mexico TechFest** from 8 a.m. to 5 p.m., Saturday, March 18 at the UNM Continuing Education Conference Center, 1634 University Boulevard NE. Website: <www.nmham.org>. Balloon launch.

BUFFALO, MINNESOTA — The Maple Grove Radio Club will hold its **39th Annual Midwinter Madness Hobby Electronics Show** from 8 a.m. to noon, Saturday, March 18 at the Buffalo Civic Center, 1306 County Road 134. Phone: (763) 537-1722. Website: <http://k0ltc.org>. Talk-in 147.000+ (PL 114.8). VE exams, ARRL card checking.

CHARLESTON, WEST VIRGINIA — The Kanawha Amateur Radio Club will hold the **38th Annual Charleston Area Hamfest** and **2023 ARRL West Virginia Section Convention** from 9 a.m. to 2 p.m., Saturday, March 18 at the Beni Kedem Temple, 100 Quarrier Street. Contact Fred Vickers, WV8VF, (304) 421-1701. Email: <n8mw@arrl.net>. Website: <www.w8gk.org>.

LOOMIS, CALIFORNIA — The Sierra Foothills Amateur Radio Club will hold the **7th Annual Loomis Hamfest** from 7 a.m. to noon, Saturday, March 18 at the Historic Loomis Train Depot, 5775 Horseshoe Bar Road. Website: <www.w6ek.org>.

MIDLAND, TEXAS — The Midland Amateur Radio Club will hold the **67th Annual St. Patrick's Day Hamfest** and the **2023 ARRL West Texas Section Convention** from 8 a.m. to 2 p.m., Saturday, March 18 at the MLK Community Center, 2300 Butternut Lane. Email: <marc.w5qgg@gmail.com>. Website: <hamfest.w5qgg.org>. VE exams, DXCC / VUCC / WAS card checking.

SCOTTSDALE, ARIZONA — The Scottsdale Amateur Club will hold Scottsdale SpringFest beginning 7 a.m., Saturday, March 18 at the Fender Musical Instrument Parking Lot, 17705 North Pacesetter Way. Contact Bill or James, <hamfestscottsdalearc.org>. Website: <www.springfest.scottsdalearc.org>. Talk-in 147.180+ (PL 162.2) or 443.575+ (PL 100).

STUART, FLORIDA — The Martin County Amateur Radio Association will hold the **48th Annual Stuart Hamfest** from 8 a.m. to 2 p.m., Saturday, March 18 at the Martin County Fairgrounds, 2616 SE Dixie Highway (A1A). Website: <www.mcaraweb.com>. Talk-in 145.150- (PL 107.2).

ZEPHYRHILLS, FLORIDA — The Zephyrhills Area Amateur Radio Club will hold its **Spring Tailgate Swap Meet** from 8 a.m. to noon, Saturday, March 18 at the St. Elizabeth Episcopal Church, 5855 16th Street. Contact Charles Nelson <ke7uth@arrl.net>. Website: <www.zaarc.org>. Talk-in 146.910- (PL 146.2). VE exams.

JEFFERSON, WISCONSIN — The Tri-County Amateur Radio Club will hold its **Hamfest 2023** beginning 8 a.m., Sunday, March 19 at the Jefferson County Fairgrounds Activity Center, 503 North Jackson Avenue. Contact: Mike, AE9MZ, (414) 455-5493. Email: <hamfest@w9mqb.org>. Website: <www.w9mqb.org>. Talk-in 145.49 (PL 123). VE exams.

PERRYSBURG, OHIO — The Toledo Mobile Radio Association will hold its **65th Annual Hamfest** from 8 a.m. to 2 p.m., Sunday, March 19 at the Owens Community College-Student Health and Activity Center, 30335 Oregon Road. Contact: TMRA, P.O. Box 9673, Toledo, OH 43697-9673. Website: <www.tmrahamradio.org>. Talk-in 147.27+ (PL 103.5). VE exams.

VIENNA, VIRGINIA — The Vienna Wireless Society will hold its **WINTERFEST!** from 7 a.m. to 2 p.m., Sunday, March 19 at the Oakton High School, 2900 Sutton Road. Email: <winterfest2023@viennawireless.net>. Website: <www.viennawireless.net>. Talk-in 146.910 (PL 77).

LEWISTON, MAINE — The Androscoggin Amateur Radio Club will hold its **2023 Hamfest** and **2023 ARRL Maine State Convention** from Friday, March 24 through Saturday, March 25 at the Ramada Inn Conference Center, 490 Pleasant Street. Contact Ivan, N1OXA, (207) 577-5152. Email: <n1oxa@yahoo.com>. Website: <www.w1npp.org>.

FORT PAYNE, ALABAMA — The DeKalb County Amateur Radio Club will hold the **23rd Annual Hamfest / Tailgate Outing** from 8 a.m. to noon, Saturday, March 25 at the VFW Fairgrounds, 151 18th Street NE. Contact: Carlton Floyd, W4CTK, (256) 630-4639. Email: <w4tkk@gmail.com>. Website: <www.w4dgh.org>. Talk-in 147.270+ (PL 100). VE exams.

FREDERICK, MARYLAND — The Frederick Amateur Radio Club will hold **FredFest 2023** from 8 a.m. to noon, Saturday, March 25 at the Independent Hose Company Social Hall, 310 Baughmans Lane. Contact: Jeff, <ljfish1@comcast.net>. Website: <frederickarc.org/fredfest>. Talk-in 146.64

MILWAUKEE, WISCONSIN — The Milwaukee Radio Amateurs' Club will hold its **11th Annual Swapfest** from 8 a.m. to noon, Saturday, March 25 at the Elks Lodge #46, 5555 Good Hope Road. Email: <swapfest@w9rh.org>. Website: <https://tinyurl.com/6cx92u4f>. Talk-in 145.390 (PL 127.3). VE exams.

MOUNT VERNON, MISSOURI — The Ozark Amateur Radio Society will hold its **Hamfest 2023** from 8 a.m. to 1 p.m., Saturday, March 25 at The MARC, 822 W. Mt. Vernon Boulevard. Contact Zach Zullig, WØZAC, 331 W. Cherry Street, Mount Vernon, MO 65712. Website: <www.w0oar.com>.

HENNICKER, NEW HAMPSHIRE — The Contooncook Valley Radio Club will hold the CVRC 2023 Ham Radio Indoor Flea Market from 8

(Continued on page 100)

contesting

BY TIM SHOPPA,* N3QE

We've Got Your Number (But is it Right?)

Tips on Correctly Copying Serial Numbers in Contest Exchanges

The last weekend in March and May each year, approximately 10,000 stations will be sending and copying serial numbers as the required exchange in the 48-hour CQWW WPX SSB and CW contests. Dozens of other contests use serial numbers, too, either as a standalone exchange or — as in ARRL Sweepstakes — as a variable part of a longer exchange.

How hard is it to copy a serial number correctly? In the log checking reports for almost 2 million QSOs logged in the 2022 CQWW WPX SSB contest, serial numbers were miscopied at a 3.0% rate; while callsigns were busted only about half as often, at a 1.6% rate. From a purely information-theory analysis, one might think that copying a serial number correctly would be easier than copying a callsign. After all, a callsign is often six characters, and each character in the callsign could be either a letter or digit, making 36 possible choices for each character. Serial numbers used in ham contests are shorter — four digits or less – and only made up of the 10 possible digits.

Contesters have a couple trick up their sleeves to copy callsigns more accurately. Foremost, a station calling CQ gives its callsign over and over on the same frequency, and this is a constant; contrasted with the ever-changing serial number. Assisted entrants going search-and-pounce may be able to verify a callsign with a spot on the same frequency coming in through a post to a Telnet cluster. The most effective CQing stations are making use of Super Check Partial — a dictionary of the most common callsigns — and are familiar with the most common domestic and DX callsigns heard on the air, to help them piece together callsigns through QRM and QRN.

But perhaps more than all the above, the WPX contest rules (like many big contests) have very different scoring policies for miscopied callsigns than for miscopied exchanges. An incorrect exchange leads to the loss of credit for that one QSO; a busted callsign not only results in losing that QSO, but also carries a point penalty of two additional QSOs. Savvy contesters pay heed to the rules and work much harder to avoid miscopying the call than the exchange.

We can break down the 3.0% of miscopied exchanges into five large groupings of categories. **Extra** digits are copied in 0.4% of exchanges, and digits are **dropped** by the receiver 0.6% of the time. Two adjacent digits in the serial number are transposed about 0.1% of the time; 1.4% of the time, only a **single digit was copied incorrectly**. The remainder of busted exchanges (0.5%) have more complex error syndromes. Let's go through some strategies for avoiding the most common of these mistakes.

A strategy to reducing **extra** or **dropped** digits begins with an awareness of what "typical" serial numbers are being exchanged in that phase of the contest. If you're starting late — Sunday afternoon — and sending very low serial numbers, you'll be frequently asked for serial number repeats by those who are used to copying much larger serial numbers. If you're in the opening minutes of the contest, you'll be suspicious of numbers much larger than 100; if someone says "13, 13" they likely are repeating the number 13 twice, rather than sending the number 1313.

Digit Sent	Thousands of times busted	Most commonly busted to
0	1.3	2
1	1.6	4
2	4.5	3
3	3.7	2
4	2.6	2
5	2.3	9
6	2.6	8
7	1.2	0
8	1.8	6
9	1.8	5

Table 1. The single-digit miscopy rate for the digits 0-9 in CQWW WPX SSB 2022, and the most likely bust for each digit. Data compiled from 2.074 million QSO records in the 2022 CQWW WPX public logs.

When sending your exchange, one technique for making plain the magnitude of your serial number and ensuring your QSO party knows the correct number of digits, is to give it including "thousand" and "hundred." For example, when giving the serial 2121 I might voice "Two thousand one hundred twenty one" and avoid any possible confusion with the serial number 21 being repeated twice.

Table 1 shows the most common **single-digit copying** errors made in CQWW WPX SSB 2022 logs. The most commonly miscopied digit was "2", with "3" close behind, and this pair was most commonly mistaken for each other. The leading "t" and "th" sounds of these two digits are very similar, especially after passing through the restrictive SSB voice bandwidth, so we must depend on the trailing vowel sound "oo" or "ree" to carry the difference.

Another common bust pair seen in *Table 1* is mistaking 5 for 9 and the reverse. The vowel sounds in "five" and "nine" are very similar. A common convention in aviation radio — ICAO convention, in fact — is to say "niner," giving an extra syllable to help differentiate these two digits in numeric communications. A complete list of ICAO numeric digit recommendations is online at <https://bit.ly/3HIe8db>. I can't say I've ever heard "five niner" in giving the 59 signal report.

In **especially difficult QRM or QSB**, when asked for a repeat of the serial number, it often makes sense to give it twice. I

email: <n3qe@cq-amateur-radio.com>

First Digit	% WPX SSB Occurrence
1	32%
2	17%
3	12%
4	9%
5	8%
6	7%
7	6%
8	5%
9	5%

Table 2. The first digit of serial numbers copied in the WPX Contests are observed to closely follow Benford's Law, with "1" being by far the most common first digit.

like to include the word "number" before and between repeats; i.e. I'll pronounce "number three six seven number three six seven." It's not necessary to again give the 59 signal report when asked for a repeat; in fact, those two digits may end up confusing the receiver into thinking they are part of your serial number if you give them during each repeat.

You may notice some **apparent irregularities in serial numbers** while you are waiting in a pileup to get through to a prolific station during the busiest hours of the contest. He may give the 1210 to one caller, then the number 1212 to the next caller. Is he skipping numbers? No, but he is using advanced Single Operator Two Radio (SO2R) techniques to work stations on a second band. He gave the intervening number 1211 to a station on a different band.

A follow-on from this is that you can't assume that because the previous station was given 1212, that your QSO will

Calendar of Events

All year	**CQ DX Marathon**	**bit.ly/3FyPiui**
Mar. 1	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Mar. 1	UKEICC 80m Contests SSB	https://ukeicc.com/80m-rules.php
Mar. 1-2	AWA John Rollins Memorial DX Contest	http://bit.ly/2WCGT2C
Mar. 4	SARL YL QSO Party	http://bit.ly/H0IqQf
Mar. 4-5	ARRL SSB DX Contest	www.arrl.org/arrl-dx
Mar. 4-5	AWA John Rollins Memorial DX Contest	http://bit.ly/2WCGT2C
Mar. 4-5	Open Ukraine RTTY Championship	http://krs.ho.ua/openrtty
Mar. 4-5	Veron SLP Contest	http://bit.ly/2L9eT1L
Mar. 4-12	Novice Rig Round-Up	www.novicerigroundup.org
Mar. 5	SARL Hamnet 40M Simulated Emergency Contest	http://bit.ly/H0IqQf
Mar. 5	UBA Spring Contest 80m CW	http://bit.ly/2KKAtb9
Mar. 6	RSGB 80m Club Championship, Data	bit.ly/3TxCrxl
Mar. 7	AGCW YL-CW QSO Party	www.agcw.de/contest/yl-cw-party
Mar. 8	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Mar. 11	YB DX RTTY Contest	https://rtty.ybdxcontest.com
Mar. 11-12	EA PSK63 Contest	https://tinyurl.com/hsfd5buy
Mar. 11-12	Idaho QSO Party	www.pocatelloarc.org/idahoqsoparty
Mar. 11-12	Oklahoma QSO Party	http://k5cm.com/okqp.htm
Mar. 11-12	North American RTTY Sprint	http://ncjweb.com/north-american-sprint
Mar. 11-12	RSGB Commonwealth CW Contest	bit.ly/3TxCrxl
Mar. 11-12	Stew Perry Topband Challenge	www.kkn.net/stew
Mar. 12	AGCW QRP Contest	www.agcw.de/contest/qrp
Mar. 12	FIRAC HF Contest	www.firac.de/html/contest.html
Mar. 12	UBA Spring Contest 2m CW/Phone	http://bit.ly/2KKAtb9
Mar. 12-13	Wisconsin QSO Party	www.warac.org/wqp/wqp.htm
Mar. 15	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Mar. 15	RSGB 80m Club Championship, CW	bit.ly/3TxCrxl
Mar. 18	AGCW VHF/UHF Contest	www.agcw.de/contest/vhf-uhf
Mar. 18	PODXS 070 Club St. Patrick's Day Contest	http://bit.ly/38ugUiF
Mar. 18-19	Maidenhead Mayhem Sprint	https://w9et.com/rules.html
Mar. 18-19	SARL VHF/UHF Analogue Contest	http://bit.ly/H0IqQf
Mar. 18-19	Virginia QSO Party	https://bit.ly/3iXGNkX
Mar. 18-20	BARTG HF RTTY Contest	http://bartg.org.uk/wp/contests
Mar. 19	UBA Spring Contest 80m SSB	http://bit.ly/2KKAtb9
Mar. 20	Bucharest Digital Contest	https://yo3test201x.blogspot.com
Mar. 23	RSGB 80m Club Championship, SSB	bit.ly/3TxCrxl
Mar. 25	FOC QSO Party	www.g4foc.org/qsoparty
Mar. 25-26	Veron SLP Contest	http://bit.ly/2L9eT1L
Mar. 25-26	**CQWW WPX SSB Contest**	**www.cqwpx.com**
Mar. 26	UBA Spring Contest 6m CW/ Phone	http://bit.ly/2KKAtb9
Mar. 27	RSGB FT4 Contest	bit.ly/3TxCrxl
Mar. 29	UKEICC 80m Contests CW	https://ukeicc.com/80m-rules.php
Mar. 31-Apr. 1	Sasquatch Stomp	www.pnwqrp.org/sasquatch-stomp
Apr. 1	RSGB FT4 International Activity Day	bit.ly/3TxCrxl
Apr. 1-2	EA RTTY Contest	https://tinyurl.com/hsfd5buy
Apr. 1-2	Florida State Parks on the Air	http://flspota.org

be number 1213. “Listening ahead” to get the first couple digits is fine, but be completely prepared to copy a serial number that that may be one or two higher than the most direct numeric increment.

Another odd pattern you may notice is that you work a loud station a few hours in on the first night on a low band and he gives you the serial number 312. The next morning you work the same station on a high band, and he gives you the number 65. Should you try to get a correction to the previous night’s serial number, as it appears to be out of sequence? No, you just worked a Multi-Two or Multi-Multi station that uses independent serial number sequences on each band, each band starting with 1.

The WPX contest, like nearly all modern contests, does not give a penalty for duplicate contacts. Still, you will likely run across a station or two that, even though he is not in your log, tells you are a dupe and refuses to work you again. Often these stations will read back previously exchanged serial numbers from their log rather than go through another QSO with new serial numbers. If you run across this, it’s often most productive to take note of the station that claims you’re a dupe and simply avoid calling that station again in the contest or at least on that band. Efficient stations simply work apparent dupes with a new set of serial numbers, rather than insist on a possible correction of logs — a process that is tedious, as it takes longer than simply working the apparent dupe again, and certainly more error-prone.

The challenge of copying a completely variable and unpredictable exchange element in WPX can be key to important decisions affecting your accuracy and rate. If you are having

Apr. 1-2	Louisiana QSO Party	http://laqp.org
Apr. 1-2	Mississippi QSO Party	www.arrlmiss.org
Apr. 1-2	Missouri QSO Party	https://bit.ly/3rkAl87
Apr. 1-2	PODXS 070 Club 31 Flavors Contest	http://bit.ly/2SESbDg
Apr. 1-2	SP DX Contest	https://spdxcontest.pzk.org.pl/2023
Apr. 3	RSGB 80m Club Championship, CW	bit.ly/3TxCrxl
Apr. 5	UKEICC 80m Contests SSB	https://ukeicc.com/80m-rules.php
Apr. 5	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Apr. 6	SARL 80m QSO Party	http://bit.ly/H0IqQf
April 8	QRP Spring QSO Party	www.qrpcontest.com
Apr.8-9	FT8 DX Contest	https://europeanft8club.wordpress.com
Apr. 8-9	Georgia QSO Party	https://gaqsoparty.com
Apr. 8-9	IG-RY World Wide RTTY Contest	www.ig-ry.de/ig-ry-ww-contest
Apr. 8-9	JIDX CW Contest	www.jidx.org
Apr. 8-9	New Mexico QSO Party	www.newmexicoqsoparty.org/wp
Apr. 8-9	North Dakota QSO Party	www.ndarrlsection.com/index.html
Apr. 8-9	OK-OM DX SSB Contest	http://bit.ly/3ioS3Cl
Apr. 8-9	Yuri Gagarin International DX Contest	http://gc.qst.ru/en/section/32
Apr. 9	Hungarian Straight Key Contest	http://hskc.ha8kux.com
Apr. 9	International Vintage Contest HF	www.iv3ehh.it/vintage.htm
Apr. 9	WAB 3.5/7/14 MHz Data Modes	http://bit.ly/31yE4kT
Apr. 10	144 MHz Spring Sprint	http://bit.ly/3XM4RpW
Apr. 12	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Apr. 14-15	Holyland DX Contest	www.iarc.org/iarc/#HolylandContest
Apr. 15	DARC Easter Contest	http://bit.ly/3bOk9pd
Apr. 15	ES Open HF Championship	www.erau.ee/en/es-open-contests
Apr. 15	QRP to the Field	https://tinyurl.com/2s3zxah3
Apr. 15-16	CQ Manchester Mineira DX Contest	www.cqmmdx.com/rules
Apr. 15-16	Michigan QSO Party	https://miqp.org/index.php/rules
Apr. 15-16	Ontario QSO Party	www.va3cco.com/oqp/rules.htm
Apr. 15-16	Texas State Parks on the Air	www.tspota.org
Apr. 15-16	Worked All Provinces of China DX Contest	www.mulandxc.com/index/index
Apr. 15-16	YU DX Contest	http://yudx.yu1srs.org.rs
Apr. 16	ARRL Rookie Roundup, SSB	www.arrl.org/rookie-roundup
Apr. 18	222 MHz Spring Sprint	http://bit.ly/3XM4RpW
Apr. 19	RSGB 80m Club Championship, SSB	bit.ly/3TxCrxl
Apr. 19	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Apr. 22-23	SP DX RTTY Contest	https://tinyurl.com/yckz49rm
Apr. 23	BARTG Sprint75 Contest	http://bartg.org.uk/wp/contests
Apr. 23	North American SSB Sprint	https://ssbsprint.com/rules
Apr. 24	RSGB FT4 Contest Series	bit.ly/3TxCrxl
Apr. 26	432 MHz Spring Sprint	http://bit.ly/3XM4RpW
Apr. 26	UKEICC 80m Contests CW	https://ukeicc.com/80m-rules.php
Apr. 27	RSGB 80m Club Championship, Data	bit.ly/3TxCrxl
Apr. 29-30	10-10 Spring Digital Contest	http://bit.ly/1FrFeBc
Apr. 29-30	Florida QSO Party	www.floridaqsoparty.org
Apr. 29-30	Helvetia Contest	www.uska.ch
Apr. 29-30	UK/EI DX Contest, CW	www.ukeicc.com/dx-contest-rules.php
May 27-28	**CQWW WPX CW Contest**	**www.cqwpx.com**

difficulty copying a caller's callsign, that's a very strong hint that you'll also find it difficult to copy his serial number. You might encourage him to try again later when conditions are more favorable. This factor weighs even more heavily in contests with much longer and complex exchanges, such as the ARRL Sweepstakes.

In the 2022 CQWW WPX SSB contest, several stations were consistently giving **serial numbers one higher, or one lower**, than what their log showed they had sent. These stations were not interpreting the visual clues given by their loggers, as to what serial number belongs to the current QSO. *Figure 1* shows how color-coding of past vs. current serial numbers works in the popular N1MM+ logger. At the top, you'll see that I'm getting ready to work WX3B, I've typed his callsign into the left part of the entry window, and I'm seeing the number "100" in the "SntNR" box where the number I'll send is read from. But note, that the digits of SentNR are greyed out; this is a clue from my logging program that 100 was the serial number of my previous QSO. At the bottom, you'll see that only after I tab over to the RcvNR field do I get the serial number I should send, 101, and it is not greyed out. Several multi-op organizers make a policy of discussing the proper way of reading the current serial number out of their logging program, and they have noted to me that operators that insist on writing callsigns and serial numbers on paper before entering them into the computer are most likely to make patterns of serial-number-off-by-one exchanges. If you're a visiting operator at a multi-op, and aren't familiar with the clues given by the logging software in use, I strongly advise doing some research on exactly how to read the correct serial number.

After several years of WPX entries, I noticed that the serial numbers I was copying seemed to **most commonly begin with the digit "1"**. This property has been noticed for many other large data sets. In 1938, physicist Frank Benford researched this phenomenon by tabulating the leading digits given in several diverse and readily available data sets, including the house numbers in street addresses, molecular weights tabulated in chemical handbooks, and the surface areas of rivers worldwide. This property of "1" appearing most commonly as the first digit in a wide variety of data sets is called **Benford's Law**.

I tabulated the first digits of serial numbers sent and received in the 2022 CQWW WPX SSB public logs in *Table 2*. Note that "1" as the first digit occurs for almost one-third of serial numbers; at the bottom of the table, "9" as the leading digit occurs only one-sixth as often. The frequency of leading digits in WPX is a close match to the theoretical prediction of Benford's Law. Benford's Law is applicable in this case because WPX serial numbers span four orders of magnitude and everyone in the contest starts with serial number 1. Note that this principle is not applicable to the last digit of a serial number, which will be equally distributed from 0 to 9. Benford's Law is not applicable to other fixed-magnitude contest exchanges, like the check year in Sweepstakes, or the zone number in CQWW, that follow age-based or geographically-based distributions. Read more about Benford's Law at <https://bit.ly/3Rgeiff> before the next contest.

March and April Contest Highlights

A second big phone contest is also held in March: The 48-hour **ARRL DX SSB** contest is March 4th and 5th. In this contest, DX stations work U.S. and Canadian stations. Hams in the W/VE send their state or province as part of the exchange; DX stations count these per band as their multiplier. W/VE sta-

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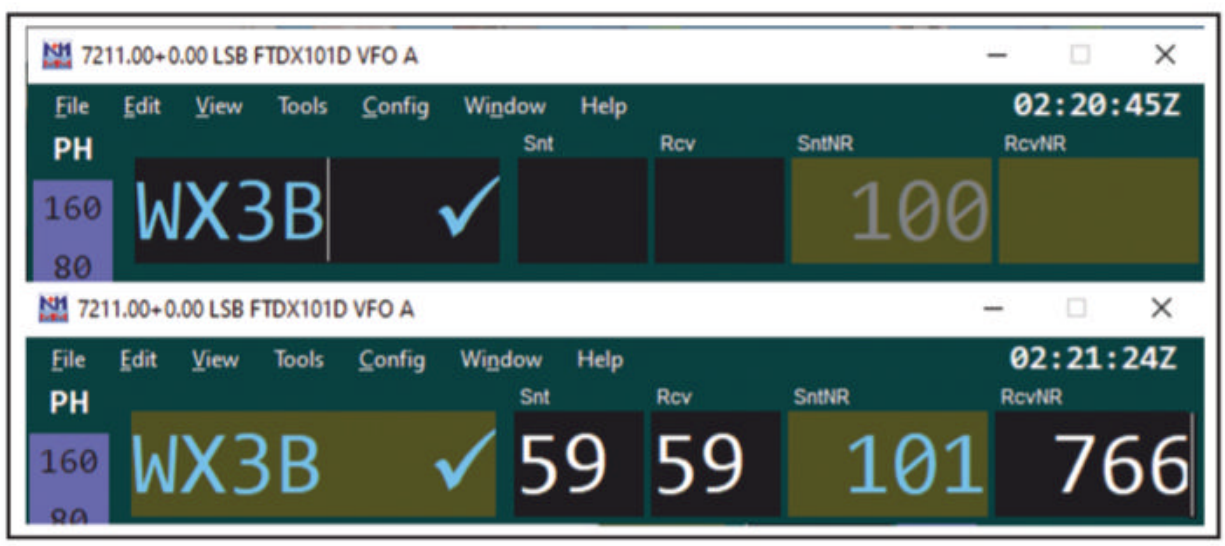


Figure 1. Top: Cursor is still in callsign box, and the serial number (greyed out) in SntNR is for the previous contact. Bottom: Cursor has been moved to the RcvNR box where a serial number was entered, and now SntNR is reading the correct serial number to send for this QSO.

tions count DXCC entities per band as their multiplier, and copy the transmitter power sent by the DX. While the most commonly heard transmitter powers heard as DX exchanges this weekend are "100 Watts," "400 Watts," and "Kilowatt," be prepared to copy oddball numbers like "99 watts" and of course QRP stations will be sending a number of "5 watts" or less. Find the full ARRL DX SSB rules at <www.arrl.org/arrl-dx>.

The next weekend, starting at 0200 UTC March 11th, is the **BARTG HF RTTY** contest. Note that the sponsor, the British Amateur Radio Teletype Group, has recently set some stringent limits on the allowed frequencies for this event. Among these are a prohibition on QSOs between 14099 and 14101 kHz (requiring contesters to keep well clear of the DX beacon frequencies around 14100 kHz). Additionally, no RTTY QSOs are to be made below 3580 kHz on the 80-meter band, which I've noticed has become the "overflow" region during the world's largest CQWW RTTY and CQWW WPX RTTY contests as U.S. stations cannot transmit digital modes above 3600 kHz. Find the new BARTG band plan and full rules at <https://bit.ly/3jEqNEy>.

The first weekend of April has the **SP DX Contest**, sponsored by Polish Amateur Radio Union and the SP DX Club. Hams around the world work Polish stations, copying the one-letter province designator as the exchange; provinces count as multipliers on each band. Non-SP stations send a serial number. This contest had been cancelled in 2022 in response to the Russian invasion of Ukraine as Polish citizens mobilized to accommodate a flood of refugees. The contest starts at 1500 UTC Saturday, April 1st, and runs for 24 hours. A helpful list of Polish province multipliers are in the full rules at <https://bit.ly/3jeRMqq>.

April 29-30th is the **Florida QSO Party.** This is one of the more popular QSO parties. Rovers move around handing out multiple Florida counties, and CW contacts count for more points than SSB, highly motivating heavy CW efforts. See <https://floridaqsoparty.org> for the rules.

propagation

BY TOMAS HOOD,* NW7US

Exceeding Expectations

Quick Look at Current Cycle 25 Conditions:
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, December 2022: **113**
12-month smoothed, June 2022: **81**

10.7-cm Flux:
Observed Monthly, December 2022: **148**
12-month smoothed, June 2022: **123**

One Year Ago:
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, December 2021: **69**
12-month smoothed, June 2021: **28**

10.7-cm Flux:
Observed Monthly, December 2021: **87**
12-month smoothed, June 2021: **103**

As we pointed out before: One recent study suggests that Cycle 25 could be one of the strongest since record keeping began. Look at the progress of the cycle in *Figure 1*. The latest 10.7-cm Radio Flux for the month of January 2023 was 182.5, much higher than the predicted 100.4. Clearly, we are witnessing a much stronger cycle than predicted.

March Shortwave Propagation

March is one of the optimal DX months. As the spring equinox approaches, the gray line begins to run straight North and South. With the return of sunlight to the polar north, the higher high-frequency (HF) bands are quickly improving over conditions we witnessed during winter.

Ten meters will be a strong worldwide DXing band, with the most reliable propagation along north-south paths, plus strong but shorter openings occurring between stations on east-west paths into Asia and Europe. These paths will quickly disappear as we move into April, so don't miss out.

Twelve and 15 meters will be even more usable than the 10-meter band. We will find 15 meters staying open longer into the evenings, being the band of choice as we move through the month and into April. Daytime paths will not degrade much until midsummer. You will see more early closures if you live closer to the North Pole.

Seventeen and 20 meters will remain in good shape and both short- and long-path circuits should be reliable and solid. All nighttime paths will be wide open during March with primetime being the evening hours in the U.S. as they are sunrise hours across Russia, Africa, and both the Near and Far East. Expect a lot of short- and long-path DX into these areas of the world.

Between sunset and midnight, expect DX openings on all bands between 20 and 160 meters, with occasional openings on 15 and 17 when conditions are high or above normal. Conditions on 30, 40, 60, 80, and 160 meters should favor openings to the east and south. These bands should peak for openings to Europe and Africa near midnight.

From midnight to sunrise, expect optimum DX conditions on 30, 40, 60, 80, and occasionally, 160 meters. Conditions should favor openings toward the west and south. Some rather good 20-meter openings should also be possible toward the south and west during this time.

Daytime MUFs continue to drop and the planetary index (A_p) is on the rise, so take advantage of the current excellent conditions, and work the world!

VHF Conditions

Check for low-VHF short-skip openings during the daylight hours. Some short-skip openings over distances of about 1,200-2,300 miles may occur. The best times for such openings are during the afternoon hours.

Auroral activity often occurs during periods of radio storminess on the HF bands. Look for days where the A_p is climbing and when the K index (K_p) reaches 4 or higher. These are the days on which VHF auroral-type openings are most likely to occur.

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for March 2023

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 1-8, 13, 15-16, 18-21, 23-31	A	A	B	C
High Normal: 9-10, 12, 14, 17, 22	A	B	C	C-D
Low Normal: 11	B	C-B	C-D	D-E
Below Normal: n/a	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 **4** will be excellent on March 1st through March 10th, good on March 11th, then excellent again the rest of the month.

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.

There are no major meteor showers during March that could provide any VHF meteor scatter propagation. For a detailed list of meteor showers, check out <https://tinyurl.com/rnfkd2d8> for a complete calendar of meteor showers in 2023.

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 December 2022 is 113.1. The 12-month running smoothed sunspot number centered on June 2022 is 80.9. A smoothed sunspot count of 87, give or take about 9 points, is expected for March 2023.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 148.46 for December 2022. The 12-month smoothed 10.7-cm flux centered on June 2022 is 122.7. The predicted smoothed 10.7-cm solar flux for March 2023 is 122, give or take 7 points.

Geomagnetic activity level this month is expected to range from quiet to stormy, resulting in occasional degraded propagation this month. 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*

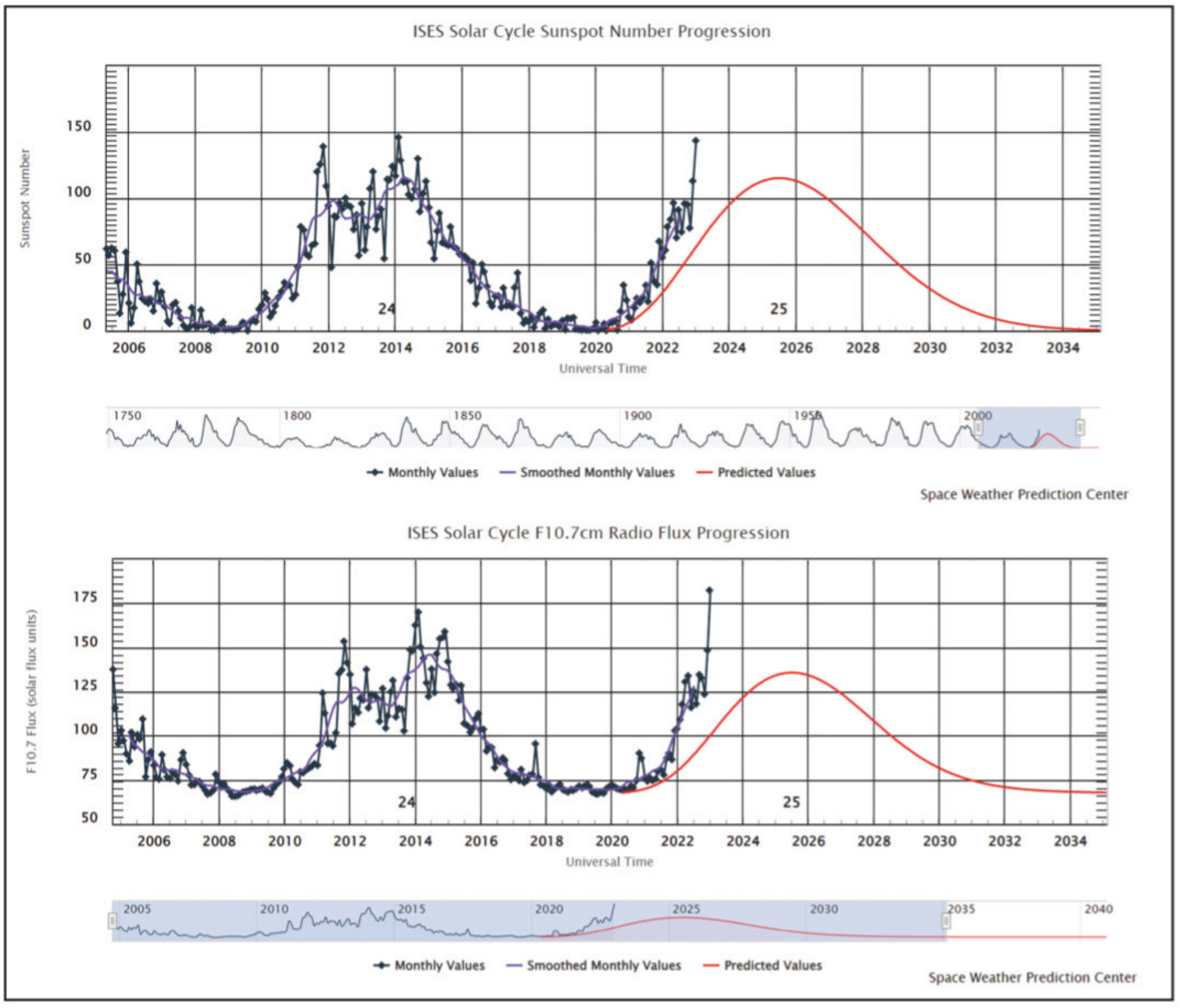


Figure 1. Cycle 25 is far outpacing the forecast! The latest monthly F10.7-cm exceeds any month in the last cycle, Cycle 24! The monthly sunspot count is also nearing the number at the peak of Cycle 24. And, we are not at the peak of this cycle, yet. We have potentially several more years to sunspot cycle peak, expected in 2025. (Courtesy of SWPC/NOAA)

announcements *(from page 92)*

a.m. to 2 p.m., Sunday, March 26 at The Hennicker Community School, 51 Western Avenue. Phone: (603) 428-3840. Email: <fest@k1bke.org>. Website: <https://k1bke.wordpress.com>. Talk-in 146.895- (PL 100). VE exams.

SOUTHINGTON, CONNECTICUT — The Southington Amateur Radio Association will hold its **Flea Market** from 8:30 a.m. to noon, Sunday, March 26 at Southington High School, 720 Pleasant Street. Contact: Bob, K1HSN, (860) 628-4808. Email: <w1cev@arrl.net>. Website: <www.chetbacon.com/sara>. Talk-in 147.345 (PL 151.4), 145.49, or 145.17 (PL 77). VE exams.

APRIL

CORINTH, MISSISSIPPI — The Alcorn County ARES will hold the April Fool – Jess Ables Memorial Hamfest from 9 am. to 5 p.m., Saturday, April 1 and from 8 a.m. to noon, Sunday, April 2 at the Crossroads Arena, 2800 South Harper Road. Email: <Harold.butler@me.com>. Website: <www.acares.reiselt.com>. Talk-in 146.925. VE exams.

CLAREMORE, OKLAHOMA — The Green Country Hamfest 2023 and the **2023 ARRL Oklahoma Section Convention** will be held from 4-9 p.m., Friday, April 7 and from 8 a.m. to 3 p.m., Saturday, April 8 at the Claremore Expo Center, 400 Veterans Parkway. Email: <info@greencountryhamfest.org>. Website: <www.greencountryhamfest.org>. Talk-in 147.090+ (PL 88.5). VE exams, DXCC / WAC / WAS / VUCC card checking.

HAMPTON, NEW HAMPSHIRE — The Port City Amateur Radio Club will hold the **Seacoast Amateur Radio Flea Market** from 8 a.m. to noon, Saturday, April 8 at the St. James Masonic Lodge, 77 Tide Mill Road. Contact: Steve Roberts, KC1ILT, <kc1ilt@maine.rr.com>. Website: <www.w1wqm.org>. Talk-in 145.150- (PL 127.3). VE exams.

HAYES, VIRGINIA — The Middle Peninsula Amateur Radio Club will hold the **3rd Annual Gloucester Hamfest** from 9 a.m. to 4 p.m., Saturday, April 8 at the Abingdon Ruritan Club, 8784 Guinea Road. Contact: Joy Safrenek, (757) 871-7772. Email: <w2jms2001@gmail.com>. Talk-in 145.370.

RALEIGH, NORTH CAROLINA — The Raleigh Amateur Radio Society will hold **RARSfest** and the **2023 ARRL Roanoke Division Convention** from 8 a.m. to 3 p.m., Saturday, April 8 at the Jim Graham Building, NC State Fairgrounds, 4285 Trinity Road. Contact: Chuck Littlewood, K4HF, (919) 630-9358. Email: <k4hf953@yahoo.com>. Website: <www.rarsfest.org>. Talk-in 146.64. VE exams.

CUYAHOGA FALLS, OHIO — The Cuyahoga Falls Amateur Radio Club will hold its 67th Annual Hamfest from 8 a.m. to 1 p.m., Saturday, April 15 at the Emidio & Sons Expo Center, 48 E. Bath Road. Contact: Bruce Ferry, (330) 790-1680. Email: <hamfest2023@w8vpv.org>. Website: <www.w8vpv.org/hamfest>. Talk-in 147.270+ (PL 110.9) or 444.850+ (PL 110.9). Free VE exams.

GEORGETOWN, DELAWARE — The Sussex Amateur Radio Association will hold the **Georgetown Hamfest** and **2023 ARRL Delaware State Convention** beginning 8 a.m., Saturday, April 15 at the Cheer Community Center, 20520 Sand Hill Road. Contact: Jamie, W3UC, (410) 202-7690. Email: <hamfestdelaware@gmail.com>. Website: <www.radioelectronicsexpo.com>. Talk-in 147.090 (PL 156.7). Free VE exams, DXCC / VUCC / WAS / WAC card checking.

ROSWELL, NEW MEXICO — The Pecos Valley Amateur Radio Club will hold the Second Annual PVARC Alien City Hamfest from 8 a.m. to 2 p.m., Saturday, April 15 at Beginnings, 3908 SE Main Street. Contact Gerald Cox, WØCOX, (575) 840-8586. Email: <w0cox@gmai.com>. Website: <www.pecosvalleyarc.com>. Talk-in 147.320 (PL 146.2).

STOUGHTON, WISCONSIN — The Madison Area Repeater Association will hold the 52nd Annual Madison Hamfest from 8 a.m. to noon, Saturday, April 15 at the Mandt Community Center, 400 Mandt Parkway. Phone: (608) 205-1994. Email: <hamfest@w9hsy.org>. Website: <www.w9hsy.org>. Talk-in 147.150+ (PL 123). VE exams.

ELIZABETH, PENNSYLVANIA — The Two Rivers Amateur Radio Club will hold the **51st Annual Amateur Radio / Computer Show** 8 a.m. to 2 p.m., Sunday, April 16 at the Elizabeth VFD Bingo Hall, 101 South 1st Avenue. Contact: Bill Powers (412) 260-5699 or Del Peterson (412) 974-9695. Email: <hamfestchairman@trarc.net>. Website: <www.trarc.net>. Talk-in 146.73. VE exams.

DOVER, OHIO — The Tusco Amateur Radio Club will hold its **2023 Hamfest, Computer & Electronics Show** from 8 a.m. to 1 p.m., Saturday, April 22 at the Tuscarawas County Fairgrounds, 259 S. Tuscarawas Avenue. Contact: Rick Dingman, KE8URA, (303) 934-0575 or Cindy Gray, KE8JNN, (330) 340-4946. Email: <w8zx@n8bag.bet>. Website: <www.w8zx.net>. Talk-in 146.730.

LANDING, NEW JERSEY — The Splitrock Amateur Radio Association will hold the **2023 North Jersey Tailgate Hamfest** beginning 8 a.m., Saturday, April 22 at the Landing Park Recreation Complex, 165 Landing Road. Email: <hamfest@splitrockara.org>. Website: <www.splitrockara.org>. Talk-in 146.985- (PL 131.8). DXCC card checking.

SONOMA, CALIFORNIA — The Valley of the Moon Amateur Radio Club will hold its **Hamfest 2023** from 8 a.m. to noon, Saturday, April 22 at the First Congregational Church of Sonoma, 252 W. Spain Street. Email: <valleyofthemoonarc@gmail.com>. Website:<www.vomarc.org>. Talk-in 145.350 (88.5). VE exams, fox hunt.

ODENTON, MARYLAND — The Maryland Mobileers Amateur Radio Club will hold the **MMARC Spring Hamfest** from 7:30 a.m. to noon, Sunday, April 23 at the Odenton Volunteer Fire Department, 1425 Annapolis Road (Rt. 175). Contact: Bruce, AB3AC, (410) 456-2500. Email: <bmcpherson73@verizon.net>. Website: <https://tinyurl.com/2p935p6k>. Talk-in 146.805- (PL 107.2).

OCALA, FLORIDA — The Marion County Emergency Radio Team will air a special event station **KG4NXO** from 1200-2359 UTC, Saturday, April 29 to celebrate 20 years of amateur radio support for Marion County Emergency Management. Frequencies include 14.262, 7.262 MHz and D-STAR on 146.790 MHz REF 037. Request further information about Certificate & QSL at the website <www.mert20.org>.

SPRING GROVE, PENNSYLVANIA — The York Hamfest Foundation will hold the **2023 York Hamfest** from 8 a.m. to 1 p.m., Saturday, April 29 at Elicker's Grove Park, 511 Roth Church Road. Email: <duane.sternee@yahoo.com>. Website: <www.yorkhamfest.org>. Talk-in 147.330+ (PL 123). Free VE exams, DXCC / VUCC / WAS / WAC card checking.

MAY

CADILLAC, MICHIGAN — The Wexaukee Amateur Radio Club will hold the **63rd Annual Cadillac Amateur Radio and Computer Swap** beginning 8 a.m., Saturday, May 6 at the Mackinaw Trail Middle School, 8401 S. Mackinaw Trail. Website: <www.wexaukee.org>. Talk-in 146.980. VE exams, card checking.

CEDARBURG, WISCONSIN — The Ozaukee Radio Club will hold its **43rd Spring Indoor Swapfest** from 8 a.m. to noon, Saturday, May 6 at the Ascension Columbia St. Mary's Center, W67N890 Washington Avenue. Contact Tom Trethewey, KC9ONY, (262) 421-6351. Email: <swapfest@ozaukeeradioclub.org>. Website: <www.ozaukeeradioclub.org>. Talk-kin 146.97- (PL 127.3).

SANDWICH, ILLINOIS — The Kishwaukee Amateur Radio Club will hold **The DeKalb Hamfest** from 8 a.m. to 1 p.m., Sunday, May 7 at the Sandwich Fairgrounds, 1401 Suydam Road. Contact: Bob Yurs, W9ICU, (815) 757-3219. Email: <w9icu@arrl.net>. Website: <www.karc-club.org>. Talk-in 146.730- (PL 100).

TOLEDO, OHIO — The Lucas County ARES will hold its **Trunk Sale & Swap Meet** from 9 a.m. to 1:30 p.m., Sunday, May 7 at the Toledo Speedway, 5639 Benore Road. Phone: (419) 370-2882. Email: <swap@lucasares.org>. Website: <http://swap.lucasares.org>. Talk-in 146.940- (PL 103.5).

PRESCOTT VALLEY, ARIZONA — The Yavapai Amateur Radio Club will hold the **2023 Prescott Hamfest** from 8 a.m. to noon, Sunday, May 13 at the Granville Elementary School, 5250 Stover Drive. Contact: John Stover, KT7P, <hamfest@w7yrc.org>. Website: <www.prescotthamfest.org>. Card checking.

STANWOOD, WASHINGTON — The Stanwood-Camano Amateur Radio Club will hold the **SCARC 30th Annual Electronic Flea Market & Hamfest** from 9 a.m. to 1 p.m., Saturday, May 13 at the Stanwood Middle School, 9405 271st Street NW. Email: <scarchamfest@yahoo.com>. Website: <www.scarcwa.org>.

XENIA, OHIO — The Dayton Amateur Radio Association will hold the **Dayton Hamvention 2023** from 9 a.m. to 5 p.m., Friday, May 19; 9 a.m. to 5 p.m., Saturday, May 20; and 9 a.m. to 1 p.m., Sunday, May 21 at the Greene County Fair and Expo Center, 210 Fairground Road. Phone: (937) 276-6930. Email: <info@hamvention.org>. Website: <www.hamvention.org>. Talk-in 146.94- (PL 123). VE exams, card checking, special event station W8BI.

behind the bylines...

… a little bit about some of the authors whose articles appear in this issue.

Steven K. Smith, K3SKS ("Persistent Practice Produces Positive POTA Progress," p. 25), retired five years ago from a career in electrical engineering. He is now putting his skills to use in building and improving the ham station that he shares with his wife, Judy, KC3JAS, who has become very active as an "activator" in the Parks on the Air (POTA) program. A ham since 2017, Steven upgraded to Extra only three months after passing his Technician exam and is now a Volunteer Examiner himself, working with a group that conducts regular licensing classes, exam sessions and new ham workshops. He and Judy live in DuBois, Pennsylvania.

Bob Herklotz, K4HRK ("A Collapsible Tri-Band Antenna…" p. 33), is an Extra Class ham and a member of the Maury County Amateur Radio Club in Columbia, Tennessee. His lifelong interest in radio and electronics was sparked by listening to shortwave on his grandparents' RCA "Magic Eye" console radio when just a kid. A retired auto industry maintenance planner, he is currently winding down his "retirement business," Fresh Aero Aviation, to spend more time on other pursuits — like ham radio.

Nicholas Petreley, N2EWS ["The Continuing Anticlimactic Adventures of the Perverted V (Part 3)," p. 38], was an award-winning columnist for the computer journal *InfoWorld* in a former life; a teacher, consultant, and programmer in a former, former life, and is currently a technical consulting engineer for Cisco Systems, Inc. You can reach him at <nicholas@petreley.com>.

Tom Weaver, WØFN ("Learning Morse Code Instant Character Recognition," p. 40), first became a ham in 1977 but let his license lapse and returned in 2018 — immediately jumping to Extra Class! After discovering CW Academy in 2019, he quickly became not only a code aficionado, but a CW Academy Advisor and, last summer, began coaching Instant Character Recognition — the subject of his article — for the Long Island CW Club. Until the COVID pandemic, he also taught indoor rock-climbing! Steven and his wife live in Des Moines, Iowa.

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Number groups after callsigns denote the following: Band, Final Score, QSOs, Zones, Countries, US/VE QTHs. An asterisk (*) indicates low power. Certificate winners are listed in boldface. Late logs are listed in italics.

2022 CQWW DX RTTY RESULTS

SINGLE OPERATOR NORTH AMERICA

United States

District 1

K5ZD	**A**	**4,273,200**	**3102**	**100**	**289**	**211**
NG1M	"	986,232	1187	68	167	142
AE1P	"	981,848	1226	62	168	126
KA1YQC	"	571,890	843	52	149	129
K2RB	"	258,213	460	50	124	75
W1GD	"	143,166	265	50	120	53
K1BZ	"	136,246	304	52	101	89
K1SM	"	117,820	330	34	72	66
K3IU	"	76,680	210	35	83	24
AA1SU	"	38,295	187	23	41	47
***W1UE**	**A**	**420,462**	**617**	**54**	**148**	**80**
*W1HY	"	241,379	475	55	131	95
*K7RB	"	178,605	390	50	95	100
*W1DYJ	"	144,460	311	50	97	86
*K1VW	"	108,800	292	35	90	75
*W1IG	"	101,672	277	36	87	56
*AF1R	"	67,872	204	37	71	60
*KA1C	"	65,910	200	40	68	61
*WV1H	"	53,098	180	32	68	39
*KG1V	"	47,278	159	37	61	56
*KB1IKD	"	22,932	130	23	43	32
*KC1SA	"	22,842	111	19	47	28
*W1ZFG	"	3,796	40	15	20	17
*N2HX	"	2,989	48	16	13	32
*AA1NK	"	1,694	72	21	23	33
***W1QK**	**21**	**123,684**	**467**	**24**	**68**	**40**
*NY1E	"	49,162	271	18	44	32
*AB1J	"	8,208	75	15	25	17
***KC1RET**	**14**	**5,508**	**65**	**9**	**23**	**22**
***K9JY**	**7**	**25,315**	**169**	**13**	**37**	**33**
K1LZ	**AA**	**4,929,804**	**2956**	**115**	**365**	**228**
				(OP: LU9ESD)		
W1DX	"	1,095,040	1025	92	251	129
				(OP: W1AN)		
W1ARY	"	519,479	737	64	163	134
K1AR	"	406,098	641	57	138	98
KB1W	"	340,083	576	42	130	89
NF1O	"	152,880	307	53	114	78
NE1F	"	138,402	280	52	106	75
WA1ZYX	"	99,414	342	31	67	91
KV1J	"	80,444	223	41	74	67
W1HS	"	16,926	106	21	40	30
N1MGO	"	4,896	50	9	21	18
***KI1G**	**AA**	**958,760**	**977**	**78**	**213**	**149**
*KA2KON	"	381,364	637	42	134	92
*N1DID	"	208,740	364	53	134	58
*KX1X	"	91,164	224	52	95	66
*N1API	"	90,365	285	32	81	42
*WB1AEL	"	37,680	131	35	57	28
*AE1EZ	"	26,730	119	23	51	36
*K1TNX	"	16,422	93	32	42	28
*ND1X	"	15,228	76	23	50	8
*N1DCH	"	2,448	32	17	19	15
*W1MI	"	1,927	29	12	11	18

District 2

KD2UBH	**A**	**278,460**	**540**	**61**	**131**	**123**
WS9M	"	213,759	417	60	122	91
KC2GOW	"	174,484	403	31	86	64
K2XA	"	136,656	309	51	98	70
WA3AFS	"	87,361	225	51	94	54
KD2DVW	"	58,100	206	32	58	76
AD2BO	"	18,360	96	34	38	48
WA3RGY	"	16,290	81	25	42	23
KC2KZJ	"	1,690	23	8	16	2
KU2M	**14**	**384,122**	**1107**	**25**	**73**	**51**
WB2WPM	**7**	**15**	**2**	**2**	**2**	**1**
***AC2RL**	**A**	**209,296**	**395**	**49**	**120**	**85**
*WB2COY	"	179,103	423	39	91	97
*KI2D	"	168,910	383	50	107	109
*W2FDJ	"	149,760	325	49	103	82
*K2TWI	"	126,252	277	38	105	46
*AC2OC	"	84,854	225	49	86	68
*KR2D	"	84,600	206	44	86	58
*KS2G	"	63,882	198	38	76	55
*ND2K	"	59,200	209	41	60	59
*W2DXE	"	56,420	202	32	66	57
*WA2QAU	"	46,200	182	31	63	38
*WA2VAM	"	26,035	155	29	38	60
*K3WHD	"	24,225	116	24	51	20
*WO2Y	"	21,930	98	20	55	11
*WB2KWC	"	6,552	64	15	21	27
*AC2ZZ	"	3,700	35	16	23	11
*KC2DVD	"	1,782	32	7	16	10
*KD2KEH	"	360	21	7	4	19
*KD2CQ	"	154	7	5	6	3
*N2OMD	"	3	1	1	1	1
***KB2DSQ**	**14**	**12,544**	**117**	**12**	**27**	**25**
***W2VTV**	**7**	**40,837**	**278**	**13**	**42**	**42**
K2RET	**AA**	**1,040,337**	**1048**	**82**	**232**	**163**
K4RUM	"	720,846	936	65	174	139
WA2DNI	"	672,640	1030	52	150	118
AA2GF	"	639,111	956	54	147	120
N2KI	"	635,040	881	70	182	126
N2WK	"	624,915	752	75	208	122
K4KGG	"	367,079	592	60	151	120
W2JV	"	256,360	490	47	117	68
NN2NN	"	251,592	476	50	117	97
N2RC	"	236,697	325	71	175	61
AB2ZY	"	177,855	396	32	97	84
K2NV	"	157,251	389	36	91	32
KE1IH	"	152,334	309	47	113	57
WB2NVR	"	92,456	254	38	78	66
K2QB	"	50,728	197	28	59	49
KA2K	"	40,950	136	32	74	44
AB2E	"	16,928	104	21	33	38
NG2P	"	8,374	58	14	32	7
N2NI	*"*	*6,052*	*48*	*22*	*26*	*20*
N8CL	"	5,610	55	18	23	25
K2QO	"	5,394	47	16	24	18
WT2J	**21A**	**99,081**	**363**	**21**	**64**	**24**
***W2NO**	**AA**	**396,772**	**545**	**60**	**176**	**117**
*WB2PJH	"	272,448	419	63	145	80
*KC2WUF	"	116,550	290	47	95	68
*W2LCQ	"	70,952	281	36	78	82
*NJ2DX	"	8,008	52	18	37	1
*K1NY	"	5,040	40	17	25	14
***NM2K**	**21A**	**84,863**	**308**	**22**	**60**	**31**
***W2CG**	**14A**	**86,100**	**297**	**22**	**73**	**10**

District 3

WC3N	**A**	**378,160**	**605**	**55**	**143**	**92**
K2EJ	"	192,696	352	48	116	58
4U1WB	"	120,900	477	37	54	95
				(OP: AJ3M)		
AK3B	"	116,630	308	48	94	76
N3DUE	"	101,972	260	47	86	79
N3MWQ	"	100,700	271	40	86	64
K3UL	"	65,685	207	35	75	35
NT3U	"	55,296	246	23	46	75
KC3NNO	"	48,840	164	27	84	0
K3ATO	"	46,472	173	37	66	45
KG4USN	"	35,505	126	36	61	38
N3RM	"	35,500	136	30	71	24
NS3L	"	14,350	99	17	32	33
AI3Q	**14**	**142,128**	**540**	**17**	**56**	**39**
N3RW	"	7,791	73	9	30	10
K3RWN	**3.5**	**6,490**	**113**	**7**	**12**	**36**
W3LL	"	2,640	45	5	12	16
***KC3SDJ**	**A**	**57,986**	**201**	**35**	**63**	**60**
*AI3KS	"	53,988	181	32	71	29
*K3LT	"	40,081	143	38	67	44
*KB3LIX	"	33,360	128	27	61	32
*AB3GY	"	30,607	146	28	41	58
*N3MLB	"	19,910	104	26	49	35
*N3JNX	"	18,700	93	24	40	36
*N2MA	"	10,744	66	22	39	18
*WD8RYV	"	10,283	83	24	37	30
*KN1OLA	"	9,017	72	16	24	31
*K2PMD	"	6,612	61	13	25	20
*WF3W	"	2,030	39	18	24	16
***N3TKG**	**28**	**2,688**	**51**	**11**	**14**	**7**
***W3ZGD**	**21**	**11,122**	**86**	**17**	**34**	**16**
				(OP: WB3FQI)		
***KB3AAY**	**14**	**91,375**	**388**	**20**	**57**	**48**
*KE3ZT	"	4,794	53	10	17	20
*K3UA	"	1,664	39	7	8	17
***WA3FAE**	**7**	**52,392**	**268**	**19**	**48**	**44**
AA3B	**AA**	**5,452,090**	**3375**	**115**	**361**	**234**
K3MM	"	3,210,300	2217	113	339	223
N3QE	"	2,583,999	1983	99	301	207
W3FV	"	1,808,460	1548	88	255	167
K3WW	"	1,445,995	1299	88	240	163
W3FIZ	"	1,437,735	1317	89	249	167
K3WJV	"	863,464	834	83	221	172
N3FJP	"	495,690	741	61	133	116
KD3TB	"	418,236	545	73	175	116
W3UL	"	302,395	507	66	134	107
N3AML	"	264,888	476	57	127	99
WT3K	"	249,655	422	58	130	57
NN3RP	"	209,096	455	36	112	88
NF3R	"	202,797	372	57	116	88
WA3AAN	"	190,720	411	44	114	98
NX3Z	"	133,515	319	44	106	65
K3MD	"	99,716	300	41	83	70
AG4Q	"	97,384	293	40	74	74
K3FH	"	81,286	225	44	78	72
K3OQ	"	56,112	206	18	57	37
WY3A	"	43,605	135	52	70	49
K3RMB	"	29,040	137	29	48	43
W2CDO	"	23,443	124	26	42	51
W3OU	"	22,338	96	25	47	30
KA3D	"	17,328	74	37	50	27
AA3S	"	16,324	89	12	42	23
KG5TA	"	14,946	84	30	32	44
KB3Z	"	12,615	87	21	39	27
N3FZ	"	10,318	75	17	35	25
K3AU	"	3,864	33	16	26	4
KA3YJM	"	2,091	34	13	13	15
NA3M	**7A**	**83,570**	**317**	**20**	**66**	**51**
***W3KB**	**AA**	**502,541**	**547**	**74**	**196**	**133**
*K3AK	"	233,856	466	44	112	105
*AC5XK	"	227,971	536	50	109	118
*K3QP	"	182,971	392	37	113	79
*KC3SVR	"	109,817	299	38	93	62
*K3QIA	"	82,908	224	42	76	70
*N3AM	"	44,240	141	39	78	23
*KC3UDO	"	40,590	271	36	62	67
*N3GT	"	34,220	154	25	51	42
*W3TAS	"	22,684	108	27	44	35
*W3MAM	"	1,599	30	10	9	20
***W3IDT**	**21A**	**10,230**	**118**	**17**	**28**	**21**
***K3JSJ**	**7A**	**3,000**	**66**	**6**	**8**	**26**

District 4

KØZR	**A**	**2,295,756**	**2072**	**87**	**243**	**192**
AC8Y	"	835,052	1108	65	166	151
WS6X	"	601,839	836	65	168	136
AI4WW	"	547,856	908	67	146	140
W4VIC	"	524,835	745	63	154	104
W4CQE	"	453,492	704	62	141	103
K4ZW	"	445,775	669	48	135	92
W4WWQ	"	296,980	480	63	143	104
N4CF	"	261,072	458	65	127	102
AD4TJ	"	206,184	408	61	111	92
ND8L	"	198,302	354	56	131	76
W3SA	"	193,200	400	47	103	90
W4BBT	"	170,478	463	50	85	111
K8KI	"	169,048	387	46	100	80
WF4W	"	158,916	391	52	90	104
W4UK	"	123,714	395	29	72	73
K7OM	"	121,142	311	61	87	90
W4OX	"	109,200	260	44	82	74
NN4SS	"	89,590	223	40	83	47
ND4G	"	76,824	205	42	78	74
K9EZ	"	74,481	255	36	66	81
N3KN	"	67,431	207	35	77	57
KO8V	"	61,408	199	34	66	52
K3WR	"	38,771	146	41	58	38
K4NWX	"	32,943	121	41	57	41
K9GWS	"	19,089	102	26	42	33
K4KZ	"	18,270	98	26	43	36
W7HJ	"	16,590	96	29	42	34
K4EES	"	13,674	85	22	31	33
AB4IQ	"	7,744	58	14	27	23
WO4O	**28**	**75,786**	**313**	**20**	**54**	**28**
AA5JF	"	40,836	204	21	44	18
KEØL	**7**	**12,462**	**150**	**11**	**17**	**39**
***N9TF**	**A**	**411,943**	**649**	**66**	**146**	**131**
*N4MMR	"	186,633	447	39	97	97
*K4MIL	"	168,256	358	43	107	89
*K4BX	"	151,369	429	45	78	106
*N5SMQ	"	142,205	351	52	89	98
*KW4J	"	137,460	306	53	91	93
*W4PJW	"	117,912	343	36	75	93
*NN4RB	"	115,560	280	50	90	76
*AC4G	"	112,320	253	55	98	63
*K4FTO	"	110,448	291	42	82	84
*W4TM	"	110,308	281	48	89	81
*W4DAN	"	105,300	280	59	89	86
*N4QI	"	97,614	283	40	78	69
*KS4X	"	84,825	231	41	77	77
*AE4Y	"	71,060	245	33	63	74
*K4YCR	"	65,072	192	38	78	50
*K9QJS	"	58,384	202	45	62	57
*KB4MIS	"	52,480	234	28	51	81
*WA8OJR	"	51,997	203	38	61	64
*K4FJW	"	49,856	176	45	60	59
*AI4DB	"	47,988	217	42	56	74
*KA4JRY	"	47,056	207	32	54	50
*KB4S	"	41,031	155	31	56	54
*W2DEN	"	32,625	135	35	47	43
*W4AFB	"	30,360	138	29	50	41
*N4KXO	"	25,748	164	41	62	54
*NG4L	"	23,312	119	35	39	50
*KE4QCM	"	19,656	97	35	46	36
*KO4OL	"	16,940	101	29	31	50
*K3YDX	"	16,912	83	31	40	41
*KT4DW	"	15,040	101	26	30	38
*K4MI	"	13,674	77	26	36	24
*K4HAL	"	12,760	94	22	26	40
*KT6D	"	11,680	68	24	41	15
*N8AID	"	8,890	57	19	37	14
*KG3V	"	6,600	54	21	29	25
*K3NC	"	6,438	58	15	27	16
*KO4IFG	"	4,661	51	19	19	21
*AE4WG	"	4,599	53	15	17	31
*KI4WVW	"	3,108	28	16	26	0
*AA5UN	"	1,922	32	13	18	0
*K4KGM	"	1,517	27	15	17	9
***K4WI**	**28**	**20,658**	**171**	**19**	**32**	**15**
***WA1FCN**	**21**	**111,531**	**446**	**22**	**63**	**28**
***W4LC**	**14**	**99,712**	**390**	**18**	**61**	**49**
*KC4HW	"	8,131	96	7	20	20
*NC4MI	"	3,800	45	7	18	15
*N4KGL	"	506	16	6	5	11
***W6HGF**	**7**	**25,502**	**220**	**12**	**28**	**42**
*NS4T	"	2,700	47	12	12	21
*AD4EB	"	54	5	2	2	5
N1RM	**AA**	**1,621,829**	**1272**	**100**	**275**	**142**
N6AR	"	1,316,799	1214	94	253	170
WJ2D	"	1,087,120	1107	85	225	118
W4TTY	"	1,078,191	1048	89	242	128
WB4YDL	"	986,328	1215	75	189	148
N4IQ	"	932,558	1198	74	195	168
AA4DD	"	900,028	933	88	212	146
AG4W	"	805,980	950	71	184	125
KG4W	"	682,420	719	84	213	161
NS4X	"	486,411	833	52	134	95
K3IE	"	328,563	530	58	147	78
N2TU	"	326,019	487	63	177	87
K5VIP	"	310,878	414	66	171	105
KT4O	"	283,360	461	68	149	105
N4YDU	"	266,880	412	74	147	99
N4QS	"	234,720	446	53	120	67
AC4MC	"	232,120	449	58	114	108
W4GHV	"	163,744	308	58	123	57
N4TL	"	139,120	305	57	99	79
W3GQ	"	96,579	241	43	89	57
NN4NT	"	79,740	217	41	80	59
W1AJT	"	73,284	149	53	120	13
NF4A	"	60,955	199	39	64	64
K5ZQ	"	44,748	138	35	78	0
K4RO	"	43,522	172	24	56	14
AF4T	"	37,638	144	38	59	56
KN4PHS	"	33,702	150	34	46	43
W4PF	"	31,339	119	28	61	32
KB4QZH	"	13,098	80	13	44	2
K3WA	"	5,590	48	21	25	19
K4QQG	"	1,855	37	7	9	19
AJ4A	"	594	11	9	9	0
K4EA	**21A**	**454,140**	**1020**	**32**	**103**	**45**
WW4LL	"	385,616	971	28	94	54
W4GKM	*14A*	*47,712*	*249*	*17*	*43*	*36*
***KG4IGC**	**AA**	**276,735**	**536**	**55**	**122**	**108**
*W4EE	"	196,779	378	57	116	94
*K2MK	"	195,584	436	53	103	100
*N8IK	"	57,200	201	25	59	59
*W9SN	"	41,400	181	21	54	25
*W4NNF	"	38,860	157	37	54	54
*WAØWHT	"	32,368	134	27	53	32
*N4NTO	"	32,195	134	35	48	54
*WN8Y	"	27,233	149	31	60	22
*N3MM	"	20,905	102	32	47	34
*KT3T	"	18,620	97	26	44	25
*K3ABE	"	17,202	122	33	51	38
*N1KX	"	10,428	55	28	50	1
*N3CW	"	6,213	52	14	27	16
*N3GTG	"	4,968	51	19	25	25
*K4FT	"	1,925	36	16	13	26
**KS4S*	*"*	*1,776*	*26*	*12*	*13*	*12*
*KM5AT	"	1,128	27	16	12	19
***N3UA**	**21A**	**146,727**	**461**	**24**	**77**	**36**
***KA4RRU**	**14A**	**187,340**	**558**	**25**	**76**	**44**

District 5

AD5XD	**A**	**993,960**	**1303**	**84**	**182**	**174**
WQ5L	"	794,313	1061	74	163	166
WA9JBR	"	144,807	318	50	97	90
AD5A	"	102,300	366	31	41	114
N2IC	"	71,500	306	22	44	64
AK5Y	"	34,342	180	31	34	89
AA5SH	"	30,858	125	40	49	50
WV5Y	"	12,120	87	29	25	47
K5XH	"	7,920	82	11	18	37
W5ZP	"	7,200	48	30	43	2
W5KI	"	4,332	40	21	20	16
W5PR	**28**	**81,730**	**401**	**20**	**48**	**42**
N8OO	**14**	**527,823**	**1530**	**28**	**89**	**56**
N5KAE	"	2,280	34	10	16	14
WØZW	**3.5**	**7,280**	**109**	**10**	**9**	**37**
***K5CS**	**A**	**385,776**	**616**	**73**	**141**	**128**
*K5TXM	"	382,725	796	64	113	138
*NK5G	"	308,476	619	62	112	148
*WB5BHS	"	261,478	646	45	89	132
*AJ4F	"	225,498	506	57	95	121
*NN5T	"	181,844	393	60	92	117
*AD5LU	"	166,060	451	50	87	93
*WB5JJJ	"	156,870	370	54	96	99
*WA5LFD	"	145,200	332	63	98	103
*W5ITR	"	141,086	432	48	66	128
*N5XE	"	91,980	256	55	80	75
*K5LY	"	83,142	296	44	62	80
*KF5KWO	"	49,572	231	34	43	85
*WB5K	"	48,900	239	33	39	91
*N5KWN	"	41,616	190	33	48	63
*KG5U	"	21,094	115	25	37	44
*AE5MI	"	19,278	119	29	30	67
*K5AEB	"	9,990	80	26	27	37
*W5KY	"	9,579	91	22	21	50
*KC2LM	"	5,214	53	17	17	32
*AE5P	"	4,503	55	13	15	29
*KF5RLL	"	2,660	30	14	20	1
*WS5D	"	432	16	6	4	14
*N5AF	"	60	4	4	4	4
***KD5ILA**	**28**	**3,528**	**62**	**13**	**17**	**6**
*N5WE	"	2,201	36	12	11	8
*K5QR	"	1,430	24	9	12	1
*KI6HQT	"	6	1	1	1	0
***AF5CC**	**21**	**5,450**	**80**	**12**	**15**	**23**
WBØTEV	**AA**	**719,600**	**679**	**107**	**258**	**195**
AA5H	"	588,141	734	82	188	141
NT5V	"	385,875	686	61	115	139
W9DCT	"	211,671	386	60	114	87
KD5DD	"	104,384	300	49	69	106
				(OP: NN5O)		
N5XJ	"	72,450	197	38	78	22
WDØGTY	"	50,184	227	38	49	66
WA5LXS	"	45,504	159	40	57	61
N5REL	"	44,829	204	35	46	72
W2GS	"	44,064	140	40	71	25
N5LPT	"	10,192	77	25	26	40
K5WW	**21A**	**26,896**	**199**	**20**	**27**	**35**
***AA5AU**	**AA**	**1,001,984**	**1136**	**90**	**231**	**191**
*N5YT	"	405,888	676	71	132	133
*AB8YZ	"	46,818	207	37	54	71
*KD5YS	"	44,160	191	39	51	70
*N5JGE	"	14,933	74	31	47	31
*KC6ZBE	"	7,434	48	21	33	5
*WW5L	"	7,400	47	29	28	17
*K5LGX	"	2,070	34	13	13	19
*NE5A	"	1,443	35	8	7	22
***K5ND**	**28A**	**2,720**	**52**	**11**	**16**	**5**

District 6

AJ6V	**A**	**681,126**	**1057**	**76**	**120**	**170**
WQ6Q	"	482,090	976	73	105	177
K6NR	"	331,591	636	59	94	146
K6XX	"	293,370	508	62	86	106
W1PR	"	191,880	424	50	79	105
W6RKC	"	35,321	141	43	43	57
K6MM	"	14,976	102	23	25	56
KJ6JUS	*"*	*14,763*	*82*	*37*	*36*	*38*
W6DPM	"	1,584	36	9	9	26
W6JBR	*"*	*896*	*19*	*9*	*8*	*11*
KO6LU	"	110	6	4	3	4
NT6X	**21**	**208,172**	**757**	**26**	**63**	**53**
***N6RVI**	**A**	**86,028**	**269**	**52**	**51**	**98**
*KD6HOF	"	53,760	202	44	48	68
*K6FA	"	50,796	172	46	48	59
*W6RQ	"	49,749	217	38	43	80
*KE6SHL	"	48,400	201	46	46	84
*KF6RY	"	37,389	179	33	34	54
				(OP: W6ZL)		
*N6UTC	"	24,360	140	34	34	52
*N6BHX	"	10,527	79	27	21	39
*KM6HB	"	9,882	98	18	15	48
*KG6YJ	"	3,306	41	20	16	22
*AG6JA	"	3,276	33	17	16	9
*WU6X	"	2,236	49	11	8	24
*N6EWG	"	850	12	12	12	1
*KN6OON	"	207	17	5	5	13
***KW6AA**	**21**	**1,551**	**32**	**9**	**8**	**16**
***WZ6ZZ**	**3.5**	**693**	**34**	**4**	**3**	**14**
W6SX	**AA**	**427,050**	**975**	**61**	**73**	**191**
N6IE	"	303,021	398	81	149	157
N5KO	"	237,728	426	75	110	119
N6QQ	"	186,046	316	70	137	67
K6TQ	"	165,044	451	47	79	116
N6GP	"	124,000	316	59	71	118
K6NV	"	113,520	327	49	67	99
N6GEO	"	108,120	317	54	63	87
W6TK	"	99,425	271	50	66	89
NN6NN	"	78,554	270	47	43	91
				(OP: W6XK)		
K6GFJ	"	67,802	211	46	56	65
WD6T	"	51,792	205	43	51	72
K6XV	"	48,984	193	40	42	74
AF6SA	"	47,256	171	49	52	78
AC6BW	"	46,020	140	50	64	42
N6RV	"	43,790	119	42	90	13
W6MOB	"	23,716	94	38	62	21
W4UAT	"	18,316	136	17	30	29
K6ZP	"	6,399	49	25	23	33
W6IA	"	5,635	61	15	14	20
NK6A	**21A**	**39,100**	**218**	**18**	**39**	**43**
***WQ6X**	**AA**	**80,464**	**309**	**45**	**44**	**99**
*AA2IL	"	46,893	212	35	39	73
*W6DMW	"	14,626	99	29	25	49
*W6INO	"	3,780	41	21	20	13
*W6BG	"	1,968	40	12	9	27
*K6EI	"	840	16	9	9	6

District 7

W7RN	**A**	**2,321,738**	**2732**	**91**	**180**	**243**
				(OP: WK6I)		
KU1CW	"	1,210,968	1374	99	184	201
W7YAQ	"	1,060,665	1219	91	170	204
KH6ND/W7	"	442,384	977	65	103	176
KC7V	"	409,661	939	52	92	157
K6XT	"	282,125	573	67	91	147
WB6JJJ	"	274,752	616	61	87	176
AC7GL	"	212,954	463	65	94	128
K7HP	"	188,669	387	75	86	138
N7XCZ	"	137,668	384	63	77	114
KØIP	"	130,600	363	47	62	91
WU7W	"	67,335	243	50	54	97
NW7D	"	50,100	198	42	48	77
WO7V	"	47,263	225	35	40	76
K7RAT	"	36,472	193	25	28	41
				(OP: N6TR)		
WG7X	"	18,676	141	23	20	73
K7MY	"	15,520	104	26	31	40
W7UDH	"	11,532	105	21	22	50
KF7ZN	"	4,692	40	18	22	11
W7JHR	"	1,408	24	17	15	12
KG7QXE	"	837	20	9	6	16
N7GP	**21**	**187,070**	**766**	**23**	**55**	**52**
W6OAT	"	308	10	5	5	4
***N7IR**	**A**	**433,784**	**675**	**69**	**121**	**154**
*WS7V	"	286,272	707	50	91	147
*W7TMT	"	188,124	518	50	68	139
*WZ8T	"	134,456	405	43	56	97
*N7DB	"	120,978	356	51	55	128
*NØKRE	"	102,960	346	47	54	107
*NU7F	"	97,704	319	41	52	114
*NQ7R	"	92,771	263	56	65	82
*K7AZT	"	64,959	248	39	43	95
*AF7NX	"	57,969	186	43	59	69
*N7ESU	"	57,750	332	29	36	85
*K7JQ	"	52,808	265	30	33	101
*W7MTL	"	42,192	212	32	28	84

**N7VS*	*"*	*29,160*	*146*	*40*	*35*	*60*
*KE7GKI	"	27,911	202	22	19	72
*KW7WP	"	22,317	136	29	26	74
*KB7BTO	"	20,944	122	28	30	61
*N7PWZ	"	20,700	135	24	24	67
*N7VGO	"	18,120	110	29	31	60
*KX7L	"	8,436	65	25	24	27
*KF7FK	"	7,739	80	18	15	38
*N7DSX	"	6,868	52	25	22	21
*K7QA	"	5,250	60	10	16	24
*KI7DET	"	4,602	56	15	14	30
*AG7AB	"	2,970	40	15	12	27
*NØJOY	"	588	19	8	5	15
*K7CNT	"	418	13	8	7	7
*N6LB	"	336	12	9	9	3
*KJ7RUP	"	96	6	4	3	5
***KC7CM**	**21**	**21,505**	**156**	**18**	**30**	**37**
***K7HKR**	**14**	**10,472**	**97**	**15**	**19**	**34**
*WB7QMR	"	3,430	51	12	11	26
***WB3JFS**	**7**	**7,398**	**88**	**13**	**14**	**27**

KA6BIM	**AA**	**1,548,984**	**1566**	**106**	**224**	**224**
KO7SS	"	1,183,890	1074	102	236	232
N7NM	"	868,175	1127	83	154	214
K7AR	"	753,819	911	79	179	173
W7ZR	"	590,580	934	75	135	176
KF7U	"	474,438	973	56	101	164
N7ZUF	"	384,744	656	74	132	122
W7GES	"	343,872	698	59	88	141
WØVQ	"	292,600	662	66	89	111
W7CXX	"	277,347	629	66	96	167
						(OP: WA7LNW)

W7VJ	"	277,206	491	66	123	93
K7VIT	"	143,385	391	53	69	115
WC7Q	"	131,760	409	45	68	103
KN7K	"	122,266	376	52	57	117
NG7M	"	108,053	316	47	66	96
W7VXS	"	83,007	312	38	41	128
K9PY	"	65,190	223	52	53	100
K7BVT	"	62,900	218	43	48	79
K9DR	"	52,839	229	39	44	88
WR7T	"	35,400	160	39	46	65
KI6QDH	"	32,868	203	25	36	71
W7BP	*"*	*16,863*	*101*	*29*	*48*	*0*
N6SS	**28A**	**98,838**	**530**	**23**	**43**	**48**
KY7M	"	2,911	36	13	15	13
N7AT	**21A**	**349,475**	**998**	**29**	**88**	**58**
						(OP: K8IA)

W7MRF	**3.5A**	**43,262**	**355**	**16**	**29**	**52**
						(OP: KW7MM)

***WAØWWW**	**AA**	**149,898**	**314**	**63**	**93**	**102**
*N7UJJ	"	142,290	411	60	65	130
*WN6W	"	81,000	278	45	51	84
*N1JM	"	29,866	169	35	31	71
*W7VC	"	26,962	155	26	21	75
*KB7AK	"	25,996	146	34	32	68
*K7UK	"	17,649	134	28	30	53
*WA7YAZ	"	9,438	80	21	20	37
*WS7I	"	6,270	103	14	11	41
*KD7LEE	"	4,480	60	18	13	33
*WM5F	"	1,218	24	15	13	14
*N9NA	"	1,148	28	11	10	20

District 8

W8TWA	**A**	**228,888**	**397**	**57**	**119**	**88**
K8RCT	"	16,405	106	19	35	31
***AA8CA**	**A**	**552,375**	**962**	**61**	**149**	**165**
*WB8JUI	"	125,744	309	50	90	92
*N8WCP	"	109,760	288	46	82	68
*K4YJ	"	82,040	236	32	83	25
*AA8OY	"	79,344	238	30	72	69
*K7DR	"	73,500	257	38	66	71
*WB8TDG	"	72,192	257	42	60	86
*ND3N	"	64,711	296	28	43	92
*AA8SW	"	29,890	141	30	47	45
*K8DP	"	27,600	129	30	47	43
*WA8KAN	"	21,952	127	30	40	42
**AA8EN*	*"*	*20,313*	*135*	*25*	*33*	*53*
*W8KNO	"	19,764	106	24	36	48
*N8TCP	"	9,709	83	15	24	34
*KC8R	"	9,266	100	16	20	46
*W8YA	"	5,016	73	16	18	23
*K8AJS	"	4,560	52	18	19	23
*N8AJM	"	2,760	29	17	19	10
*WA8UMT	"	1,125	18	9	12	4
*N8BEK	"	832	18	4	11	1
**WJ8SON*	*"*	*90*	*7*	*3*	*3*	*4*
***W8AKS**	**28**	**11,275**	**99**	**17**	**27**	**11**
*W8JGU	"	3,531	44	12	21	0
*WB8JAY	"	1,300	27	7	13	5
***K8VT**	**14**	**49,980**	**245**	**18**	**48**	**39**
***N8CWU**	**7**	**52,767**	**354**	**15**	**37**	**47**
*W8TOM	"	30,744	257	12	26	46

KI6DY	**AA**	**702,119**	**941**	**49**	**151**	**119**
W8JWN	"	419,498	735	63	148	138
KD8FS	"	326,400	539	64	144	92
K8JQ	"	242,484	690	35	77	130
N4EL	"	185,493	412	43	100	76
K8PK	"	167,400	388	49	95	104
AA4R	"	127,160	272	47	113	60
KA8G	"	62,640	195	33	83	28
W8BI	"	37,996	144	31	55	32
						(OP: KB8UEY)

W8CAR	"	31,108	183	21	51	29
K8ESQ	"	29,500	110	31	62	32
WA8LRW	"	24,442	126	28	46	47
K8YE	"	16,647	98	29	29	35
***KK8MM**	**AA**	**120,003**	**268**	**51**	**105**	**65**
*AB8OU	"	22,791	125	26	39	42
*KD8VMM	"	3,234	33	14	24	4
*K8GT	"	930	16	12	11	7

District 9

WI9WI	**A**	**554,112**	**1005**	**50**	**112**	**126**
K9UC	"	306,300	537	55	129	116
KC9EOQ	"	211,593	410	59	117	105
NT9E	"	176,850	364	56	114	100
K9DUR	"	119,110	317	37	86	92
AA9L	"	98,136	288	39	77	72
KG9N	"	63,792	227	28	58	58
KØVW	"	42,924	183	36	44	66
***WD9CIR**	**A**	**259,096**	**566**	**51**	**107**	**120**
*WU9D	"	226,416	538	45	96	126
*W9YK	"	217,083	437	54	112	103
*KB9DVC	"	97,712	249	40	86	71
*KC9YL	"	64,558	228	30	62	77
*N9LYE	"	41,184	179	33	45	66
*KD9NHZ	"	38,052	196	26	42	58
*N9MR	"	35,532	126	37	60	29
*N9TNT	"	35,478	145	41	49	56
*WA9LEY	"	25,728	135	34	40	60
*WO9B	"	19,610	105	26	40	40
*W9VQ	"	19,100	80	33	51	16
*W9KG	"	14,430	82	23	43	12
*KB9S	"	12,900	100	21	26	39
*WA9LKZ	"	7,956	67	18	34	16
*KZ9V	"	980	20	9	9	10
*WD9IGL	"	600	18	7	6	12
***W9AKS**	**7**	**7,011**	**104**	**7**	**9**	**41**
*KA9VLC	"	270	14	4	3	11
*NV9X	"	45	5	3	1	5

W9MR	**AA**	**384,780**	**558**	**67**	**153**	**110**
K9TI	"	279,648	510	61	123	104
KC9K	"	258,071	394	69	149	101
K9NW	"	189,707	285	74	150	63
W9FFA	"	168,075	386	50	94	81
AA9JS	"	140,309	362	59	102	90
KØTQ	"	114,608	284	40	89	79
N7US	"	108,064	270	37	75	64
N9TCA	"	43,865	120	48	77	30
KBØV	"	20,352	103	25	52	19
K9EL	"	10,001	50	30	40	3
W9PA	**21A**	**272,976**	**705**	**31**	**94**	**51**
N9LQ	"	26,650	137	21	44	17
W9ILY	**14A**	**231,530**	**613**	**30**	**87**	**52**
KC9EE	"	891	24	6	8	13
K9OM	**7A**	**239,936**	**761**	**25**	**83**	**55**
***N9TTK**	**AA**	**402,948**	**603**	**75**	**158**	**136**
*N9UA	"	312,268	537	59	128	115
*N9SB	"	101,490	311	40	66	93
*WB9HFK	"	43,594	174	31	54	57
*KE9SA	"	37,120	148	33	55	40
*KYØQ	"	29,040	112	31	65	24
**WB9VGO*	*"*	*27,324*	*142*	*33*	*38*	*61*
*WB9TFH	"	16,324	91	22	42	13
*N9VPV	"	9,945	69	20	35	10
**KD9OIN*	*"*	*1,428*	*24*	*10*	*13*	*11*
*WA9IVH	"	1,092	28	12	10	20
*K9QH	"	928	27	7	4	18
*KD9NZB/AG	"	414	14	6	5	7
*AA9RK	"	315	14	5	3	13
***AB9YC**	**28A**	**12,312**	**136**	**16**	**28**	**10**

District Ø

WØMB	**A**	**630,992**	**1058**	**68**	**163**	**118**
KØJJR	"	486,506	681	68	160	121
KØAD	"	477,840	907	55	121	154
NØBUI	"	451,045	873	61	129	153
NGØE	"	345,066	627	54	117	118
WBØN	"	292,962	555	65	118	131
NØTA	"	287,056	682	63	94	151
KIØF	"	265,200	600	49	105	106
WØZQ	"	260,100	518	61	110	129
KØTC	"	242,757	540	53	102	88
KEØUI	"	217,056	585	55	75	136
WØZA	"	136,206	483	42	58	107
WØETT	"	63,684	205	42	62	79
KØVG	"	56,279	190	46	55	66
NFØN	"	46,818	166	39	59	55
KØFJ	"	31,007	195	18	37	46
N5TU	"	29,040	128	38	56	38
N6RSH	"	24,310	138	25	31	74
NRØT	"	22,264	103	35	48	38
WAØTXJ	"	15,753	106	19	31	39
ACØE	"	15,360	101	24	27	45
W8LYJ	"	10,324	109	21	18	50
WD5ACR	"	4,104	37	19	21	14
WA2PCN	"	3,552	52	10	10	28
WØTY	**14**	**5,405**	**53**	**11**	**24**	**12**
***NØUR**	**A**	**569,322**	**934**	**65**	**140**	**146**
*WØIZ	"	180,681	579	50	63	116
*WØNY	"	143,165	568	29	47	133
*WØRX	"	123,606	278	55	94	69
*AI6O	"	98,064	274	49	79	88
*WØYJT	"	90,681	300	41	83	57
*KBØNES	"	86,275	285	47	64	92
*WØPI	"	70,224	244	34	61	73
*WØDC	"	60,120	201	38	63	66
*KBØGT	"	58,135	270	27	45	79
*WØPMO	"	53,985	214	43	53	81
*WAØLIF	"	37,120	173	26	54	48
*KDØOIX	"	35,894	220	24	20	93
*NØKK	"	34,524	193	22	34	70
*KFØIDT	"	31,860	155	39	42	54
*KOØZ	"	28,575	146	33	47	47
*WØADL	"	24,676	125	30	43	51
*NEØDA	"	21,645	119	32	39	46
*WAØEJX	"	19,936	199	15	16	58
*KØYQ	"	12,986	89	25	25	36
*KFØARE	"	10,700	113	21	15	64
*KCØLQL	"	9,296	93	19	22	42
*AEØIB	"	6,156	51	16	27	14
*KCØNFB	"	4,510	46	17	19	19
*W3ZF	"	2,150	32	15	10	25
*KØGMK	"	1,927	37	12	13	16
**K4RVA*	*"*	*1,824*	*32*	*12*	*8*	*28*
*WØZF	"	1,813	42	6	6	25
*K7BG	"	1,739	38	8	7	22
*KJØP	"	900	19	11	8	11
*NØUM	"	18	3	2	1	3
***KTØDX**	**14**	**40,800**	**315**	**18**	**33**	**49**
*WNØL	"	12,376	98	12	28	28

KØMD	**AA**	**1,922,448**	**1941**	**95**	**250**	**183**
KØTG	"	1,387,908	1491	100	226	217
NØAT	"	841,050	1136	77	187	181
NXØI	"	471,920	912	64	128	155
WØPR	"	410,260	966	49	106	137
KØCN	"	408,240	552	72	172	71
KØYR	"	344,520	688	60	125	145
KS9W	"	327,988	626	58	119	157
W7II	"	306,560	535	66	137	117
KØHB	"	287,946	503	58	124	124
WØHRO	"	281,488	575	57	111	124
WØBM	"	144,060	282	54	113	78
NØAV	"	110,637	253	41	94	36
W5AP	"	94,505	288	50	66	89
ADØTR	"	54,071	166	33	71	35
KØTLG	"	38,475	150	34	56	45
NØRN	"	38,468	123	41	66	11
KSØCW	"	35,098	133	28	58	23
NOØL	"	15,714	85	28	45	24
KØPC	"	15,450	126	21	18	64
WØAD	"	12,008	71	23	44	9
WØERP	"	2,070	31	13	12	20
WØLSD	**28A**	**15,209**	**118**	**18**	**27**	**22**
NØKQ	**21A**	**28,704**	**154**	**19**	**43**	**34**
KFØIQ	"	2,035	25	14	17	6
KSØAA	**7A**	**9,960**	**128**	**11**	**16**	**33**
***KØKX**	**AA**	**545,296**	**710**	**79**	**165**	**150**
*NØHJZ	"	512,820	1013	68	126	176
*KØRC	"	417,775	555	87	179	159
*WØJW	"	348,300	590	67	140	117
*AIØY	"	309,024	822	52	82	154
*K4IU	"	161,895	489	49	78	124
*AAØAW	"	101,920	345	47	65	112
*AEØDX	"	71,816	227	46	71	71
*NWØM	"	70,782	250	29	60	52
*KØMPH	"	70,472	264	40	52	92
**KØIL*	*"*	*66,612*	*261*	*39*	*46*	*98*
*KØTI	"	34,560	196	22	43	55
*NØUJJ	"	30,132	132	28	48	48
*KØWOI	"	17,675	112	29	31	41
*WØLM	"	10,032	67	24	33	19
*N5KB	"	7,931	69	19	22	36
*WO7U	"	1,260	29	8	6	21

Alaska

AL7LO	**A**	**271,779**	**561**	**45**	**73**	**101**
KL2R	"	116,864	312	31	55	80
						(OP: N1TX)
N6QEK/KL7	"	61,686	207	30	40	68
AL2F	**AA**	**316,479**	**582**	**55**	**77**	**117**

Canada

District 1

VO2AC	**A**	**325,299**	**580**	**37**	**99**	**111**
**VA1XH*	*7*	*540*	*13*	*3*	*9*	*3*
VO1CH	**21A**	**255,948**	**660**	**24**	**84**	**46**
VE1ANU	**14A**	**10,835**	**94**	**10**	**17**	**28**

District 2

***VE2BVV**	**A**	**702,860**	**898**	**52**	**147**	**112**
*VE2OWL	"	63,732	178	35	64	42
*VE2GSO	"	37,534	154	18	40	40
VE2RYY	**14A**	**440,631**	**980**	**30**	**93**	**50**
***VE2NMB**	**AA**	**220,374**	**432**	**41**	**91**	**99**
*VE2HEW	"	189,658	390	41	83	93
*VA2QR	"	106,210	246	42	87	61

District 3

VE3TW	**A**	**666,391**	**908**	**55**	**128**	**136**
VE3GYL	"	476,784	680	57	132	112
VE3WVA	"	404,982	662	57	103	138
VA3WW	"	339,290	610	54	116	92
VE3ORY	"	78,080	229	34	62	64
VA3IK	"	60,306	194	31	53	54
VE3SST	**14**	**14,280**	**87**	**14**	**30**	**26**
***VE3DZ**	**A**	**2,417,672**	**2027**	**79**	**222**	**192**
*VE3TM	"	346,880	537	50	127	94
*VE3NFN	"	253,890	462	40	104	90
*VA3RTG	"	236,750	388	52	115	83
*VE3EUS	"	23,229	112	20	39	30
*VA3FN	"	14,608	72	27	38	23

VA3LR	**AA**	**1,157,632**	**1056**	**82**	**212**	**154**
VE3NZ	"	702,789	929	50	157	110
VE3BR	"	562,453	734	62	140	135
VE3EY	"	240,900	395	62	123	90
VA3OGG	"	231,068	507	40	76	128
VE3DZP	"	96,525	212	49	114	32
VE3JZT	"	15,600	83	27	29	44
VE3MZD	**21A**	**35,541**	**142**	**24**	**62**	**13**
***VE3MGY**	**AA**	**734,019**	**974**	**64**	**151**	**162**
*VE3PJ	"	335,120	511	59	177	0
*VA3WB	"	157,094	296	55	101	73
*VA3FF	"	118,170	243	47	95	60
*VA3PAF	"	102,120	264	38	71	76
*VE3FZ	"	81,590	181	51	109	45
*VA3ROC	"	24,360	112	26	48	31
*VA3UAP	"	20,640	94	24	38	34

District 4

VE4VT	**AA**	**377,568**	**502**	**76**	**142**	**124**
***VE4DL**	**AA**	**44,776**	**207**	**21**	**20**	**75**

District 5

***VE5KS**	**A**	**496,320**	**720**	**66**	**124**	**130**
***VE5SF**	**AA**	**203,742**	**437**	**52**	**73**	**106**

District 6

VE6BMX	**28**	**6,235**	**61**	**12**	**13**	**18**
***VE6BBP**	**A**	**567,207**	**814**	**60**	**101**	**160**
*VA6RCN	"	56,210	182	34	41	71
						(OP: VE3RCN)
*VE6SPS	"	32,828	144	23	19	74
VE6WQ	**21A**	**126,882**	**478**	**21**	**59**	**46**

District 7

VA7XH	**A**	**94,047**	**329**	**27**	**44**	**70**
VA7MAY	"	34,775	162	24	24	59
***VE7BGP**	**A**	**432**	**11**	**8**	**5**	**11**
***VE7MID**	**7**	**21,973**	**151**	**14**	**21**	**38**
VE7DX	**AA**	**172,050**	**388**	**48**	**63**	**111**
VE7IO	"	23,562	123	24	28	47
VE7SZ	**21A**	**218,538**	**672**	**24**	**68**	**50**
VE7CC	**14A**	**468,825**	**1156**	**31**	**88**	**56**
VA7KO	"	212,772	673	28	69	52
***VA7RY**	**AA**	**144,210**	**306**	**47**	**73**	**89**
*VE7NNT	"	28,305	128	24	23	64
*VA7EET	"	27,720	127	25	23	62
***VA7DX**	**21A**	**44,932**	**230**	**17**	**34**	**43**

Cayman Islands

*ZF2WB	A	1,652,876	1770	68	157	211
						(OP: LU8EOT)

Costa Rica

***TI2OY**	**A**	**721,072**	**901**	**64**	**149**	**161**
***TI2WMP**	**AA**	**85,950**	**215**	**47**	**68**	**76**

Cuba

***CO8NMN**	**A**	**620,704**	**890**	**54**	**111**	**161**
*CO2KY	"	8,509	70	16	17	34
***CO6HLP**	**21**	**178,048**	**599**	**19**	**59**	**50**
*CO2GL	"	63,654	309	16	42	45
***CO2AME**	**14**	**339,888**	**1007**	**23**	**69**	**54**
***CO2JD**	**7**	**57,776**	**305**	**15**	**34**	**43**
***CM6TC**	**21A**	**52,528**	**261**	**17**	**44**	**37**

Dominican Republic

***HI3T**	**A**	**701,730**	**984**	**51**	**139**	**149**
*HI3MM	"	156,240	381	37	94	86
***HI3K**	**AA**	**204,300**	**474**	**36**	**85**	**104**
*HI3TT	"	12,411	107	13	11	39
***HI3MM**	**AA**	**799,686**	**1138**	**58**	**121**	**175**

Grenada

***J35X**	**21**	**155,485**	**543**	**18**	**53**	**50**

Guatemala

***TG9ADQ**	**A**	**328,032**	**552**	**46**	**89**	**133**
***TG9ANF**	**14**	**124,074**	**483**	**19**	**45**	**49**

Haiti

***HH2AA**	**A**	**875,538**	**985**	**52**	**148**	**183**
						(OP: K6DTT)

Mexico

***6D5C**	**A**	**290,080**	**473**	**64**	**84**	**132**
						(OP: XE1H)
*XE2AD	"	253,800	479	51	84	100
*XE2AU	"	79,713	251	35	50	68
*XE2OK	"	53,808	174	37	37	78
*XE2KJ	"	31,979	147	25	20	68
*XE2WF	"	924	15	11	12	5
***XE1O**	**28**	**13,380**	**103**	**14**	**16**	**30**
*XE2S	"	7,595	64	13	20	16
*XE2N	"	2,584	40	11	12	15
***XE3N**	**21**	**31,992**	**163**	**14**	**36**	**36**
***XE1SVT**	**7**	**5,304**	**61**	**10**	**18**	**23**
*XE2NL	"	2,065	36	7	7	21
						(OP: XE2N)
4A5E	**21A**	**68,579**	**320**	**18**	**39**	**44**
						(OP: XE1EE)
***4A2B**	**AA**	**631,780**	**927**	**61**	**112**	**137**

Panama

***HP1DCP**	**21**	**9,234**	**69**	**15**	**34**	**8**

Puerto Rico

***KP4JFR**	**A**	**290,400**	**516**	**40**	**116**	**84**
*KP4ALR	"	156	13	11	10	5
***KP4JRS**	**14**	**19,942**	**153**	**8**	**19**	**32**
***WP3E**	**AA**	**6,204**	**50**	**19**	**20**	**27**
						(OP: NP4EG)

U.S. Virgin Islands

***WP2Z**	**A**	**17,578**	**88**	**24**	**37**	**33**

AFRICA

Angola

***D2UY**	**A**	**774,613**	**944**	**42**	**129**	**116**

Canary Islands

EA8ZS	*A*	*685,531*	*808*	*51*	*137*	*119*
***EA8AQV**	**A**	**407,982**	**481**	**53**	**146**	**92**
***EA8DHH**	**28**	**65,604**	**276**	**18**	**58**	**8**
***EA8ARG**	**14**	**9,936**	**74**	**8**	**25**	**15**
***EA8CNR**	**AA**	**556,206**	**732**	**53**	**173**	**40**

Gabon

***CN8YZ**	**21**	**30,552**	**158**	**10**	**38**	**19**
TR8CA	**AA**	**175,311**	**399**	**31**	**111**	**9**

Mayotte

***CN8YZ**	**21**	**30,552**	**158**	**10**	**38**	**19**
***FH/OK1M**	**14A**	**216**	**12**	**2**	**7**	**0**

Morocco

***CN8YZ**	**21**	**30,552**	**158**	**10**	**38**	**19**

St. Helena

ZD7BG	**A**	**61,812**	**210**	**20**	**72**	**10**

ASIA

Asiatic Russia

District 9

***RC9T**	**A**	**115,817**	**291**	**38**	**112**	**1**
*UA9OEX	"	53,504	175	43	82	3
*R8QAN	"	17,810	104	18	47	0
***RL9L**	**14**	**46,694**	**230**	**16**	**45**	**13**
*RA8AI	"	5,010	63	6	24	0
RK8I	**14A**	**115,050**	**383**	**24**	**63**	**31**

District Ø

RWØSR	**A**	**399,408**	**726**	**46**	**138**	**28**
RAØACM	"	288,196	510	55	141	22
UAØOK	"	273,352	587	52	122	14
***UBØAZR**	**A**	**56,668**	**177**	**38**	**79**	**7**
*RØUT	"	46,515	171	31	73	1
*RWØUM	"	44,642	196	38	63	0
*UAØLKD	"	9,400	98	16	24	7
*RØUO	"	1,378	30	11	15	0
***RGØS**	**28**	**15,288**	**163**	**13**	**29**	**0**
RMØW	**28A**	**18,179**	**137**	**13**	**36**	**0**
RAØFLP	"	7,004	82	13	21	0
***UAØJFD**	**AA**	**31,304**	**161**	**28**	**48**	**10**
***RAØWHE**	**28A**	**33,152**	**189**	**15**	**49**	**0**

Asiatic Turkey

TA4AU	**7**	**76,893**	**380**	**11**	**49**	**11**
***TA7I**	**A**	**984,096**	**1207**	**45**	**171**	**72**
*TA4/ OH2KW	"	306,000	690	34	117	2
*TA2MN	"	137,445	303	37	110	18
*TA2E	"	126,008	294	39	99	14
*TA4RC	"	32,190	114	37	66	8
***TA3/ HB9FIH**	**14**	**24,585**	**181**	**11**	**44**	**0**
***TA2FT**	**7**	**25,346**	**153**	**9**	**40**	**9**
***TA3NE**	**21A**	**18,018**	**179**	**8**	**30**	**1**

Bahrain

A92GE	**14**	**21,170**	**130**	**14**	**43**	**1**

China

***BI8CZM**	**A**	**137,160**	**311**	**53**	**123**	**4**
*BA5HAM	"	105,820	314	48	88	7
*BD7BW	"	83,055	374	39	65	1
*BD4VGZ	"	76,752	242	40	78	5
*BD4UJ	"	15,808	104	19	45	0
*BA2BA	"	14,516	193	16	20	2
*BD7OA	"	11,077	100	20	33	0
*BH2SWB	"	4,796	51	14	30	0
*BH4UMN	"	266	8	7	7	0
*BA4SCP	"	126	9	3	4	0
***BG8PM**	**28**	**1,775**	**27**	**8**	**17**	**0**
***BA3AX**	**21**	**20,776**	**212**	**16**	**35**	**2**
*BD4RHV	"	12,084	90	17	30	6
*BG5UZW	"	91	5	3	4	0

BA4DL	**AA**	**152,208**	**383**	**55**	**104**	**9**
BA4AEO	"	11,286	81	25	31	1
BD3CB	**21A**	**110,880**	**429**	**24**	**65**	**16**
BI4WRI	**14A**	**377**	**12**	**5**	**8**	**0**
***BH3GIY**	**AA**	**26,970**	**132**	**35**	**56**	**2**
						(OP: BG3IAY)
*BG5FCH	"	20,808	157	29	37	6
**BD7IS*	*28A*	*19,215*	*164*	*12*	*33*	*0*
***BH3BFE**	**21A**	**3,051**	**74**	**9**	**17**	**1**
***BG8DIV**	**7A**	**6,228**	**78**	**11**	**25**	**0**

Cyprus

P3X	AA	5,823,924	3257	118 377	139
					(OP: 5B4AMM)
5B4AIF	"	20,355	123	20 38	1

Georgia

4L2M	7	153,549	610	20 66	13

Hong Kong

VR25XMT	AA	210,372	609	36 92	13

India

VU2ZMK	A	489,632	843	47 153	8
***VU2FGQ**	21	49,552	248	20 55	1
VU2DED	AA	222,807	402	50 146	1
***VU2GRM**	AA	50,959	154	43 83	5
***VU2IBI**	21A	127,942	437	20 66	20

Israel

4Z5LY	A	803,136	1014	56 189	37
***4X6FR**	A	523,004	858	45 145	22
***4Z5MY**	21	944	21	3 13	0
***4X6FB**	7	4,000	43	7 23	2
***4X1ST**	AA	321,711	510	41 155	23
*4Z4AK	"	55,438	193	25 78	3
***4Z5FI**	21A	178,992	558	23 66	24

Japan

District 1

JA1OVD	A	982,928	1023	91 190	87
JF1LMB	"	330,332	454	77 159	33
JH1SJN	"	253,644	351	86 142	48
JA1XRA	"	202,720	319	66 117	41
JA1IAZ	"	146,601	306	56 98	25
JH1CTV	"	143,780	304	56 97	29
JA1BWA	"	106,812	248	55 94	23
JA1QOW	"	95,274	215	53 88	17
JA1AYO	"	83,804	224	44 70	32
JH1HIC	"	19,106	87	25 40	17
JK1HIY	"	11,741	72	19 23	17
JA1PVX	"	11,310	68	18 24	16
JS1NDM	"	3,036	31	15 22	7
JL1JJD	"	627	11	7 11	1
JK1BAB	"	30	7	3 3	4
JR1NHD	21	54,035	183	30 53	24
JG1LHB	"	53,200	206	24 48	23
JI1LNR	*"*	*9,593*	*63*	*15 26*	*12*
***7N2UQC**	A	338,484	504	79 144	45
*JS1KKY	"	113,399	252	51 90	28
*JA1PCM	"	111,484	225	60 104	24
*JA1EMQ	"	104,961	228	56 91	30
*JK1JAS	"	103,592	206	61 100	23
*JF1WNT	"	97,682	226	52 85	32
*JR1AQI	"	75,600	197	48 71	21
*JK1NSR	"	70,966	184	43 75	19
*JA1ATM	"	54,656	169	41 69	12
*JJ1KZZ	"	41,040	116	46 74	15
*JA1IZ	"	31,302	122	33 44	17
*7K1VKU	"	28,645	134	27 47	11
*JH1BHW	"	27,948	113	36 51	15
*JA1IE	"	21,942	119	37 53	16
*JK1ESR	"	14,008	87	23 39	6
*JA1IQV	"	9,387	65	25 32	6
*JG1TGQ	"	8,910	55	25 36	5
*JK1FNN	"	6,318	43	21 23	10
**JI1SAI*	*"*	*5,047*	*43*	*18 27*	*4*
*JJ1MBU	"	3,800	42	17 29	4
*JH1KPT	"	3,496	35	20 20	6
*JA3GZE/1	"	2,016	23	16 18	2
*JA1DKU	"	1,395	21	13 13	5
*JA1GZK	"	464	11	6 7	3
*JA1EQO	"	390	10	6 6	1
*JF1WAM	"	75	7	7 7	1
*JG1CMT	"	30	3	3 3	0
***JF1OVA**	28	7,134	65	15 25	1
***JH1KYA**	21	47,472	192	23 52	17
*JA1SCE	"	40,020	174	24 48	15
*JG1UKW	"	37,932	167	24 49	14
*JJ1ENZ	"	29,645	143	22 47	8
*JI1BBN	"	25,806	138	22 41	6
*JE1RRK	"	19,044	101	18 40	11
*JA1RYC	"	10,535	77	12 31	6
*JA1DBG	"	4,608	52	13 19	4
*JA1WBX	"	3,234	37	11 16	6
*JF1AZQ	"	1,260	18	12 15	1
*JS1LQI	"	1,007	18	7 7	5
***JF1TEU**	14	26,809	117	23 44	16
*JR1AKD	"	1,953	25	12 14	5
*JE1GZB	"	527	14	6 7	4
*JH1EYM	"	340	9	6 9	2
JE1LFX	AA	1,706,176	1273	115 275	113
JA1CSN	"	1,492,984	1288	107 236	88
JM1XCW	"	1,243,494	1113	99 211	107
JN1THL	"	517,353	602	85 171	75
JL1CNY	"	358,848	512	74 148	45
JA1WSK	"	223,517	319	80 138	41
JN1BMX	"	196,386	331	58 99	56
7K4VPV	"	150,960	305	56 104	25
JJ1XBQ	"	146,248	266	62 112	28
JH1RFM	"	143,450	281	55 100	35
JA1ILA	"	34,314	98	46 69	14
JA1WWO	"	29,648	99	35 50	24
JR1BAS	"	16,744	64	34 46	12
JA1SJV	28A	14,235	87	21 42	2
***JG1XIO**	AA	152,453	287	64 108	31
*7L4IOU	"	79,632	189	56 87	25
*JK1TCV	"	59,736	142	51 76	25
*JR1EMO	"	57,040	166	34 59	31
*JA1GFD	"	4,539	33	22 22	7
*JA1PTO	"	187	6	5 6	0
***JF1RYU**	28A	26,530	154	23 42	5
***JA1UII**	21A	48,034	183	25 55	14
***JG1LFR**	14A	69,760	248	29 61	19

District 2

JA2AXB	A	176,384	304	63 109	40
JG2REJ	"	70,744	182	45 78	25
JH2BTM	21	18,971	115	15 36	10
JF2CTS	"	16,920	107	18 35	7
JR2BCF	"	14,455	85	15 31	13
JF2FIU	"	5,566	46	12 27	7
***JA2FXV**	A	122,544	254	62 99	23
*JE2BOM	"	73,084	174	53 86	12
*JA2GHP	"	68,680	185	43 75	18
*JG2DZM	"	24,864	104	30 50	4
*JM2LEI	"	22,102	100	32 49	5
*JQ2OUL	"	1,972	27	14 15	5
*JI2IXA	"	1,716	21	12 12	9
**JK2AQT*	*"*	*1,173*	*19*	*8 8*	*7*
***JH2MYN**	28	19,520	125	21 38	2
***JF2AIJ**	21	10,302	69	11 36	4
*JH2JNU	"	2,523	32	8 18	3
***JR2UQU**	7	6	3	1 1	0
***JR1BFZ/2**	3.5	196	23	2 3	2
JA2HYD	AA	166,320	299	65 112	33
JF2XGF	"	27,876	129	27 47	18
JH2FXK	"	20,930	89	30 42	19
***JE2CPI**	28A	3,200	36	12 20	0

District 3

JA3HBF	A	411,232	560	79 168	37
JE3RMQ	"	87,828	211	49 93	14
JR3RIU	"	68,666	198	47 72	20
JR3UIC	"	23,712	94	38 53	13
JP3UBR	"	10,349	57	31 40	8
JF3NDW	"	6,370	55	12 31	6
JA3BXF	28	6,760	62	19 32	1
JR3RIY	21	161,483	496	29 72	18
JA3VOV	"	8,730	76	15 26	4
JA3GOJ	14	4,536	41	14 19	9
JH3FUK	7	70,087	258	27 57	25
***JA3JM**	A	94,563	233	57 91	23
*JF3DCH	"	79,650	210	51 81	18
*JH3WKE	"	57,820	175	49 71	20
*JA3JND	"	16,892	73	33 36	13
*JJ3QJI	"	13,286	78	28 34	11
*JH3GMI	"	13,172	71	27 38	9
***JK3DGX**	21	29,896	156	19 51	4
*JH3QFY	"	4,235	43	11 17	7
*JR3GPP	"	2,850	36	9 18	3
*JA3RAZ	"	2,028	26	7 15	4
*JG3LDD	"	54	3	2 1	3
JM3UGA	AA	214,605	282	95 156	34
JR3BOT	"	36,188	123	35 52	22
JH3EQP	"	17,200	77	31 44	11
JF3LOP	28A	20,352	119	21 42	1
***JI3KDH**	28A	9,457	79	17 31	1

District 4

JH4UYB	A	2,340,110	1789	104 269	109
JG4AKL	"	235,104	359	76 136	36
JH4CPC	"	87,864	188	51 87	30
JA4RED	"	54,120	166	37 60	26
JA4OPW	21	23,667	136	18 42	9
***JI4WHS**	A	177,060	362	63 104	28
*JE4MHL	"	69,120	207	42 71	22
*JA4RMX	"	35,182	127	33 57	8
*JA4EZP	"	870	19	13 14	2
*JA4PXC	"	20	2	2 2	0
***JH4CES**	21	5,577	50	13 14	12
*JH4FUF	"	2,555	26	14 16	5
JR4OZR	AA	2,192,108	1720	102 276	100
JA4CZM	"	141,710	286	53 97	35
JR4VEV	7A	14,905	119	15 31	9
***JM4WUZ**	28A	2,280	34	9 13	2

District 5

JA5SUD	A	105,703	233	52 101	20
***JE5HTN**	A	36,920	151	46 67	17
***JA5OXV**	28	620	12	9 11	0
***JH5FTY**	21	450	10	4 4	7
JA5FNX	AA	15,675	119	29 34	12
JE5JHZ	14A	1,197	21	5 14	0
***JH5HDA**	AA	80,855	207	47 92	18

District 6

JA6BZI	A	398,643	492	79 167	41
JA6FFO	21	448	11	6 7	1
***JR6YAA**	A	88,968	300	46 69	17
					(OP: JR6AG)
*JK6JAB	"	441	17	9 11	1
***JH6WHN**	28	42,354	207	20 56	2
***JA6LJN**	21	19,738	98	21 39	11
*JA6BCV	"	18,300	86	22 45	8
*JE6TUP	"	96	6	3 5	0
JA6MWW	AA	82,111	195	46 89	22
JE6QQN	"	70,905	189	41 77	27
JA6ZPR	14A	252,240	794	25 67	28
***JA6GCE**	AA	1,330,755	1260	90 235	70
*JH6QIL	"	204,266	391	62 127	29
*JG6JAV	"	139,621	331	59 103	29
*JA6GMC	"	31,734	130	24 48	14
*JE6PJP	"	1,120	20	9 9	2
***JA6WFM**	21A	194,688	480	28 84	32

District 7

JH7QXJ	A	762,604	864	83 144	105
JA7IC	"	599,242	696	85 171	66
JG7AMD	"	472,416	600	77 153	66
JM7OLW	"	192,600	387	50 50	80
JA7ACM	"	163,746	299	55 91	52
JR7IWL	"	99,166	228	59 89	31
JA7LLL	14	49,400	186	24 50	26
***JA7MWC**	A	64,944	173	50 71	23
*JR7ANB	"	24,934	99	27 50	14
*JP7OQS	"	22,784	99	32 49	8
*JN7TAN	"	7,150	50	16 25	9
*JL7OTC	"	5,712	50	21 28	2
*JE7LHT	"	416	9	7 9	0
*JK7CWL	"	406	11	6 8	0
JA7FTR	AA	187,210	346	48 93	53
JH7RTQ	"	164,528	296	56 113	39
JO7KMB	"	110,410	222	57 95	29
JA7GYP	"	47,481	126	43 64	26
JR7IWC	"	16,962	88	18 39	9
JA7ZP	"	14,640	73	28 39	13

District 8

JA8DNV	A	40,158	115	47 75	16
JA8IDS	21	52,836	209	27 53	22
JA8TGD	"	324	9	4 8	0
***JM8FEI**	A	90,692	245	50 77	31
*JM8SMO	"	49,343	144	43 68	22
*JK8PBO	"	13,740	80	21 39	0
*JE8KKX	"	1,428	17	11 10	7
***JA8RAT**	21	46,060	181	24 51	19
*JH8DBJ	"	12,420	80	15 34	5
JA8KSF	AA	754,245	834	80 174	79
JH8FIH	"	8,662	49	18 22	21

District 9

JA9CWJ	A	387,903	487	81 167	43
JH9CEN	"	44,125	138	43 71	11
JA9CCG	"	28,975	114	27 62	6
***JA9LX**	A	160,992	293	65 114	29

District 0

JH0ILL	A	55,473	168	34 58	31
JA0IOF	"	37,968	146	40 57	15
JH0MJY	"	8,528	55	15 31	6
JA0GCI	21	5,655	60	13 20	6
***JJ0PJD**	A	141,102	252	64 110	27
*JH0DUG	"	49,407	175	48 66	15
*JR0DZH	"	25,852	106	33 42	17
*JA0BZY	"	16,224	74	26 39	13
*JR0BNF	"	13,983	76	31 44	4
*JH0MUC	"	4,068	45	12 24	0
*JA0JHQ	"	3,440	39	14 19	7
***JH0EPI**	14	33,374	145	24 39	19
***JA0FVU**	AA	273,105	436	78 121	56

Kazakhstan

UP7L	A	1,620,872	1797	74 239	13
					(OP: UN6LN)
***UN7JX**	21	41,925	250	14 51	0
***UN7LV**	14	31,680	208	13 44	3
***UN4PG**	28A	11,088	89	10 34	0

Lebanon

***OD5ZF**	A	104,430	303	19 83	16

Mongolia

JT5DX	A	895,776	1254	73 218	10
					(OP: JT1DN)

Nepal

9N7AA	21	242,420	945	21 69	2
					(OP: S53R)

Qatar

***A73A**	A	68,400	253	18 70	7
					(OP: 4J3DJ)

Republic of Korea

HL2WA	A	638,362	802	84 191	39
DS5DNO	"	40,590	172	35 43	21
HL2AHL	"	10,952	72	27 40	7
HL4CEL	"	7,289	105	17 19	1
***HL2CFY**	A	73,788	191	46 87	10
*HL2DCM	"	462	12	10 11	1
***HL2ASZ**	7	968	18	9 12	1
*HL2KV	"	576	13	8 7	3
***HL1VAU**	AA	143,763	326	53 109	11

Saudi Arabia

***HZ1TT**	AA	834,030	1106	47 187	36

Singapore

**9V1HY*	*14*	*338*	*9*	*5 8*	*0*

Taiwan

BX4AG	21	7,954	79	11 26	4
BV4VQ	"	1,464	53	5 7	0
***BU2BE**	A	156,938	505	46 81	4
*BU2BO	"	14,760	150	16 25	0
BV2LA	AA	171,801	336	62 111	16

Thailand

HS6VW	A	3,634	71	10 13	0
***HS5ZLD**	A	2,584	27	18 20	0
HS5NMF	AA	1,150,633	1381	77 211	31
E20XMG	21A	38,870	226	19 45	1
HS3NBR	14A	17,954	146	12 35	0
***HS8NKB**	AA	47,532	174	27 74	1

United Arab Emirates

***A65/ DL2RMC**	A	25,146	98	26 63	10

Vietnam

XV9BPO	A	7,014	69	15 27	0

West Malaysia

***9M2TDX**	A	32,676	161	22 62	0
*9W2FHG	"	1,508	29	11 15	0
*9M2CIF	"	140	5	5 5	0
***9M2HUS**	21	3,768	62	10 13	1
***9M4BCN**	AA	503,304	988	45 155	1
					(OP: 9M2TO)

EUROPE

Austria

OE6MMF	A	555,660	700	68 199	76
***OE1CIW**	A	144,495	338	41 122	32
*OE3NHW	"	56,575	170	37 87	31
*OE5CYL	"	35,226	150	30 80	4
*OE5FDM	"	8,909	71	16 42	1
*OE7BJT	"	1,377	25	8 18	1
***OE5BYE**	14	1,998	40	5 22	0
OE1TKW	AA	109,505	262	38 112	31
OE5TXF	7A	302,400	994	25 83	36
					(OP: G3TXF)
***OE4EIE**	AA	165,423	333	41 128	32
*OE8TED	"	111,398	238	53 156	9

Balearic Islands

EC6DX	14	106,021	534	14 50	33
***EA6ZS**	14	1,976	43	5 21	0

Belarus

EW8DX	A	826,529	1284	70 213	36
EW8OM	"	262,581	607	44 164	11
EU8U	14	183,488	709	26 72	24
EW8Z	"	85,728	445	18 54	22
***EU1DX**	14	141,564	453	27 81	33
EU4E	AA	1,328,124	1204	103 297	89
EV1R	"	1,130,535	994	103 308	74

Belgium

ON7ZJ	A	290,360	515	48 116	74
OT2X	"	70,950	302	26 91	12
ON7ET	"	52,481	137	40 64	39
***ON4CT**	A	905,904	912	89 245	98
*ON6AT	"	118,080	305	38 108	34
*ON4LY	"	14,840	101	18 49	3
*ON4AMP	"	3,936	41	15 27	6
***ON5GF**	21	31,486	145	18 53	20
***ON3UN**	14	42,676	204	21 59	14
*OR2A	"	26,296	161	15 46	15
					(OP: ON1DX)
*OP5T	"	18,585	150	10 34	15
					(OP: ON4DS)
***ON4CBA**	3.5	14,175	167	7 32	6
ON4TTT	AA	622,108	771	69 178	99
OR3A	"	375,136	519	59 162	83
					(OP: ON6CC)
ON6LR	"	7,378	50	21 40	1
***ON5GQ**	AA	1,144,494	1209	70 221	111
*OO4O	"	455,277	595	76 207	56
*ON8LX	"	211,526	501	43 131	29

Bosnia-Herzegovina

E72U	A	121,204	252	42 99	52
***E72X**	A	375,687	726	49 143	55
*E78T	"	187,308	427	33 112	53
*E77D	"	6,517	68	13 36	0
***E79D**	3.5	77,274	485	13 56	12
***E77EA**	AA	121,346	359	30 123	13
*E77C	"	74,752	243	31 95	20
*E70AW	"	74,692	280	34 95	13

Bulgaria

LZ5R	A	4,458,540	3306	109 299	162
					(OP: LZ5DB)
LZ5XQ	3.5	22,572	214	7 40	7
***LZ2ZY**	A	400,920	724	54 161	45
*LZ3QE	"	339,768	684	48 145	49
*LZ1GE	"	61,628	211	33 98	11
*LZ1QB	"	45,314	143	43 80	16
*LZ1MC	"	20,610	122	21 69	0
*LZ50YE	"	2,130	36	6 21	3
					(OP: LZ1YE)
***LZ5GM**	14	35,784	269	14 54	3
***LZ2JA**	7	76,000	393	16 63	16
*LZ2HT	"	9,504	118	8 35	1
LZ1ZJ	AA	311,634	588	55 173	33
LZ8E	"	290,410	496	57 141	59
					(OP: LZ2BE)
LZ2YO	21A	359,920	861	33 97	46
LZ2ZG	7A	7,520	76	8 39	0
LZ6Y	3.5A	16,362	169	9 41	4
					(OP: LZ1KU)
***LZ7X**	AA	349,180	532	64 206	46

Crete

***SV9DJO**	AA	201,168	495	39 140	19

Croatia

9A5X	21	634,550	1311	34 96	55
***9A7V**	A	383,160	550	66 190	53
*9A9Z	"	154,068	321	52 130	40
					(OP: 9A0W)
*9A3SM	"	146,376	299	53 117	44
*9A1DR	"	133,578	345	33 109	39
*9A7B	"	62,814	272	23 87	4
***9A5HZ**	14	11,424	108	9 34	8
***9A9TT**	3.5	10,062	125	7 35	1
9A2ZI	AA	2,743,698	1829	123 356	150
9A6KX	"	110,684	405	29 95	10
9A1CAL	"	41,870	170	26 61	19
					(OP: 9A3LET)
9A3XV	"	4,284	45	11 39	1
9A5Y	21A	677,200	1348	33 110	57
					(OP: 9A7DX)
9A5D	"	589,056	1230	32 108	52
					(OP: 9A3SMS)
9A3K	7A	445,704	1191	29 92	47
9A6OY	"	21,167	178	10 44	7
***9A6KZH**	28A	8,428	70	17 32	0
***9A1FL**	7A	56,811	331	14 60	13

Czech Republic

OK1PX	A	262,196	501	43 145	48
OK1AWC	"	157,076	323	47 126	41
OK1EP	"	116,850	277	41 125	39
OK1DOY	21	67,512	249	20 34	43
OK2SFP	3.5	29,792	276	7 42	7
***OK1PMA**	A	254,644	496	51 150	35
*OK5NW	"	251,894	601	40 139	23
*OK1HEH	"	178,178	493	38 133	11
*OK1AUO	"	84,500	203	47 92	30
*OK1UKY	"	55,968	203	28 83	21
*OK2VIR	"	49,320	177	28 95	14
*OK1MGA	"	49,300	212	22 73	21
*OK1TK	"	25,284	122	24 64	10
*OK1BJ	"	11,781	82	20 53	4
*OK1AY	"	6,795	75	8 34	3
*OK1TVL	"	930	21	12 19	0
***OK1LO**	28	4,080	46	12 21	1
***OK2LC**	21	65,720	252	24 57	25
*OK2CLW	"	41,820	154	23 50	29
*OK1MGW	"	21,525	115	17 37	21
*OK1MDK	"	12,896	85	17 36	9
***OK4RQ**	14	38,984	203	20 55	13
*OK2DIK	"	27,552	155	17 51	14
***OK1WCF**	7	363,474	1045	28 89	42
*OK2AK	"	1,364	30	6 16	0
OL1T	AA	827,244	982	74 243	79
					(OP: OK6DJ)
OK1PI	"	33,390	133	31 61	14
OK1VK	14A	5,400	48	11 25	14
OK5M	7A	96,278	573	16 56	19
					(OP: OK5MM)
***OK4GP**	AA	624,600	753	73 195	92
*OK1ALX	"	328,872	503	60 171	53
*OK2CMW	"	169,122	354	50 128	35
*OK1TRJ	"	97,410	262	31 108	31
*OK1DLX	"	12,561	68	21 42	16
*OK1CT	"	12,402	65	24 36	18
*OK2PF	"	3,600	32	15 26	7
*OK1TDX	"	1,647	35	6 21	0

Denmark

OZ11A	A	918,750	1128	68 195	87
OZ9GA	"	598,260	981	56 192	47
OZ0JD	"	370,656	772	45 150	39
***OZ1LFI**	A	87,314	284	30 103	16
*OZ7DK	"	77,250	245	35 97	18
*OZ6AGX	"	48,856	181	27 81	16
*OZ1QX	"	41,181	181	24 80	7
*OZ4HJ	"	3,915	39	13 29	3
5Q2J	AA	504,165	754	69 195	41
OZ1FHU	"	274,794	564	55 172	44
OZ2TF	"	75,752	254	27 83	26
OZ1AXG	"	5,871	49	19 36	2
OZ1ADL	7A	112,200	400	26 85	21
***OZ7HB**	AA	138,600	431	34 121	13
					(OP: DL1OJ)
*OZ1CK	"	130,140	357	38 121	21
***5P1KZX**	21A	61,739	237	24 64	19
***OZ1JVX**	7A	15,444	165	9 39	4

Dodecanese

***SV5DKL**	A	332,750	652	43 169	38
***SV5/ SV9COL**	21A	2,871	53	6 23	0

England

G1SCT	A	145,230	332	44 128	34
M0NKR	28	5,133	87	7 22	0
G0MBA	"	4,515	62	9 26	0
G9D	21	101,955	402	17 49	39
					(OP: G6NHU)
G4LPD	"	33,294	158	19 48	26
***G0MTN**	A	1,134,566	1295	76 233	100
*M5W	"	1,111,110	1255	68 219	103
					(OP: M0HMJ)
*G0FGI	"	431,472	654	55 178	70
*G0C	"	339,360	587	53 160	67
					(OP: G0CER)

*G4OZG	"	300,228	549	47	156	51
*M3X	"	299,013	648	37	151	33
						(OP: MØIHT)
*GØHDV	"	294,320	729	35	145	28
*GØW	"	195,000	482	36	130	34
						(OP: GØVDZ)
*MØAFZ	"	188,860	520	38	128	24
*M1VPN	"	176,675	462	34	128	29
*MØKKM	"	133,952	329	33	119	32
*G7H	"	131,930	391	30	115	22
						(OP: G7SYW)
*G4SGI	"	113,918	328	32	93	33
*G1P	"	107,778	397	27	105	10
*MØTQR	"	102,336	292	33	102	29
*G5LSI	"	99,484	306	34	94	26
*2EØLMA	"	59,600	296	21	79	0
*G3XTZ	"	55,808	191	29	76	23
**G4IDF*	*"*	*51,870*	*187*	*27*	*89*	*17*
*G7RTI	"	47,632	227	20	71	13
*MØRYB	"	46,500	179	27	81	17
						(OP: MØRYB/P)
*G5ROB	"	38,456	226	18	74	0
*GØOSK	"	26,112	131	22	64	10
*G5C	"	22,540	128	20	67	5
						(OP: G4OGB)
*G7WHI	"	10,132	78	16	47	5
*G3ZNU	"	7,888	53	16	29	13
*G6MXL	"	3,480	43	11	26	3
*MØXKI	"	2,144	33	9	23	0
*G3WYW	"	1,674	30	9	18	0
*MØJQQ	"	640	18	6	14	0
***GØORY**	**21**	**45,414**	**237**	**12**	**47**	**28**
*G4ZOB	"	18,340	108	17	39	14
*M9N	"	16,750	109	14	32	21
						(OP: G7WHI)
*G6C	"	14,762	114	11	32	18
						(OP: MØITR)
*M1TZR	"	7,650	64	10	25	15
***GØSNG**	**14**	**26,195**	**188**	**10**	**37**	**18**
*GØTKZ	"	22,330	151	12	43	15
*G8PGO	"	11,074	124	10	34	5
*G4WGE	"	8,820	110	8	31	3
***G4SJX**	**7**	**56,826**	**353**	**12**	**55**	**15**
*MØUNI	"	36,846	263	10	45	14
***G1A**	**3.5**	**17,531**	**189**	**6**	**37**	**4**
						(OP: MØNKR)
*M5A	"	2,046	50	3	19	0
						(OP: G3WVG)
G7C	**AA**	**3,618,227**	**2676**	**103**	**329**	**157**
						(OP: MØCKE)
M2J	**"**	**1,069,300**	**1105**	**79**	**248**	**98**
						(OP: G4NBS)
G1N	**"**	**737,412**	**884**	**64**	**203**	**110**
						(OP: GØURR)
G5K	**"**	**727,590**	**817**	**76**	**235**	**84**
						(OP: GØBNR)
MØVBY	**"**	**75,840**	**217**	**40**	**98**	**22**
GØDWV	**"**	**5,671**	**46**	**13**	**23**	**17**
G3G	**"**	**3,807**	**39**	**8**	**36**	**3**
						(OP: G3XLG)
MØIPU	**"**	**12**	**2**	**1**	**1**	**0**
G8X	**28A**	**91,208**	**389**	**21**	**72**	**11**
						(OP: G4FJK)
GØORH	**"**	**9,890**	**96**	**14**	**29**	**0**
M7W	**21A**	**279,243**	**661**	**30**	**97**	**44**
						(OP: G3TBK)
M2E	**3.5A**	**28,090**	**290**	**7**	**40**	**6**
						(OP: GØRPM)
***2EØINN**	**AA**	**550,459**	**873**	**54**	**186**	**59**
*M5X	"	230,090	387	54	165	47
						(OP: G3RLE)
*MØLKW	"	140,292	437	27	107	28
*G8KEK	"	97,152	265	32	109	35
*M4N	"	67,662	256	22	81	23
						(OP: G4IZZ)
*G4ENZ	"	64,938	156	36	79	43
*G8VPE	"	25,823	115	24	87	8
*G3RTU	"	23,144	125	20	56	12
*MØVLX	"	8,892	69	12	33	12
***M6W**	**21A**	**114,875**	**388**	**21**	**70**	**34**
						(OP: G3WW)
*MØBLF	"	40,827	187	19	47	27
*G4RQI	"	27,566	137	15	30	32
*G1VDP	"	22,932	128	16	42	20
***M5P**	**14A**	**71,000**	**339**	**19**	**55**	**26**
						(OP: M5BIR)
***G4N**	**7A**	**144,643**	**663**	**17**	**67**	**25**
						(OP: G4ZVB)

Estonia

***ES3HEA**	**A**	**156,222**	**422**	**39**	**139**	**20**
***ES5MJR**	**14**	**3,172**	**62**	**5**	**20**	**1**
ES4RD	**21A**	**162,606**	**552**	**24**	**74**	**25**
***ES1BH**	**AA**	**75,438**	**307**	**26**	**98**	**3**
*ES3BH	"	13,124	112	16	51	1
***ES5RY**	**28A**	**38,982**	**172**	**23**	**64**	**2**

European Russia

District 1

RW1A	**A**	**1,288,687**	**1270**	**97**	**243**	**103**
UF1F	"	17,952	112	24	45	19
***RV1OO**	**A**	**115,280**	**394**	**38**	**91**	**2**
*RN1AO	"	49,680	201	28	89	3
*RV1AQ	"	16,560	141	14	46	0
*R1LN	"	4,550	95	6	20	0

District 3

RC5Z	**A**	**476,320**	**890**	**60**	**173**	**27**
RT2H	"	99,383	334	29	114	6
RA3NC	"	82,450	229	44	122	4
R3TE	**14**	**79,380**	**482**	**18**	**62**	**4**
***R3AQ**	**A**	**466,368**	**583**	**81**	**241**	**25**
**R5AN*	*"*	*169,194*	*472*	*43*	*102*	*18*
*RK2M	"	144,690	394	43	138	1
*RV3ZN	"	69,615	320	21	97	1
*RX3MM	"	44,550	199	27	83	0
*UA3UBT	"	32,010	129	30	76	4
*RA3V	"	26,712	195	14	70	0
*RA3E	"	23,084	97	28	82	6
*UB5MCD	"	15,768	112	14	58	0
*RA3FD	"	1,710	28	10	20	0
***RU5X**	**28**	**3,770**	**55**	**13**	**16**	**0**
***RV3YR**	**14**	**7,749**	**95**	**7**	**29**	**5**
*UA3IHJ	"	7,392	74	13	32	3
*UB5MBA	"	2,688	43	7	23	2
***UA3PI**	**7**	**7,240**	**99**	**8**	**32**	**0**
RM3DA	**AA**	**1,191,000**	**1356**	**92**	**251**	**54**
RA3TT	"	21,138	132	17	60	1
***RA3Y**	**AA**	**949,045**	**1326**	**76**	**229**	**42**
*UC5D	"	87,120	339	33	93	6
*RX3AFE	"	6,448	48	21	19	12
**RX3Z*	*7A*	*43,335*	*253*	*17*	*53*	*11*

District 4

***UA4HBM**	**A**	**102,750**	**358**	**32**	**100**	**5**
*R4FCJ	"	82,761	286	35	110	2
**RT4W*	*"*	*66,993*	*236*	*36*	*100*	*1*
*R4IQ	"	29,736	183	18	66	0
***UC4I**	**AA**	**64,272**	**213**	**42**	**110**	**4**
*RU4LM	"	2,440	30	16	24	0
***RW4W**	**28A**	**33,969**	**216**	**20**	**47**	**0**

District 6

R6DM	**A**	**18,432**	**108**	**17**	**28**	**19**
UA6CE	**21**	**272,090**	**758**	**30**	**93**	**38**
***R6KX**	**A**	**227,408**	**415**	**56**	**149**	**39**
*UA6AUA	"	20,502	89	31	67	4
***RA6LIS**	**14**	**30,160**	**291**	**9**	**43**	**0**
***RT6DI**	**7**	**8,106**	**102**	**9**	**33**	**0**
***R7MM**	**AA**	**668,817**	**870**	**78**	**247**	**34**

District 9

***R9FE**	**A**	**32,085**	**180**	**21**	**72**	**0**

European Turkey

***YM1KE**	**A**	**29,491**	**207**	**16**	**61**	**0**
						(OP: TA1BX)

Finland

OH1XY	**A**	**75,808**	**174**	**46**	**112**	**26**
OG4W	**7**	**111,132**	**495**	**20**	**66**	**22**
						(OP: OH4KZM)
***OG16M**	**A**	**97,000**	**382**	**31**	**89**	**5**
*OH1SIC	"	93,784	306	27	118	7
						(OP: SM5SIC)
*OH2HOD	"	50,505	228	27	77	7
*OH2LU	"	45,375	181	28	92	5
*OH2EUU	"	38,781	198	22	60	11
*OH5UQ	"	15,124	103	18	51	7
*OH3UAI	"	7,224	61	16	38	2
***OH5ELX**	**14**	**11,037**	**123**	**13**	**26**	**0**
*OH6TN	"	2,088	33	9	19	1
***OH5CY**	**7**	**48,360**	**395**	**11**	**50**	**1**
OH1F	**AA**	**3,284,820**	**2415**	**114**	**358**	**122**
						(OP: OH1TM)
OG2P	"	1,805,804	1377	113	346	113
						(OP: OH2PM)
OH3FM	"	975,408	1358	72	229	35
OH2MAS	"	391,608	615	72	203	21
						(OP: OH5VT)
OG6N	"	311,704	374	88	268	20
						(OP: OH6NIO)
OH8JJ	"	163,785	424	42	134	7
OH1XX	"	51,436	124	58	95	14
OH2BBT	"	22,041	103	33	53	7
OH8WW	**21A**	**238,815**	**799**	**25**	**74**	**36**
						(OP: OH8GDU)
OG66X	**14A**	**496,908**	**1254**	**30**	**94**	**48**
						(OP: OH8WW)
***OG1ØØAAAA**		**311,376**	**734**	**50**	**144**	**14**
						(OP: OH8KVY)
**OH7L*	*"*	*95,342*	*232*	*51*	*132*	*10*
						(OP: OH8TV)
*OH7GGX	"	5,814	41	21	36	0
*OH8KA	"	4,508	47	12	34	0
***OH4HAX**	**14A**	**1,632**	**34**	**4**	**20**	**0**

France

TM5T	**A**	**820,855**	**1042**	**60**	**186**	**83**
						(OP: F5VKT)
F5OAM	"	364,180	682	44	147	71
F1RHS	"	255,915	484	53	138	44
F5GFA	"	118,657	373	29	91	41
F8FUA	"	70,376	204	40	88	24
F6ITD	"	58,671	156	42	84	33
F6EQZ	"	40,920	130	39	63	30
F4DPT	"	36,218	184	29	62	0
F5NBX	**28**	**1,456**	**23**	**11**	**13**	**2**
**F4FRC*	*A*	*256,719*	*509*	*50*	*159*	*40*
***F5RD**	**"**	**170,892**	**386**	**42**	**129**	**31**
*F6BQG	"	157,868	290	49	154	41
*F4ITQ	"	152,520	324	42	112	51
*F6GCI	"	144,936	325	50	127	39
*F4FDR	"	140,361	380	43	123	17
*F4CZV	"	110,943	299	46	143	0
*F6BUL	"	68,971	241	40	108	19
*F4CVO	"	48,763	192	27	75	19
*F5TYY	"	32,809	149	28	71	10
*F6KRK	"	31,302	118	30	53	28
						(OP: F4AFQ)
*F1IWH	"	29,520	158	21	58	11
*F1IKA	"	27,920	175	17	56	7
*F4IRV	"	27,552	158	17	59	8
*F5CT	"	10,665	61	27	35	17
*F1TEM	"	6,862	82	7	40	0
*F1VEV	"	5,992	57	11	44	1
***F4VSD**	**14**	**7,326**	**100**	**7**	**30**	**0**
*F5ROX	"	3,738	46	9	24	9
***F5PVJ**	**7**	**37,400**	**274**	**9**	**47**	**12**
*F6GPT	"	8,748	134	6	29	1
*F4JMJ	"	77	6	2	5	0
***F5BEG**	**3.5**	**66,150**	**450**	**8**	**50**	**17**
F4AIF	**AA**	**1,538,916**	**1314**	**100**	**292**	**122**
F1ADG	"	198,237	403	42	118	61
F1TRE	"	109,983	257	43	109	31
F4EQN	*"*	*103,332*	*314*	*35*	*97*	*26*
F5BMI	"	66,040	330	18	74	12
F5PHW	"	42,665	97	63	80	18
***TM3Z**	**AA**	**3,610,698**	**2140**	**127**	**398**	**189**
						(OP: F4DSK)
*TM7Y	"	1,013,397	991	82	266	103
						(OP: F8BDQ)
*F8CRS	"	717,848	599	93	275	120
*F4VVG	"	77,507	195	41	116	22
						(OP: DJ4MZ)
*F5LEN	"	71,487	192	37	52	52
*F8CPA	"	68,766	234	29	90	27
*F4FHV	"	64,636	205	34	78	31
*F6FLU	"	61,824	135	47	63	58
*F8FTY	"	58,674	162	34	71	49
*F5TAB	"	21,627	123	22	67	0
*F4GYM	"	3,510	31	17	22	6
***F6IRG**	**28A**	**9,752**	**80**	**17**	**28**	**1**
**F4FFZ*	*"*	*1,886*	*30*	*8*	*8*	*7*
**F6KPQ*	*21A*	*289*	*12*	*6*	*10*	*1*
***F4BKT**	**7A**	**6,946**	**75**	**8**	**34**	**4**

Germany

DF8QB	**A**	**813,200**	**959**	**75**	**225**	**80**
DL1DTL	"	524,900	632	79	228	55
DH6BH	"	247,748	485	50	148	43
DJ2IA	"	185,440	358	60	159	25
DL5NAV	"	165,400	414	37	128	35
DL5BCF	"	162,609	412	38	117	46
DL8DWL	"	147,159	254	69	161	19
DK2CC	"	143,583	281	48	144	37
DK6CQ	"	112,100	246	49	109	32
DF5BX	"	107,275	311	37	119	19
DK3GI	"	96,068	222	49	112	27
DK1FW	"	77,355	278	29	89	17
DL3XM	"	27,258	98	29	72	17
DL7UGO	"	18,954	97	23	46	12
DL1LQL	"	17,563	90	30	58	3
DF6RI	"	15,054	97	15	51	12
DK3AX	"	14,707	78	19	36	22
DG2BAR	"	8,280	61	23	45	1
DF6QE	"	7,920	53	21	44	1
DL1TLA	"	2,829	30	15	22	4
DL3BQA	**28**	**37,260**	**195**	**22**	**56**	**3**
DK2WH	"	31,392	180	21	50	1
DR5N	"	4,560	54	13	25	0
						(OP: DL2DBH)
***DL3SYA**	**A**	**510,040**	**819**	**64**	**208**	**39**
*DM5B	"	464,493	881	57	181	43
						(OP: DG6IMR)
*DF4ZL	"	451,408	693	69	199	49
*DD5M	"	423,150	615	68	197	60
						(OP: DJØZY)
*DL8ULF	"	346,952	719	47	162	39
*DF1DX	"	336,426	527	56	164	62
*DL5KUD	"	284,610	489	55	165	45
*DL75HIL	"	247,000	474	51	160	39
						(OP: DL1EAL)
*DG2BWG	"	237,350	504	46	157	32
*DL4ZA	"	230,880	513	42	120	60
*DJ5FS	"	206,976	432	46	141	37
*DD7UW	"	206,080	419	46	140	44
*DL1EHG	"	189,864	403	44	124	48
*DL3DRN	"	140,844	344	41	104	49
*DL6EZ	"	132,691	333	36	101	36
*DL1ZBO	"	114,660	400	33	105	18
*DR1ØØRY	"	110,704	396	30	107	11
						(OP: DF2SD)
*DL2HYH	"	104,220	217	39	107	47
*DL6SFR	"	101,541	257	40	96	45
*DL5JS	"	99,330	247	35	87	43
*DL5KBO	"	98,400	284	40	101	23
*DGØAM	"	93,624	219	45	117	26
*DL5IF	"	83,538	263	37	98	18
*DL7UKT	"	75,175	241	33	101	21
*DL9NO	"	74,141	246	37	105	9
*DB2WD	"	66,856	248	31	90	16
*DL2RUG	"	53,900	171	33	85	22
*DL2FK	"	53,856	193	31	85	20
**DP75ALF*	*"*	*51,875*	*198*	*26*	*80*	*19*
						(OP: DF7OA)
*DL9MWG	"	47,747	188	32	94	7
*DL1HSI	"	47,684	181	31	86	14
*DL5CV	"	46,827	236	18	71	10
*DJ3GE	"	42,822	152	30	65	22
*DL1KLF	"	40,040	147	32	101	7
*DL5ALW	"	39,424	133	25	71	32
*DJØMA	"	38,037	207	20	71	2
*DL2LMS	"	33,448	139	28	65	20
*DL1EJD	"	33,124	161	24	68	6
**DJ7UC*	*"*	*32,585*	*131*	*24*	*47*	*24*
*DF8IU	"	31,356	118	31	52	34
*DL8ZAJ	"	29,256	121	27	58	21
*DL9GMC	"	26,574	164	19	61	6
*DK1OZ	"	26,460	112	32	63	10
*DO2SBS	"	26,315	163	27	60	8
*DJ9SN	"	26,136	115	28	59	21
*DK7ZT	"	25,700	98	25	42	33
*DG3NAB	"	25,098	154	18	65	6
*DB1KK	"	24,598	130	23	64	11
*DL6RBH	"	23,736	135	26	65	1
*DD5MA	"	22,575	98	27	55	23
*DL1DXF	"	20,256	101	31	64	1
*DL2AK	"	19,800	140	14	59	2
**DL8ZU*	*"*	*17,739*	*115*	*20*	*58*	*3*
*DG1RPU	"	17,617	117	13	54	12
*DF5RF	"	17,190	72	25	43	22
*DL3LJ	"	16,942	80	23	45	18
**DLØGE/P*	*"*	*16,827*	*120*	*16*	*47*	*8*
						(OP: DG2ELK)
*DC8YZ	"	16,800	117	19	53	3
*DM1SG	"	16,617	102	21	58	8
*DL5RFK	"	14,850	103	15	56	4
*DK1VY	"	14,694	108	20	69	4
*DG3BZ	"	14,553	89	29	61	9
*DL1YCF	"	13,916	105	14	50	7
*DKØBM	"	13,167	94	17	43	17
						(OP: DK7CH)
*DO1ZYM	"	13,068	107	14	48	4
*DK1AUP	"	12,090	72	23	44	11
*DL1LZ	"	11,925	72	22	43	10
*DG3IS	"	10,956	89	15	51	0
*DL7VRG	"	10,530	76	24	48	6
*DG6ME	"	10,143	70	18	47	4
*DG4AM	"	9,849	72	18	39	10
*DM2DLG	"	9,815	73	16	41	8
*DL9FB	"	8,905	71	16	39	10
*DL7UPN	"	8,775	63	16	36	13
*DK9ZE	"	8,640	67	17	40	7
*DL9ZWG	"	8,580	65	18	39	9
*DL1JPF	"	8,479	70	15	45	1
*DL2ART	"	7,738	68	13	32	8
*DF3TZ	"	6,825	50	16	46	3
*DL9MFY	"	6,726	51	16	24	19
*DK2NVA	"	6,552	53	19	26	18
*DM6WAN	"	5,928	76	16	41	0
*DO9JN	"	5,265	89	8	37	0
*DG3DJ	"	5,243	54	14	35	0
*DL4APJ	"	4,674	59	10	31	0
*DM2RN	"	2,924	32	14	26	3
*DL1STV	"	2,656	47	9	23	0
*DF1ZW	"	2,652	44	10	24	0
*DO1TOM	"	2,030	39	6	22	1
*DC1RW	"	2,002	50	5	21	0
*DF2AJ	"	1,998	21	15	16	6
**DH1VY*	*"*	*1,715*	*26*	*9*	*19*	*7*
*DL8UI	"	1,617	17	15	15	3
*DL6RG	"	1,450	29	7	21	1
*DL8MKG	"	1,326	21	10	16	0
*DM6JKC	"	286	11	4	9	0
*DL1RPR	"	276	9	5	7	0
*DH6DAO	"	252	9	6	6	0
***DL2LDE**	**28**	**5,895**	**47**	**17**	**25**	**3**
***DJ6TK**	**21**	**13,872**	**97**	**18**	**40**	**10**
*DO2MOG	"	8,154	75	11	29	14
***DL4FN**	**14**	**216,986**	**589**	**25**	**87**	**42**
*DK7PA	"	25,813	149	16	48	19
*DL3MB	"	22,792	139	14	48	15
*DL1AKL	"	16,445	151	11	40	4
*DLØGEO	"	14,042	114	10	38	11
						(OP: DL2YAK)
*DL164ØY	"	8,758	79	14	36	8
						(OP: DL3CQ)
***DM6DX**	**7**	**340,535**	**968**	**30**	**98**	**41**
*DQ7D	"	4,128	100	2	22	0
						(OP: DB1WA)
***DL1AOB**	**3.5**	**39,957**	**413**	**7**	**44**	**6**
*DL1HUH	"	3,828	63	5	28	0
DM7XX	**AA**	**2,437,018**	**1622**	**118**	**366**	**142**
DAØRR	"	1,525,332	1360	87	261	126
						(OP: DF8XC)
DL4VDA	"	1,338,352	1253	92	253	121
DL6JZ	"	1,317,195	1133	96	287	112
DP8M	"	1,125,944	1016	93	293	101
						(OP: DL6NDW)
DF6QV	"	1,080,246	975	89	292	93
DL9GTB	"	1,013,328	783	109	330	119
DJ5AN	"	960,872	830	100	284	104
DL1QW	"	945,120	912	86	252	102
DM5TI	"	884,040	956	88	242	94
DL6KVA	"	816,660	834	86	206	98
DL5XJ	"	782,358	677	102	293	103
DHØGHU	"	773,364	699	88	262	96
DK6WL	"	763,980	602	109	315	86
DL9UP	"	737,891	800	89	242	76
DQ1P	"	737,880	719	87	256	86
						(OP: DK1IP)
DJ9DZ	"	722,051	704	91	287	73
DJ8EW	"	667,845	706	75	245	85
DD1JN	"	566,076	810	60	204	58
DK8ZZ	"	405,074	513	73	174	90
DL6ON	"	393,441	581	61	197	55
DJ9MH	"	379,271	475	75	204	68
DK3RA	"	370,152	498	74	201	43
DL2OE	"	359,807	445	81	204	58
DK4VW	"	349,872	495	69	176	51
DF3VM	"	315,242	393	79	189	58
DF2LH	"	294,922	358	81	185	68
DH1TST	"	292,480	407	68	204	48
DL4AMK	"	290,835	484	56	180	45
DJ4WT	"	274,275	456	60	164	41
DL5ST	"	255,498	395	71	180	40
DF2RG	"	245,875	377	69	157	55
DK2TG	"	202,488	293	72	158	56
DF8V	"	187,544	335	54	123	61
						(OP: DF8VO)
DK2CX	"	174,984	262	61	158	57
DL9NCR	"	171,986	371	52	134	40
DJ5IW	"	128,535	286	40	115	50
DL1RTL	"	101,706	216	57	125	19
DL9GCG	"	97,970	203	52	108	34
DL8RDL	"	86,500	243	44	110	19
DK2AT	"	82,303	246	40	104	25
DL7VEE	"	64,515	132	68	94	25
DL5RDQ	"	62,168	169	44	81	27
DL1STG	"	61,932	173	47	98	11
DK5JM	"	61,766	139	63	80	35
DJ5MW	"	59,830	156	48	93	14
DL9MKN	"	57,855	176	39	91	15
DGØKS	"	57,096	225	32	82	8
DK5PH	"	19,039	96	21	30	28
DL7CX	"	18,042	94	33	64	0
DL5ASK	*"*	*15,075*	*73*	*23*	*27*	*25*
DK5KK	"	13,840	73	25	47	8
DL6UAA	"	9,250	56	21	52	1
DL9NDV	"	3,888	29	24	29	1
DM5JBN	"	3,645	32	19	26	0
DL4ME	**7A**	**93,730**	**498**	**20**	**70**	**13**
DJ9KM	"	65,072	292	21	68	23
DJ8VH	"	64,584	257	20	66	31
DK9HN	"	2,331	29	10	23	4
***DK8NT**	**AA**	**609,234**	**841**	**71**	**220**	**63**
*DM7W	"	546,840	698	71	220	69
						(OP: DL8MAS)
*DL1GME	"	520,506	664	80	218	59
*DL8TG	"	512,523	734	66	217	58
*DL1MHJ	"	475,756	625	67	187	78
*DK1KC	"	417,274	689	58	169	59
*DAØBCC	"	392,176	756	51	156	47
						(OP: DO4OD)
*DL5ARM	"	343,710	602	52	176	42
*DL5RMH	"	329,104	571	51	165	52
*DL9PN	"	200,450	512	40	125	25
*DL2NBU	"	200,187	321	62	150	49
*DK2OY	"	187,332	493	38	142	21
*DK3WN	"	179,069	363	45	132	46
*DK3WW	"	161,455	299	53	143	49
*DJ4MX	"	157,550	240	72	141	61
*DC8SG	"	148,255	367	45	140	14
*DR7T	"	144,248	256	59	157	31
						(OP: DF1DN)
*DA3T	"	132,778	366	38	129	30
						(OP: DL8DXL)
*DA22LGS	"	122,310	411	30	102	30
						(OP: DL7ACN)
*DL9DX	"	120,139	298	40	122	29
*DG4O	"	113,098	294	37	128	28
						(OP: DG2BPW)
*DNØUKW	"	108,477	347	31	93	29
*DL1PSK	"	102,704	253	42	122	32
*DL1EMA	"	101,244	319	33	105	18
*DM4EAX	"	98,783	291	40	112	21
*DL9NEI	"	80,030	249	39	105	7
*DK7TY	"	72,816	209	38	111	15
*DJ6OI	"	70,990	180	34	76	45
*DL7ALM	"	59,717	200	29	80	24
*DJ7TW	"	58,752	211	32	93	19
*DF7CB	"	53,911	195	31	102	10
*DM6EE	"	41,072	157	33	94	9
*DM4AB	"	40,115	187	28	83	2
*DH6KM	"	39,060	171	24	73	27
*DK4VY	"	33,948	144	30	77	16
*DL5SFC	"	32,851	113	34	91	8
*DL1NEO	"	29,400	101	35	67	18
*DD5VL	"	26,010	98	25	44	33
*DL75DRG	"	25,482	142	21	65	7
						(OP: DL4EAX)
*DF1LX	"	22,200	96	20	81	10
*DG9VH	"	20,720	148	15	52	7
*DK7AM	"	19,530	99	23	60	10
*DC7MA	"	18,758	119	14	62	7
*DG6UAX	"	18,444	100	25	60	2
*DL8DWW	"	16,965	98	21	54	12
*DL4DRG	"	9,152	96	13	50	1
*DL7YS	"	7,228	73	11	38	3
*DLØABT	"	6,783	65	15	41	1
						(OP: DL3ZZA)
*DK8EY	"	6,552	62	17	37	2
*DF5EM	"	5,625	60	12	31	2
*DF9GH	"	5,564	37	17	22	13
*DO1JJK	"	5,328	53	10	27	11
*DL3RCG	"	4,026	43	20	35	6
*DL4SDW	"	3,560	34	11	14	15
*DL2OO	"	2,812	37	12	23	2
*DL3RAR	"	1,833	25	12	24	3
**DM4ET*	*"*	*1,008*	*25*	*5*	*13*	*3*

*DJ1MM	"	104	5	4	4	0
***DK9IP**	**21A**	**41,070**	**145**	**26**	**64**	**21**
***DJ5TT**	**7A**	**30,336**	**206**	**13**	**56**	**10**
*DL6MHW	"	10,621	138	8	32	3
*DK4DJ	"	2,511	50	6	25	0
*DK2ZO	"	170	7	3	5	2
***DF1MM**	**3.5A**	**74,880**	**557**	**10**	**55**	**13**

Greece

SV8OVH	**A**	**192,360**	**494**	**52**	**149**	**9**
SV1QN	"	6,630	61	15	36	0
SV3GKU	**28**	**14,868**	**108**	**20**	**32**	**7**
SV1GYG	"	725	27	13	16	0
***SV1CKZ**	**A**	**152,760**	**400**	**45**	**145**	**0**
*SV2SKD	"	56,175	292	18	79	8
*SV7CUD	"	35,937	142	34	75	12
*SV1PMQ	"	11,328	98	18	41	0
*SV8SYK	"	7,252	69	12	32	5
*SV1MO	"	3,465	31	17	19	9
*SV4RNT	"	247	9	5	8	0
***SV3SKM**	**14**	**103,103**	**469**	**19**	**60**	**24**
*SV3EXU	"	102,928	435	19	71	22
***SV3IBP**	**7**	**27,360**	**196**	**10**	**45**	**17**
SV1RK	**AA**	**254,250**	**435**	**56**	**134**	**60**
SV2SNS	"	204,390	340	62	174	34
SV1ABB	"	56,984	213	32	85	19
SV7QNV	"	32,802	217	18	59	0
SV2ESW	**21A**	**106,425**	**378**	**26**	**64**	**39**
***SV2AEL**	**AA**	**1,495,350**	**1535**	**93**	**274**	**83**
*SV1JFL	"	150,414	487	37	114	8
*SV8JVJ	"	33,888	200	20	69	7
*SV2HJW	"	4,788	40	11	12	19
*SV8PMM	"	350	12	5	9	0
*SV2RIM	"	180	11	3	7	0
***SV1JG**	**28A**	**44,144**	**191**	**26**	**52**	**11**

Guernsey

***GU0SUP**	**A**	**200,265**	**350**	**49**	**130**	**58**

Hungary

HA1BC	**A**	**489,260**	**613**	**75**	**202**	**63**
						(OP: DL1MAJ)
***HA/DK7TM**	**A**	**276,356**	**571**	**50**	**156**	**30**
*HA3HK	"	103,356	323	34	115	13
*HA3MGA	"	39,483	146	34	75	14
*HG5BMU	"	16,380	100	17	52	9
*HA3OOM	"	850	22	7	18	0
**HA8KM*	*"*	*72*	*6*	*3*	*6*	*0*
***HA0MS**	**14**	**68,159**	**359**	**18**	**59**	**14**
*HA8BQ	"	33,592	201	14	39	23
*HA0HV	"	14,756	117	13	40	15
***HA1TIB**	**7**	**19,012**	**196**	**7**	**38**	**4**
HA5UX	**AA**	**200,618**	**373**	**60**	**143**	**39**
HA5AQ	"	105,789	203	57	106	34
HG1G	**28A**	**33,440**	**166**	**24**	**53**	**3**
HG1S	**21A**	**713,200**	**1367**	**34**	**111**	**55**
						(OP: HA1DAE)
HG5D	**14A**	**621,680**	**1374**	**35**	**104**	**51**
						(OP: HA8QZ)
HA8BT	**7A**	**49,588**	**235**	**21**	**71**	**6**
HA1TJ	**3.5A**	**160,928**	**741**	**18**	**64**	**25**
***HA3OU**	**AA**	**195,510**	**337**	**61**	**161**	**44**
*HA1TNX	"	108,564	205	66	128	24
***HA8WY**	**3.5A**	**20,050**	**203**	**8**	**41**	**1**

Iceland

TF1AM	**A**	**740,096**	**1380**	**42**	**162**	**52**
TF3D	"	72,450	228	30	88	32
TF2CT	"	59,204	167	34	107	23
TF8KY	"	14,910	100	15	45	10
***TF2MSN**	**A**	**75,628**	**227**	**29**	**89**	**28**
*TF3VS	"	34,013	132	22	61	30
*TF3VE	"	14,418	100	20	57	4
TF3AO	**14A**	**103,014**	**503**	**14**	**57**	**26**
***TF3PPN**	**AA**	**47,652**	**305**	**12**	**48**	**16**

Ireland

EI8KF	**A**	**33,578**	**136**	**24**	**52**	**27**
EI8IU	**21**	**120,270**	**454**	**17**	**59**	**38**
***EI0W**	**A**	**56,792**	**228**	**21**	**72**	**31**
*EI3GRB	"	41,516	181	25	62	20
***EI3CTB**	**21**	**6,536**	**68**	**9**	**25**	**9**
EI6LA	**AA**	**835,752**	**1061**	**58**	**211**	**90**
EI6JK	"	533,902	605	80	234	69
***EI8KW**	**AA**	**122,484**	**345**	**32**	**127**	**14**
***EI5KO**	**14A**	**22,080**	**149**	**11**	**39**	**19**

Isle of Man

MD4K	**21**	**8,379**	**74**	**9**	**23**	**17**
MD7C	**14**	**344,201**	**1080**	**24**	**76**	**43**
						(OP: M5RIC)

Italy

I4JED	**A**	**1,124,003**	**1117**	**85**	**201**	**115**
I1NVU	"	700,560	720	84	224	109
IZ1PKV	"	517,702	751	71	176	66
IK7NXU	"	374,517	547	63	166	68
IK1UGX	"	291,712	686	39	132	41
IZ3QHA	"	190,211	499	40	147	16
IZ2BVC	"	170,892	628	26	110	5
IZ0PMV	"	153,584	678	22	71	23
I0GIA	"	123,464	310	44	115	25
IK2AHB	"	116,472	251	40	102	42
IZ2ZQP	"	114,800	343	38	100	37
IK4HPS	"	92,272	309	31	87	28
IU2IHM	"	79,035	201	41	86	38
IK2OWX	"	76,959	215	35	98	20
IZ4UFB	"	70,328	301	24	77	17
IK0YUT	"	55,031	189	21	44	48
IV3IXN	"	54,560	134	45	76	34
IW2DOY	"	36,698	137	33	70	15
IK2IKW	"	23,232	108	28	62	6
IZ2LQD	"	23,219	102	30	63	14
IW2NOO	"	22,176	144	15	64	5
IZ4FUE	"	13,530	77	25	50	7
IZ0IRH	"	10,385	73	19	44	4
IU6LSJ	"	7,605	67	18	47	0
IZ4GWE	**28**	**5,472**	**53**	**16**	**27**	**5**
I5MXX	**21**	**387,842**	**821**	**33**	**101**	**48**
IU4CSS	"	2,322	43	9	13	5
IK2AQZ	**14**	**58,250**	**208**	**28**	**68**	**29**
IK8NBE	"	37,655	213	18	59	8
IV3JAG	"	24,236	138	17	52	14
IU3PMA	"	13,384	105	7	28	21
I5WNN	**7**	**84,537**	**482**	**16**	**62**	**15**
IV3BTY	"	1,334	34	5	15	3
***IK2BUF**	**A**	**558,744**	**653**	**80**	**226**	**66**
*IK1JJM	"	512,216	635	66	191	87
*IW1PNJ	"	457,430	748	62	177	59
*IU3FBL	"	402,682	523	76	189	78
*IK0TUM	"	303,831	478	61	158	60
*IK1RGK	"	223,377	430	50	125	56
*IW0RLC	"	190,624	374	50	126	48
*IK4QJF	"	184,274	437	40	114	45
*IW1CBG	"	157,608	429	39	141	19
*IK4IDP	"	154,287	287	55	138	44
*I2XLF	"	129,947	312	48	104	47
*IV3UHL	"	128,649	332	33	121	29
*IZ8FPK	"	127,786	312	34	96	51
*IZ0MQN	"	126,633	390	40	120	31
*IN3EYI	"	126,243	388	36	124	9
*IK8GYS	"	125,856	349	37	112	35
*IK4RQJ	"	122,576	271	44	100	44
*IZ4YAB	"	120,692	283	45	140	26
*IK8IOO	"	117,392	311	41	112	31
*IU0PVM	"	116,946	312	33	108	37
*IK2AUK	"	112,948	303	38	120	29
*IZ8CLM	"	107,500	186	61	110	44
*I2BZN	"	103,206	305	31	108	28
*IK0ALT	"	98,532	229	39	128	40
*IZ5NRF	"	88,466	234	43	98	37
*IW5AOT	"	76,504	255	26	86	34
*IZ6BXQ	"	64,538	264	30	79	13
*IW2NKY	"	63,960	199	42	100	22
*IZ1PLH	"	62,624	195	33	97	22
*IK2YSJ	"	59,496	248	26	99	9
*IK4XQT/4	"	55,920	233	25	75	20
*I1YGQ	"	53,875	213	27	87	11
*IZ4OSH	"	52,440	225	32	71	12
*IV3IPA	"	48,730	249	23	78	9
*IK3MLF	"	47,728	136	41	86	30
*IN3OWY	"	41,395	277	14	70	1
*IK5FKE	"	38,704	138	27	58	33
*IW3IOD	"	38,599	162	37	84	0
*IK5FKF	"	37,269	148	31	84	8
*IW0AEN	"	34,727	129	29	68	24
*IQ7EY	"	31,350	196	22	65	8
*IZ2ABZ	"	29,884	113	27	76	21
*IK2RLS	"	29,680	108	28	52	32
*IZ3ZOO	"	20,000	122	17	61	2
*IK2SAR	"	18,690	83	24	38	27
*IW8BCG	"	17,280	115	18	59	3
*IK2SGF	"	16,182	103	16	24	22
*IZ5FSA	"	10,626	58	22	24	23
*IK2OVT	"	8,970	59	20	31	14
*IK2REA	"	8,928	56	17	27	18
*IZ0TWI	"	6,783	67	16	35	6
*I2IOJ	"	4,005	36	15	21	9
*IU3BPW	"	3,872	40	13	23	8
*IW2JRV	"	1,846	47	8	18	0
*IN3MNS	"	1,512	31	7	20	0
*IK2WZV	"	1,320	21	10	20	0
*IZ8MCG	"	551	16	7	12	0
***IZ3NXC**	**28**	**9,350**	**74**	**19**	**30**	**1**
***I3FGX**	**21**	**76,986**	**234**	**26**	**66**	**34**
*IK7DXP	"	33,947	190	18	43	22
*IK0EIE	"	28,797	122	16	35	36
***IK4MTF**	**14**	**57,245**	**234**	**19**	**61**	**27**
*IV3ZNK	"	48,682	213	19	61	21
*IZ7XNB	"	46,440	230	18	53	19
*IU1FQQ	"	35,670	214	17	53	12
*IZ4IRO	"	34,860	188	16	39	29
*IK5AMB	"	31,280	155	16	41	28
*IW3RCK	"	29,156	183	12	47	15
*I5OVS	"	15,246	124	12	39	12
*IK0RMR	"	4,030	74	8	23	0
*IK2AOO	"	3,430	45	9	24	2
***IK0REP**	**7**	**144,958**	**574**	**20**	**70**	**31**
*I3PXN	"	141,454	671	17	68	22
*IK1BPL	"	25,661	208	11	47	9
*IZ5DKO	"	17,472	174	8	38	10
*IK2EBP	"	4,340	87	4	24	0
*IK2SBB	"	3,030	59	7	22	1
*IZ2XCK	"	646	16	5	14	0
***IW2HUS**	**3.5**	**21,758**	**250**	**6**	**40**	**0**
IZ4BOY	**AA**	**5,243,463**	**2992**	**133**	**407**	**191**
						(OP: IT9RGY)
IK1PMR	"	889,977	844	84	259	104
I2BRT	"	638,820	696	82	227	81
IU3BTY	"	596,097	751	72	149	100
IZ4ZZB	"	546,807	624	68	153	118
IK2XSL	"	460,174	627	66	149	71
I2DJX	"	333,402	445	63	173	71
IK3SWB	"	288,586	412	70	179	64
I3VJW	"	270,282	328	88	168	65
IK2TDM	"	206,444	289	69	163	60
IK2LOL	"	180,061	387	45	101	57
IK2XRW	"	163,615	293	53	108	54
IK0XBX	"	115,786	243	50	118	41
IK5PWS	"	90,540	225	50	110	20
I2WIJ	"	86,879	241	44	100	19
I5MPN	"	47,838	187	29	83	22
IK4ZHH	"	47,180	129	43	73	24
IK2QIN	"	35,742	124	25	53	33
IK3XJP	*"*	*12,719*	*62*	*36*	*40*	*3*
IZ8DVD	"	11,935	63	24	36	17
IK4MTK	"	10,877	93	19	52	2
IU1JCZ	"	9,690	94	12	38	7
I7CSB	**28A**	**33,259**	**159**	**24**	**49**	**6**
IZ3GOM	**21A**	**297,120**	**704**	**30**	**88**	**42**
IU4CHE	**14A**	**234,156**	**654**	**28**	**82**	**46**
I0WBX	"	169,799	630	23	72	32
IW1CHX	"	128,773	477	25	71	35
IV3ZXQ	**7A**	**298,224**	**921**	**25**	**88**	**39**
IK2XDE	"	215,204	791	22	84	28
IN3BFW	"	73,980	414	16	68	6
IU1HHH	"	19,482	208	7	41	3
IK0LNN	"	17,360	153	9	44	3
I4AVG	**3.5A**	**109,560**	**662**	**11**	**54**	**23**
I1JTQ	"	60,137	458	10	50	11
IO3C	"	25,600	286	5	45	0
***IK8UND**	**AA**	**826,728**	**911**	**74**	**231**	**94**
*IW2MXY	"	816,000	978	80	245	75
*IW5EIJ	"	359,544	562	68	172	44
*IU2JWF	"	180,720	317	58	143	39
*IV3XNF	"	111,940	257	46	107	40
*IU4FNO	"	110,547	231	52	128	33
*IV3ONZ	"	106,600	311	35	112	17
*IK4OMU	"	73,632	197	41	82	33
*IW2FUT	"	71,415	245	22	73	40
*IZ7GEG	"	31,565	148	29	74	4
*I2XYI	"	28,684	139	25	70	6
*IK2GZU	"	24,544	107	22	65	17
*IV3HAX	"	12,726	95	18	45	0
*IZ2BHQ	"	8,700	41	32	38	5
*IZ5MMT	"	1,377	27	8	19	0
***IK5RUN**	**28A**	**29,700**	**127**	**25**	**54**	**11**
***IZ8BGY**	**21A**	**17,690**	**128**	**13**	**31**	**14**
*IK5MEP	"	3,760	38	11	14	15
*IK1NEG	"	2,600	33	15	21	4
***IK6VXO**	**14A**	**477,118**	**1078**	**34**	**102**	**55**
*IK1SOW	"	124,250	385	28	82	32
*IV3XZG	"	35,046	140	21	53	25
*IK2GWH	"	30,129	166	14	52	17
*IZ0EHL	"	28,386	170	17	53	13
*IZ1ZHG	"	25,438	147	16	46	17
*IW3RQT	"	19,764	124	16	51	14
*I2ORX	"	3,939	49	7	25	7
***IK4ZIF**	**7A**	**189,336**	**681**	**22**	**80**	**36**
*I4IKW	"	26,448	143	18	59	10
*IU5ICR	"	17,505	218	8	37	0
***IK4RVG**	**3.5A**	**40,980**	**389**	**7**	**50**	**3**

Jersey

MJ0X	**A**	**808,787**	**1248**	**50**	**184**	**67**
						(OP: M0RTI)

Kaliningrad

UA2CZ	**A**	**1,536**	**27**	**9**	**15**	**8**
***RN2FQ**	**A**	**43,956**	**200**	**26**	**81**	**4**
**R2KMO*	*"*	*3,024*	*37*	*15*	*27*	*0*

Latvia

YL2CI	**3.5**	**56,606**	**485**	**8**	**50**	**4**
***YL2NK**	**A**	**176,733**	**397**	**49**	**147**	**23**
***YL2LW**	**21**	**18,850**	**136**	**15**	**39**	**11**
YL2KO	**AA**	**126,945**	**349**	**33**	**91**	**31**
***YL1ZF**	**AA**	**1,204,330**	**1343**	**85**	**269**	**61**
*YL1YF	"	369,974	720	52	170	29
						(OP: YL3GAZ)
*YL3IR	"	51,968	208	27	71	18

Liechtenstein

HB0/DL5YM	**AA**	**497,945**	**787**	**47**	**167**	**73**
HB0WR	"	72,695	208	33	87	35
HB0/DF8DX	**7A**	**2**	**1**	**1**	**1**	**0**

Lithuania

***LY2PAD**	**A**	**189,527**	**391**	**57**	**156**	**26**
*LY4BF	"	87,975	290	34	107	12
LY1R	**AA**	**454,152**	**669**	**68**	**176**	**54**
LY3CY	"	183,200	431	40	141	19
LY2CX	"	4,850	45	12	29	9
LY2MM	**14A**	**111,888**	**436**	**20**	**61**	**31**
***LY2F**	**AA**	**166,158**	**418**	**39**	**104**	**38**
*LY3I	"	21,675	129	18	61	6

Luxembourg

LX1HD	**AA**	**310,684**	**560**	**50**	**139**	**64**
***LX1ER**	**AA**	**1,046,382**	**1062**	**92**	**266**	**80**

Malta

***9H1CG**	**A**	**376,211**	**677**	**57**	**148**	**48**

Netherlands

PA0CT	**A**	**165,120**	**399**	**35**	**121**	**36**
PA4JJ	"	82,203	218	38	83	38
PA3ADU	"	966	19	6	14	3
***PA3EWG**	**A**	**119,652**	**347**	**30**	**114**	**25**
*PA1FNW	"	116,232	311	35	105	27
*PA3ARM	"	107,570	329	33	102	20
*PA4DN	"	96,425	250	41	102	32
*PD0MHZ	"	95,238	438	20	77	14
*PA0PIW	"	91,203	355	30	94	5
*PA0CMF	"	49,266	198	28	84	14
*PA2W	"	48,360	200	22	86	12
*PD0WVB	"	46,366	247	22	74	1
*PA0ALG	"	41,004	196	22	68	12
*PF6X	"	39,590	193	25	73	9
*PA2VS	"	36,955	198	20	63	12
*PA3DBS	"	35,750	164	26	68	16
*PA3DVA	"	35,226	151	22	58	23
*PA3BWK	"	25,571	147	20	70	1
*PE1LDS	"	25,200	157	18	63	3
*PD5JOS	"	19,418	145	13	42	18
*PD0MWG	"	14,994	124	17	46	0
*PA4R	"	14,344	74	27	50	11
*PD1NL	"	8,775	62	15	33	17
*PA0TCA	"	6,325	51	15	33	7
*PA7RW	"	2,738	35	11	23	3
*PA3CXB	"	2,263	32	7	19	5
*PA8KW	"	1,200	24	9	16	0
*PA3EPO	"	518	18	3	11	0
***PD2PKM**	**14**	**78,280**	**379**	**18**	**56**	**21**
*PA0FVH	"	20,412	161	14	49	0
*PD4Q	"	7,155	76	7	28	10
PA6AA	**AA**	**864,280**	**896**	**77**	**248**	**85**
						(OP: PB7Z)
PA7LV	"	657,270	921	72	197	66
PA4WM	"	472,185	628	64	183	68
PA5WT	"	382,320	591	61	192	42
PC4H	"	358,648	655	53	165	36
PD9X	"	268,690	678	39	117	38
PA3GCU	"	254,448	588	46	147	23
PE1PIX	"	237,896	500	47	145	35
PA0GJV	"	88,970	249	30	84	41
PA5N	"	65,688	220	32	92	14
***PA3DUU**	**AA**	**408,096**	**540**	**66**	**181**	**80**
*PA2TA	"	355,866	651	52	173	34
*PC1PM	"	290,570	566	51	157	37
*PD1RP	"	207,207	444	46	120	41
*PE1FTV	"	186,810	449	39	129	27
*PE1OYB	"	172,656	401	48	137	33
*PA2JCB	"	144,020	348	39	121	30
*PA3EVY	"	143,520	326	50	125	33
*PA6Q	"	142,627	352	39	135	19
*PD2GSP	"	129,888	384	32	97	35
*PD0ME	"	117,920	354	34	104	22
*PA3BUD	"	102,027	198	59	123	31
*PC5D	"	99,919	309	31	99	33
*PH9B	"	85,652	262	31	103	27
*PD0JMH	"	46,041	222	20	76	7
*PD3LPA	"	44,844	200	24	60	17
*PA4GDR	"	39,440	151	26	66	24
**PE1HWO*	*"*	*34,823*	*154*	*18*	*54*	*25*
*PA0GRU	"	31,968	145	26	69	16
*PA1M	"	24,038	99	28	76	15
*PD4RD	"	19,976	110	22	57	9
*PA3HGF	"	19,201	101	21	57	13
*PE4KH	"	16,872	106	15	50	9
***PF6W**	**14A**	**10,486**	**101**	**8**	**31**	**10**
***PG7M**	**7A**	**17,111**	**122**	**11**	**52**	**8**

North Macedonia

Z33B	**A**	**103,320**	**438**	**27**	**90**	**3**
***Z32ZZZ**	**A**	**9,660**	**74**	**18**	**45**	**6**
***Z33F**	**21**	**82,425**	**346**	**22**	**58**	**25**
***Z35Z**	**3.5**	**8,676**	**133**	**5**	**31**	**0**
Z35T	**21A**	**502,860**	**1181**	**29**	**91**	**50**
Z39A	**7A**	**42,267**	**279**	**14**	**53**	**6**
***Z36W**	**AA**	**656,766**	**929**	**59**	**194**	**68**
***Z36N**	**14A**	**89,262**	**548**	**14**	**54**	**13**

Northern Ireland

MI0ULK	*A*	*52,204*	*234*	*24*	*74*	*26*
***MI0DWE**	**A**	**177,110**	**406**	**37**	**110**	**52**
*GI4H	"	80,850	247	32	100	22
						(OP: GI4JTF)
***GI4SJQ**	**AA**	**174,528**	**416**	**42**	**134**	**26**

Norway

LN8W	**A**	**2,512,260**	**2115**	**97**	**283**	**130**
						(OP: LB8IB)
***LA2HFA**	**A**	**92,160**	**244**	**39**	**131**	**10**
*LA7SI	"	24,948	146	23	68	8
*LB4YI	"	3,690	50	11	32	2
*LB4ZI	"	3,036	43	13	31	0
*LC7D	"	736	19	7	15	1
						(OP: LA6PBA)
***LA0GE**	**14**	**17,556**	**126**	**14**	**40**	**12**
LA100B	**AA**	**744,232**	**1080**	**66**	**192**	**70**
						(OP: LA6VQ)
LA3BO	"	531,288	899	64	201	17
LC5Z	"	240,090	388	65	146	54
						(OP: LB5GI)
LB6KC	**21A**	**25,972**	**135**	**18**	**54**	**14**
***LA9TY**	**AA**	**586,920**	**712**	**83**	**229**	**53**
*LA3BPA	"	240,500	442	60	164	26
*LC7N	"	130,620	278	53	139	18
						(OP: LA5LJA)
*LB6VI	"	45,568	251	17	65	7
*LA6CF	"	6,780	45	20	27	13

Poland

SN6A	**A**	**45,570**	**125**	**52**	**82**	**13**
						(OP: SP6CES)
SQ9DXT	"	34,317	184	18	68	7
SP2QCW	"	32,342	144	25	70	8
SP9GKJ	"	24,610	110	33	63	11
SP8K	**14**	**197,190**	**687**	**25**	**63**	**38**
SP2TQQ	**7**	**5,291**	**74**	**5**	**30**	**2**
***SP9DLY**	**A**	**519,696**	**747**	**68**	**208**	**48**
*SQ6PLE	"	326,628	625	53	170	35
*SP9EZM	"	284,504	532	48	147	49
*SP3LGF	"	273,924	502	54	159	39
*SP2V	"	266,208	497	47	140	49
*SP5GNI	"	211,827	420	52	152	27
*SP9GMI	"	194,233	355	50	119	54
*SP9CXN	"	185,866	456	39	139	21
*SQ2TOM	"	147,840	328	42	134	34
*SQ1X	"	145,977	346	41	124	32
*SP5UFK	"	145,860	386	41	131	15
*SO200IL	"	141,370	300	44	130	37
						(OP: SP8EEX)
*SP1TJ	"	130,453	363	41	119	31
*SP3OKS	"	96,570	237	43	111	31
*SP6JZP	"	92,824	271	40	109	15
*SO3O	"	88,948	322	32	107	9
*SP1DMD	"	85,888	229	43	104	29
*SP8CGU	"	74,640	285	29	69	22
*SP6NIV	"	73,753	261	27	88	16
*SP1DOZ	"	65,856	295	22	77	13
*SO1RON	"	56,100	170	36	87	27
*SP3QDX	"	52,503	200	30	88	11
*SP3MZ	"	50,407	205	35	90	8
*SP3MEO	"	46,652	227	29	71	7
*SP6SOZ	"	36,400	151	27	66	19
*SP9ICU	"	32,640	183	22	63	11
*SP4BPH	"	28,120	139	27	63	5
*SP4AAZ	"	25,398	128	24	66	12
*SP9IHP	"	24,823	86	35	40	28
*SP5BYC	"	15,642	102	14	35	17
*SQ9PPT	"	14,527	106	17	56	0
*SP5CMW	"	10,030	84	13	44	2
*SP3BES	"	7,155	64	15	33	5
*SQ6ILH	"	6,496	47	18	35	5
*SP9DLS	"	4,312	50	13	31	0
*SP6BEN	"	2,800	30	16	23	1
*SP3BBS	"	210	8	7	8	0
***SP2FNC**	**21**	**14,151**	**110**	**14**	**28**	**11**
*SP2FOV	"	11,336	89	16	33	3
***SO0A**	**14**	**110,432**	**456**	**23**	**59**	**30**
*SQ6KXY	"	61,380	311	17	61	15
*SP6DMI	"	42,987	228	17	52	20
*SQ8W	"	31,875	303	9	33	9
*SQ8DSB	"	720	19	6	12	0
***SP9Z**	**7**	**54,678**	**351**	**12**	**57**	**9**
*SQ5CZP	"	51,666	326	12	51	16
*SQ2OMK	"	2,760	58	5	25	0
*SQ7LQJ	"	1,794	46	4	19	0
***SP9CTS**	**3.5**	**5,344**	**92**	**5**	**27**	**0**
*SP9KJU	"	99	8	2	7	0
						(OP: SP9MDY)
SN7Q	**AA**	**4,627,395**	**2806**	**130**	**387**	**164**
						(OP: SP7GIQ)
SP9KR	"	651,836	780	74	186	96
SP3HRN	*"*	*111,134*	*299*	*47*	*118*	*16*
SQ2RGB	"	81,468	209	52	111	23
SP4Z	"	36,533	112	32	53	34
SP3JDZ	"	1,776	23	16	21	0
SP7IIT	**28A**	**18,005**	**105**	**22**	**39**	**4**
SN5X	**21A**	**494,000**	**1029**	**32**	**111**	**47**
						(OP: SP5GRM)
SP3A	**14A**	**77,740**	**304**	**21**	**69**	**25**
***SP2R**	**AA**	**1,227,534**	**1260**	**90**	**290**	**82**
*SQ6ELK	"	107,882	308	39	109	19
*SQ9FMU	"	96,900	256	38	106	26
*SO5WD	"	95,620	343	28	104	8
*SP2MKI	"	84,315	219	34	102	29
*SP6FXY	"	54,720	171	34	86	24
*SP3CMX	"	45,264	179	29	86	8
*SP9JZT	"	28,615	131	25	57	15
*SP9IVD	"	15,225	86	20	44	11
**SP2WGB*	*"*	*5,194*	*49*	*18*	*35*	*0*
*SQ8L	"	3,200	31	16	18	6
***SP6IHE**	**28A**	**7,084**	**52**	**20**	**24**	**2**
*SN0R	"	1,917	27	12	15	0
						(OP: SQ9IAU)
*HF6C	21A	125,528	361	28	80	34
						(OP: SP6OPC)
*SP2QOT	"	38,964	151	27	57	18
*SP8BRT	14A	5,513	78	9	28	0

Portugal

CR6T	**21**	**512,141**	**1298**	**28**	**78**	**55**
						(OP: CT1ESV)
CT7AIX	"	57,800	235	17	51	32
***CR5O**	**A**	**1,425,060**	**1639**	**63**	**223**	**104**
						(OP: CT7AJL)
*CT1BWU	"	462,231	613	57	169	93
*CT1EKD	"	5,452	64	10	36	1
***CT1BWW**	**21**	**25,004**	**112**	**20**	**48**	**26**
***CT7AUP**	**AA**	**457,620**	**787**	**48**	**150**	**65**
***CT7AHV**	**3.5A**	**3,920**	**51**	**7**	**28**	**5**

Romania

YO4FPF	**A**	**245,575**	**555**	**43**	**130**	**36**

***YO3VU**	A	383,568	728	56	142	46
*YO9BCM	"	314,712	603	43	165	40
*YO6HSU	"	274,480	556	42	151	42
*YO3YV	"	272,814	540	50	165	31
*YO8RFS	"	183,064	450	35	129	32
*YO2LXW	"	108,836	343	37	118	6
*YO4SI	"	28,476	121	33	67	13
*YO2CMI	"	13,580	95	20	49	1
*YO2LDU	"	11,136	102	11	44	3
*YO2GL	"	8,568	66	18	39	15
*YO2MOO	"	2,535	33	11	28	0
*YO6PVX	"	35	4	3	4	0
***YO2IS**	21	30,856	188	14	36	26
*YO4BXX	"	2,128	38	7	13	8
***YO5AXF**	14	36,920	257	13	49	9
*YO4CVV	"	4,392	61	7	28	1
***YO6BGT**	7	28,800	200	13	51	8
*YO4GO	"	6,975	77	9	33	3
YO7CW	AA	227,766	470	46	154	31
YO4NF	21A	36,068	242	16	43	12
YO9HP	14A	376,152	959	29	91	48
YO3IJ	"	39,508	297	16	51	1
YQ6A	7A	180,000	567	25	80	39
						(OP: YO6BHN)
***YO4DG**	AA	268,765	512	56	161	28
*YO2DFA	"	65,351	205	40	92	11
*YO4RDW	"	59,520	246	27	89	4
*YR2X	"	31,510	109	34	53	28
						(OP: YO2LEA)
*YO6CFB	28A	7,548	63	20	31	0

San Marino

***T7ØA**	14A	362,710	908	28	86	52

Sardinia

***ISØBRQ**	A	2,508	29	9	29	0
***IMØ/IK5AEQ**	28	9,900	70	20	27	8

Scotland

GM2V	28	8,856	119	6	30	0
						(OP: GM3WOJ)
GM7V	3.5	774	23	4	14	0
						(OP: GM3WOJ)
***GM5BDX**	A	184,032	403	40	128	45
*GM3STM	"	75,616	261	29	87	23
**GM2TT*	"	29,856	180	22	74	0
*GM4OSS	"	8,694	79	12	40	2
***GM6DX**	21	9,284	146	8	36	0
***MM1E**	14	450	14	3	10	2
						(OP: MMØGOR)
MM9I	AA	2,236,332	1770	96	320	137
						(OP: GMØOPS)
GM9A	"	868,180	1180	69	186	77
GM4Z	"	131,826	300	36	82	55
						(OP: GM4ZUK)
GM3S	7A	197,604	694	24	77	31
***MM2T**	AA	243,410	488	45	150	46

Serbia

YT3D	A	1,161,303	1080	87	226	116
YT8A	28	27,370	175	22	45	3
***YU1GU**	A	27,945	116	28	78	9
***YT9WW**	7	5,640	75	8	32	0
YU7BW	AA	869,312	1041	83	236	57
YT3X	14A	593,110	1364	33	104	48
YU5R	7A	427,094	1059	31	100	48
						(OP: YT2AAA)
***YT2U**	AA	129,503	309	41	111	41
*YU1KT	"	113,448	366	36	125	2
***YT7E**	14A	27,755	242	13	47	1
*YT2TNT	"	19,955	161	13	37	15
***YT9VM**	7A	119,616	517	19	70	23
*YU3TA	"	13,716	135	9	44	1

Sicily

IT9STX	14	287,400	829	23	77	50
IT9UFP	"	5,966	78	8	22	8
***IT9RBW**	A	905,519	1279	59	190	88
*IT9FRX	"	114,696	364	42	90	45
*IT9MRM	"	104,438	315	37	91	30
*IT9ZZO	"	22,148	96	30	44	24
*IT9ACJ	"	20,367	133	25	65	3
*IW9BJP	"	8,976	68	19	46	1
***IR9D**	21	196,812	574	31	81	42
IT9ESW	AA	189,837	326	62	149	56
IT9WDC	21A	167,808	450	30	81	41
IT9SSI	"	48,111	250	15	41	31
IT9VCE	14A	249,860	911	25	76	29
***IT9FTP**	AA	14,688	64	33	54	9
***IT9RZU**	28A	25,461	142	24	40	5
***IT9XTP**	14A	274,736	813	27	86	41
***IT9IVU**	3.5A	23,766	235	7	40	4

Slovak Republic

OM3CFR	A	193,620	420	42	137	31
OM2VL	21	659,932	1316	33	107	56
***OM5XX**	A	387,790	576	72	193	49
*OM5NL	"	308,760	591	47	145	56
*OM5TX	"	279,282	532	61	172	34
*OM5CM	"	155,124	428	37	129	20
*OM5MX	"	133,812	361	38	105	34
*OM7AG	"	24,288	144	23	66	3
*OM2WX	"	15,288	87	23	50	11
*OM3RJB	"	4,601	55	9	34	0
						(OP: OM5MB)
*OM6AI	"	896	28	3	13	0
***OM8WG**	14	18,333	130	9	43	11
*OM8ATS	"	11,000	115	10	34	6
*OM8GRS	"	10,653	95	10	33	10
***OM3ZWA**	3.5	35,478	348	7	46	1
*OM5KM	"	17,526	198	6	39	1
OM4MW	AA	226,341	387	70	144	35
OM3CW	14A	106,672	427	20	57	36
***OM8MF**	AA	54,188	198	29	74	21
**OM7JG*	"	714	14	8	11	2

Slovenia

S51JQ	14	37,584	192	12	45	30
***S5/MØMPM**	A	35,136	130	28	61	33
***S5ØA**	21	310,707	730	30	90	51
S52WW	AA	344,560	688	41	142	53
S53F	"	84,231	190	51	118	22
S53M	14A	742,050	1562	35	107	52
						(OP: S51FB)
S57DX	"	457,794	1126	32	92	50
S52X	7A	558,386	1402	30	97	51
S51CK	"	363,440	1088	29	89	36
S53X	3.5A	138,838	759	13	60	21
***S53K**	AA	808,840	958	75	209	81
*S56A	"	787,075	739	90	286	99
***S5ØSL**	7A	2,375	56	5	20	0
***S51ZJ**	3.5A	67,968	547	7	49	8
*S53NW	"	49,472	414	8	49	7
*S51W	"	41,904	398	6	43	5

Spain

EA2DLX	A	568,176	989	42	150	75
EH2JDZ	"	119,928	340	24	67	61
						(OP: EA2DR)
EB5A	"	19,588	106	25	50	8
EB1IC	28	1,740	24	12	15	3
EA3OH	14	20,468	136	10	41	17
EA1DA	7	38,454	228	10	41	27
***EA3FZT**	A	735,299	940	71	201	81
*EA3CI	"	684,080	885	62	189	89
*EA2XR	"	507,496	775	59	155	78
*EA3Y	"	260,820	481	44	155	53
*EA3F	"	189,224	402	44	121	52
*EA5/DL5EO	"	148,533	265	66	115	50
*EA3HKA	"	65,145	243	30	80	19
*EA3AKA	"	53,862	191	32	83	26
*EA1AY	"	52,328	194	29	79	16
*EA4HKF	"	45,080	197	29	78	8
*EA1AAP	"	43,160	155	31	79	20
*EB1CAR	"	41,652	156	24	58	35
*EA3CFV	"	36,138	181	26	85	3
*EA1EWY	"	32,700	138	23	51	26
*EA5MR	"	29,631	190	18	57	8
*EA3JW	"	29,070	149	21	53	16
*EA5KE	"	25,038	102	29	59	19
*EB5CS	"	20,790	85	28	48	23
*EA7HAB	"	4,371	42	12	26	9
***EA7Z**	28	30,294	142	20	38	23
*EF7W	"	24,700	149	17	41	7
						(OP: EC7KW)
***EA5O**	21	30,800	139	16	37	35
*EB3TR	"	17,484	133	12	34	16
*EA7K	"	13,969	99	14	34	13
***EC5C**	14	66,810	317	18	61	23
*EA7JTP	"	14,634	136	7	39	8
***EA2BNU**	7	7,920	126	6	29	1
EF7N	AA	3,061,829	2454	96	303	158
						(OP: EA7KHB)
EE4Y	"	2,509,740	1944	109	317	147
						(OP: EA4GOY)
EF1A	"	389,856	646	45	137	80
						(OP: EA1X)
EB5F	"	287,328	496	39	109	71
EA4FME	"	207,665	485	45	118	42
EA2DDE	"	165,866	298	54	126	59
EA5J	"	141,759	345	29	79	63
EA1AP	"	117,786	404	25	70	39
EA4R	"	19,388	131	17	54	3
EA2A	"	2,937	30	7	6	20
EA1B	14A	137,750	535	22	68	35
***EA4BAS**	AA	886,256	1057	73	217	96
*EA2CCG	"	283,879	619	36	119	68
*EA2EVM	"	167,063	482	30	102	49
*EA5JDN	"	142,680	406	34	117	23
*EA5LU	"	129,360	398	40	123	13
*EC5KY	"	62,780	232	33	99	14
*EA2EVC	"	58,960	207	22	81	31
*EB1TR	"	34,505	251	14	47	6
*EB5CUZ	"	32,550	139	26	59	20
*EA4AFP	"	4,998	36	15	16	18
*ED2V	"	1,914	24	9	15	9
						(OP: EA2CYJ)
***EA1KP**	28A	20,313	141	16	38	7
*EB1ADD	"	7,134	69	13	26	2
*EF5U	"	3,150	44	10	20	0
						(OP: EA5U)
***ED7O**	21A	361,257	969	28	79	50
						(OP: EA7EU)
*EE5K	"	307,648	707	33	95	48
						(OP: EA5DF)
*EC7YY	"	139,020	444	25	71	44
***EA1CQ**	14A	81,972	417	14	53	25
*EA5HJO	"	37,620	287	13	53	0
***EA3IAZ**	7A	49,966	308	14	54	15
*EA5GIE	"	8,274	120	7	34	1

Sweden

SM5ILE	A	424,512	782	54	174	40
SD1A	"	56,100	195	37	86	9
						(OP: SM1TDE)
SM3PZG	21	90,736	368	23	67	16
***SM5FQQ**	A	257,145	566	46	145	26
*SE6K	"	232,163	660	35	130	14
						(OP: SM6FZO)
*SM5ACQ	"	131,905	366	39	130	16
*SM7CIL	"	75,752	227	27	71	38
*SM5DXR	"	44,486	230	23	93	2
*SI3A	"	25,915	173	16	57	0
						(OP: SM3LIV)
*SM5MX	"	12,616	92	21	53	2
*SM6IQD	"	1,440	20	12	19	1
SM6MVE	AA	135,408	363	42	128	16
SM6YEC	"	5,304	53	17	34	0
SM2M	21A	482,600	956	34	112	54
						(OP: SM2LIY)
7S9A	14A	114,912	484	17	64	27
***SM5IMO**	AA	489,368	847	46	163	59
*SE4E	"	272,104	589	45	164	17
						(OP: SM4DQE)
*SFØA	"	187,935	502	38	131	18
						(OP: SMØLPO)
*SM6NET	"	166,410	341	54	130	31
*SM7BHM	"	143,500	344	47	127	31

Switzerland

HB9AWS	A	209,934	502	37	130	47
HB9CAL	"	128,037	322	48	126	27
HB9HBV	"	36,952	140	32	78	14
HB9DOS	14	46,725	250	10	33	32
***HB9AVK**	A	163,728	354	45	139	32
*HB9TZU	"	146,358	422	31	126	16
*HB9HQX	"	40,255	205	19	78	0
*HB9MXY	"	33,520	223	11	69	0
*HB9TSU	"	25,600	149	16	56	8
*HB9DDZ	"	21,255	89	29	62	18
*HB9GFT	"	18,224	143	17	49	1
*HB9BGF	"	4,715	57	10	31	0
*HB9GKM	"	1,305	25	11	18	0
HB2U	AA	616,792	827	71	174	81
						(OP: HB9EYP)
HB9DQL	"	386,340	555	56	166	60
HB9BAS	"	201,553	297	59	110	82
HB9DCO	"	157,050	281	51	101	73
HB9DVZ	"	139,104	333	40	130	19

Ukraine

US2YW	A	230,346	496	46	116	39
***UT3SO**	A	260,184	556	49	145	28
*US7UK	"	234,610	372	61	190	39
*UT3IJ	"	23,157	121	24	69	0
*UT7MR	"	19,266	129	18	60	0
***UT5CL**	28	60	6	2	3	0
***UT8EU**	21	56,072	314	19	59	8
*UT2EF	"	32,631	218	13	49	11
**UXØFF*	"	7,722	66	13	29	12
***US7IS**	14	84,550	432	22	62	11
UR5MW	AA	4,246,335	3402	112	364	115
UT5UGR	"	29,150	131	34	62	10
***UW8SM**	AA	155,940	315	48	144	34
***UY7C**	21A	94,017	311	26	65	30

Wales

GWØA	A	2,089,494	1747	91	294	134
						(OP: GW4SKA)
***MW1MDH**	A	8	3	1	3	0
***GW4HBK**	7	11,468	125	8	34	5
*GW4TSG	"	1,988	34	6	21	1
***MW9W**	21A	179,664	504	27	84	41

OCEANIA

Australia

VJ3A	A	727,209	896	71	167	53
						(OP: VK3JA)
VK4AFU	"	81,454	219	42	67	30
VK7BO	"	34,968	111	45	59	20
VJ3O	14	70,672	240	23	60	29
						(OP: VK3TX)
***VK4ZP**	A	158,979	296	52	105	40
*VK4XU	"	12,740	72	20	35	10
*VK3YV	"	12,556	65	23	31	19
*VK2ATW	"	5,208	43	20	28	8
*VK3LF	"	1,725	25	8	12	5
*VK6WR	"	55	5	2	2	1
VJ5W	AA	954,216	1001	80	195	73
						(OP: VK5GR)
VL3V	"	10,120	89	18	26	0
						(OP: VK3VT)
VL2N	"	7,040	54	18	18	19
						(OP: VK2PN)
VK4SN	28A	120,768	420	20	46	36
***VK4FJ**	21A	21,070	181	15	20	8

Brunei Darussalam

V85RH	A	1,776,198	1697	93	218	55
						(OP: JO1RUR)

East Malaysia

***9W6EZ**	28	4,725	50	11	24	0

Fiji

3D2AG	A	282,128	463	57	76	96

Hawaii

KH6ZM	A	2,179,502	1737	93	150	199
***KH6CJJ**	A	975,764	969	76	102	169
KH6TU	AA	1,067,287	983	83	128	166
						(OP: AD6E)
***KH6OO**	AA	12,496	66	25	23	23

Indonesia

YB2MM	A	410,423	606	63	152	26
YB7YGR	"	268,716	514	57	118	21
YBØECT	"	153,797	351	56	105	12
YE1BON	"	104,554	350	40	79	3
YCØSCZ	"	91,140	224	45	92	10
YB7OHB	"	77,520	230	40	88	8
YB2GBS	"	33,031	217	23	39	5
YC8DUL	"	23,436	124	26	53	5
YB8UTI	"	5,330	95	12	14	0
YB2HAF	"	1,650	24	10	15	0
YB7KE	28	7,632	80	13	22	1
YC2BST	21	47,970	257	21	47	10
YB8CMT	"	36,846	228	18	44	7
YB3BLJ	"	25,560	127	18	50	4
YF2UFA	"	7,450	100	14	36	0
YB7MP	14	28,243	190	15	43	3
***YB1AYO**	A	586,950	805	71	178	24
*YBØNSI	"	208,638	416	57	124	20
*YCØBAS	"	190,105	386	58	127	12
*YB8MJG	"	148,434	424	47	78	18
*YC2XCD	"	129,176	393	38	88	8
*YB4KRZ	"	106,684	319	45	89	15
*YB6RMT	"	94,290	352	34	67	4
*YB9UA	"	78,492	312	36	74	14
*YB4FIK	"	66,250	262	32	70	4
*YC6HRI	"	64,311	269	29	67	1
*YB2VYY	"	61,204	218	34	68	5
*YB7GRN	"	45,101	187	37	82	0
*YC1GDF	"	44,460	204	39	75	0
*YD9UW	"	40,280	193	33	60	13
*YC1RYX	"	33,792	137	24	58	6
*YCØRNC/1	"	31,900	162	37	60	3
*YB1DFE	"	29,336	164	24	50	2
*YB1DCW	"	23,577	121	27	51	9
*YB8RVI	"	17,136	173	25	38	0
*YB1GBN	"	16,218	134	15	35	1
*YBØSCV	"	11,408	80	24	36	2
*YB2TDP	"	10,281	73	25	39	5
*YB7SKM	"	9,715	98	25	40	2
*YF8XRT	"	9,486	83	17	28	6
*YB1MBA	"	9,052	61	20	35	7
*YC1LIQ	"	8,800	77	21	34	0
*YC1BTG	"	8,680	78	19	37	0
*YCØAUN	"	6,027	82	14	24	3
*YB1ICC	"	5,562	53	20	34	0
*YD7MAW	"	5,520	77	14	32	0
*YB7WR	"	4,356	39	19	24	1
*YB9GDP	"	4,294	56	16	16	6
*YC6HSK	"	3,965	60	23	38	0
*YC4SJA	"	3,729	41	9	24	0
*YC2UXN	"	2,964	43	17	20	2
*YE3FAX	"	2,905	41	15	18	2
*YC9BVB	"	2,720	49	13	21	0
*YC1CAR	"	2,378	63	16	25	0
*YC7YCP	"	2,185	56	8	9	6
*YC3BUE	"	1,830	43	12	15	3
*YD2IFA	"	1,701	32	10	16	1
*YD3CQX	"	1,210	40	9	13	0
*YD2KFP	"	1,100	29	10	14	1
*YD3DCZ	"	1,060	23	9	11	0
*YC8GPH	"	792	40	12	21	0
*YC9VRJ/3	"	744	20	10	14	0
*YC2TTG	"	228	8	6	6	0
*YD2BIU	"	36	6	3	3	0
*YG2ABP	"	30	7	3	3	0
*YD9UAN	"	8	3	2	2	0
***YC2VOC**	28	67,782	308	19	57	3
*YC7UDD	"	19,380	127	21	46	1
*YD9MBM	"	14,716	115	17	34	1
***YB1IUQ**	21	55,275	296	17	54	4
*YB1DBU	"	34,804	199	22	49	6
*YB9GV	"	30,942	237	14	40	0
*YB1NIN	"	28,329	178	19	49	3
*YB2CPO	"	20,240	144	15	33	7
*YD9WFT	"	16,646	176	11	26	4
*YB1CQU	"	16,555	132	14	40	1
*YG3EMH	"	13,992	107	14	36	3
*YDØBCG	"	13,750	141	15	40	0
*YB1NWP	"	12,789	97	12	36	1
*YB1DUU	"	12,150	98	15	35	0
*YB3BGM	"	10,302	86	15	35	1
*YB2CTE	"	5,248	83	11	29	1
*YD2UFR	"	5,226	72	12	27	0
*YD1NDX	"	2,400	40	8	16	0
*YD8MWM	"	1,311	71	8	11	0
*YC8CGK	"	936	31	11	15	0
*YB1HDR/P	"	442	20	6	7	0
*YCØNAN	"	152	7	4	4	0
***YE4IJ**	14	16,104	100	16	42	3
*YB1JUS	"	600	20	8	12	0
***YB9DE**	7	33,896	179	19	42	15
*YCØVM	"	11,400	102	15	29	6
*YD2UXA	"	782	45	6	10	1
*YC1HUL	"	104	21	4	6	3
**YB2CBD*	"	36	7	2	2	0
***YB1MIG**	3.5	30	3	2	3	0
YBØMZI	AA	173,600	442	48	107	5
YB1BZV	"	59,502	270	28	50	16
YBØSAS	"	38,413	146	35	65	7
YB7MYS	"	11,780	122	24	29	9
YB2TS	"	6,076	70	17	32	0
YBØBAC	"	1,482	34	8	10	1
YB3IZK	28A	5,474	68	12	22	0
YF3FZR	"	3,705	49	13	24	2
YE3AA	14A	4,859	43	14	28	1
YB2WA	7A	825	25	8	14	3
***YB1RKT**	AA	194,068	363	60	133	10
*YC2KJC	"	152,918	373	42	102	13
*YD1FRU	"	95,520	410	26	70	0
*YC1PZ	"	81,653	253	43	85	15
*7C9R	"	63,012	285	33	54	2
						(OP: YB9GWR)
*YB1LUE	"	55,176	185	40	88	4
*YCØJOY	"	33,028	155	34	58	0
*YD8IKY	"	32,712	212	30	49	8
*YB2ECG	"	25,456	132	28	42	4
*YF1AAH	"	10,992	113	14	34	0
*YB2SLF	"	9,792	79	24	48	0
*YF2AIV	"	8,540	68	29	39	2
*YE8DWC	"	8,120	88	22	29	7
*YE3ESW	"	7,128	51	19	32	3
*YE3CLS	"	1,566	41	10	19	0
*YD3BWK	"	1,375	25	10	15	0
*YBØISE	"	1,302	23	12	19	0
*YD3BSB	"	840	28	9	15	0
*YD1LYG	"	810	33	9	9	0
*YC9AAI	"	648	13	8	8	2
*YB1GRZ	"	300	26	7	8	0
*YC1TCA	"	42	3	3	3	0
***YF3FBV**	28A	17,914	133	18	32	3
*YB1HR	"	14,520	106	18	37	0
*YG1BJM	"	3,135	46	10	23	0
**YDØRFS*	"	2,464	38	12	16	0
*YD2UWF	"	24	6	4	4	0
***YB9ELS**	21A	128,200	498	24	62	14
*YB1BML	"	101,442	372	25	62	19
*YE9PBZ	"	73,953	415	18	57	6
*YD3ASV	"	39,116	206	19	45	13
*YB1UUN	"	37,800	156	22	49	19
*YD9UBT	"	28,974	201	18	47	1
*YC2DUC	"	24,017	147	19	47	7
*YB1BX	"	16,555	127	15	39	1
*YC1JEL	"	12,485	127	17	37	1
*YC8RAG	"	7,810	150	10	12	0
*YC1IFR	"	1,586	34	10	12	4
*YB3COY	"	1,100	21	6	14	0
*YC2AUP	"	1,064	25	7	12	0
*YC3BBD	"	704	25	7	9	0
						(OP: K1DHO)

Marshall Islands

***V73MS**	AA	10,787	67	28	33	6

New Zealand

ZL3IO	AA	1,864,107	1478	89	200	152
ZL1T	"	14,763	99	20	19	18
ZL2RX	14A	14,868	97	14	30	15
***ZL3GK**	AA	8,642	60	19	30	9

Philippines

DU1IVT	A	14,008	154	15	19	0
***DV3TSJ**	A	102,196	380	42	72	2
*DU1/N6HPX	"	14,420	100	29	35	6
*DU1/NFØO	"	8,555	66	23	34	2
*4I1BNC	"	4,394	80	12	14	0
***DU1JM**	AA	215,477	525	47	89	15
*DV3A	"	91,936	259	46	72	18
						(OP: DU3TW)
***4F3BZ**	28A	76,518	348	22	54	2

Samoa

5W1SA	28	174,070	581	22	33	48

SOUTH AMERICA

Argentina

LU6ETB	A	1,425,492	1277	71	180	151
LU1BJW	"	139,629	289	39	73	71
L33M	28	13,452	83	9	18	30
						(OP: LU3MAM)
L2ØX	21	10,712	108	13	31	8
						(OP: LU1XP)
***LV1F**	A	515,480	753	45	99	101
						(OP: LU4FTA)
*LT9H	"	200,008	386	37	66	81
						(OP: LU3HY)
*LU1DW	"	13,770	57	27	38	20
*LW3DC	"	9,858	60	16	27	19
*LU7DLS	"	1,056	25	14	14	4
***LU5DF**	28	18,368	111	10	12	34
*LV1E	"	3,465	39	10	15	8
						(OP: LW6EQG)
*LT5A	"	490	13	4	3	7
***LU7DW**	7	608	18	6	8	2
LU4DX	AA	14,276	82	28	33	22
LT6M	28A	458,134	1046	23	78	50
						(OP: LU8MHL)
LU7HN	"	369,083	918	20	70	53
***L73H**	AA	417,690	587	51	100	104
						(OP: LU4HK)
***AZ1D**	28A	206,460	608	17	57	50
						(OP: LU1DX)
***L71D**	21A	60,667	249	20	47	36
						(OP: LU7DUE)
***LU1VYL**	7A	6,579	76	13	22	16

Aruba

P49X	**A**	**5,619,984**	**3386**	**91**	**247**	**235**
				(OP: WØYK)		

Brazil

PW2L	**A**	**3,140,436**	**2231**	**81**	**231**	**179**
				(OP: PY2MNL)		
PY2KP	"	113,684	228	44	103	47
PY2EU	"	41,656	136	35	72	20
PY3LX	**28**	**43,110**	**179**	**15**	**41**	**34**
PY3TR	**21**	**7,938**	**60**	**13**	**23**	**18**
PY3TD	**14**	**52,824**	**222**	**19**	**51**	**23**
***PY2GTA**	**A**	**626,778**	**717**	**59**	**163**	**96**
*PY1ZV	"	192,990	349	41	78	91
*PU2USK	"	61,854	208	31	46	45
*PY2WLM	"	21,208	102	25	33	30
*PU2VLW	"	19,656	90	23	37	24
*PY2EDU	"	19,228	90	25	39	28
*ZV2F	"	10,360	70	28	29	17
				(OP: PY2SFA)		
*PY4ARS	"	7,200	48	20	21	19
*PY3CAD	"	6,161	45	22	22	17
*PV8DX	"	720	13	7	13	0
*PR7KSA	"	72	12	8	10	0
***PU2WDX**	**28**	**113,940**	**370**	**15**	**50**	**43**
*PY4TC	"	93,522	296	19	52	38
*PR8KW	"	49,984	216	18	44	26
*PU3VON	"	8,208	73	16	23	18
*PU7ASP	"	8,060	71	14	22	16
*PS7JN/P	"	7,222	71	11	22	13
***PY2QT**	**21**	**208,290**	**589**	**21**	**64**	**46**
*PU1JSV	"	156,618	454	20	59	47
*PY2KO	"	53,833	206	18	43	40
*PY4LH	"	50,052	209	18	41	38
***PY2NY**	**14**	**303,750**	**700**	**28**	**72**	**50**
*PY2DPM	"	11,505	68	15	26	24
PV2K	**AA**	**3,523,130**	**2341**	**90**	**258**	**185**
				(OP: PY2KNK)		
PY5AMF	"	785,460	1051	49	120	116
PY5ZHP	"	633,672	740	58	146	108
PY2KJ	"	328,242	471	54	119	68
PY4EK	**28A**	**93,312**	**336**	**17**	**54**	**25**
PY2EBD	"	13,200	85	14	29	17
PY2XJ	"	684	17	5	12	1
PS7DX	**14A**	**2,822**	**29**	**9**	**11**	**14**
***PY1VOY**	**AA**	**331,500**	**535**	**45**	**103**	**73**
*PV2ØØBR	"	266,625	449	42	112	71
				(OP: PY7XC)		
*PY1DX	"	192,600	385	32	88	60
*PY2ZR	"	166,599	381	35	64	74
*PY2XV	"	89,775	201	35	71	69
*PY6TS	"	84,364	202	37	68	56
*PY1FI	"	38,068	126	29	49	46
*PP5TI	"	17,381	76	30	39	22
*PY2FRQ	"	11,899	55	18	15	40
*PV8AAS	"	2,418	26	16	20	3
***PY4XX**	**28A**	**83,268**	**265**	**19**	**49**	**40**
*PU3LTA	"	29,718	145	15	39	24
*PU2XFF	"	9,947	74	10	11	28
*PU2VNC	"	4,000	39	14	19	7
*PU8MGB	"	459	13	6	9	2
***PY2VZ**	**21A**	**97,902**	**319**	**19**	**48**	**44**
*PT8DX	"	50,052	193	18	38	41
*PU8YPL	"	43,498	190	15	34	42
*PU8PSF	"	9,920	118	15	33	16
*PY2KC	"	7,869	66	9	23	11
***PY3DZ**	**7A**	**12**	**2**	**2**	**2**	**0**

Chile

***CB8E**	**A**	**262,182**	**438**	**44**	**86**	**92**
				(OP: CE8EIO)		
*3G3O	"	242,811	428	38	58	111
				(OP: XQ3OP)		
*CE1PTT	"	97,844	323	25	58	39
*CB3CE	"	31,824	172	32	49	55
				(OP: CE3KWA)		
*CE3KRM	"	2,660	26	13	13	12
*CE3JSX	"	99	6	4	3	4
***CA3FJK**	**28**	**5,043**	**53**	**11**	**21**	**9**
***XQ3SK**	**21**	**2,156**	**31**	**9**	**14**	**5**
***CB3R**	**14**	**86,884**	**290**	**23**	**44**	**40**
				(OP: XQ3SK)		
XQ1KZ	**21A**	**276,246**	**668**	**28**	**71**	**50**
***CE4PPC**	**AA**	**121,600**	**293**	**35**	**43**	**82**
*CE3CMH	"	57,392	185	32	50	54

Colombia

***HK3VHZ**	**A**	**9,792**	**61**	**22**	**22**	**28**
*HK4ZZ	"	6,952	58	27	32	20
*HK3CFM	"	2,430	26	19	22	4
*HK4J	"	960	24	14	10	16
***HK3YL**	**21**	**70,000**	**272**	**17**	**41**	**42**
***HK3DX**	**7**	**40,228**	**193**	**14**	**35**	**40**
*HK6RF	"	19,404	101	12	28	26
***HK6F**	**3.5**	**294**	**11**	**3**	**2**	**9**
***HK6J**	**AA**	**132,042**	**257**	**28**	**41**	**108**

Ecuador

***HC1JP**	**A**	**32**	**4**	**4**	**4**	**0**
***HC7AE/1**	**21**	**6,031**	**64**	**10**	**27**	**0**

French Guiana

FY5KE	**AA**	**2,878,500**	**2015**	**78**	**236**	**186**
					(OP: F5UII)	

Suriname

PZ5RA	**A**	**2,273,708**	**1776**	**64**	**207**	**175**

Uruguay

***CX2DK**	**A**	**1,800,201**	**1576**	**71**	**183**	**149**
***CX2AQ**	**28**	**114,540**	**347**	**16**	**51**	**48**
*CX8AF	"	4,950	47	13	16	16
CX7SS	**21A**	**660,813**	**1247**	**29**	**99**	**55**

Venezuela

YV4ABR	**A**	**124,906**	**259**	**33**	**50**	**90**
***4M1W**	**28**	**149,580**	**491**	**19**	**39**	**50**
				(OP: YV1SW)		
***YV6CA**	**21**	**50,641**	**210**	**16**	**38**	**35**
***YV5AEP**	**7**	**493**	**12**	**5**	**9**	**3**

QRP

K2YG	**A**	**375,760**	**615**	**55**	**136**	**114**
CT1BXT	**"**	**325,304**	**483**	**54**	**159**	**83**
SP2UUU	**"**	**285,108**	**515**	**61**	**174**	**41**
HG6C	**"**	**241,080**	**472**	**53**	**163**	**29**
				(OP: HA6IAM)		
EA1GT	**"**	**232,170**	**529**	**37**	**128**	**48**
				(OP: EA1GT/QRP)		
YL3FW	**"**	**216,756**	**483**	**41**	**161**	**21**
LZ7K	**"**	**135,780**	**383**	**34**	**133**	**19**
				(OP: LZ3GW)		
JH7UJU	**"**	**135,424**	**302**	**58**	**85**	**41**
PE2K	**"**	**123,723**	**415**	**31**	**122**	**24**
W6QU	**"**	**111,666**	**297**	**51**	**67**	**104**
				(OP: W8QZA)		
DL2AMT	**"**	**105,944**	**384**	**30**	**116**	**6**
EW8G	**"**	**87,502**	**345**	**27**	**105**	**2**
WA3LXD	**"**	**87,236**	**247**	**45**	**78**	**70**
G4FPA	**"**	**71,371**	**231**	**34**	**98**	**17**
AA5KD	**"**	**65,048**	**271**	**34**	**46**	**93**
IK3BVD	**"**	**51,480**	**191**	**27**	**84**	**19**
JK2VOC	**"**	**45,356**	**166**	**42**	**64**	**10**
DK9BM	"	40,828	160	31	65	22
RV3DBK	**"**	**36,218**	**198**	**15**	**75**	**1**
PY2PLL	**"**	**32,421**	**130**	**27**	**58**	**16**
G3ZGC	"	30,302	138	25	78	6
DL8LR	"	27,588	101	30	66	18
WDØBGZ	**"**	**26,660**	**117**	**32**	**45**	**47**
YO4AAC	**"**	**25,972**	**153**	**19**	**64**	**3**
RQ7R	**"**	**25,641**	**100**	**35**	**67**	**9**
EA4U	"	17,200	98	22	55	9
VE3HG	**"**	**15,895**	**84**	**21**	**26**	**38**
YB1PEF	**"**	**14,448**	**72**	**32**	**50**	**2**
YD6ROA	"	10,476	121	19	35	0
DL1GBQ	"	10,075	80	18	47	0
F4FSB	**"**	**9,798**	**69**	**18**	**43**	**8**
LA3CLA	**"**	**9,570**	**81**	**15**	**43**	**0**
YC5YDD	"	9,240	85	24	42	0
DJ2GMS	"	6,726	59	16	38	3
N7JI	**"**	**6,615**	**66**	**20**	**14**	**29**
DL/LU5VQV	"	6,426	71	14	39	1
YB3EDD	"	6,006	72	19	21	2
SV3AUW	**"**	**5,184**	**54**	**14**	**34**	**0**
IK3TZB	"	4,680	42	10	12	18
YB1DGG	"	3,700	42	12	25	0
YC8FEE	"	3,479	49	19	28	2
TA3OWL	**"**	**3,042**	**39**	**6**	**17**	**3**
DL2BIS	"	2,660	39	10	25	0
PU3VRW	"	2,211	36	13	15	5
DH1DH	"	2,170	38	7	23	1
TG9JMR	**"**	**1,650**	**23**	**12**	**11**	**10**
DF5GO	"	1,242	26	8	18	1
EE2A	"	1,222	24	8	18	0
				(OP: EA2SN)		
KE5DXX	"	900	24	9	7	14
N6HI	"	720	16	11	11	2
N4NQY	"	462	14	7	6	9
CE4JW	**"**	**270**	**8**	**6**	**7**	**2**
JO1EEQ	**"**	**90**	**19**	**2**	**3**	**0**
BH6AOV	**"**	**90**	**7**	**3**	**3**	**0**
9W2EYR	**"**	**32**	**6**	**4**	**4**	**0**
VE2GT	**"**	**24**	**2**	**2**	**2**	**2**
PP1WW	**28**	**111,562**	**330**	**22**	**59**	**40**
TIØRC	**"**	**102,060**	**450**	**21**	**38**	**49**
				(OP: TI2YO)		
3G3R	**"**	**24,320**	**139**	**13**	**18**	**33**
				(OP: XQ3SK)		
WE6EZ	**"**	**16,254**	**123**	**18**	**29**	**16**
TA1BM	**"**	**9,805**	**78**	**20**	**27**	**6**
M7V	**"**	**5,740**	**69**	**12**	**29**	**0**
				(OP: MØVAA)		
YO3DAC	**"**	**3,366**	**36**	**13**	**19**	**1**
PA2REH	**"**	**731**	**16**	**7**	**10**	**0**
IW2NRI	**"**	**465**	**17**	**6**	**9**	**0**
CE3ERM	"	100	16	8	7	10
OH5AG	**"**	**8**	**2**	**1**	**1**	**0**
				(OP: OH5CW)		
JA6VZB	**21**	**49,896**	**226**	**21**	**52**	**15**
KD9MS	**"**	**49,000**	**226**	**21**	**55**	**22**
CO2AJ	**"**	**36,582**	**186**	**16**	**38**	**37**
SP4NKJ	**"**	**32,619**	**179**	**19**	**50**	**14**
JE1CAC	**"**	**29,904**	**128**	**22**	**44**	**18**
JR1NKN	"	20,274	131	20	31	11
YC4SIZ	**"**	**13,413**	**120**	**16**	**34**	**1**
YB8JEC	"	13,260	158	12	25	2
TI2BSH	**"**	**12,525**	**110**	**14**	**33**	**28**
OK1LV	**"**	**5,040**	**47**	**13**	**25**	**7**
YCØRXA	"	4,140	66	11	25	0
IW2ODC	**"**	**3,535**	**36**	**8**	**8**	**19**
SP6EIY	"	2,883	35	12	16	3
JR2EKD	**"**	**2,871**	**40**	**9**	**20**	**0**
YB8XM	"	1,416	26	8	16	0
OH5LAQ	**"**	**230**	**11**	**3**	**7**	**0**
				(OP: OH5CW)		
YU1NR	**14**	**74,445**	**360**	**23**	**68**	**14**
PD8DX	**"**	**53,802**	**240**	**15**	**47**	**36**
SV3IBQ	**"**	**51,170**	**289**	**16**	**56**	**14**
				(OP: SV3IBQ/QRP)		
KO1H	**"**	**43,022**	**248**	**13**	**46**	**39**
DJ3HW	**"**	**41,735**	**222**	**17**	**49**	**19**
SP4LVK	**"**	**35,640**	**214**	**16**	**54**	**11**
YU1RH	"	25,506	171	14	51	13
W1IE	**"**	**22,632**	**175**	**13**	**39**	**30**
HAØGK	**"**	**22,504**	**198**	**11**	**43**	**4**
IK1RKU	**"**	**17,754**	**131**	**12**	**42**	**12**
XE1CT	**"**	**14,472**	**105**	**14**	**20**	**33**
IZ3NVR	"	10,440	86	11	37	10
R7RBE	**"**	**9,400**	**83**	**9**	**24**	**14**
DL2TM	"	8,684	85	10	38	4
J43POTA	"	1,596	46	3	18	0
				(OP: SV3SPC/P)		
UB4FFB	**"**	**1,458**	**33**	**6**	**21**	**0**
YO9JAZ	**"**	**1,122**	**37**	**3**	**14**	**0**
W4ER	"	1,020	22	8	9	13
OH5C	**"**	**944**	**31**	**3**	**13**	**0**
				(OP: OH5CW)		
IW1BEF	"	720	22	5	12	1
LC9S	**"**	**374**	**17**	**2**	**9**	**0**
				(OP: LA9GSA)		
BH8PHG	**"**	**312**	**14**	**6**	**6**	**0**
IC8POF	"	6	1	1	1	0
ES2MC	**7**	**57,333**	**314**	**17**	**58**	**12**
YO4BEW	**"**	**13,091**	**128**	**9**	**39**	**5**
SV1CDN	**"**	**7,920**	**96**	**10**	**34**	**0**
VE3BFU	**"**	**7,050**	**74**	**8**	**13**	**26**
9W2JHZ	**"**	**1,770**	**40**	**11**	**19**	**0**
LX1NO	**"**	**1,148**	**41**	**2**	**12**	**0**
IU4AAJ	**"**	**112**	**8**	**2**	**6**	**0**
ON3DI	**3.5**	**29,302**	**322**	**6**	**41**	**2**
SNØE	**"**	**9,504**	**155**	**4**	**28**	**0**
				(OP: SO8OO)		
HG5O	**"**	**3,164**	**56**	**5**	**23**	**0**
				(OP: HA5OB)		
HA8BE	"	1,300	33	3	17	0
EA4FJX	**"**	**544**	**21**	**3**	**13**	**0**
OH5CW	**"**	**160**	**12**	**2**	**8**	**0**
JA5NSR	**"**	**27**	**8**	**1**	**2**	**0**

QRP ASSISTED

NORTH AMERICA

United States

Dictrict 2

K2AL	**AA**	**94,800**	**275**	**38**	**78**	**84**

Dictrict 3

K3HW	**AA**	**49,640**	**154**	**43**	**86**	**41**
N8URE	**14A**	**30,438**	**174**	**14**	**43**	**32**

Dictrict 4

KI4MZC	*AA*	*4,095*	*39*	*20*	*22*	*21*
WB4OMM	**28A**	**7,248**	**64**	**17**	**23**	**8**
N4IJ	**14A**	**24,360**	**132**	**16**	**45**	**26**

Dictrict 6

K6JS	**AA**	**22,082**	**125**	**34**	**32**	**56**
K6CTA	**"**	**2,520**	**37**	**12**	**9**	**24**

Dictrict 8

K8ZT	**AA**	**16,830**	**82**	**32**	**50**	**28**

Dictrict Ø

W7RY	**14A**	**27,540**	**163**	**19**	**44**	**45**

Dominican Republic

HI3K	**AA**	**88,312**	**276**	**26**	**57**	**83**

ASIA

Asiatic Turkey

TA9J	**AA**	**9,632**	**67**	**15**	**41**	**0**

Japan

District 1

JM1NKT	**21A**	**94,887**	**295**	**25**	**68**	**24**

District 3

JA4XHF/3	**AA**	**144,918**	**279**	**59**	**109**	**26**
JH3DMQ	**28A**	**2,805**	**44**	**13**	**19**	**1**

District 8

JK8VPQ	**21A**	**3,708**	**37**	**12**	**17**	**7**

West Malaysia

9M2S	**21A**	**30**	**9**	**1**	**1**	**0**
				(OP: 9M2CDX)		

EUROPE

Belgium

ON6NL	**AA**	**596,520**	**754**	**65**	**211**	**84**
OQ4B	**14A**	**37,584**	**216**	**17**	**51**	**13**
				(OP: ON4BHQ)		

Bosnia-Herzegovina

E7AA	**21A**	**54,514**	**253**	**22**	**53**	**22**
					(OP: E73AA)	

Croatia

9A2VX	**21A**	**54**	**4**	**3**	**4**	**2**
9A1CRT	**14A**	**2,277**	**37**	**7**	**26**	**0**
				(OP: 9A7RA)		
9A6TT	**7A**	**8,360**	**114**	**7**	**31**	**2**

Czech Republic

OL6D	**3.5A**	**21,805**	**250**	**5**	**44**	**0**
				(OP: OK1DWQ)		

England

MØGVZ	AA	20,280	133	16	53	9
GØJSP	**"**	**17,766**	**90**	**24**	**61**	**9**
G5N	21A	15,048	122	10	31	16
				(OP: GØSBN)		

France

F1DHX	**AA**	**45,630**	**172**	**33**	**81**	**16**
F/EI5KF	"	1,488	31	7	17	0

Germany

DL6ZBN	**AA**	**319,770**	**398**	**76**	**181**	**73**
DDØVS	"	476	21	2	12	0

Italy

IZ5IOM	**AA**	**4,558**	**56**	**16**	**32**	**5**
IZ8DFO	**28A**	**2,156**	**29**	**10**	**15**	**3**
IZ2QKG	**14A**	**1,914**	**45**	**4**	**18**	**0**

Poland

SP9RQH	**AA**	**48,720**	**169**	**42**	**90**	**13**
SP3EMA	**3.5A**	**14,736**	**166**	**5**	**43**	**0**

Romania

YO7BGA	**AA**	**27,639**	**119**	**34**	**68**	**9**

Serbia

YU1LM	**AA**	**201,188**	**485**	**40**	**137**	**35**

Sicily

IT9RJE	**28A**	**5,106**	**54**	**13**	**19**	**5**

Slovenia

S59MZ	**AA**	**24,564**	**127**	**22**	**58**	**12**

Spain

EA7Q	**AA**	**76,033**	**279**	**27**	**99**	**13**
EA5Y	**28A**	**17,028**	**94**	**18**	**38**	**10**
EA3O	**3.5A**	**4**	**1**	**1**	**1**	**0**

Ukraine

UT2O	*AA*	*8,320*	*83*	*16*	*48*	*0*

OCEANIA

Hawaii

NH6O	**AA**	**21,565**	**89**	**28**	**27**	**40**

Indonesia

YB2NDX	**AA**	**18,423**	**95**	**33**	**52**	**4**
YC1LJT	**21A**	**28,908**	**170**	**18**	**47**	**1**
YC8IKU	"	11,424	120	15	33	0

SOUTH AMERICA

Brazil

PY2DN	**AA**	**31,828**	**121**	**30**	**45**	**34**
PY2CER	**21A**	**17,617**	**113**	**16**	**36**	**27**
PU2MLO	"	7,074	63	14	20	20
PS8CW	**14A**	**19,418**	**106**	**14**	**28**	**31**

Chile

CB4T	**AA**	**3,180**	**36**	**17**	**15**	**21**
					(OP: CE4WT)	

ROOKIE

United States

Dictrict 1

***KC1RET**	**5,508**	**65**	**9**	**23**	**22**
*AA1NK	1,694	72	21	23	33

Dictrict 2

KD2UBH	**278,460**	**540**	**61**	**131**	**123**
***KI2D**	**168,910**	**383**	**50**	**107**	**109**

Dictrict 3

N3AML	**264,888**	**476**	**57**	**127**	**99**
***K3AK**	**233,856**	**466**	**44**	**112**	**105**
*KC3SVR	109,817	299	38	93	62
*KC3UDO	40,590	271	36	62	67
*N3GT	34,220	154	25	51	42
*KN1OLA	9,017	72	16	24	31
*N3TKG	2,688	51	11	14	7

Dictrict 5

W9DCT	**211,671**	**386**	**60**	**114**	**87**

Dictrict 7

***W7VC**	**26,962**	**155**	**26**	**21**	**75**
*KJ7RUP	96	6	4	3	5

Dictrict 9

***KD9NZB/AG**	**414**	**14**	**6**	**5**	**7**

Dictrict Ø

***KFØIDT**	**31,860**	**155**	**39**	**42**	**54**
*WØADL	24,676	125	30	43	51
*KFØARE	10,700	113	21	15	64

Canada

Dictrict 3

VA3OGG	**231,068**	**507**	**40**	**76**	**128**
VE3JZT	15,600	83	27	29	44

Mexico

***XE1O**	**14,012**	**104**	**15**	**17**	**30**

ASIA

Asiatic Russia

District Ø

***UBØAZR**	**56,668**	**177**	**38**	**79**	**7**

China

BA4AEO	**11,286**	**81**	**25**	**31**	**1**

Japan

District 1

JK1BAB	**30**	**7**	**3**	**3**	**4**

EUROPE

Austria

***OE5BYE**	**1,998**	**40**	**5**	**22**	**0**

England

***MØLKW**	**140,292**	**437**	**27**	**107**	**28**
*G5LSI	99,484	306	34	94	26
*G5ROB	38,456	226	18	74	0

Estonia

***ES5MJR**	**3,172**	**62**	**5**	**20**	**1**

European Russia

District 3

***UB5MCD**	**15,768**	**112**	**14**	**58**	**0**

France

***F4ITQ**	**152,520**	**324**	**42**	**112**	**51**

Germany

DK5PH	**19,039**	**96**	**21**	**30**	**28**
***DL9DX**	**120,139**	**298**	**40**	**122**	**29**
*DJØMA	38,037	207	20	71	2
*DO2SBS	26,315	163	27	60	8
*DD5VL	26,010	98	25	44	33
*DO9JN	5,265	89	8	37	0

Greece

***SV8SYK**	**7,252**	**69**	**12**	**32**	**5**

Hungary

***HA3MGA**	**39,483**	**146**	**34**	**75**	**14**

Ireland

EI6LA	**835,752**	**1061**	**58**	**211**	**90**

Italy

IV3JAG	**24,236**	**138**	**17**	**52**	**14**
***IUØPVM**	**116,946**	**312**	**33**	**108**	**37**
*IV3IPA	48,730	249	23	78	9

Netherlands

***PD4Q**	**7,155**	**76**	**7**	**28**	**10**

Norway

***LB6VI**	**45,568**	**251**	**17**	**65**	**7**

Poland

***SP5CMW**	**10,030**	**84**	**13**	**44**	**2**

Romania

***YO9JAZ**	**1,311**	**38**	**4**	**15**	**0**

Scotland

***GM3STM**	**75,616**	**261**	**29**	**87**	**23**

Slovak Republic

***OM8GRS**	**10,653**	**95**	**10**	**33**	**10**

Spain

***EA5JDN**	**142,680**	**406**	**34**	**117**	**23**
*EA2EVC	58,960	207	22	81	31
*EA4HKF	45,080	197	29	78	8

OCEANIA

Australia

***VK2ATW**	**5,208**	**43**	**20**	**28**	**8**

Indonesia

***YC6HRI**	**64,311**	**269**	**29**	**67**	**1**
*YD9UBT	42,504	220	25	57	6
*YDØBCG	13,750	141	15	40	0
*YD7MAW	5,520	77	14	32	0

*YD2UFR	5,226	72	12	27	0
*YC6HSK	3,965	60	23	38	0
*YC3BUE	1,830	43	12	15	3
*YD3BWK	1,375	25	10	15	0
*YD8MWM	1,311	71	8	11	0
*YC8CGK	936	31	11	15	0
*YD3BSB	840	28	9	15	0
*YC8IKU	12,000	121	16	34	0

SOUTH AMERICA

Brazil

***PU2VNC**	**4,000**	**39**	**14**	**19**	**7**

CLASSIC

United States

District 1

NG1M	**986,232**	**1187**	**68**	**167**	**142**
AE1P	981,848	1226	62	168	126
KA1YQC	571,890	843	52	149	129
W1GD	143,166	265	50	120	53
***W1UE**	**420,462**	**617**	**54**	**148**	**80**
*W1HY	241,379	475	55	131	95
*K7RB	178,605	390	50	95	100
*W1DYJ	144,460	311	50	97	86
*W1QK	123,684	467	24	68	40
*AF1R	67,872	204	37	71	60
*NY1E	49,162	271	18	44	32
*N2HX	2,989	48	16	13	32

District 2

KU2M	**384,122**	**1107**	**25**	**73**	**51**
***AC2RL**	**209,296**	**395**	**49**	**120**	**85**
*KR2D	84,600	206	44	86	58
*W2VTV	40,837	278	13	42	42
*K3WHD	24,225	116	24	51	20
*KD2CQ	154	7	5	6	3

District 3

N3DUE	**101,972**	**260**	**47**	**86**	**79**
N3MWQ	100,700	271	40	86	64
W3LL	2,640	45	5	12	16
***KB3AAY**	**91,375**	**388**	**20**	**57**	**48**
*KC3SDJ	57,986	201	35	63	60
*AI3KS	53,988	181	32	71	29
*K3LT	40,081	143	38	67	44
*AB3GY	30,607	146	28	41	58
*WD8RYV	10,283	83	24	37	30

District 4

AC8Y	**835,052**	**1108**	**65**	**166**	**151**
WS6X	601,839	836	65	168	136
AD4TJ	206,184	408	61	111	92
W3SA	193,200	400	47	103	90
W4BBT	170,478	463	50	85	111
WF4W	158,916	391	52	90	104
ND4G	76,824	205	42	78	74
AA5JF	40,836	204	21	44	18
K3WR	38,771	146	41	58	38
K4NWX	32,943	121	41	57	41
***W4PJW**	**117,912**	**343**	**36**	**75**	**93**
*AC4G	112,320	253	55	98	63
*K4FTO	110,448	291	42	82	84
*W4LC	99,712	390	18	61	49
*N4QI	97,614	283	40	78	69
*W4AFB	30,360	138	29	50	41
*K3YDX	16,912	83	31	40	41
*NC4MI	4,128	46	8	19	16
*NS4T	2,700	47	12	12	21
*WA3LXD	87,236	247	45	78	70

District 5

WQ5L	**794,313**	**1061**	**74**	**163**	**166**
WA9JBR	144,807	318	50	97	90
AD5A	102,300	366	31	41	114
AA5SH	30,858	125	40	49	50
***NN5T**	**181,844**	**393**	**60**	**92**	**117**
*WB5JJJ	156,870	370	54	96	99
*WA5LFD	145,200	332	63	98	103
*W5ITR	137,760	421	48	66	126
*KF5KWO	49,572	231	34	43	85
*WB5K	48,900	239	33	39	91
*W5KY	9,579	91	22	21	50
*AF5CC	5,450	80	12	15	23

District 6

AJ6V	**681,126**	**1057**	**76**	**120**	**170**
K6XX	293,370	508	62	86	106
W6RKC	35,321	141	43	43	57
***KD6HOF**	**51,012**	**199**	**42**	**46**	**68**
*W6RQ	49,749	217	38	43	80
*WZ6ZZ	49,452	220	38	34	84
*KF6RY	37,389	179	33	34	54
					(OP: W6ZL)
*N6BHX	10,527	79	27	21	39
*KG6YJ	3,306	41	20	16	22

District 7

KU1CW	**1,100,608**	**1311**	**98**	**171**	**195**
K6XT	282,125	573	67	91	147
K7HP	188,669	387	75	86	138
WU7W	67,335	243	50	54	97
K7RAT	36,472	193	25	28	41
					(OP: N6TR)
K7MY	15,520	104	26	31	40
***N7IR**	**433,784**	**675**	**69**	**121**	**154**
*W7TMT	188,124	518	50	68	139
*N7DB	120,978	356	51	55	128
*NU7F	97,704	319	41	52	114
*K7AZT	64,959	248	39	43	95
*K7JQ	52,808	265	30	33	101
*KC7CM	21,505	156	18	30	37
*N7VGO	18,120	110	29	31	60
*K7HKR	10,472	97	15	19	34
*N7JI	6,615	66	20	14	29

District 8

***AA8OY**	**79,344**	**238**	**30**	**72**	**69**
*K7DR	73,500	257	38	66	71
*W8TOM	50,544	300	23	40	54
*AA8SW	29,890	141	30	47	45
*K8AJS	4,560	52	18	19	23

District 9

WI9WI	**554,112**	**1005**	**50**	**112**	**126**
K9UC	306,300	537	55	129	116
KØVW	42,924	183	36	44	66
***WD9CIR**	**259,096**	**566**	**51**	**107**	**120**
*KC9YL	64,558	228	30	62	77
*KB9S	12,900	100	21	26	39
*W9AKS	7,011	104	7	9	41

District Ø

NGØE	**345,066**	**627**	**54**	**117**	**118**
NØTA	287,056	682	63	94	151
WØETT	63,684	205	42	62	79
KØVG	56,279	190	46	55	66
***WØIZ**	**180,681**	**579**	**50**	**63**	**116**
*WØPI	70,224	244	34	61	73
*KOØZ	28,575	146	33	47	47
*KØGMK	1,927	37	12	13	16
*WØZF	1,813	42	6	6	25

Alaska

AL7LO	**271,779**	**561**	**45**	**73**	**101**

Canada

District 1

VO2AC	**325,299**	**580**	**37**	**99**	**111**

District 2

***VE2OWL**	**63,732**	**178**	**35**	**64**	**42**
*VE2GT	24	2	2	2	2

District 3

VE3GYL	**476,784**	**680**	**57**	**132**	**112**
VA3WW	339,290	610	54	116	92
***VE3TM**	**346,880**	**537**	**50**	**127**	**94**

District 7

***VE7MID**	**21,973**	**151**	**14**	**21**	**38**

Cuba

***CO8NMN**	**593,920**	**869**	**53**	**108**	**159**

Haiti

***HH2AA**	**875,538**	**985**	**52**	**148**	**183**
					(OP: K6DTT)

AFRICA

Angola

***D2UY**	**774,613**	**944**	**42**	**129**	**116**

ASIA

Asiatic Russia

District 9

***RC9T**	**115,817**	**291**	**38**	**112**	**1**
***UA9OEX**	**53,504**	**175**	**43**	**82**	**3**
*R8QAN	17,810	104	18	47	0

District Ø

***RØUT**	**46,515**	**171**	**31**	**73**	**1**
*UAØLKD	9,400	98	16	24	7

Asiatic Turkey

***TA4/ OH2KW**	**306,000**	**690**	**34**	**117**	**2**
*TA2MN	118,575	280	36	101	18
*TA4RC	32,190	114	37	66	8
*TA2FT	25,346	153	9	40	9

China

***BD4RHV**	**12,430**	**91**	**18**	**31**	**6**
*BG8PM	3,325	35	12	23	0

India

***VU2FGQ**	**66,816**	**264**	**29**	**66**	**1**

Israel

4Z5LY	**803,136**	**1014**	**56**	**189**	**37**
***4Z5MY**	**1,300**	**25**	**4**	**16**	**0**

Japan

District 1

JH1CTV	**143,780**	**304**	**56**	**97**	**29**
JA1QOW	95,274	215	53	88	17
JR1NHD	54,035	183	30	53	24
JA1PVX	11,310	68	18	24	16
***JS1KKY**	**113,399**	**252**	**51**	**90**	**28**
*JA1ATM	54,656	169	41	69	12
*JJ1KZZ	41,040	116	46	74	15
*JI1BBN	25,806	138	22	41	6
*JK1FNN	6,318	43	21	23	10
*JA1GZK	464	11	6	7	3
*JE1CAC	29,904	128	22	44	18
*JO1EEQ	90	19	2	3	0

District 2

***JE2BOM**	**73,084**	**174**	**53**	**86**	**12**
*JR2UQU	6	3	1	1	0

District 3

JR3RIU	**68,666**	**198**	**47**	**72**	**20**
JP3UBR	10,349	57	31	40	8
JA3VOV	8,730	76	15	26	4
***JR3GPP**	**5,428**	**45**	**17**	**26**	**3**
*JG3LDD	54	3	2	1	3

District 4

*JE4MHL	69,120	207	42	71	22
*JH4FUF	2,555	26	14	16	5

District 6

JA6BZI	**398,643**	**492**	**79**	**167**	**41**
***JA6BCV**	**18,300**	**86**	**22**	**45**	**8**
*JK6JAB	441	17	9	11	1

District 7

JH7QXJ	**559,251**	**705**	**79**	**124**	**94**
JG7AMD	472,416	600	77	153	66
JA7ACM	163,746	299	55	91	52
***JA7MWC**	**64,944**	**173**	**50**	**71**	**23**
*JL7OTC	5,712	50	21	28	2

District 8

***JM8SMO**	**49,343**	**144**	**43**	**68**	**22**
*JK8PBO	13,740	80	21	39	0
*JE8KKX	1,428	17	11	10	7

District Ø

JAØGCI	**5,655**	**60**	**13**	**20**	**6**
***JHØDUG**	**49,407**	**175**	**48**	**66**	**15**
*JAØJHQ	3,440	39	14	19	7

Singapore

**9V1HY*	*338*	*9*	*5*	*8*	*0*

Taiwan

BV4VQ	**1,464**	**53**	**5**	**7**	**0**

EUROPE

Belgium

ON7ET	**52,481**	**137**	**40**	**64**	**39**
***ON4CT**	**897,773**	**905**	**89**	**244**	**98**
*ON5GF	31,486	145	18	53	20
*ON4CBA	14,175	167	7	32	6

Bosnia-Herzegovina

E72U	**121,204**	**252**	**42**	**99**	**52**

Bulgaria

***LZ3QE**	**339,768**	**684**	**48**	**145**	**49**
*LZ2HT	35,062	196	21	72	1
*LZ1MC	20,610	122	21	69	0
*LZ7K	135,780	383	34	133	19
					(OP: LZ3GW)

Croatia

***9A7V**	**383,160**	**550**	**66**	**190**	**53**

Czech Republic

OK2SFP	**29,792**	**276**	**7**	**42**	**7**
***OK1AUO**	**84,500**	**203**	**47**	**92**	**30**
*OK2LC	65,720	252	24	57	25
*OK1TK	25,284	122	24	64	10
*OK1AY	6,795	75	8	34	3
*OK1LO	4,080	46	12	21	1
*OK1TVL	930	21	12	19	0
*OK1LV	5,040	47	13	25	7

Denmark

OZ11A	**918,750**	**1128**	**68**	**195**	**87**
OZØJD	370,656	772	45	150	39

England

G9D	**101,955**	**402**	**17**	**49**	**39**
					(OP: G6NHU)
***GØFGI**	**431,472**	**654**	**55**	**178**	**70**
*M1VPN	176,675	462	34	128	29
*G4ZOB	139,656	343	41	116	27
*MØRYB	46,500	179	27	81	17
					(OP: MØRYB/P)
*G5C	22,540	128	20	67	5
					(OP: G4OGB)
*G8PGO	11,074	124	10	34	5
*G6MXL	3,480	43	11	26	3

European Russia

District 1

RW1A	**1,274,511**	**1254**	**97**	**243**	**103**
UF1F	17,952	112	24	45	19

District 3

RC5Z	**476,320**	**890**	**60**	**173**	**27**
RT2H	99,383	334	29	114	6
***R3AQ**	**466,368**	**583**	**81**	**241**	**25**
*RV3ZN	69,615	320	21	97	1
*RX3MM	44,550	199	27	83	0
*UB5MBA	2,688	43	7	23	2

District 4

***R4FCJ**	**82,761**	**286**	**35**	**110**	**2**

District 6

R6DM	**18,432**	**108**	**17**	**28**	**19**
***RA6LIS**	**30,160**	**291**	**9**	**43**	**0**

District 9

***R9FE**	**32,085**	**180**	**21**	**72**	**0**

Finland

***OH1SIC**	**93,784**	**306**	**27**	**118**	**7**
					(OP: SM5SIC)
*OH2EUU	38,781	198	22	60	11

France

TM5T	**820,855**	**1042**	**60**	**186**	**83**
					(OP: F5VKT)
***F4CVO**	**48,763**	**192**	**27**	**75**	**19**
*F4IRV	27,552	158	17	59	8

Germany

DL1DTL	**465,327**	**581**	**75**	**219**	**53**
DL8DWL	147,159	254	69	161	19
DK2CC	143,583	281	48	144	37
DK1FW	77,355	278	29	89	17
DL3BQA	37,260	195	22	56	3
DK2WH	35,680	184	25	54	1
DL1LQL	17,563	90	30	58	3
DF6RI	15,054	97	15	51	12
DL1TLA	2,829	30	15	22	4
***DL3SYA**	**508,174**	**816**	**64**	**208**	**39**
*DL8ULF	339,512	704	47	162	39
*DL5KUD	284,610	489	55	165	45
*DJ5FS	206,976	432	46	141	37
*DG2BWG	172,016	417	42	143	23
*DR1ØØRY	110,704	396	30	107	11
					(OP: DF2SD)
*DL2HYH	104,220	217	39	107	47
*DL7UKT	75,175	241	33	101	21
*DL5ALW	39,424	133	25	71	32
*DF8IU	31,356	118	31	52	34
*DL8ZAJ	29,256	121	27	58	21
*DJ9SN	26,136	115	28	59	21
*DK7PA	25,813	149	16	48	19
*DL2AK	19,800	140	14	59	2
*DO1ZYM	13,068	107	14	48	4
*DK1AUP	12,090	72	23	44	11
*DG4AM	9,849	72	18	39	10
*DL9FB	8,905	71	16	39	10
*DL164ØY	8,758	79	14	36	8
					(OP: DL3CQ)
*DL9ZWG	8,580	65	18	39	9
*DL1JPF	8,479	70	15	45	1
*DO2MOG	8,154	75	11	29	14
*DL9MFY	6,726	51	16	24	19
*DF1ZW	2,652	44	10	24	0
*DO1TOM	2,030	39	6	22	1
*DC1RW	2,002	50	5	21	0
*DL8MKG	1,326	21	10	16	0
*DJ3HW	41,735	222	17	49	19
*DK9BM	40,828	160	31	65	22
*DJ2GMS	6,726	59	16	38	3
*DL/LU5VQV	6,426	71	14	39	1
*DH1DH	2,170	38	7	23	1

Greece

SV8OVH	**127,160**	**389**	**43**	**119**	**8**
***SV1CKZ**	**104,496**	**306**	**41**	**127**	**0**
*SV3SKM	103,103	469	19	60	24
*SV7CUD	35,937	142	34	75	12
*SV1CDN	7,920	96	10	34	0

Guernsey

***GUØSUP**	**200,265**	**350**	**49**	**130**	**58**

Hungary

HA1BC	**489,260**	**613**	**75**	**202**	**63**
					(OP: DL1MAJ)
***HAØGK**	**22,504**	**198**	**11**	**43**	**4**

Ireland

EI8IU	**120,270**	**454**	**17**	**59**	**38**
***EI3CTB**	**16,068**	**94**	**22**	**44**	**12**

Italy

I4JED	**1,029,033**	**1060**	**84**	**195**	**108**
I1NVU	700,560	720	84	224	109
IZ1PKV	517,702	751	71	176	66
IK7NXU	374,517	547	63	166	68
IZ2BVC	170,892	628	26	110	5
IK2AHB	116,472	251	40	102	42
IK2OWX	76,959	215	35	98	20
IZ4UFB	70,328	301	24	77	17
IV3IXN	54,560	134	45	76	34
IW2DOY	36,698	137	33	70	15
IU4CSS	2,322	43	9	13	5
***IK2BUF**	**558,744**	**653**	**80**	**226**	**66**
*IK1JJM	512,216	635	66	191	87
*IW1PNJ	457,430	748	62	177	59
*IK1RGK	223,377	430	50	125	56
*IWØRLC	190,624	374	50	126	48
*IK4QJF	184,274	437	40	114	45
*IW1CBG	157,608	429	39	141	19
*IKØREP	144,958	574	20	70	31
*IV3UHL	128,649	332	33	121	29
*IZ8FPK	127,786	312	34	96	51
*IK8GYS	125,856	349	37	112	35
*IK4RQJ	122,576	271	44	100	44
*IZ8CLM	107,500	186	61	110	44
*IZØMQN	98,640	315	38	112	30
*IKØALT	98,532	229	39	128	40
*IZ5NRF	88,466	234	43	98	37
*I3FGX	76,986	234	26	66	34
*IW2NKY	63,960	199	42	100	22
*IZ1PLH	62,624	195	33	97	22
*IK2YSJ	59,496	248	26	99	9
*IU1FQQ	35,670	214	17	53	12
*IZ4IRO	34,860	188	16	39	29
*IQ7EY	31,350	196	22	65	8
*IZ2ABZ	29,884	113	27	76	21
*IK1BPL	25,661	208	11	47	9
*IZ3ZOO	20,000	122	17	61	2
*IW8BCG	17,280	115	18	59	3
*IK2SGF	16,182	103	16	24	22
*IK2REA	8,928	56	17	27	18
*IZØTWI	6,783	67	16	35	6
*IU3BPW	3,872	40	13	23	8
*IW2JRV	1,846	47	8	18	0
*IZ3NVR	10,440	86	11	37	10

Kaliningrad

**R2KMO*	*3,024*	*37*	*15*	*27*	*0*

Latvia

YL2CI	**56,606**	**485**	**8**	**50**	**4**
***YL2NK**	**176,733**	**397**	**49**	**147**	**23**

Lithuania

***LY2PAD**	**189,527**	**391**	**57**	**156**	**26**

Malta

***9H1CG**	**376,211**	**677**	**57**	**148**	**48**

Netherlands

***PA2VS**	**36,955**	**198**	**20**	**63**	**12**

Norway

***LB4YI**	**3,690**	**50**	**11**	**32**	**2**

Poland

SP2TQQ	**45,425**	**191**	**20**	**82**	**13**
SQ9DXT	34,317	184	18	68	7
SP9GKJ	24,610	110	33	63	11
*SP2V	217,580	436	46	131	43
*SP9CXN	185,866	456	39	139	21
*SP9GMI	174,836	330	50	118	50
*SP5UFK	145,860	386	41	131	15
*SP1DMD	85,888	229	43	104	29
*SP1DOZ	65,856	295	22	77	13
*SP3MZ	50,407	205	35	90	8
*SQ8W	31,875	303	9	33	9
*SQ9PPT	14,527	106	17	56	0
*SP6BEN	2,800	30	16	23	1
***SP2UUU**	**285,108**	**515**	**61**	**174**	**41**

Portugal

***CT1EKD**	**5,452**	**64**	**10**	**36**	**1**

Romania

YO4FPF	**245,575**	**555**	**43**	**130**	**36**
***YO9BCM**	**314,712**	**603**	**43**	**165**	**40**
*YO5AXF	36,920	257	13	49	9
*YO2CMI	13,580	95	20	49	1

Sardinia

***IMØ/ IK5AEQ**	**21,402**	**112**	**26**	**48**	**8**

Serbia

YT3D	**1,161,303**	**1080**	**87**	**226**	**116**
***YT9WW**	**5,640**	**75**	**8**	**32**	**0**

Sicily

***IT9FRX**	**114,696**	**364**	**42**	**90**	**45**
*IT9ACJ	20,367	133	25	65	3
*IW9BJP	8,976	68	19	46	1

Slovak Republic

***OM5KM**	**17,526**	**198**	**6**	**39**	**1**

Spain

EA2DLX	**452,104**	**841**	**40**	**138**	**70**
EA1DA	38,454	228	10	41	27
EB1IC	*1,740*	*24*	*12*	*15*	*3*
***EA3CI**	**684,080**	**885**	**62**	**189**	**89**
*EA3F	189,224	402	44	121	52
*EC5C	68,432	318	19	62	23
*EA3HKA	65,145	243	30	80	19

*EA3AKA	53,862	191	32	83	26
*EF7W	33,575	171	20	51	8
			(OP: EC7KW)		
*EB3TR	17,484	133	12	34	16
*EA4U	17,200	98	22	55	9
*EE2A	1,222	24	8	18	0
			(OP: EA2SN)		

Switzerland

HB9DOS	**46,725**	**250**	**10**	**33**	**32**
HB9HBV	36,952	140	32	78	14
***HB9AVK**	**163,728**	**354**	**45**	**139**	**32**

Ukraine

US2YW	**230,346**	**496**	**46**	**116**	**39**
***UT3SO**	**260,184**	**556**	**49**	**145**	**28**
*UT3IJ	23,157	121	24	69	0

Wales

***GW4HBK**	**11,468**	**125**	**8**	**34**	**5**

OCEANIA

Australia

VJ3O	**56,406**	**208**	**21**	**56**	**25**
			(OP: VK3TX)		

Brunei-Darussalam

V85RH	**896,643**	**1045**	**79**	**175**	**43**
			(OP: JO1RUR)		

Hawaii

***KH6CJJ**	**695,824**	**769**	**71**	**89**	**154**

Indonesia

YB2MM	**410,423**	**606**	**63**	**152**	**26**
YC2BST	47,970	257	21	47	10
YC8DUL	23,436	124	26	53	5
YB7KE	7,632	80	13	22	1
YB8UTI	5,330	95	12	14	0
YB2HAF	1,650	24	10	15	0
***YBØNSI**	**208,638**	**416**	**57**	**124**	**20**
*YB9UA	67,743	291	36	69	12
*YB1IUQ	55,275	296	17	54	4
*YD9UW	40,280	193	33	60	13
*YC1RYX	33,792	137	24	58	6
*YCØRNC/1	31,900	162	37	60	3
*YB9GV	30,942	237	14	40	0
*YB3BGM	10,302	86	15	35	1
*YB2TDP	10,281	73	25	39	5
*YC1BTG	8,680	78	19	37	0
*YB2CTE	5,248	83	11	29	1
*YD2UXA	782	45	6	10	1
*YC9VRJ/3	744	20	10	14	0
*YB1HDR/P	442	20	6	7	0
*YD9UAN	8	3	2	2	0
*YB1PEF	14,448	72	32	50	2
*YB8JEC	13,260	158	12	25	2
*YCØRXA	10,317	92	18	39	0
*YC5YDD	9,240	85	24	42	0

Philippines

DU1IVT	**14,008**	**154**	**15**	**19**	**0**

SOUTH AMERICA

Argentina

LU1BJW	**139,629**	**289**	**39**	**73**	**71**
***LT9H**	**200,008**	**386**	**37**	**66**	**81**
			(OP: LU3HY)		
*LW3DC	9,858	60	16	27	19
*LU7DW	608	18	6	8	2
*LT5A	490	13	4	3	7

Brazil

***PY2GTA**	**626,778**	**717**	**59**	**163**	**96**
*PY2NY	303,750	700	28	72	50
*PY1ZV	192,990	349	41	78	91
*PY2DPM	90,951	190	48	85	50
*PY2KO	53,833	206	18	43	40
*PR8KW	51,390	219	19	45	26
*PY4LH	50,052	209	18	41	38
*PU7ASP	19,923	101	24	37	26
*ZV2F	10,360	70	28	29	17
			(OP: PY2SFA)		

Chile

***CB8E**	**262,182**	**438**	**44**	**86**	**92**
			(OP: CE8EIO)		

*3G3O	242,811	428	38	58	111
			(OP: XQ3OP)		
*CB3R	86,884	290	23	44	40
			(OP: XQ3SK)		
*CE3KRM	2,660	26	13	13	12
*XQ3SK	2,156	31	9	14	5
*3G3R	24,320	139	13	18	33
			(OP: XQ3SK)		

Colombia

***HK3VHZ**	**9,792**	**61**	**22**	**22**	**28**
*HK4ZZ	6,952	58	27	32	20
*HK4J	960	24	14	10	16

Venezuela

***4M1W**	**209,670**	**514**	**32**	**51**	**62**
			(OP: YV1SW)		
*YV6CA	71,642	235	25	45	43

YOUTH

ASIA

China

***BD4VGZ**	**76,752**	**242**	**40**	**78**	**5**

EUROPE

Bosnia-Herzegovina

***E7ØAW**	**74,692**	**280**	**34**	**95**	**13**

Croatia

9A2ZI	**2,743,698**	**1829**	**123**	**356**	**150**
9A1CAL	41,870	170	26	61	19
			(OP: 9A3LET)		
***9A1CRT**	**2,277**	**37**	**7**	**26**	**0**
			(OP: 9A7RA)		

Germany

DM7XX	**2,437,018**	**1622**	**118**	**366**	**142**
***DO1JJK**	**5,328**	**53**	**10**	**27**	**11**

Ireland

***EI8KW**	**122,484**	**345**	**32**	**127**	**14**

Italy

***IU4FNO**	**110,547**	**231**	**52**	**128**	**33**

Poland

*SP8BRT	5,513	78	9	28	0
*SP9DLS	4,312	50	13	31	0

MULTI-OPERATOR SINGLE TRANSMITTER

NORTH AMERICA

United States

District 1

***N1SOH**	**46,904**	**176**	**40**	**62**	**62**

District 2

*W2RC	13,515	92	17	43	25
AK2S	**363,307**	**587**	**58**	**148**	**95**
***NY6DX**	**1,857,136**	**1544**	**97**	**290**	**209**
*K1RQ	127,971	301	54	102	85

District 3

K3AJ	**2,806,610**	**1989**	**107**	**302**	**201**
K9RS	521,260	592	78	212	99

District 4

AG4TT	**2,334,960**	**1911**	**94**	**284**	**186**
AD4ES	1,807,372	1788	83	226	167
W4MLB	1,312,486	1581	90	208	184
***N4SS**	**1,053,032**	**1051**	**86**	**239**	**147**

District 5

K5RZA	**2,394,288**	**2086**	**111**	**278**	**235**

District 7

WA7AN	**2,569,450**	**2187**	**114**	**280**	**256**
WM7A	492,375	800	74	140	161

District 9

NV9L	**3,313,125**	**2302**	**110**	**305**	**210**
K9YY	1,420,936	1468	91	226	165

District Ø

***WTØDX**	**591,890**	**1053**	**80**	**130**	**167**
*KEØOR	21,300	118	25	40	35

Canada

District 3

VA3LML	**598,264**	**790**	**58**	**151**	**123**
***VE3RUA**	**252,992**	**449**	**50**	**84**	**134**

Dominican Republic

***HI8SDR**	**984,268**	**1002**	**74**	**176**	**162**

US Virgin Islands

***KP2B**	**3,868,931**	**2517**	**103**	**297**	**243**

AFRICA

Canary Islands

***EA8DED**	**2,882,547**	**1989**	**85**	**294**	**134**

ASIA

Asiatic Turkey

***TC3N**	**1,309,208**	**1571**	**52**	**177**	**67**

China

BH2RO	**220,992**	**527**	**60**	**116**	**16**

Thailand

E2WRTC	**953,837**	**1167**	**81**	**215**	**15**

United Arab Emirates

A65DR	**223,665**	**496**	**31**	**107**	**17**

West Malaysia

***9M2U**	**141,638**	**390**	**33**	**100**	**1**

EUROPE

Bosnia-Herzegovina

***E71EZC**	**24,220**	**166**	**21**	**49**	**0**

Croatia

***9A7T**	**1,828,908**	**1263**	**114**	**347**	**145**

Czech Republic

*OK1KKI	73,776	210	41	99	19
*OK1OFM	12,008	74	23	49	4
OK5Z	**5,047,174**	**2710**	**137**	**433**	**196**
OK1KSL	2,402,980	1875	98	320	130
OK7O	2,152,248	1644	100	298	154
OL1C	44,935	216	20	52	23
***OL1Z**	**873,595**	**1029**	**80**	**218**	**81**
*OL7K	504,020	872	59	185	46

Denmark

***OZ/DJ1XT**	**579,139**	**849**	**62**	**205**	**56**

England

GØBRC	**316,710**	**702**	**40**	**145**	**45**

European Russia

District 3

RA5AD	**7,936**	**95**	**15**	**47**	**0**

France

TM1D	**379,520**	**523**	**70**	**183**	**67**
***TM6V**	**718,642**	**1024**	**66**	**201**	**79**

Germany

DLØHMK	1,083,980	1120	79	242	94
DLØGMH	7,137	55	22	38	1
DP6A	**3,220,700**	**1921**	**130**	**401**	**169**
DKØ5ØBN	2,749,545	1783	122	371	164
DAØT	1,110,564	1134	87	274	91
DM4M	189,200	310	71	176	28
***DQ4W**	**693,117**	**843**	**75**	**236**	**76**

Greece

SZ1A	**3,763,900**	**2497**	**127**	**397**	**141**

Italy

IQ4FC	**5,815,600**	**3096**	**139**	**439**	**197**
IQ1DF	*2,404,558*	*1720*	*117*	*335*	*146*
IQ5AE	379,320	566	74	191	62
IQ3PN	375,747	797	51	149	51
IQ1VD	51,060	216	27	77	11
***IQ3RK**	**2,154,300**	**1501**	**118**	**366**	**161**
*IQ2DN	202,072	375	52	115	65

Liechtenstein

HBØDX	**1,358,900**	**1484**	**84**	**281**	**63**

Lithuania

***LY5W**	**1,987,335**	**1611**	**114**	**333**	**120**

Norway

LN5O	**89,378**	**341**	**27**	**105**	**2**

Poland

SP3KRE	23,545	147	23	61	1
***SP5KCR**	**25,755**	**168**	**22**	**60**	**3**
SP8R	**4,393,440**	**2521**	**132**	**427**	**161**
SN5Y	1,334,328	1395	90	257	77

Portugal

***CS5CRE**	**1,017,744**	**1369**	**69**	**206**	**89**

Romania

YO3GNF	**95,784**	**276**	**33**	**101**	**22**

Sardinia

IQØID	**960,384**	**1359**	**54**	**191**	**83**

Serbia

YT5A	**2,005,899**	**1770**	**93**	**264**	**126**

Sicily

***IT9BLB**	**2,683,868**	**1694**	**127**	**386**	**161**

Slovak Republic

OM5M	**2,576,970**	**1924**	**113**	**331**	**126**

Slovenia

***S51A**	**1,520,415**	**1196**	**113**	**322**	**130**
*S57ZT	467,517	856	53	176	38

Spain

***ED3D**	**501,585**	**915**	**57**	**161**	**63**

Sweden

SD3T	**833,280**	**1312**	**56**	**198**	**56**
SB7A	307,444	816	32	142	28

Switzerland

HB9EP	**33,490**	**178**	**16**	**43**	**26**

Ukraine

***US4EWY**	**101,992**	**488**	**23**	**94**	**5**

OCEANIA

Australia

VK2RT	**1,214,115**	**1155**	**73**	**156**	**144**

Guam

AH2R	**584,425**	**851**	**53**	**122**	**66**

Philippines

***4D3X**	**69,972**	**316**	**34**	**39**	**11**

SOUTH AMERICA

Argentina

LT5D	**404,202**	**535**	**65**	**140**	**98**

Brazil

PR2E	**952,511**	**1057**	**60**	**142**	**141**

Peru

OA4O	**414,990**	**574**	**52**	**103**	**110**

Uruguay

CX5A	**855,896**	**1032**	**63**	**143**	**126**

MULTI-OPERATOR TWO-TRANSMITTER

UNITED STATES

K3ODX	46,009	168	33	63	43
K9CT	**6,869,018**	**4278**	**128**	**366**	**263**
NJ4P	**5,589,675**	**3581**	**121**	**362**	**252**
KT7E	**2,225,356**	**2370**	**97**	**207**	**228**
K7BTW	2,123,280	2480	97	201	242
NA4DA	2,096,508	1951	90	247	179
WØYK	**1,840,184**	**1793**	**106**	**235**	**243**
N3DPB	**619,080**	**758**	**79**	**193**	**130**
NC1CC	**558,245**	**743**	**68**	**180**	**111**

AFRICA

CR3DX	**13,848,120**	**6015**	**130**	**414**	**248**

EUROPE

LA1K	**192,657**	**657**	**27**	**95**	**27**
OZ4GM	147,315	477	31	114	16
EC2DX	**5,968,494**	**3842**	**125**	**379**	**203**
IQ9RG	**5,514,602**	**3496**	**133**	**388**	**188**
PI4COM	**5,400,014**	**3193**	**125**	**398**	**171**
S5ØW	**5,280,956**	**3386**	**128**	**374**	**181**
DP7D	**4,913,650**	**2974**	**126**	**403**	**166**
DP9A	4,897,125	3131	126	391	158
IQ4FA	**4,543,896**	**3083**	**115**	**352**	**162**
C37N	**2,928,938**	**2826**	**76**	**245**	**142**
IO7T	2,233,440	1957	100	311	117
OU2PA	**1,787,122**	**1948**	**85**	**269**	**92**
IQ3ME	250,206	550	49	137	37

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

K1SFA	**6,166,216**	**3965**	**118**	**362**	**259**
N6WM	**3,796,002**	**3436**	**116**	**267**	**258**
W3GH	**2,948,378**	**2680**	**92**	**274**	**212**

NORTH AMERICA

VE5RI	**436,608**	**757**	**58**	**85**	**145**

AFRICA

CR3W	**12,368,664**	**5371**	**134**	**425**	**233**

ASIA

JS1YDX	**79,500**	**217**	**50**	**80**	**20**

EUROPE

9A1A	**10,482,053**	**5571**	**141**	**452**	**194**
DM4X	**3,947,364**	**2615**	**126**	**381**	**177**
PI4CC	**2,703,200**	**2271**	**106**	**322**	**117**
I3VRD	**2,669,032**	**2086**	**110**	**326**	**132**
SP9KDA	**417,768**	**640**	**67**	**187**	**55**

OCEANIA

7E3E	**2,664**	**26**	**15**	**20**	**2**

SOUTH AMERICA

HD1A	**1,395,280**	**1267**	**83**	**173**	**172**

EXPLORER

SINGLE-OPERATOR

IV3RYP	**A**	**6,955**	**61**	**19**	**46**	**0**
MØORY	**"**	**5,624**	**75**	**6**	**28**	**4**

MULTI-OPERATOR

VE2CQ	**A**	**1,575,808**	**1615**	**68**	**178**	**170**
NA5NN	**"**	**478,946**	**737**	**68**	**136**	**134**
W5NN	**"**	**193,200**	**465**	**58**	**91**	**127**

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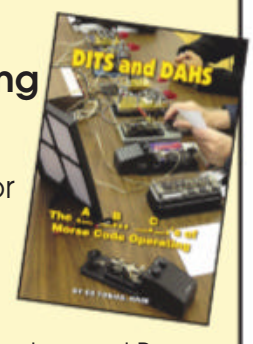
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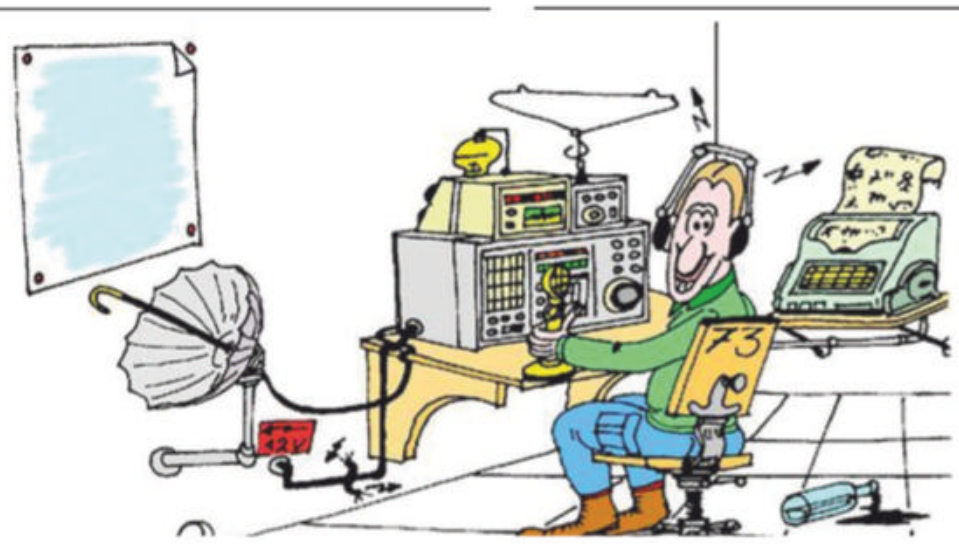
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