Scanning - Shortwave - Ham Radio - Equipment
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Exploring Amateur Radio:

Public Service, Education, and Technology

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In this issue:

- Solar Cycle 24 Exists!
- More Antenna Basics
- Review: FLEX3000SDR Transceiver

AR2300 "Black Box" Professional Grade Communications Receiver

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- An optional GPS board can be used for an accurate time base and for time stamping digital I/Q data.
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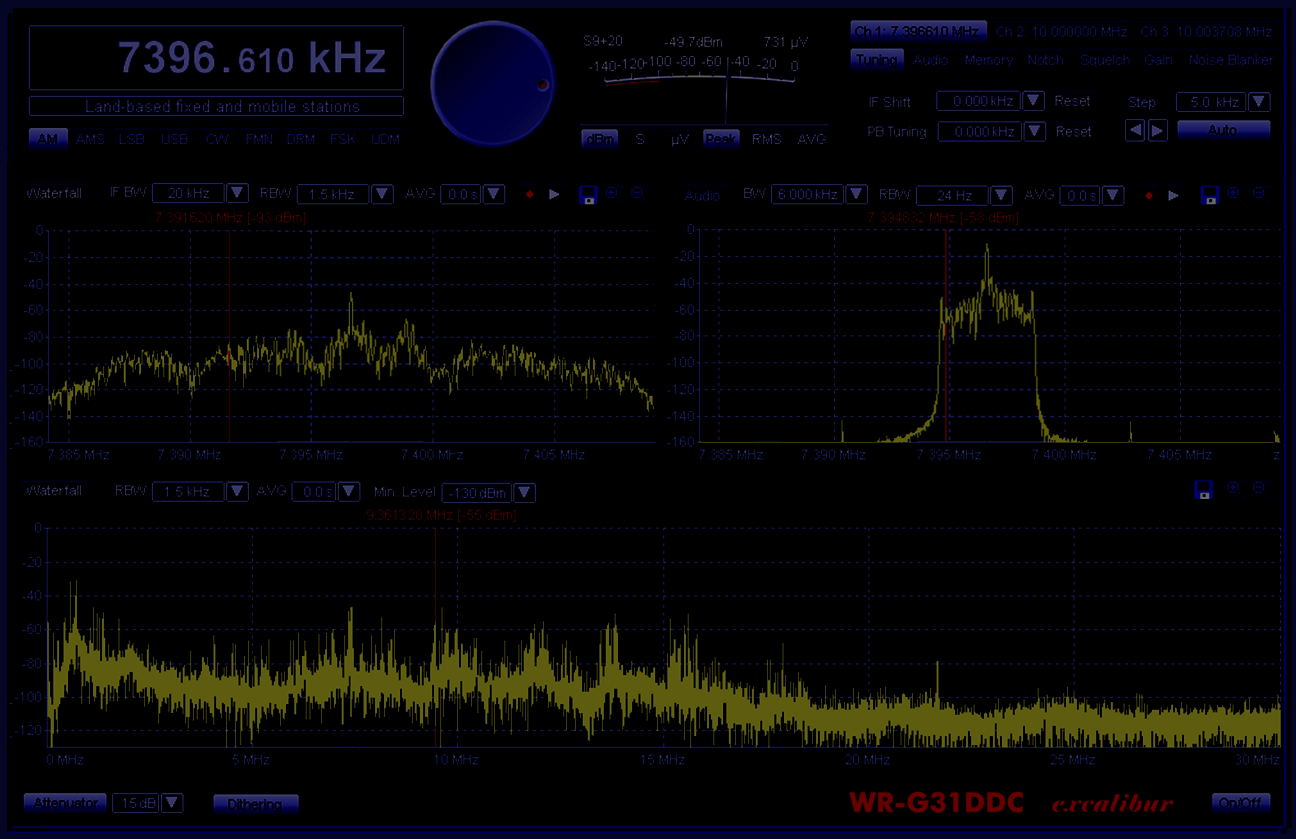

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Monitoring Times

Vol. 29 No. 5 May 2010

Cover Story 8

May is traditionally MT's amateur radio issue. It's the month of the Dayton Hamvention®; it's a time of the year for significant changes in HF propagation; it's the beginning of the hamfest season, and it's a time when many plan to take the tests that will upgrade their licenses bringing more band privileges.

This month MT takes a look at the aspects of amateur radio that keep us all involved: Public Service, Education, and Technology. Every feature article in this month's issue was written by an amateur radio operator.

There are dozens of ways that hams perform public service throughout the year and this month's story from Haiti is a case in point.

Many of us come to amateur radio because of the great attraction the technology holds for us. The articles on antenna basics and 10 meter beacons touch on this aspect.

And, amateur radio depends on each ham continuing a lifetime of self-education. For most of us, the help of a friend or family member can really get us started. This month's First Person Radio series looks at one unique story.

***On Our Cover**: The makeshift antenna farm used by several amateur radio-related disaster relief teams include a GAP Titan HF vertical, an HF folded dipole and a portable VHF antenna (Courtesy: Louis Cruz N4LDG); AE7MC with her autographed photo of astronaut Bill McArthur KC5ACR (Courtesy: Mattie Clauson AE7MC); K5DZE/B 10 meter beacon operation (Courtesy: Bob Patterson K5DZE)*

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R E V I E W S

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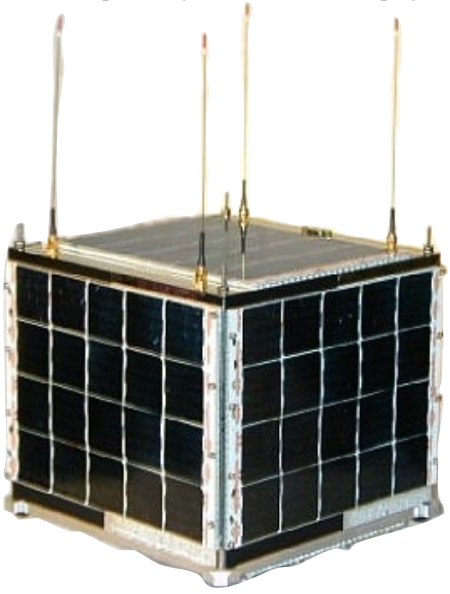
COMMUNICATIONS

by Ken Reitz

AMATEUR/SHORTWAVE RADIO

Ham Satellite in Near Miss

A report from AMSAT North America from early March detailed a near miss in Low Earth Orbit over North America with one of its amateur radio satellites. AMSAT received a warning from the U.S. Joint Space Operations Center located at Vandenberg Air Force base in California that AO-51 (see *Getting Started with Amateur Radio Satellites, MT* January, 2010) would come within 953 meters of FORMOSAT 3-D, one of several in a constellation launched in 2006 as part of a joint U.S/Taiwanese project.



AMSAT-NA VP of Operations Drew Glasbrenner KO4MA said, "the predicted miss distance was 953 meters, which is over 3,000 feet overall, but the radial difference between the two orbits was only 39 meters." Drew reported that there was no problem with the satellite and that he had received a second warning from the Air Force that a later orbit brought the two even closer.

ARRL Spring/Summer Sked Change

The American Radio Relay League (ARRL) has announced the new schedule for the spring/summer season CW, digital and voice bulletins from League HQ station W1AW. These transmissions are great practice for hams and shortwave listeners learning Morse code and as a good test of your shortwave radio's capabilities. Listeners also get the latest propagation forecasts, DX news and Keplerian data bulletins.

CW bulletins are transmitted daily at 2100, 0000, and 0300 UTC on 1.8025, 3.5815, 7.0475, 18.0975, 21.0675 and 28.0675 MHz.

Digital bulletins (RTTY, BPSK31 and MFSK16 in a revolving schedule) are heard daily at 2200 and 0100 UTC on 3.5975, 7.095, 14.095, 18.1025, 21.095, and 28.095 MHz.

Voice bulletins are heard daily at 0145 UTC (9:45 PM ET) on 1.855, 3.990, 7.290, 14.290, 18.160, 21.390, and 28.590 MHz.

BBC Budget Cuts Spares World Service

Facing reduced funding, the BBC announced in late February a number of substantial budget cuts, mostly of its domestic radio and online services. Despite being used by 43% of the United Kingdom population each week, the proposed reductions would include 25% of the current staff and budget used to run the BBC online service.

Military Buys Shortwave Tactical Sets

Harris Corporation announced a recent purchase by the U.S. Marine Corps System Command of its Falcon II NVRIC-104 HF tactical radios. The units are software defined radios that feature enhanced frequency hopping, digital voice and HF link automation. The radios cover 1.6 to 60 MHz in 10 Hz steps, making it "…a highly versatile HF SSB/VHF FM transceiver," according to a Harris product brochure. The radio puts out 20 watts PEP on SSB and 1, 5 or 10 watts FM/SSB switchable. The order was for a reported $78 million.

BROADCAST TV/RADIO

Sangean Pocket Portable HD with AM

A report in *Radio World* online told of a possible October release of the Sangean DT800HD pocket portable radio that would be able to tune both analog and digital AM and FM stations. That's a first for the industry which has seen AM-HD left out of pocket portable designs. No word as yet on price for this radio.

WJFK-FM: Sports Fan's Dream Station

According to a press release March 8 from CBS Radio, Washington, D.C. area FM station WJFK 106.7 has added a fourth channel to its multicast HD-Radio line-up. But, what's really interesting is that the all-sports CBS network station, which carries D.C.-related pro and college sports, is also multicasting the programming from three other out-of-market radio stations: WJZ-FM 105.7 (Baltimore) on HD2, WFAN 660 AM and (NYC) on HD3, WIP-AM 610 (Philadelphia) on HD4. This makes WJFK-FM a sports fan's dream station with the ability to tune in the top East Coast sports teams coverage 24/7.

SATELLITES: WX/TV/RADIO

NASA Launches NOAA's GOES-P

NASA and NOAA reported the successful launch March 10 of GOES-P now renamed GOES-15 which joins four other weather satellites in geostationary orbit and completes the constellation begun more than 12 years ago. The satellite is a backup for the two main weather satellites keeping an eye on Atlantic and Pacific weather.

Liberty Media Backs out of WorldSpace Deal

Liberty Media, the Denver-based conglomerate corporation that saved Sirius/XM from bankruptcy (so far), had plans for taking over global satellite radio service WorldSpace, based in Silver Spring, Maryland, which has been floundering in Chapter 11 since 2008. According to a report in the Denver *Business Journal*, Liberty has put $21 million into the troubled service, said to be worth more than $300 million, but could get stuck for $2.2 billion in debts owed to various previous WorldSpace creditors.

Apparently, the risks of this rescue proved to be too great, causing Liberty to back out of the deal at the last minute. WorldSpace then told the bankrupcty court that it intended to "de-orbit" its two geostationary satellites, which involves moving them to a higher orbit where they will not interfere with other working satellites.

Meanwhile, a curious move by DirecTV, a subsidiary of Liberty Media, saw it take XM radio programming off its DirecTV service and replace it on February 9, according to an announcement on the satellite-TV provider's web site, with SonicTap, a service of Digital Music Express (DMX), a long-time satellite-delivered music service not related to Liberty.

Adding to its misery, Sirius/XM faced de-listing March 17 by NASDAQ for failing to meet the requirements of qualifying for listing on the Over-the-Counter exchange that's home to most of America's high-tech stocks. Accord-

SIRIUS | ((XM)) SATELLITE RADIO

ing to a news release from Sirius/XM, an appeal of the de-listing gives the company another 180 days to bring its price up to NASDAQ requirements.

Satellite Tracks Great White Sharks

You'll never guess where great white sharks, terror inspiring creatures that spend their summers off the Massachusetts coast, go for the winter. They go to Florida! That's what researchers from the Division of Marine Fisheries in Boston discovered when they outfitted a number of great white sharks with satellite tracking devices. Turns out they hang out just off Cape Cod until September and then head straight to Florida at a rate of 1 to 2.5 mph along the edge of the continental shelf. Apparently, they like the water between 59 and 73 degrees, that's the signal to head south. By the time they get to Florida they're happy.

Strange Saga of DISH, Texas

It's pretty unusual for a town of only a few hundred residents to make the national news once, but to do it twice is even more unusual. In 2006 the small town of Clark, Texas won a contest, devised as a publicity stunt by DISH Network, which promised to give everyone in the winning town 10 years of free DISH Network basic satellite TV if the town would just change its name to DISH. Of course, they probably weren't going to choose a place of any great population, and so the town of Clark, Texas won and its name was promptly changed to DISH (**www.townofdish.com**).

In less benign news, earlier this year the town hit the headlines again as a result of air quality tests that showed a high concentration of carcinogens and neurotoxins supposedly coming from a nearby natural gas compression station.

PUBLIC SERVICE

Two EPIRB Tales

A planned five month "semester-at-sea" for 64 Brazilian students aboard a 188 foot steel schooner built in 1992 almost had a catastrophic end. According to a report from the Associated Press, the ship was caught in a micro-burst 300 miles off Brazil's northeast coast, causing it to capsize. The ship sank in just 15 seconds along with all the sophisticated radio gear onboard.

What kept it from being a tragedy was the GME AccuSat MT403FF Emergency Position Indicating Radio Beacon (EPIRB) which was designed to self-release and automatically activate in 2 to 4 meters of water. Even so, it was a near thing for the students and crew of 16 professional sailors. The sailors and students had been split into two groups and were forced to ride out the heavy seas in lifeboats for 30 hours and 40 hours before search aircraft were able to locate them all.

Then there's the story from the Denver *Post* detailing the frustrations of rescue crews involved in search and rescue false alarms triggered nine times from December 2009 to February 2010 in a remote mountain region in Colorado. It turned out that a skier, given a personal locator beacon as a present, mistook the device for an avalanche beacon and apparently had no idea that every time he triggered the device the signal was tracked by a constellation of satellites and the U.S. Air Force Rescue Coordination Center. The problem was that the skier only turned it on for short periods of time, too short to track. It wasn't until the witless skier turned the unit on for a long period of time that rescuers had time to locate the unregistered device. Authorities said that two things could have prevented the false alarms: Personal Locator Beacons should be registered and users should read the instructions carefully.

Restrictive Illinois Radio Bill Reworded

A bill in the Illinois state legislature (see last month's *Communications* column) was amended to drop wording that might have restricted Internet streaming of public safety radio communications. The amendment to drop the restriction was adopted by voice vote in the Illinois House of Representatives.

FCC ACTIVITY

FCC's "2020 Broadband Vision"

The FCC's long-awaited National Broadband Plan was sent to Congress for consideration March 15. The plan is seen by FCC chairman Julius Genachowski as, "a 21st century roadmap to spur economic grown and investment, create jobs, educate our children, protect our citizens and engage in our democracy." It seeks to "close the broadband gaps" and is the result of 36 public workshops, 9 field hearings and 31 public notices that produced 75,000 pages of public comments. The FCC took the debate online with 131 blogposts that triggered 1,489 comments; 69,500 views on YouTube and 335,000 Twitter followers.

The 2020 Broadband Vision hopes to connect 100 million households to 100 megabits/second service and bring affordable access to every community in the U.S. and at least 1 gigabit/second access at "anchor institutions" such as schools, hospitals and military installations. Among the challenges facing this plan are financing, building the necessary infrastructure, and finding the bandwidth to bring this plan to fruition. Genachowski sees this plan as basic as the right of all Americans to telephone and electric service.

FCC Broadcast Station Totals

In the better-late-than-never category comes the FCC's list of broadcast station totals as of September 31, 2009 which was released February 26, 2010. There are now a total of 4,789 AM stations; 6,472 commercial FM stations; 3,136 educational FM stations and 861 low power FM stations, for a total of 15,258 licensed AM and FM stations. But, there are also 6,149 FM translators and boosters making a total of 21,407 radio stations on the bands across the U.S. There are also several thousand unlicensed FM radio stations on the air across the U.S. which are not counted by the FCC.

There are 1,017 UHF commercial TV stations; 377 VHF commercial TV stations; 283 UHF educational TV stations and 107 VHF educational TV stations; 454 Class A UHF TV stations and 86 Class A VHF TV stations as well as 2,921 UHF TV translators and 1,441 VHF TV translators. And finally, there are 1,856 lower power UHF TV stations and 531 VHF low power TV stations, for a total of 5,776 TV stations on the air across the U.S.

CELL FONE FOLLIES

Smile, You're on Candid Cell Camera!

A report in the Southern California *Press-Enterprise* told how a witness to a bank holdup contacted police and was able to provide a full "play-by-play" description of the suspect using their cell phone. The alleged robber was caught, along with the cash and a handgun.

Bungling Car Thief Turns Self In

An article in *The Jersey Journal* told of a plainclothes officer who saw a suspect getting into an unlocked car on the street late at night. The officer gave chase, lost the suspect, but found the suspect's cell phone which he had apparently dropped. After that it was just a matter of calling the suspect's relatives from his own cell phone and asking them to tell him to give himself up, which he did.

Car Thief Tracked by Victim

According to an article in the Kansas City *Star*, a man who left his car running for a few seconds while he went into a house to pick up his son, had the car stolen along with his expensive cell phone. While dad despaired, sonny showed him how to use the phone's built-in GPS to track the phone. After alerting local police, they watched online as the phone zigzagged around town trying to shake the cops. The crook finally turned off the phone, stole another car and picked up a woman accomplice and the coast was clear. That is, until the woman turned the phone back on to (and who could make this up?) call her probation officer. Eventually the two geniuses were caught.

"Communications" is compiled by Ken Reitz KS4ZR (kenreitz@monitoringtimes.com) from news clippings and links supplied by our readers. Many thanks to this month's fine reporters: Anonymous, Rachel Baughn, Norman Hill, Larry Van Horn, and Dave Weaver.

MARS Operators in Haiti:
Providing an Essential Communications Link

By David J. Trachtenberg, N4WWL/AFA3TR

On January 12, 2010 the island nation of Haiti was rocked by a magnitude 7.0 earthquake and multiple aftershocks that devastated the country, destroying roads, collapsing buildings, and killing, by some estimates, up to 250,000 people. The country's fragile infrastructures, including its communications networks, were demolished. At the time of this writing more than a month after the initial quake, relief efforts are continuing to help the survivors and restore a sense of normalcy to that troubled land.

Throughout this disaster, amateur radio operators played a substantial role in providing essential life-saving communications. This includes the efforts of operators who are members of the Military Auxiliary Radio System (MARS).

The Military Auxiliary Radio System (MARS) Comes of Age

MARS is a Department of Defense (DoD)-sponsored organization of volunteer licensed civilian amateur radio operators who provide contingency radio communications support to DoD and civil authorities at all levels. Formerly known as the Military Affiliate Radio System, the program is separately managed and operated by the Army, Air Force, and Navy-Marine Corps.

In years past, MARS primarily relayed morale messages between U.S. military personnel stationed abroad and their families at home. The advent of cell phones, e-mail, and the internet, however, has generally supplanted this function. Emergency preparedness has now assumed a more prominent role in day-to-day MARS operations.

A new DoD Instruction published on December 23, 2009 revalidated the importance of MARS, upgrading it to an "auxiliary" organization, and officially broadened its mission to include precisely the type of emergency response communications capabilities that have proven to be a lifeline for many in Haiti.

The DoD Instruction not only refocuses MARS on providing contingency communications support to DoD and civil authorities at all levels in support of homeland defense requirements; it also integrates MARS more tightly to the DoD Components; invests a greater number of Office of Secretary of Defense-level entities with equities in the program; mandates an annual reporting mechanism as a metric for focusing attention within DoD on MARS issues; and authorizes additional membership benefits that can accrue to MARS members. The text of the DoD Instruction can be found at **www.dtic.mil/whs/directives/corres/pdf/465002p.pdf**.

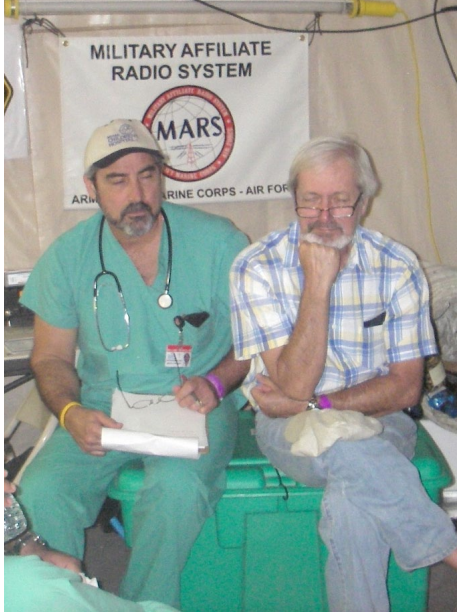
Makeshift tents set up at a triage unit at the Port-au-Prince airport house volunteer medical teams from the United States (Courtesy: Louis Cruz, N4LDG)

Connecting Those in Need to Those Who Help:
On the Scene...

Volunteer Army, Navy-Marine Corps, and Air Force MARS operators traveled to Haiti in teams as part of the medical and humanitarian organizations assisting in the disaster response effort.[1] In particular, doctors and medical support personnel from the University of Miami's Project Medishare program and the Nassau University Medical Center in Long Island, New York were on site in Port-au-Prince and elsewhere in Haiti tending to the needs of the injured. To overcome the lack of telephone and internet connectivity, these medical teams relied significantly on the communications support provided by amateur radio and MARS operators.

Amateur radio operators associated with the University of Miami Hospital, the WX4NHC Amateur Radio Club Station at the National Hurricane Center in Miami, the American Radio Relay League (ARRL), and others organized a well-coordinated effort to provide medical units with this backup emergency communications capability. Julio Ripoll (WD4R), Louis Cruz (N4LDG), John McHugh (K4AG), University of Miami officials, and other team members did a remarkable job in getting this effort off the ground and making it a success. Travel arrangements, other logistical coordination, and reciprocal licensing were only some of the issues that this group of communicators successfully confronted.

As one of the first MARS operators to arrive in Port-au-Prince with the Project Medishare team, Air Force MARS operator Jack Satterfield of St. Pete Beach, Florida (W4GRJ/AFA4DG) helped set up the communications tent at the airport to support the medics working at a triage unit there. He spent two weeks embedded with the medical team and facilitated numerous contacts by radio in the initial critical days after the earthquake struck.



Doctors take a break in the communications tent to assess the situation (Courtesy: Jack Satterfield, W4GRJ/AFA4DG)

In one instance, Satterfield made radio contact with the American hospital ship USNS *Comfort* stationed off the Haitian coast and requested assistance for a critically injured 13-year-old girl needing emergency surgery. The *Comfort* sent a fast boat to the port and the girl was transported in less than 30 minutes. As Satterfield noted in one of his daily situation reports, "The doctor said she would have died if this didn't happen."

Working with other MARS and amateur radio operators to establish a reliable communications link, the most suitable location for transporting another injured patient was determined, and resulted in the patient's prompt transport to a University of Miami hospital facility in Port-au-Prince. The "patient's life was saved by their actions," noted Satterfield.

The Haiti tragedy was immense in its magnitude and effect and provided the first significant test of MARS's backup emergency communications role in a major disaster since disaster preparedness became its primary focus. From the comments of those on the ground assisting in the relief efforts, the MARS volunteers passed this test with flying colors.

The after-action reports from those on the scene were welcomed by MARS officials back in the United States. Jim Edmonds, the National Exercise Coordinator for Air Force MARS, stated, "Although we hope our emergency communications capabilities are never needed, this is what we train for." Bo Lindfors, Chief of the Navy-Marine Corps MARS program, noted that the success of MARS' participation in the Haiti operation "demonstrates the value of this contingency communications capability in a real-world emergency."

The rotation of amateur and MARS operators into and out of Haiti was coordinated by Neil Lauritsen (W4NHL/NNN0TFH) of Clearwater, Florida, one of the many Navy-Marine Corps MARS operators supporting the relief effort. Other Navy-Marine Corps MARS participants in-country included Carmelo Marchese (WA2STL/NNN0YTB) of Homosassa, Florida; Gary Mentro (N3OS/NNN0EKB) of Dade City, Florida; and Bill Williams (AG4QX/NNN0YTD-T) of Tampa Florida. Navy-Marine Corps MARS operator George Riedel (N1EZZ/NNN0ICH) traveled from Akron, Ohio to provide on-site communications support.

Amateur radio and Army MARS operator Ron Tomo (KE2UK/AAT2BC) of North Bellmore, New York performed exceptional service in support of the humanitarian relief operation. He not only provided thousands of dollars worth of radio equipment for use by the medical teams, but assisted the Nassau University Medical Center doctors located outside Port-au-Prince under difficult conditions. As Jack Satterfield noted after returning to the United States, "Ron has a physical disability where he has no use of his right arm. He did amazing things under extremely difficult conditions with no help on site." Tomo was injured in the process of helping doctors move a patient to the hospital, but took it all in stride, noting, "I had my own medical team there to attend to me."

Working together with other amateur radio operators that traveled to Haiti to support the work of the medical teams on site, MARS operators transmitted urgent requests for medical supplies, arranged transportation for injured survivors to appropriate medical care facilities, and facilitated other logistical arrangements for the doctors and surgeons who treated the wounded under extraordinarily difficult conditions. There were setbacks as well as successes, but the effort was conducted with professionalism and demonstrated the ability of amateur radio and MARS operators to work together as a team under difficult conditions in support of a major humanitarian relief mission.

...And Over the Horizon

Radio operators in the United States also played a valuable role in ensuring reliable communications links between Haiti and the United States. For example, Don Veckarelli (W4AWP/NNN0ICX) provided communications support from his location in Fleming Island, Florida. Fred Moore (W3ZU/NNN0JAD), located in Inverness, Florida, provided phone patches between Haitian quake survivors and relatives living in North America. He even posted a YouTube link to one of those conversations at **www.youtube.com/watch?v=JqaKzIkyBug**. In addition, Moore helped arrange transportation for recovering patients dislocated by the earthquake to an orphanage on the small island of Île à Vache, several miles off the southern coast of Haiti.

Operators with the Air Force MARS Phone Patch Net also facilitated communications between U.S. military aircraft en route to and from Haiti and ground stations in the United States. In one instance, Air Force MARS operators ran a phone patch for a transport aircraft returning from the Caribbean area with a group of foreign nationals on board.

"The volunteer service our MARS operators provide is greatly appreciated by the air crews who rely on us to get the job done," said Barry Priddy (K5VIP/AFA3CU), an Air Force MARS phone patch operator in Chesapeake, VA. "Sophisticated on-board communications equipment sometimes fails, but they know we are here 24/7 to help," he said.

Working together, the Army, Navy-Marine Corps, and Air Force MARS Chiefs divided responsibilities for various aspects of the MARS-related portion of the communications support effort in Haiti among their respective MARS programs. This delegation of responsibility facilitated more efficient utilization of MARS communications assets in the overall relief operation.

Navy-Marine Corps MARS assumed responsibility for recruiting volunteers, who traveled to Florida at their own expense, to serve in Haiti as part of the essential communications link. Army MARS coordinated frequency authorizations and use of digital communications for MARS operations on the island. And Air Force MARS was given primary responsibility for coordinating and releasing public affairs information on the activities of MARS radio operators assisting with the Haiti relief operation.

As Allen Eiermann, Chief of the Air Force MARS program, put it, "The delegation of responsibilities among the three MARS services not only makes practical sense, but is an excellent example of interoperability in action." This view was echoed by Jim Griffin, Chief Army MARS, who cited it as an example of "true unity of effort."

Amateur Radio in the Service of Humanity

Much of the credit for the success of the extensive communications support operation goes to the selfless volunteer efforts of other amateur radio operators and organizations. For example, the Salvation Army Team Emergency Radio Network (SATERN) was activated to provide communications support, and many MARS stations across the country participated in its emergency nets. The Intercon Net and the Maritime Mobile Service Network, both operating daily on 14.300 MHz, served as on-the-air meeting points and relay stations for Haiti-related traffic.

ARRL and the Amateur Radio Emergency Service (ARES) provided outstanding support, once again demonstrating the veracity of the ARRL maxim: "Amateur Radio – When All Else Fails."

Despite the fragility of Haiti's communications infrastructure, amateur radio and MARS operators were able to reliably communicate with the U.S. military, medical teams, and others working around-the-clock to treat the wounded and restore critical services to the devastated country. They also established reliable communications links between and among U.S. and foreign official and non-governmental relief agencies.

These communications links were carried over both HF and VHF frequencies. In addition to voice modes, medical traffic and situation reports were transmitted over the WinLink 2000 system, a digital emergency communications method developed by a non-profit consortium of amateur radio operators that allows users to send and receive e-mail by radio in the absence of internet connectivity. Army MARS has been an active user of the system for years and coordinated its use in the Haiti operation, as WinLink provided a key communications capability.

A number of U.S. government agencies and organizations worldwide use WinLink for emergency communications, and its use by MARS operators in Haiti allowed them to be a more effective conduit of information regarding the on-going humanitarian relief effort and to provide reliable back-up communications to the agencies they support despite the sporadic availability of the internet.

"The successful use of this technology in a real-life emergency demonstrates its value as a communications tool," said Jim Griffin, the Army MARS Chief. "Our Army, Navy-Marine Corps, and Air Force MARS operators in Haiti have all used the system with excellent results."

Amateur radio operator Louis Cruz N4LDG (left) and U.S. Air Force MARS operator Jack Satterfield W4GRJ/AFA4DG man the communications station in Port-au-Prince (Courtesy: Louis Cruz, N4LDG)

Looking Ahead

Although MARS operators traveled to Haiti as part of the amateur radio contingent associated with humanitarian relief organizations and not as the result of any DoD-sponsored activation, there are numerous lessons to be learned from the experience. As the immediate crisis subsided, participants began to capture some of the lessons learned. These lessons, which are just being compiled at the time of this writing, will no doubt be analyzed for their applicability to any future emergency contingencies.

In his after-action report, Jack Satterfield focused on the importance of interoperability. He noted that although "a lot of our recent MARS training and exercises have been focused on interoperability, this actual event put it to the ultimate test." Interoperability between the MARS Services, the military, ARES, and other organizations is critical in disaster situations, and the Haiti experience can provide useful examples for future operations.

The response to the Haiti disaster by the amateur radio community has been extraordinary. The dedicated amateur and MARS radio operators who have volunteered their time and effort – in some cases at great personal sacrifice and expense – to assist the people of Haiti in their recovery reflect the very best that amateur radio has to offer. Their commitment to public service is not only admirable but is a credit to the organizations they represent.

Hopefully, the services of these dedicated amateur radio communications specialists will never be needed again to deal with a domestic emergency of the scale and magnitude of the Haitian earthquake. But should the unthinkable happen, it is reassuring to know that the well-trained and "professional" amateur radio and MARS operators are there for us all.

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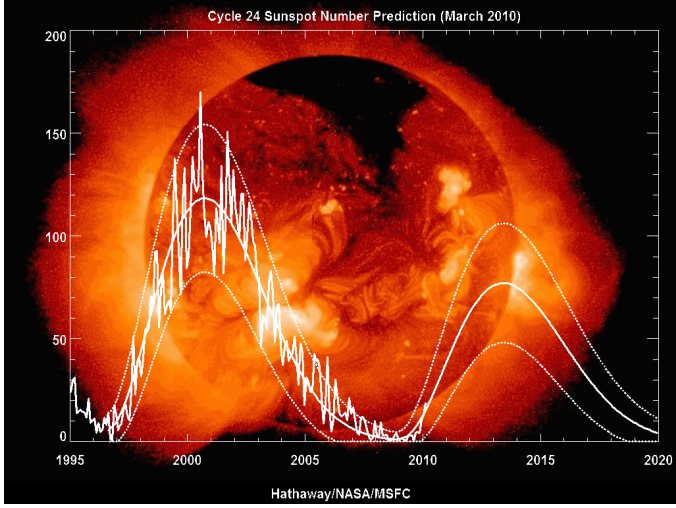
1. It is important to stress that the MARS operators who traveled to Haiti to assist in the relief effort did so on their own, under the auspices of the humanitarian organizations they supported, and not as part of any official DoD activation of MARS. Their efforts were tangible evidence of the spirit of volunteerism in action.

Sunspot Cycle 24 Exists!

By Tomas Hood NW7US



For the last several years, those who watch the sun for any sign of a new sunspot cycle have been disappointed. As reported in past editions of this outlook, the current sunspot cycle minimum (the period between the approximately eleven-year sunspot cycles during which very few if any sunspots are observed) was longer than expected.

The solar cycle minimum, which began during 2006, between Sunspot Cycle 23 and the new Cycle 24, is one of the longest since the early 1900s. In 2007, it looked like an average cycle minima, but by 2008, it became clear that something was not typical (in relationship with the most recent few cycles). In 2008, there were 266 spotless days (73% of the year), and 2009 had a total of 260 spotless days (71% of the year).

During most of 2009, it was the same story: long periods without any sunspot activity. It was doubtful that Sunspot Cycle 24 would ever have any life, or any hope for change. But, in September, two sunspot regions emerged at nearly the same time. This pushed the 10.7-cm flux into the mid-70s and causing a bit of cautious hope. But, after these two sunspot regions rotated out of view, the sun remained quiet again, until mid-October, when they rotated back into view. The leading region no longer had well-defined sunspots, yet still contributed to a rise in 10.7-cm activity. After two years of mostly no sunspot activity, even this slight increase was new and promising.

During October 2009, as the Sun began to show signs that the extended period of sunspot slumber might be ending, scientists and observers of sunspots hesitantly became excited. The October sunspot grew very large (the largest since early 2008) and even produced a few flares. But, because the Sun has fooled us throughout this cycle minimum (we'd see signs of life with a sunspot region emerging only to see it fade away leaving a spotless sun for days and weeks), October's grand sunspot showing was not enough to convince the once-bitten, twice-shy heliophiles.

Then came November and an increase in sunspot activity. Only the first four days in November were spotless. Five continuous days with a zero sunspot (October 31 through November 4) ended with the arrival of a series of new sunspots that lasted until November 7. Heliophiles around the world thought that things were going back to "normal" for this sunspot cycle minimum: no spots for days on end.

This dismal outlook was cut short on November 9 when sunspot region 1030, thought to be dead and gone, flared up with a sunspot count of 14. This region was active until November 12, and the next day was again spotless. Heliophiles again became skeptics, pointing out how small this active region was compared to the region seen during the end of October.

However, a handful of observers noted that overall sunspot activity was increasing. Little by little, the period of days with zero sunspots was becoming shorter than during most all of the current solar cycle minima. This was proven true when another sunspot region emerged on November 15, starting a run of daily sunspot activity.

During all of November, the 10.7-cm flux remained above 70. This slight and welcomed increase in daily flux activity, combined with the expected yearly improvement that comes each autumn, resulted in very good conditions on the shortwave frequencies. During most of November, the sun remained active, though the end became spotless again.

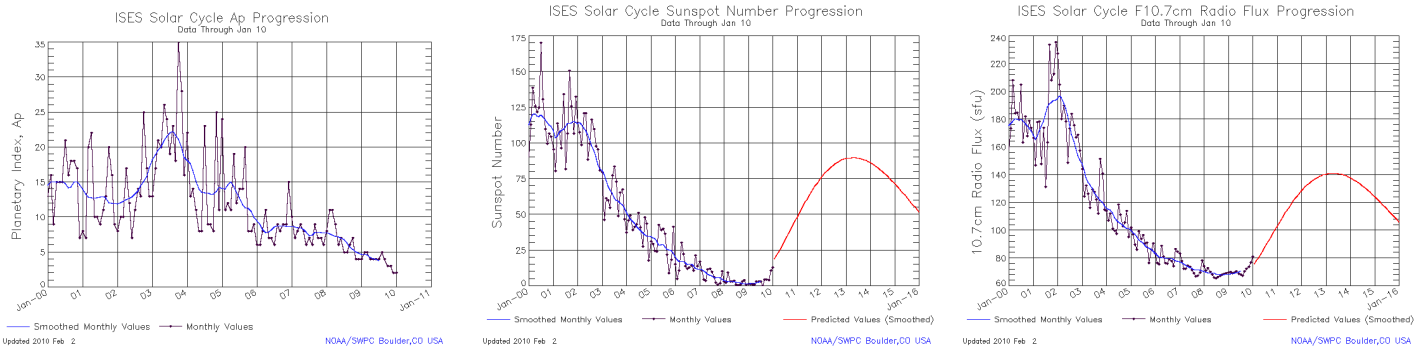
While the latter part of November were void of official sunspot regions, by December 9th, ending sixteen days of zero spots, the Sun began to show signs of activity. Sunspot activity increased enough that the 10.7-cm radio flux climbed into the upper 80s for the first time since early 2008.

With the noticeable increase in sunspot activity came one of the first significant coronal mass ejections (CME), associated with the X-ray flares erupting from the large sunspot regions. This massively huge cloud of solar plasma (billions of tons!) was directed toward Earth and arrived about three days later, though it did not cause any geomagnetic disturbance.

By December 19, the Sun kicked into high-gear with the total sunspot count climbing to 43. This pushed the 10.7-cm flux up to 87 on December 17, becoming the highest flux reading of 2009!

Speaking of size, the size of active sunspot regions is given as units, each unit being one millionth of the Sun's visible hemisphere (this unit does not have a specific name). On December 20, the total area of all sunspot regions equaled a huge 330 millionths of the visible Solar hemisphere, the largest sunspot region of 2009.

Between Christmas and New Year's Eve, four additional sunspot regions emerged. On January 7, 2010, one of the previous sunspot regions seen in December rotated back into view. This region quickly grew and became larger than ten-times the size of Earth, peaking at 380 millionths of the visible Sun hemispheres! This region was peppered with spots and as a



Sunspot Cycle 24 progression charts (through Feb 2, 2010) showing the continuing rise in both the monthly observed sunspot counts since August 2009, as well as the rise in the 10.7-cm flux monthly figures.Notice the geomagnetic conditions, however. The geomagnetic conditions are the most quiet observed at least during the last two solar cycles. (Courtesy: Space Weather Prediction Center / NOAA)

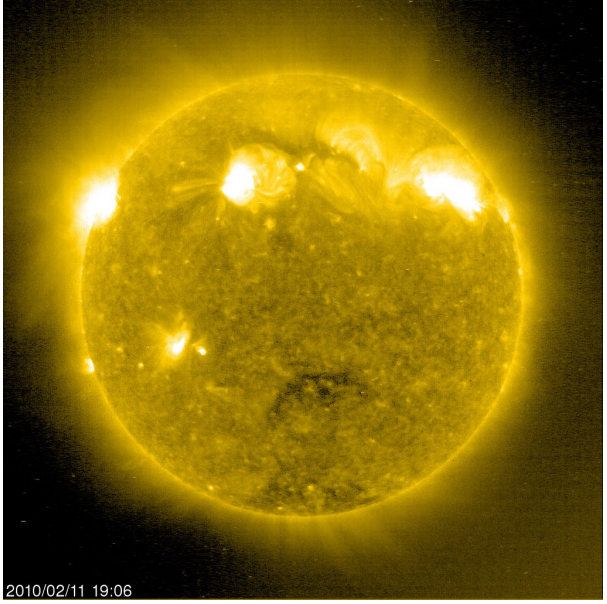
result, the 10.7-cm radio flux peaked at 93 on January 12. With these sunspots came a series of X-ray flares, some of which were moderately strong. Flares of this intensity have not occurred since the start of the sunspot minima.

February became the month of incredible excitement, as the sun did not wane quiet. There was not one day without spots during all of February 2010. The last time a month had zero days with zero sunspots is January 2007.

During the middle of February, a constant parade of X-ray flares erupted, some of the most powerful in several years. Coronal mass ejections (CMEs) could be seen exploding away from these active regions. The arrival of those CMEs produced active geomagnetic disturbances about three days later. The sunspot count on February 8 was an amazing 71 and the combined size of the active regions was 460 millionths! Activity like this has not been seen since the end of Solar Cycle 23!

Minor flaring continued over the next several days, as the 10.7-cm continued to climb into the mid-90s. The higher end of the HF spectrum began to become active with DX signals, with even 12-meter activity world-wide. By February 12, solar activity was high, and included the largest M-class flare yet recorded in Solar Cycle 24. This flare originated in Active Region 1046, and was the source of a full-halo CME that was aimed directly toward Earth. This later produced minor aurora and geomagnetic disturbances. Active Region 1045 also produced a series of flares, including another M-class X-ray flare. By February 12, the 10.7-cm flux peaked at 96, just shy of 100! This level of activity was last seen in 2006.

The impact on world-wide radio DX is noticeable in the drastic improvement of propagation on the middle high frequency spectrum, as well as in the variable improvements noted on the upper HF bands. Amateur radio operators have worked DX paths on a regular basis on frequencies as high as the 12-meter band. Some limited openings have even been reported on ten meters. It seems evident that we're no longer at solar minimum, but are now in the steady climb toward solar cycle maxima!



The bright regions as seen in this extreme ultraviolet image of the Sun on February 11, 2010 pushed the 10.7-cm radio flux to the highest yet recorded during Solar Cycle 24 (see text). Two of the active regions (top middle, top right) produced a series of C- and M-class flares. (Courtesy: Solar and Heliospheric Observatory (SOHO)

The Spring/Summer Season

Twice a year, the center of the Sun will spend a nearly equal amount of time above and below the horizon at every location on Earth. The hours of darkness and the hours of daylight will be of nearly the same length. The moment (not the day) when the sun is observed to be directly above the equator is known as the Vernal Equinox, and occurred on March 20, 2010 at 1732 UTC. These equinoctial transitions occur twice a year, in the autumn and in the spring.

In the Northern Hemisphere, when the hours of daylight increase, the lowest shortwave frequencies and the medium wave frequencies begin to suffer. On radio propagation paths that traverse the Northern Hemisphere, these lower frequencies become mostly unusable for much of the daylight hours because of signal absorption in the lowest of the ionospheric layers, the D region. This absorption occurs most prominently at these low frequencies. The amount of absorption is directly tied to the amount of sunlight energizing the D region.

At night when the D region is in darkness, it quickly loses energy and absorbs very little of the signals that it did during daylight hours (some nighttime absorption still occurs, however). These lower frequencies then become usable again during the night.

Since the period of darkness is short in the summer season, the window for hearing a DX medium wave (MW) broadcast station or a tropical shortwave DX station on the lower HF spectrum is very short. At the same time, the radio noise-level caused by weather is higher, masking those weak MF and low HF signals that might still make it through the D region.

The higher shortwave frequencies come alive, though. The more energized the ionosphere, the higher the radio frequencies that it can refract. With the recent increase of sunspot activity, more and more radio propagation in the higher shortwave spectrum is occurring.

International shortwave broadcasters are taking all of this into consideration and typically change their transmission schedules and their choice of frequencies so that they can better reach their audience. This seasonal change is made by most broadcasters at the end of March in order to take advantage of the summer Ionospheric conditions.

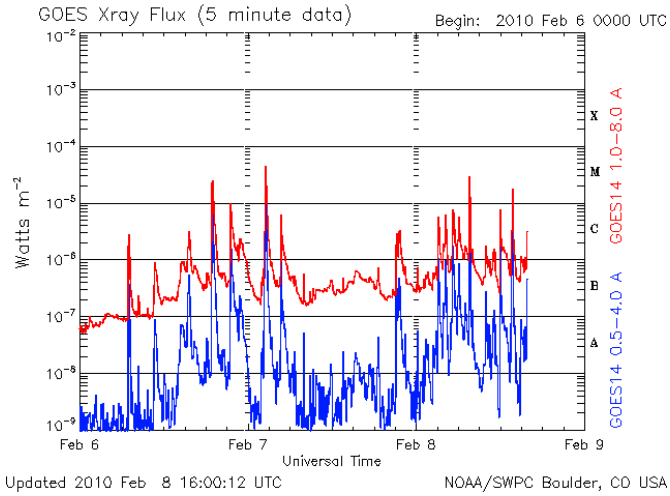
The VHF/UHF hobbyist also benefits from the changes in season. The summer season holds a lot of unique opportunities for exotic radio activity. Trans-equatorial propagation between stations on either hemisphere is common during the spring and early summer. Another interesting pursuit of exotic VHF propagation is via Aurora, which is expected to be more intense this year with the rise in solar activity.

One other very exciting mode of VHF propagation is found from May through late summer. This is the yearly Sporadic-E (Es) Season. Also noteworthy is the DXing of distant FM radio stations and TV broadcasts via tropospheric ducting from mid through late summer.

Summertime Shortwave Propagation

While the lower HF and MF bands become less usable as we move through the spring and into summer in the Northern Hemisphere, the characteristics of higher shortwave propagation changes. Paths between many areas of the Earth begin opening up on higher shortwave frequencies. During the spring equinoctial season, propagation openings between the northern and southern hemispheres become more reliable. Because the Sun is mostly overhead above the equator during April, we have optimal DX conditions on paths crossing the equator, especially on paths that follow the grey line terminator.

The terminator is the line on the earth between the sunlit side and the side in darkness. This is also known simply as the "grey line" and often, the "twilight zone." Because of the tilt of the earth as it rotates in relation to the sun, the location of the terminator line changes dramatically. During the two yearly equinoxes, the terminator runs straight from pole to pole. This transitional



At press time, February 2010 was the most active month of new Sunspot Cycle 24. This graph shows the barrage of strong X-ray flares erupting from the active sunspot regions from February 6 through February 9, 2010.These flares caused sudden ionospheric disturbances (SIDs), or 'radio blackouts' on the sunlit side of the Earth. (Courtesy: SWPC /NOAA)

period is significant in terms of radio wave propagation because of how the ionosphere changes during this period. In the most general terms, unique and enhanced modes of HF radio wave propagation exist along this terminator.

As high summer arrives, conditions on shortwave frequencies become quite different from those of winter. Radio paths running east and west are not as strong as the signal paths that run between points north and south. On June 21, 2010, at 1128 UTC, the period of sunlight is the longest of the year in the Northern Hemisphere.

At the end of the summer season, we move again through the autumnal equinoctial period, and those east/west paths open back up, and we enter the prime "winter" DX season.

From April to June, fair to good propagation occurs on both daytime and nighttime paths on the middle shortwave bands. The strongest propagation occurs on paths that span areas of both day and night. From April through June, peaking in May, the frequencies between 9 and 16 MHz should offer occasional 24-hour DX to all parts of the world. Thirty-one meters will be the most stable as a nighttime band, with propagation following grayline and nighttime paths.

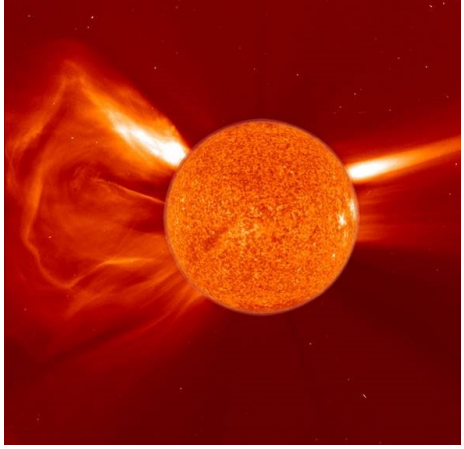
Expect excellent propagation on lower shortwave frequencies, like in the 41-meter band, with Europe in the evening, and Asia in the mornings. Occasional DX openings will occur on the tropical bands around sunrise. However, these bands are quickly losing ground because of the seasonal increase in noise.

June through July marks the changeover from equinoctial to summertime propagation conditions on the shortwave bands. Solar absorption is expected to be at seasonally high levels, resulting in generally weaker signals during the hours of daylight when compared to reception during the winter and spring months.

Sunspot activity will still be considered "low" and that translates to low maximum usable frequencies, consistent with conditions experienced during 2008. During this summer, 19 and 16 meters will be the most reliable daytime DX band though signals will be weaker and more unstable. Sporadic-E propagation will make reception of signals possible over short-skip paths for stations on higher shortwave bands, though.

Twenty-five through 31 meters will be fairly good in the evenings and mornings. At night, those paths that remain open may be marginal. During periods of moderate geomagnetic activity expected this year, these bands may offer occasional long-distance DX, but expect signals to be weaker and variable in strength. The most reliable band for both daytime and nighttime should be a toss-up between these two bands.

Forty-one and 49 meters offer domestic propagation during daylight hours and somewhat during the night. The tropical bands (60, 75, 90, and 120 meters) are not as noticeably affected by the solar flux, but are degraded during geomagnetic storminess. Through the summer, expect these bands to be more challenging, though less this year than last year, due to the somewhat lower geomagnetic activity levels expected. Look for Europe and Africa as early as sunset. After midnight, start looking south and west for Pacific, South America, and Asia. Short-skip should be possible out to about 750 miles during the daytime.



A coronal mass ejection, a huge cloud of solar plasma, escapes from the sun on February 18, 2002. During February 2010, CMEs like this one were hurled toward Earth, causing minor aurora when these massive clouds of plasma reached Earth. (Courtesy: NOAA)

Expect some openings on 75 and 90, similar to how 40 Meters will be acting. Fairly frequent short-skip openings up to 1000 miles are possible during darkness, but expect very few daytime openings with all the static and absorption. MW and 120 meter propagation is rough in the summer due to the high static and higher overall absorption caused by the short nights and higher D-Layer ionization.

Overall, daytime bands will open just before sunlight, and last a few hours after dark. Look higher in frequency during the day, as these frequencies will be less affected by any solar storms occurring, and more broadcasters have transmissions in these upper bands.

VHF Propagation

Widespread auroral displays can occur during April, bringing with them unusual ionospheric short-skip openings on the VHF bands. Best times for these to occur are during periods of radio storminess on the SW bands. Look for days with high planetary K (Kp) and A (Ap) figures (typically, the Kp should be over 5).

Will that occur often this year? Probably, since we are now seeing a steady rise in X-ray flare activity along with the increased sunspots. Because of the CMEs associated with X-ray flares, expect occasional periods of moderate geomagnetic storminess. These occasional moments of geomagnetic storminess caused by fast solar winds and the passage of plasma released from the Sun's corona may trigger aurora, providing possible Ionospheric propagation by way of the aurora.

On VHF, expect Sporadic-E propagation starting in May that may produce some great weak-signal DX. During July and August short-skip propagation over distances as great as 1,400 miles should be possible for about ten percent of the time on 6 Meters. Higher VHF (2m) openings may also be possible during periods of intense sporadic-E ionization.

Tropospheric ducting begins to form over wide areas of North America, and over the Atlantic and Pacific Oceans, during the middle to late summer. Watch for stalled high-pressure weather cells between your location and the distant (DX) station. Stalled high-pressure weather cells, with pressures reaching above 1025 millibars, are known to cause the ducting of VHF radio signals. Ducting allows VHF radio signals to bounce through these natural waveguides far beyond the normal line of sight distances.

Tropospheric ducting forms each year between Hawaii and the U.S. West Coast, and from San Francisco to Los Angeles, Denver to Dallas, Texas to Florida, the Great Lakes to the eastern seaboard, from the Great Lakes to Texas, Nova Scotia to Miami, and from the Midwest to the Southeast.

Meteor Showers

There are a number of meteor showers during this period between April and September that might provide opportunity for observing VHF/UHF Meteor Scatter propagation DX. Most meteor showers are at their best after midnight. After midnight, you're on the leading edge of the Earth and you're meeting the meteors head-on. Before midnight, you're on the trailing edge of the Earth and the meteors have to catch up to you.

As a result, not only are more meteors seen in the pre-dawn hours, but their impact speeds encountering the Earth's atmosphere are much higher and the meteors are generally faster and brighter. This causes greater ionization, which is what you use to refract a radio signal. Look for TV and FM broadcast "pings" (short bursts of reception) during these events. If you are an amateur radio operator, look for six and two meter openings off of the ionized meteor trails.

Lyrids, a major meteor shower, takes place from mid to late April, and you may just catch the end of it. The unpredictability of the shower in any given year always makes the Lyrids worth watching, since we cannot say when the next unusual return may occur. If this year's event is average or better (30 to 60 good-sized meteors entering the atmosphere every hour), meteor-scatter openings could occur on the VHF bands.

Another major meteor shower, the Eta Aquarids, will occur in May. This shower has a peak rate of up to 20 to 50 per hour.

Minor showers include the Alpha Aurigids (continuing from August), the Beta Cassiopeids (peaking September), the Epsilon Perseids (peaking September), the Delta Aurigids (peaking September) and the Piscids.

I hope to hear from you regarding your observations and with any questions you may have about space weather, the solar cycle, and radio propagation. Please explore the online resources at **http://propagation.hfradio.org** and at **http://hfradio.org/forums**. If you are on Facebook, please join the "Space Weather and Radio Propagation Group" at **http://tinyurl.com/fb-spacewx**. Finally, I invite you to become a "fan" of my personal radio hobby Facebook page, located at **http://tinyurl.com/fb-nw7us**.

Until next time, I wish you a happy radio-monitoring season! *73 de NW7US, Tomas Hood*
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When you buy your Bearcat 796DGV Trunktracker package deal from Communications Electronics, you get more. The GV means "Great Value." With your BC796DGV scanner purchase, you also get a **free deluxe scanner headphone** designed for home or race track use. Headset features independent volume controls and 3.5 mm gold right angle plug. The 1,000 channel Bearcat 796DGV is packed with features to track Motorola Type I/II/IIi Hybrid, EDACS, LTR Analog Trunk Systems and Motorola APCO 25 Phase I digital scanner including 9,600 Baud C4FM and CQPSK. Also features control channel only mode to allow you to automatically trunk many systems by simply programming the control channel, S.A.M.E. weather alert, full-frequency display and backlit controls, built-in CTCSS/DCS to assign analog and digital subaudible tone codes to a specific frequency in memory, PC Control and programming with RS232C 9 pin port (cable not supplied), Beep Alert, Record function, VFO control, menu-driven design, total channel control and much more. Our CEI package deal includes telescopic antenna, AC adapter, cigarette lighter cord, DC cord, mobile mounting bracket with screws, owner's manual, trunking frequency guide and one-year limited Uniden factory warranty. For maximum scanning enjoyment, order magnetic mount antenna part number ANTMMBNC for $29.95. For complete details, download the owners manual from the **www.usascan.com** web site. For fastest delivery, order on-line at www.usascan.com.

Bearcat® BCT8 Trunk Tracker III

Manufacturer suggested list price $299.95

CEI Special Price $169.95

250 Channels • 5 banks • PC Programmable

Size: 7.06" Wide x 6.10" Deep x 2.44" High

Frequency Coverage: 25.0000-54.0000 MHz., 108.0000-174.,.0000 MHz., 400.0000-512.000. MHz., 806.0000-823.9950 MHz., 849.0125-868.9950 MHz., 894.0125-956.0000 MHz.

The Bearcat BCT8 scanner, licensed by NASCAR, is a superb preprogrammed 800 MHz trunked highway patrol system scanner. Featuring TrunkTracker III, PC Programming, 250 Channels with unique BearTracker warning system to alert you to activity on highway patrol link frequencies. Preprogrammed service searches makes finding interesting active frequencies even easier and include preprogrammed police, fire and emergency medical, news agency, weather, CB band, air band, railroad, marine band and department of transportation service searches. The BCT8 also has preprogrammed highway patrol alert frequencies by state to help you quickly find frequencies likely to be active when you are driving. The BCT8 includes AC adapter, DC power cable, cigarette lighter adapter plug, telescopic antenna, window mount antenna, owner's manual, one year limited Uniden warranty, frequency guide and free mobile mounting bracket. For maximum scanning enjoyment, also order the following optional accessories: External speaker **ESP20** with mounting bracket & 10 feet of cable with plug attached $19.95. Magnetic Mount mobile antenna **ANTMMBNC** for $29.95.

Bearcat® BCD396T Trunk Tracker IV

Suggested list price $799.95/**CEI price $519.95**

APCO 25 9,600 baud compact digital ready handheld TrunkTracker IV scanner featuring Fire Tone Out Paging, Close Call and Dynamically Allocated Channel Memory (up to 6,000 channels), SAME Weather Alert, CTCSS/DCS, Alpha Tagging. Size: 2.40" Wide x 1.22" Deep x 5.35" High

Frequency Coverage:
25.0000-512.0000 MHz., 764.0000-775.9875 MHz., 794.0000-823.9875 MHz., 849.0125-868.8765 MHz., 894.0125-956.000 MHz., 1240.0000 MHz.-1300.0000 MHz.

The handheld BCD396T scanner was designed for National Security/Emergency Preparedness (NS/EP) and homeland security use with new features such as **Fire Tone Out Decoder**. This feature lets you set the BCD396T to alert if your selected two-tone sequential paging tones are received. Ideal for on-call firefighters, emergency response staff and for activating individual scanners used for incident management and population attack warning. **Close Call Radio Frequency Capture** – Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. Useful for intelligence agencies for use at events where you don't have advance notice or knowledge of the radio communications systems and assets you need to intercept. The BCD396T scanner is designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS, LTR and EDACS® analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. **Dynamically Allocated Channel Memory** - The BCD396T scanner's memory is organized so that it more closely matches how radio systems actually work. Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 3,000 channels are typical but **over 6,000 channels are possible** depending on the scanner features used. You can also easily determine how much memory you have used and how much memory you have left. **Preprogrammed Systems** - The BCD396T is preprogrammed with over 400 channels covering police, fire and ambulance operations in the 25 most populated counties in the United States, plus the most popular digital systems. **3 AA NiMH or Alkaline battery operation and Charger** – 3 AA battery operation - The BCD396T includes 3 premium 2,300 mAH Nickel Metal Hydride AA batteries to give you the most economical power option available. You may also operate the BCD396D using 3 AA alkaline batteries. Unique Data Skip - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. Memory Backup - If the battery completely discharges or if power is disconnected, the frequencies programmed in the BCD396T scanner are retained in memory. Manual Channel Access - Go directly to any channel. LCD Back Light - A blue LCD light remains on when the back light key is pressed. Autolight - Automatically turns the blue LCD backlight on when your scanner stops on a transmission. Battery Save - In manual mode, the BCD396T automatically reduces its power requirements to extend the battery's charge. Attenuator - Reduces the signal strength to help prevent signal overload. The BCD396T also works as a conventional scanner to continuously monitor many radio conversations even though the message is switching frequencies. The BCD396T comes with AC adapter, 3 AA nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, SMA/BNC adapter, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO or ESAS systems. Order on-line at www.usascan.com or call 1-800-USA-SCAN.

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Bearcat 796DGV 1,000 channel Trunktracker III base/mobile	$519.95
Bearcat BCD396T APCO 25 Digital scanner with Fire Tone Out	$519.95
Bearcat 246T up to 2,500 ch. Trunktracker III handheld scanner	$214.95
Bearcat Sportcat 230 alpha display handheld sports scanner	$184.95
Bearcat 278CLT 100 channel AM/FM/SAME WX alert scanner	$129.95
Bearcat 248CLT 50 channel base AM/FM/weather alert scanner	$104.95
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Bearcat BR330T up to 2,500 ch. Trunktracker III with Tone out	$274.95
Bearcat BCT8 250 channel information mobile scanner	$169.95
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AOR AR16BQ Wide Band scanner with quick charger	$199.95
AOR AR3000AB Wide Band base/mobile receiver	$1,079.95
AOR AR5000A+3B Wide Band 10 KHz to 3 GHz receiver	$2,599.95
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AOR AR8600 Mark II Wide Band receiver	$899.95
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Scancat Gold For Windows Software	$99.95
Scancat Gold for Windows Surveillance Edition	$159.95

Bearcat® BC246T Trunk Tracker III

Suggested list price $399.95/**CEI price $214.95**

Compact professional handheld TrunkTracker III scanner featuring Close Call and Dynamically Allocated Channel Memory (up to 2,500 channels), SAME Weather Alert, CTCSS/DCS, Alpha Tagging. Size: 2.72" Wide x 1.26" Deep x 4.6" High

Frequency Coverage:
25.0000-54.0000 MHz., 108.0000-174.0000 MHz., 216.0000-224.9800 MHz., 400.0000-512.0000 MHz., 806.0000-823.9875 MHz., 849.0125-868.9875 MHz., 894.0125-956.000 MHz., 1240.0000 MHz.-1300.0000 MHz.

The handheld BC246T TrunkTracker scanner has so many features, we recommend you visit our web site at www.usascan.com and download the free owner's manual. Popular features include **Close Call Radio Frequency Capture** – Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. **Dynamically Allocated Channel Memory** - Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 1,600 channels are typical but **over 2,500 channels are possible** depending on the scanner features used. You can also easily determine how much memory is used. **Preprogrammed Service Search (10)** - Makes it easy to find interesting frequencies used by public safety, news media TV broadcast audio, Amateur (ham) radio, CB radio, Family Radio Service, special low power, railroad, aircraft, marine, racing and weather frequencies. **Quick Keys** - allow you to select systems and groups by pressing a single key. **Text Tagging** - Name each system, group, channel, talk group ID, custom search range, and S.A.M.E. group using 16 characters per name. **Memory Backup** - When power is lost or disconnected, your BC246T retains the frequencies that were programmed in memory. **Unique Data Skip** - Allows the BC246T to skip over unwanted data transmissions and birdies. **Attenuator** - You can set the BC246T attenuator to reduce the input strength of strong signals by about 18 dB. **Duplicate Frequency Alert** - Alerts you if you try to enter a duplicate name or frequency already stored in the scanner. **22 Bands** - with aircraft and 800 MHz. The BC246T comes with AC adapter, 2 AA 1,800 mAH nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. For more fun, order our optional deluxe racing headset part **#HF24RS** for $29.95. Order now at www.usascan.com or call 1-800-USA-SCAN.

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All About Antennas Part 2

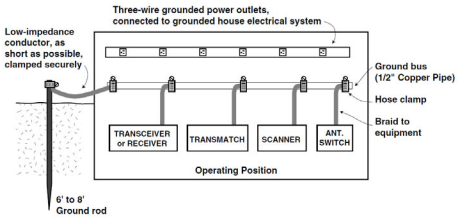
By Bob Grove W8JHD

Last month we examined some of the characteristics (peculiarities?) of radio waves and the importance of proper placement of an antenna. This month we'll take a close look at the antenna itself.

What is a *Ground*?

The earth plays an important role in radio signal propagation, but *grounding* your radio equipment is not one of them. While attaching the chassis of your radio to a buried conductor in moist soil may protect you from electrical shock; drain off static-charge buildup; help dissipate nearby lightning-induced spikes, and even reduce electrical noise pickup, it will not make received or transmitted signals stronger.

Radio waves travel through space, not through the ground except at very close ranges or at extremely low frequencies. They are intercepted by the antenna's metal element(s), not by the soil beneath it which absorbs and dissipates the signal as heat.



A good ground system utilizes short, large-gauge wire to connect radio equipment commonly to at least one deep ground rod.

A good electrical ground consists minimally of two eight-foot metal rods, at least ten feet apart, connected to the radio equipment by a short length of heavy braid. Moist, mineralized soil is best; dry, sandy soil is worst.

A radio-frequency (RF) ground, on the other hand, is more extensive. A vertical antenna may be thought of as a center-fed dipole turned on its end, and the lower half removed so that we can mount the remaining element on the ground where the coax will be attached. But we must somehow supply that missing half of the antenna.

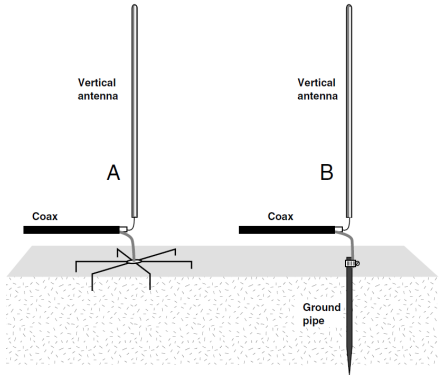
If we simply bury the needed wire in the ground, the energy that would radiate from that element is absorbed by the mineralized soil, simply heating it. Such an antenna is sometimes referred to as a "worm warmer!"

Instead, we construct a *counterpoise* on or above the soil, a metallic surface emulating a "perfect" (reflective) earth, composed of radial wires connected to, and extending outward from the coax shield at the base of the antennas.

How many spokes of wire, and how long? AM broadcast stations use at least 120 radials for transmitting purposes; you should use at least 16 1/8-wavelength wires to avoid power losses from soil absorption.

Because current is at its maximum at the feed point, density of metal around the base of the antenna is more important than the length of the radials. If you have 100 feet of wire, ten 10-foot lengths are better than two 50-foot lengths. This is not so critical on receive-only antennas.

Even a single quarter-wavelength wire provides counterpoise effect; it may be run randomly

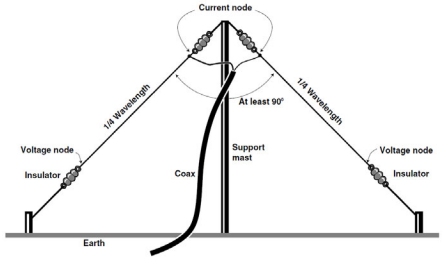


A good radial counterpoise (A) is always preferable to using lossy Earth (B) in a vertical antenna system.

or even coiled loosely in some cases. Such a wire is often connected to the chassis of the transmitter if it is *hot* during transmitting as evidenced by painful RF burns when touching the equipment, especially your lip to the mike!

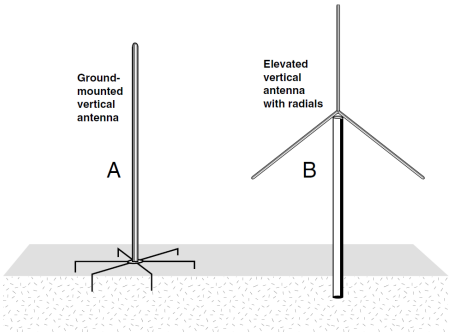
The inverted V antenna is a good example of how to keep the high-current feed point away from absorptive and reflective earth by elevating it to the apex of the antenna. The ends of the drooping elements (high-voltage points) come to within a few feet of the ground where their capacitive interaction with the soil may cause some length detuning of the antenna, but little signal loss.

Don't confuse a ground-mounted, counterpoised vertical with an elevated ground-plane



The inverted V is a popular dipole configuration.

antenna. On the ground we are trying to prevent radiation from being absorbed by the soil; an



The radial counterpoise on a ground mounted vertical (A) prevents soil absorption of the radio waves; the radials of an elevated vertical (B) are part of the antenna itself and help shape the pattern.

elevated ground-plane antenna, however, behaves more like a dipole in free space, with the radials supplying half of the antenna and forming the pattern.

Construction and Size

Two neighboring shortwave listeners decide to erect antennas to monitor 41-meter (7.1-7.3 MHz) international broadcasting. One neighbor, using rocks as counterweights, throws about 50 feet of small-gauge hookup wire over a couple of tree limbs; it sags in a number of places, has no insulators other than its plastic covering, and averages some 30 feet in the air. At the center cut of the wire he has soldered a 50-foot length of TV coax which he runs down to his receiver.

His neighbor, a purist, erects two 30 foot telephone poles 60 feet apart, stretching 66 feet of heavy gauge, silver plated, uninsulated wire between porcelain insulators. The antenna is in an open yard with no trees. At the center he carefully attaches a commercial coax connector, from which he runs a 50-foot length of large-diameter, low-loss, RG-8/U coax.

Does the purist hear signals any better? Nope. Assuming identical environment and antenna orientation, reception will be virtually the same. The difference in signal strengths between 50 and 66 feet is imperceptible. The plastic-coated wire insulates it from the moist tree limbs, but even if it touched, the resistance of the trees would not contribute significant signal loss. Signal absorption by foliage at 7 MHz is minimal; the resistance of the thinner wire is less than one ohm; and the difference between 50 feet of RG-58/U and RG-8/U at 7 MHz is a mere fraction of a dB.

For receiving purposes, an antenna may be thick or thin; its texture may be solid, stranded or tubular; its composition may be any metal (gold, steel, copper, lead or aluminum); it may be covered with insulation or left bare. All signals will sound virtually the same.

Even if signal strengths were reduced considerably, they would still be just as audible, because at shortwave frequencies, once there is enough signal to be heard above the atmospheric noise (static), a larger antenna will only capture more signal *and* noise. The S-meter may read higher, but you would hear the same signal above the noise audio with the "deficient" antenna by simply turning up the volume control.

So why bother with good construction practices? Heavy gauge, stranded wire will withstand

ice, wind loading, and flexing better than thin solid wire, and it will radiate transmitted power more efficiently. Commercially made center insulators with built-in connectors are more rigid and water resistant than soldered connections and they can be easily disconnected for servicing or inspection. Sturdy, insulated suspension is more durable over time, and keeping antennas away from tree foliage may avoid some signal loss at higher frequencies.

Skin Effect

A thin, hollow, metal tube is just as efficient in conducting and radiating radio-frequency energy as a solid wire of the same diameter and material. This is because RF energy barely dips below the surface of the conductor, and the higher the frequency, the shallower the depth. The larger the surface, the less resistance, which would waste power as heat. Skin depth varies inversely with the square root of the conductivity and the permeability (magnetic attraction) of the metal; the better the conductor, the deeper the skin effect. At microwave frequencies (10 GHz), the skin depth of silver, an excellent conductor, is 0.64 micrometers (µm), while that of aluminum, a poorer conductor, is 0.80 µm.

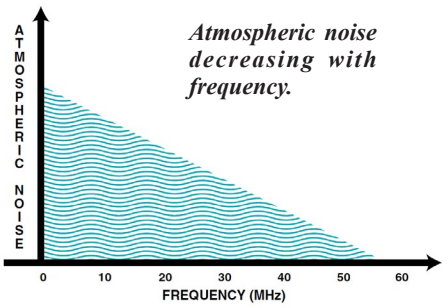
Iron is a very poor conductor and has high permeability; its skin depth is only 1/7 that of copper, making it a poor choice as a conductor at radio frequencies.

Antenna Size

The energy-intercepting area of an antenna is called its *aperture* (another similarity to light as in the aperture of a camera lens) or *capture area*; the larger its aperture, the more signal it captures. Curiously, a large antenna is not necessarily better at transmitting (or receiving) than a smaller antenna. If a small element can be designed to be just as efficient as a large antenna, and radiates the same pattern, there is no benefit in using a larger antenna unless it can be configured to offer *gain*, which comes from shaping the directionality of the antenna. Similarly, all antennas of the same size (wire dipoles, folded dipoles, fans, trap antennas, cages, or any other) radiate the same amount of power. Their relative advantages come from pattern directivity.

The U.S. Coast Guard found several decades ago that a five-foot antenna was adequate for HF reception 100% of the time. Remember, the purpose of an antenna is to detect enough signal to overcome the receiver's own internally-generated noise; once that is accomplished, more signal only means more atmospheric noise with its attendant interference from strong-signal overload.

Below approximately 50 MHz, atmospheric noise (static) becomes increasingly worse the lower we tune. This background hiss is a composite of thousands of lightning strikes occurring simultaneously, around the world. Once we detect enough signal to overcome



Atmospheric noise decreasing with frequency.

the receiver's own self-generated circuit noise, a larger aperture will only increase the atmospheric noise right along with the signal. If the noise is locally generated (power lines or an electrically-noisy neighbor, for example) a beam or loop antenna can be rotated away from the source of the noise to null the interference, hopefully toward the direction of the signal as well.

As we tune upwards from 50 MHz, atmospheric noise diminishes; therefore, larger and better-matched antenna systems do improve reception because they help overcome receiver noise, which can be higher than atmospheric noise at VHF and UHF frequencies. Ultimately, once the aperture is great enough to overcome receiver noise at these higher frequencies, larger aperture will only pick up more noise (just as at the lower frequencies) so directivity should be the goal for better reception.

Antenna Gain

Signal improvement may come from a larger aperture, or from intentionally distorting (shaping) the field to produce a narrower pattern. While larger aperture increases background noise as well as signal strengths, directivity favors one or more directions at the expense of others. This reduces overall pickup (better signal-to-noise-ratio), concentrating on a target direction for receiving and/or transmitting, and reducing reception interference from the sides and back.

Such pattern re-direction often refers to *front-to-back ratio* and *side-lobe rejection*, describing how improvement in one direction is accompanied by the desirable loss in other directions. The pattern can be shaped by adding parasitic elements, which are unconnected but secured to the boom, called reflectors and directors (see Yagi below). Feed point mismatch does not affect an antenna's gain or pattern.

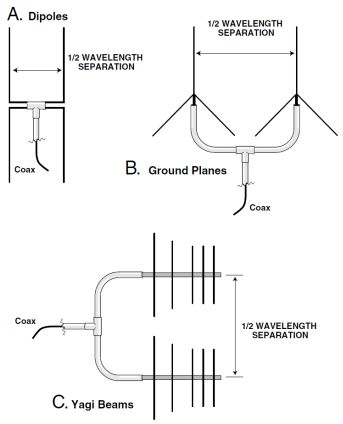
Adding a second identical antenna separated by ½ wavelength and connected in phase, known as *stacking* will increase transmitted and received signal strengths by 3 dB, regardless of the original gain. Thus, two 1-dB-gain antennas will provide 4 dB total gain, and two 20-dB-gain interconnected antennas will provide 23 dB total gain.

Antenna performance is usually compared to a half-wave dipole reference. Some manufacturers compare the gain of their antennas to an "isotropic" radiator which is a theoretical (and nonexistent) antenna that has a spherical radiation pattern. This gives manufacturers a 2.1 dB higher gain claim than if they compared it to a real antenna: a half-wave dipole. Unless the claimed gain figure is followed by dBd or dBi, referencing a dipole or isotropic radiator in free space, it is meaningless and suspect.

Assuming we run the transmission line away at right angles from the antenna for at least a quarter wavelength, the location of the feed point causes very little distortion of the pattern, but the impedance selection varies dramatically.

Is a good transmitting antenna always a good receiving antenna? Yes, if its aperture is large enough to capture enough signal to overcome receiver noise. The law of reciprocity states that if an antenna system efficiently radiates a signal into space, it will just as efficiently deliver an intercepted signal to a receiver.

Is a good receiving antenna a good transmitting antenna? Not necessarily. If randomly erected, it may be susceptible to power loss due to impedance mismatch. Its pattern will be unpredictable and reactance may shut down a transmitter with built-in protection against mismatches.

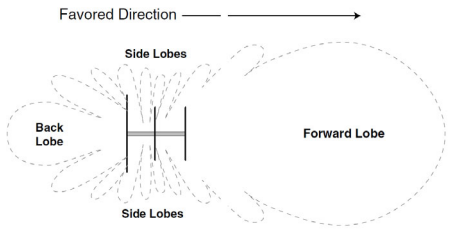


Stacking any two identical antennas, regardless of their individual gain, will increase the total gain by 3dB.

Arrays

Depending upon its thickness, taper and length, a mass of metal, brought within one-quarter-wavelength of a *radiator* (the driven element, connected to the feed line), will interact with the field, *focusing* (there's that light analogy again!) the energy to produce directivity or *gain*.

Probably the best known of these combinations is the *Yagi-Uda* array, named for the two Japanese scientists who developed the antenna in 1928. While Uda actually did all the developmental work, Yagi published the results, so the antenna, as fate would have it, usually bears his name alone.



The Yagi is a popular beam antenna with forward gain.

Curiously, the Japanese did not use the Yagi in World War II.

The modern Yagi consists of a half-wavelength driven element, a single rear reflector about 5% longer, and one or more forward directors about 5% shorter. The elements are usually spaced 0.15-0.2 wavelengths apart.

Depending upon the number of directors, a Yagi may have six to twenty decibels (6 - 20 dBd) gain over a half-wave dipole in free space.

There are many computer programs available in handbooks and on the Web for designing Yagi as well as other effective antennas.

Next Month :

What do we mean by "matching" an antenna? What is "impedance?" Is it possible to remotely "tune" an antenna for best performance? Stay tuned for the next thrilling installment!

Build Your Own 10 Meter Beacon Station

By Bob Patterson K5DZE

Have you ever tuned across the 10 meter band only to hear absolutely nothing? It's likely that you quickly decided 10 meters was not 'open' so you changed bands to continue listening elsewhere. Sound familiar? Well, actually there were dozens of stations transmitting on 10 meters when you listened, and they are on the air right now. These are the amateur radio beacon stations that operate in a specified sub-band of 10 meters commonly referred to as the *beacon band*.

Quite a few years ago, I was tuning across the 10 meter band when I copied a weak CW (Morse code) station, which at the time was very puzzling. This station was sending an amateur radio call sign with a "/B" added to the call, followed by a short message asking the listener to please confirm receipt of this transmission. Then the signal stopped for several seconds before repeating the CW string.

This seemed to be rather an odd signal, but after a little research I found that what I had heard was one of the many unattended 10 meter amateur beacons that run 24 hours a day, seven days a week. Soon, I was copying a number of such beacons scattered around the country as well as overseas.

Now I knew what I was hearing, but why were these stations operating in the first place? If you think about it, it's pretty simple. When checking the 10 meter band for activity, an amateur operator or shortwave listener (SWL) can tune across the frequencies, but if no one is transmitting, the band will sound dead. Amateur operators can call CQ over and over in hopes that, if the band is open, someone will hear and answer them, but this can often be a waste of time.

Fortunately, through the use of 10 meter propagation beacons, listeners hearing a beacon signal coming in from a specific area, know there is a good chance that they can communicate with amateur stations in that area.

The Beacon Sub-Band

Many hams are unaware that they may set up and operate an unattended, low-power beacon on certain frequencies with the blessings of the FCC. Note that unattended does not mean uncontrolled; you are still responsible for the signals that you transmit under your call sign. Full rules regarding beacon operation are found in the ARRL FCC Rules Book under §97.203. You should note, too, that many other countries also allow their amateurs to operate beacons on certain frequencies.

The main operating position at K5DZE shows the 10 meter beacon under the desk in the lower center of the picture. It is well out of the way, but easy to access. (Courtesy: Author)

Sounds great, but where is this "Beacon Sub-Band"? The U.S. 10 meter beacon band includes frequencies between 28.200 and 28.300 MHz. The current beacon list shows some Canadian stations down to 28.170 MHz and other non-U.S. amateur radio beacons down to 28.150 with at least one South American station operating as low as 28.1154 MHz.

After listening to a number of beacons across the 10 meter band for quite a while, I decided I wanted to set up a beacon at my location as part of my amateur operations. There was no beacon in my area at the time, so providing a beacon for my fellow amateurs to check band conditions seemed like a way to contribute something to the hobby. At the same time, I could experiment with various antenna configurations, which is something I really enjoy. This article will tell you how I did it and how you can join in the fun as you provide a service.

Planning a Beacon Station

Operating a 10 meter Beacon for either part-time or 24/7 operation takes a little planning if you want to set up a reliable and useful installation. Here are some considerations to think about:

You must have to have at least a Technician Class amateur license to operate a 10 meter propagation beacon. The penalties are severe if you put a transmitter on the air without a license.

Most beacons run 24/7, because nighttime at your location is daylight somewhere else. Beacons have shown 10 meter band openings as late as 1:00 in the morning.

Planning for a 24/7 operation means you need a power supply for the transmitter and a keyer that will run cool for sustained operation. It should be separate from other equipment in the shack. Your transmitter should also run cool during this extended operation. Few beacons run more than 10 watts and many run a watt or less. Remember, heat is the enemy of beacon installations. A small, whisper-quiet fan can be used to blow over the transmitter cooling fins or the circuit board to insure a cool operation.

Verticals, ground planes, dipoles, and loop antennas work well for omni-directional coverage and are the most widely used antennas for beacons. Yagis and other directional antennas work very well in one direction, but shut most listeners out who are not in the path of the antenna beam, so consider your needs and plan your coverage. Experimenting with an antenna design for a 15, 30, or 45 day period, with other amateurs, SWLs, and fellow beacon operators checking propagation and antenna effectiveness can be an

interesting and enjoyable study.

Consider setting up a separate, dedicated 10 meter antenna for your beacon so you won't have to shut down your beacon to access the antenna when you want to operate SSB, PSK31 or on another band. Tune the antenna for peak performance on your beacon frequency.

Transmitters used as beacons can be homebrewed, purchased in kit form, made from converted CB rigs, or purchased outright. Power outputs range from a fraction of a watt to 100 watts (the authorized upper limit).

A programmable keyer is a central part of your beacon. This is a device that keys the transmitter with your repetitive beacon message. A number of very small computer programmable keyers are available to do the job, and most are relatively inexpensive. A couple of excellent examples include the N0XAS ID-O-MATIC kit at $25 and the PICOKEYER PLUS kit at $18, both from **www.hamgadgets.com**. A number of CW memory keyers with message capability are also usable and may be found on the used equipment market.

The Beacon ID

Beacon messages are sent using CW. Even if you do not copy CW very well or maybe not at all, just remember that these beacon signals are of short duration, automatically generated, and continually repeated. If you are setting up a beacon, computer programmable keyers are programmed from the computer keyboard, so you don't have to know CW at all, let alone send it with a key or keyer.

Most beacons use moderate CW speeds (10-15 WPM) and you can copy the message over and over till you get all the information correctly. Very slow CW is not really practical since QSB (fading) can cause you to repeatedly miss part of the signal again and again, while a moderate to fast speed lets you copy all the signal information quickly when the QSB is on the upswing.

Beacons identify themselves by the amateur's call sign, with most adding a "/B" to the call to identify it as a beacon. Many also identify their location by a grid square designator such as EM78 or EM78qs, so you can pinpoint the transmitter site. Some stations start with a string of "V's" that will help you tune the signal and know when the message has restarted. The next part of the ID can include the state or province, power output, antenna type, and other information as well.

The 10 meter Beacon stowed under my primary operating desk. The keyer is in the black box to the left. The small power supply on the lower shelf powers the HTX-100. The large power supply on the top shelf powers the main equipment in the station. (Courtesy: Author)

There is no accepted format for a beacon message, although it has been discussed. Sending a call sign, location, and grid locator seems to be a very practical format, since it is a short message that provides all needed information. A typical string might look like this: VVV DE K5DZE/B K5DZE/B K5DZE/B EM78QS EM78QS KY KY QSA? (QSA is one of the international "Q" code for CW operations that means "What is the strength of my signal?")

This message tells you the call sign, which you can look up on QRZ.com, a grid locator which will pinpoint the transmitter site, and the state for a quick reference with no look-ups. QSA tells the listener that the beacon operator is interested in knowing how the signals sound, so feel free to contact the beacon operator. The ID string is followed by a 3 to 5 second silence before repeating the message.

It is interesting to note that a number of amateurs who regularly listen for beacons have commented that they won't spend 2-3 minutes trying to copy a beacon that sends call sign, antenna, power, other station information, etc. This makes the argument that a longer (or slower) format can defeat the purpose of the beacon and cause listeners to move on.

But, before you set up a beacon antenna and fire up a transmitter, you need to do some home work to learn as much as you can about beacons and their operations. Some of the best ways to do this is to spend a number of days or weeks listening on the beacon band at various times during the day. As summer approaches, conditions will improve. Morning and evening hours can be particularly good times to listen. This in itself demonstrates the importance of propagation beacons that announce improved conditions as the 10 meter band begins to return to its former glory!

Another way to help you get up to speed is to check out some of the links noted at the end of this article and then check out links that these sites offer. See what others have done to put their beacons on the air.

Coordinating Your Beacon

As with other amateur radio projects, the operator is free to operate on any frequency he or she may wish to use as long as it is within the regulations prescribed by the governing agency. But, it's considered good practice to coordinate your beacon frequency so that interference with other beacons is avoided.

The IARU Region 2 HF beacon coordinator is Bill Hays WJ5O. He is an experienced and dedicated 10 meter operator who has run a propagation beacon for many years. When you are ready to assemble your beacon station, contact Bill. He will provide a recommended frequency for you. As Bill would tell you, he doesn't 'own' or 'issue' frequencies, but he does try to coordinate and recommend a frequency to let you get the most out of your efforts.

Once you have a frequency, you can cut antennas and tune your beacon for the best performance. As long as you remain in the same location, your frequency should remain the same.

A homebrew 1/2 watt beacon transmitter made from a 27 MHz pocket pager. After changing the crystals, retuning the pager, and repackaging the unit, K5DDJ made a really nice unit. It has been on the air 24/7 since 2006. (Courtesy K5DDJ.com)

Be sure and contact WJ5O if you have to relocate so the coordination process can be reviewed.

The K5DZE Beacon Station

When I put my beacon on the air, I decided to mix and match my equipment so that it was effective, inexpensive, easy to set up, and dependable. I have used this equipment in two states for about 5 years and it has worked steadily and well.

BEACON TRANSMITTER:

I use a Radio Shack HTX-100 transceiver. This 1990s era 10 meter SSB/CW transceiver features a switchable 5 or 25 watt transmitter, digital tuning, CW key input, a 12 volt dc power requirement, and a host of other things that makes it a great 5 watt beacon transmitter. For the price, a used HTX-100 is hard to beat!

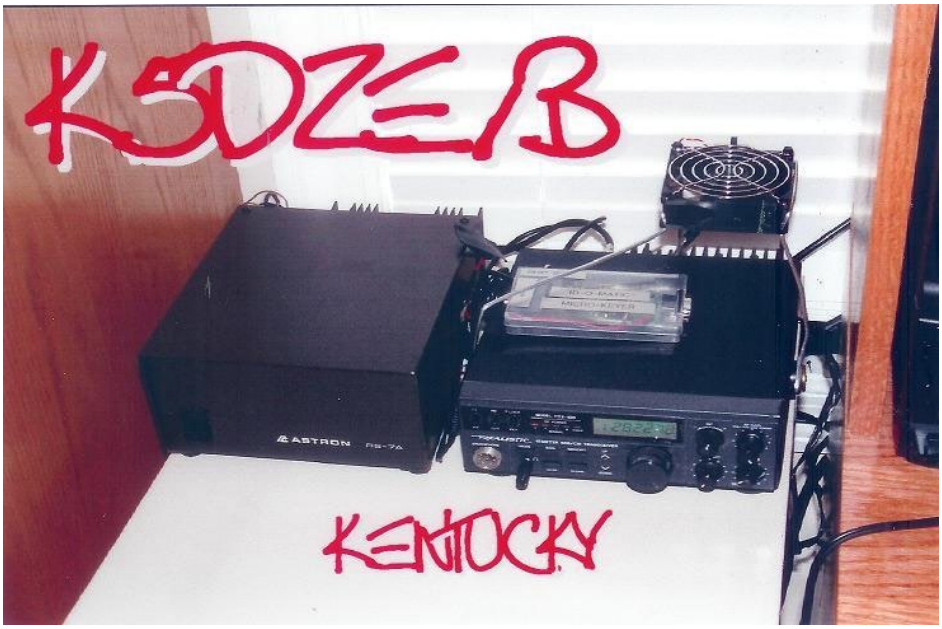
I power my HTX-100 beacon with a spare 7 amp Astron power supply and installed a small fan right over the transmitter's rear panel cooling fins. And, at 5 watts, the rig runs almost cold!

I purchased a second, very nice HTX-100 in good condition in July 2009 for $60 on QTH.com Ham Swap to use as a mobile rig. I bought my beacon HTX-100 on eBay some years before for $75 and it still works fine. But, a note of caution: Shop carefully! I suggest you look for a unit from another ham. Buying a rig, any rig, with no return and no guarantee it will even work, is a recipe for disaster.

BEACON KEYER:

The ID-O-MATIC (Model 1) kit by N0XAS was my choice for a keyer. The circuit board is very small, parts are few, construction is easy and quick, and it offers a number of options you can easily add using parts from your junk box or a local Radio Shack store. The beacon message is easily programmable with your computer and can be changed as often as needed. The new Model II offers even more features.

I originally had the keyer installed in a plastic audio cassette tape box to make it a very small controller. When I changed my installation set-up, I found that, since I wanted my beacon and keyer placed out of the way under a desk on a small rack, I needed to have controls that were more visible and easy to access. This led me to put the keyer board in an oversized plastic project box and add a number of switches and buttons to meet my needs. Originally, I added small, attractive labels on the box, but found it hard to see them at a glance, so I replaced them with large black on white labels (see photo).



One of my own beacon QSL cards. The report form is on the back. This picture shows the previous arrangement with the ID-O-MATIC keyer in a cassette tape cartridge box on top of the HTX-100. Note the added cooling fan that helps the beacon transmitter run cool. (Courtesy: Author)

BEACON ANTENNA:

As mentioned, I have experimented with a number of antennas including a vertically firing 2 element wire Yagi; a Near-Vertical Incident Skywave 10 meter loop; a G5RV (102'); a ground plane for 10 meters; and a 31 foot S9V vertical (now in regular use). Antennas can be tested and changed at will, and I am looking forward to continuing these antenna tests when conditions improve with the Cycle 24 upswing.

BEACON LOG:

It's always a good idea to keep a log of what beacons you hear. You may decide later to see how many beacons you have copied or someone may ask if anyone has copied such and such a beacon, and a simple log sheet makes it easy to go back and check to see who, what, and when you copied someone.

To do this, you might also use a computer to keep a log, or use it to make up a log sheet designed for just the way you like it to appear. I like spaces for the beacon frequency to be noted first, followed by the call sign, signal report, time/date, receiver, antenna, notes/conditions and sometimes a check box for QSL sent/received. This is a bit different from a regular ham log, but it will help you find out if you have heard that station before by quickly referencing the frequency first (which is fixed) and then looking at the call sign.

Beacon Projects

There are many tests and experiments you can do with your beacon once it's operational. Remember, you can run your beacon 24 hours a day, 7 days a week unattended, so this gives you a lot of flexibility in what you test and how you conduct your operations.

For one thing, you can actually hear your own signal when you are away from home, which is a bit unusual for most amateurs. Using a 10 meter mobile rig in the family car can let you monitor your beacon in the local area and even listen for it while traveling cross country.

Another excellent way to conduct a study is to ask several other active beacon operators to assist you by listening for your signal as you change equipment, antennas, power levels, etc. Here are some examples:

Power: You may think that small, low-powered rigs would not provide much of a signal to spot an open band, but those who are familiar with 10 meters know that, when the band is really open, you can work all over the world on very little power with only a modest antenna. Most 10 meter beacons run no more than 5 watts, with many running 1-2 watts and some even a fraction of a watt! You will be surprised at how well you can copy these flea-power rigs when the band opens up. And, if it doesn't open, 50 watts won't make any difference.

Some beacons are set up to send a signal at various power levels in quick succession so the listener can hear the difference. N4ESS, N4ES, and WB4WOR are all synchronized to send beacon messages one after the other on 28.250 MHz, first at 20 watts, then at 2 watts, and then at 200 milliwatts, allowing the listener to compare signals from three different locations with each using three different power levels. It can make for interesting listening.

Antennas: For me, antenna experimentation provides some of the most fun to be had in amateur radio. This is really the case with a beacon installation since antennas can be tested 24/7 for weeks or even months followed by a new antenna that can be compared.

Again, this is where beacon operators can work together to help obtain actual on-the-air results from various locations. For instance, you can compare 10 meter loop antennas to ground planes; verticals to dipoles; a point to point vertically polarized Yagi to a horizontally polarized Yagi; dipoles or loops at heights of 30' or more to the same antenna only 6' high. The results can be really interesting!

SWL Contributions

In the world of 10 meter beacons, the Short Wave Listener (SWL) plays an important part. Most beacon operators I know like to get SWL reports, and most all of them will quickly reply to a received SWL QSL card. Speaking from personal experience, I can say that receiving an SWL QSL report about my beacon makes for a nice day!

SWLs and other amateurs can really assist a beacon operator by providing a well detailed report, including where and when a beacon was copied, band conditions, other signals heard, his/her receiving equipment, antennas, etc. SWL beacon reports are quite valuable to beacon operators, and many amateurs will respond with a custom beacon QSL card used just for beacon reports.

Today, QSL cards are often replaced by emails or eQSLs (electronic QSL cards). Most amateur operator email addresses can be obtained from QRZ.com by simply entering in the call sign of the station you want, but don't use the "/B" on the call sign to find a beacon operator; just use the basic amateur call sign. At QRZ.com you may also find more information about the beacon operator, including photos of the beacon or a web site where you can read more about the station.

If you don't want to send a paper QSL to report a beacon, try the eQSL route or just send a simple email. This, too, will be most appreciated.

Join the Fun!

The new solar cycle 24 is beginning to show signs of strengthening and now is a great time to begin to ID these propagation beacons. It is also a good time to pick up some 10 meter equipment for beacon use before the band fully returns and the equipment is scooped up by amateurs who will be operating on 10 meters. To begin, you need only to spend some time listening, and I hope you catch my beacon on 28.2415 MHz! And, you might find you get interested enough to set up your own beacon installation!

Beacon Reading

Several websites can help get you smart in a hurry about 10 meter beacons and beacon operations, so check these out as a first step:

www.monitoringtimes.com/MT-10meters.pdf (A great article on 10 meter Beacons by Ken Reitz KS4ZR, Features Editor of *MT*)

http://userpages.troycable.net/~wj5o/ (Web site of Bill Hays WJ5O, Bill Hays, the IARU Region 2 HF Beacon Coordinator)

www.k5dze.net/BEACON.htm (The author's web page with more beacon info, beacon regulations for U. S. amateurs and other related links.)

http://userpages.troycable.net/~wj5o/bcn.htm (The WJ5O current listing of all coordinated 10 meter Beacons by frequency. Basically, it's a call book of Beacons!)

http://10mbeacons.com/beaconkeepers.html (A list of some of the 10 meter Beacon web sites that you can explore for information on beacon sites.)

http://10mbeacons.com/beaconspot/spot90.php (A 10 meter beacon-spotter website that lists current and recent beacon receptions. A Grayline map, beacon list, chat room, and beacon website list are also available here.)

MT

If You're Old Enough to Read, You're Old Enough to Get Your License

By Mattie Clauson AE7MC (all photos courtesy the author)

When I was about five years old my Mama (AC7XM) and Papa (AC7SP) got their amateur radio licenses, and I became interested in it as well. Before them, my grandma, Joan Brady W6WXU, was a ham, and before her, my great-grandfather Sam Sullivan, who originally held the W6WXU call, was one too. He was also Head of Electronics - Shore Division for the U.S. Navy.

It was really cool to hear Mama and Papa talking to people on the air, and I wanted to do the same. When I showed an interest in amateur radio, they encouraged me to study. They bought a great book (which, sadly, is not being published anymore), called "Ride the Airwaves with Alpha and Zulu" by John Abbott K6YB which I started reading right away. It was a really fun book and I learned a lot from it. Pretty soon I was taking the Technician Class practice tests online at QRZ.com.

After a while I thought I was ready to take my Technician test for real. We went to one of the test sessions, and I tried it. I was so disappointed when I didn't pass, but Mama and Papa encouraged me to try again. After some more studying, I took the test again and this time I passed it. I was really excited when I found that I passed and later I received my first call sign, KD7SDF. It wasn't long before I was ready to take my Morse code test and passed it on my first try. Mama and Papa say that some of the other people who were taking their tests at the same time were surprised that I was taking my test as young as I was, but they were all supportive.

I studied hard for my General Class license, and passed that exam when I was six years old. But, I did not pass my General on my first try, or my second, and by that time I was not so sure that I would ever pass it! When it came time to take my test again, I was very nervous and kept telling myself, "I hope I pass! I hope I pass!" over and over again. On January 8, 2003, at the age of six, I passed it on my third try and was given the call sign KD7TYN. The next year, January 14, 2004, when I was seven, I passed my Extra Class test and received the call sign AD7BL on January 20. I applied for a vanity call sign and on February 27, 2004 I received my current call sign AE7MC.

January 14, 2004, I'm taking the Extra Class exam at Valley Radio Club (Eugene, Oregon), an ARRL affiliated club since 1932. Marv Wines W7AE (then W7KV), at the head of the classroom, is one of the session Volunteer Examiners.

I enjoy working with other hams in phone mode, and I have made some really cool contacts with people as far away as Rarotonga, Palau and Japan. I used to do packet radio a lot, and enjoyed talking to Kevin Forbes, VK3UKF, in Australia, but I have not worked packet radio for a while now.

I greatly enjoy working DX stations, and meeting people in foreign countries over the air. I have made many contacts that I have really enjoyed, including many with people in places such as Japan, Finland, Siberia, China, and Mexico.

I had always dreamed about someday being able to talk to one of the astronauts on the International Space Station (ISS), and I tried lots of times, but did not get an answer. In February 2005, when I was nine years old, I tried calling the space station during one of their passes, and my heart skipped a few beats when I heard Commander Bill McArthur KC5ACR saying my call sign over the radio. It was a very short contact, almost only an acknowledgment, but still I was super-excited that I was able to talk to one of the astronauts on the ISS!

Later, on another one of the ISS's passes, I tried again. That time my call was answered as well! I was so excited that I almost fell out of my chair! That time the pass lasted long enough that I was able to have a good conversation with him. I was excited! I was able to talk to him one more time, and, as I called, he answered back saying, "Is that you Mattie?" I was so excited that I forgot what I had planned to say!

Being an amateur radio operator probably has helped me in some aspects of my schooling, such as geography and social studies. I am homeschooled along with my three sisters and one brother. My sister and one of my cousins both have shown some interest in ham radio. My sister is a ham, too; at the age of eight she passed the Technician Class test and earned her very first license and the call sign KE7PWU. Our family shares our ham station, which includes an HF (High Frequency) radio and a VHF (Very High Frequency) radio. As of right now I don't know what I want to be when I grow up, but maybe a botanist and a sailor.

Here I am with my eight year-old sister Caitlin KE7PWU and astronaut Bonnie Dunbar KD5DCB.

Our family really likes sailing. We have a 38 foot cutter rigged sailboat that we like to take out into the Pacific Ocean off the coast of Oregon. I really like being out on the ocean when the sun is shining like diamonds on the blue water and land is completely out of sight. It's a really cool feeling to be out on the ocean with all the whales and dolphins and things. But, then again, it does not feel quite the same when you're out on the ocean and the water is rough, especially when the waves look like they're going to crash over the bow at any moment! It is reassuring to know that it takes lots more than large swells to sink a boat like ours as we sail over each one. I would like it if we could sail down to Mexico someday. Besides sailing, I'm a certified Weather Spotter for the National Weather Service.

For anyone helping their kids to learn ham radio, give them lots of encouragement. There are lots of kid-friendly books and things that will help them to learn while making it fun at the same time. You could get a ham license, too! Recently they dropped the requirement where you have to have passed Morse code before you can get your General Class license, and I feel that will make it a lot easier for people who are interested in getting their license, especially young ones. I feel that if someone is old enough to read, they should be able to get their license.

I am sure that there are kids out there who would like to pursue an interest in amateur radio, but no one in their family has their license. If you would like to, you *can* get your license! Most likely there is an amateur radio club in your area. Look them up and they will be more than happy to help you! If I was able to get my license, I am positive that you can, too.

73's Mattie AE7MC

SCANNING REPORT

THE WORLD ABOVE 30MHZ

Dan Veeneman
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www.signalharbor.com

Buying Your First Scanner

With the number and variety of scanners on the market, it's not always easy to make a decision about what scanner to buy. It seems that there are so many features and options to choose from that narrowing the choices is difficult, especially if you're just getting started and trying to save some money.

❖ Lake Tapps, Washington

My name is Kelly and I would like to buy a portable type hand held scanner to monitor police, fire and emergency type action in my area. I live 40 minutes south of Seattle and 20 minutes east of Tacoma in Washington State. The area is called Lake Tapps.

What type would be best without wrapping up to much money, but still doing what I would like it to do? Should it be a digital type, or how basic should I go?

Could you suggest a Uniden or Radio Shack or other that is user friendly for a first time guy?

I would like to get one that will keep me from having to upgrade later because it is now out of date or does not have proper features.

I appreciate all of your help.

You've already answered the two most important questions when selecting a scanner – *what* and *where*. What do you want to monitor and where are you located?

Public safety is always a popular choice and is supported by nearly every scanner, so we'll take a look at the public safety agencies in your area to see what kinds of systems are in operation. The basic technical characteristics of those systems will determine the kind of scanner you'll need to use.

Lake Tapps is actually a 100-year-old reservoir located in north-central Pierce County. There are a number of small towns located around Lake Tapps, including Auburn, Bonney Lake, Buckley, Dieringer, Enumclaw, Prairie Ridge and Sumner. The county has more than 800,000 residents and covers about 1,800 square miles of varying terrain, including Mount Rainier. Tacoma is the county seat.

Pierce County operates the Law Enforcement Support Agency (LESA), which provides 9-1-1 service to the county and dispatches public safety personnel for 16 different agencies, including Bonney Lake, Edgewood, Gig Harbor, Lakewood, Puyallup, Tacoma, and Sumner police as well as the County Sheriff.

❖ Conventional Scanning

The Pierce County Sheriff's Department operates on a number of conventional (non-trunked) dedicated frequencies that can be monitored by nearly any scanner manufactured in the past thirty years, and many manually tuned radios. These VHF frequencies tend to provide better coverage than 800 MHz over longer distances, such as open and rural areas of the county. This means that, in general, more 800 MHz repeater sites are needed to provide the same level of coverage that a system operator could get from VHF sites, so you tend to find these in larger and more rural areas.

Frequency	Description
151.355	Pierce County Emergency Management
153.890	County Fire (Dispatch)
154.160	County Fire (Central Response)
154.265	Puyallup Fire
154.295	County Fire (Central Dispatch)
154.325	County Fire (South Response)
154.355	County Fire (West Response)
154.385	County Fire (East Response)
154.950	Sheriff (East Dispatch)
155.310	Sheriff (West Tactical)
155.370	Law Enforcement Radio Net (LERN) Interoperability
155.610	Sheriff (East Tactical)
155.640	Sheriff (West Dispatch)
156.090	Sheriff (Records)
156.240	County Fire (Central Response)

To monitor these frequencies, we need a scanner that meets just three basic criteria:

1. Must be a handheld (your stated requirement)
2. Must be able to tune to VHF frequencies
3. Must be able to monitor conventional analog voice activity

There are dozens of scanners that fit the bill, ranging from manually tuned police monitors and crystal-controlled radios from the 1970s all the way up to the latest digital models.

If you're just getting started, buying an older model with basic scanning functionality is a good way to get your feet wet without spending a lot of money. You'll want to get something with synthesized tuning, so the really old models that take plug-in crystals would be off the list of possibilities. I've found working, fully functional scanners built in the 1980s and 1990s for a few dollars at garage sales and thrift shops (and once for free at the top of a garbage bin on trash day!).

Web sites like Craig's List (**www.craigslist.org**), Free Cycle (**www.freecycle.org**), or other local classified advertisements might help you find a basic unit for very little money. These older scanners are generally very simple to program and will give you some experience in how to organize and enter frequencies. Many experienced listeners actually have several scanners, with their older models relegated to monitoring these types of conventional analog frequencies while using their newer units to track the latest digital systems.

❖ Trunked Scanning

If you want to monitor activity beyond the Pierce County Sheriff's Department, you'll need a more capable scanner. Many of the public safety agencies in the area use an interconnected Motorola Type II trunked radio system in the 800 MHz band. This system is operated by the county and transmits from three main locations, located around Tacoma, Puyallup, and McNeil Island. These three areas use the following frequencies:

Tacoma:
866.7875, 866.8125, 866.8375, 866.8625, 867.1625, 867.1875, 867.2125, 867.2375, 867.2625, 867.4625, 867.9500, 867.9875, 868.2500 and 868.3250 MHz.

Puyallup:
868.3500, 868.3750, 868.4000, 868.5000 and 868.5750 MHz.

McNeil Island:
866.7250, 867.3750, 867.4000, 867.9250, 868.6000 and 868.6250.

Activity on this system is reported as a mix of analog and APCO Project 25 digital signals, so to hear everything you will need a scanner that can handle both analog and digital voice traffic.

The county system is trunked, meaning that many different radio users from a variety of towns and agencies share the frequencies listed above. Conversations take place in "talkgroups" that are identified on a trunking scanner in either decimal (base 10) or hexadecimal (base 16) format. Talkgroups that have been monitored on the county system are listed below.

Decimal	Hex	Description
272	011	County Sheriff Small Town Police
336	015	Puyallup Police (Dispatch)
368	017	Puyallup Police (Tactical)
528	021	Puyallup Emergency Medical Services
592	025	Puyallup Public Works 1
624	027	Puyallup Public Works 2
656	029	Puyallup Public Works 3
688	02B	Puyallup Public Works 4
944	03B	Puyallup Police (Tactical)
1040	041	Lakewood Police (Dispatch)

1072	043	Lakewood Police (Records)
1104	045	Lakewood Police Tactical 3
45456	B19	Lakewood Police Tactical 1
45488	B1B	Lakewood Police Tactical 2
45520	B1D	Bonney Lake Police
45552	B1F	Bonney Lake Police
45585	B21	Bonney Lake Police
45712	B29	Bonney Lake Police (Dispatch)
45808	B2F	Tacoma Police (Tactical)
45840	B31	Tacoma Police (Tactical)
47824	BAD	Tacoma Police (Tactical)
52080	CB7	Tacoma Police Events (North)
52112	CB9	Tacoma Police Events (South)
52176	CBD	Tacoma Police North Primary/ Dispatch (Sectors 1 & 2)
52208	CBF	Tacoma Police (Records)
52240	CC1	Tacoma Police (North Tactical 1)
52272	CC3	Tacoma Police (North Tactical 2)
52304	CC5	Tacoma Police South Primary/ Dispatch (Sectors 3 & 4)
52368	CC9	Tacoma Police (SWAT)
52400	CCB	Tacoma Police (South Tactical 1)
52432	CCD	Tacoma Police (South Tactical 2)
52560	CD5	Law Enforcement Interoperability
52592	CD7	Law Enforcement Radio Network
52624	CD9	Law Enforcement Radio Network
53008	CF1	Tacoma Public Works
53040	CF3	Tacoma Public Works
53072	CF5	Tacoma Dome
53168	CFB	Tacoma Solid Waste Removal
53200	CFD	Tacoma Solid Waste Removal
53296	D03	Tacoma Water
53360	D07	Tacoma Solid Waste Removal
53424	D0B	Tacoma Solid Waste Removal
53520	D11	Tacoma Solid Waste Removal
53680	D1B	Tacoma Public Works (Maintenance)
53872	D27	University of Puget Sound Campus Security
54096	D35	American Medical Response Ambulance
54320	D43	Rural/Metro Ambulance (Dispatch)
54416	D49	Tacoma Fire (Training)
54512	D4F	Tacoma Police and Fire Interoperability
54544	D51	Tacoma Fire (Alternate)
54576	D53	Tacoma Fire (Tactical)
54608	D55	Tacoma Fire (Tactical)
54640	D57	Tacoma Fire (Tactical)
54672	D59	Tacoma Emergency Medical Services
54704	D5B	Tacoma Fire (Dispatch)
54736	D5D	Tacoma Fire (Events)
55120	D75	Tacoma Fire and Pierce County Fire Interoperability

Note that some of these talkgroups, in particular the law enforcement tactical channels, may be encrypted. No scanner on the market will be able to monitor these conversations. It is not unusual to be able to hear the dispatcher without any trouble but completely miss the minute-by-minute updates if the police are using an encrypted talkgroup.

❖ Selecting a Scanner

So, for most of the public safety activity in your area, here are the criteria for a scanner that will cover all the bases:

1. Must be a handheld (your stated requirement)
2. Must be able to tune to VHF frequencies
3. Must be able to monitor conventional analog voice activity
4. Must be able to tune to 800 MHz frequencies
5. Must be able to track Motorola Type II systems
6. Must be able to monitor trunked analog voice activity
7. Must be able to monitor trunked digital voice activity

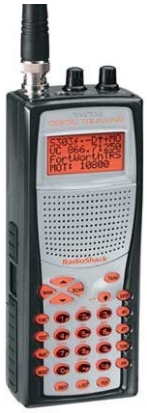
There are a number of scanners that meet all seven requirements, including these representative models:

Manufacturer	Model	Date of Introduction
Uniden	BC250D	November 2002
Radio Shack	PRO-96	September 2003
Uniden	BC296D	December 2004
Uniden	BCD396T	June 2005
GRE	PSR-500	October 2007
Radio Shack	PRO-106	October 2007

I have a more comprehensive list on my web site at **www.signalharbor.com/trunking.html** that will give you more details on these and other models.

I've organized this list according to the date of introduction, in case you're considering looking at used models (which I encourage) and want to judge how old it might be. Buying a used model will give you a chance to try out the digital features without committing to the full price of the latest model.

I'll focus on one model here, but the same can be said about other units as well. The PRO-96 is now almost ten years old, but it does everything you need it to do – it meets the seven criteria. A refurbished unit can be purchased on-line from a reputable source for less than $250, which is about half of the original retail price.



The PRO-96, like most modern scanners, can be programmed via computer as well as from the keypad. Not only can you store and organize your own frequencies, you can download scanner memory files from the Internet that have all of your local agencies already programmed. A popular program for the PRO-96 is called Win96, which allows you to read information from the PRO-96, manipulate it on your computer, and write it back to the scanner. As you might imagine, this is a big time saver and takes a lot of the tedium out of getting everything organized the way you'd like. Win96 is available for download at **www.starrsoft.com/software/win96/** and can be used free for 30 days before it requires registration.

Frequency files, along with a great deal of other information and assistance, can be found on web-based discussion groups dedicated to specific scanner models. Such a group for the PRO-96 can be found at **groups.yahoo.com/group/PRO-96** where more than 2,000 people are signed up to share files and provide assistance. Similar groups for other scanners can be found by going to **groups.yahoo.com** and entering the model number of your radio into the search field.

❖ Shelbyville, Indiana

Hi Dan,

Do you have or do you know where to get frequencies or ID numbers for Shelbyville, Indiana?

Thank you.

Shelbyville is a city of 18,000 located about 25 miles southeast of Indianapolis. It is the county seat of Shelby County, which itself is home to nearly 44,000 residents.

For many years the city and the county used conventional (non-trunked) analog frequencies for public safety operations. Their old frequency assignments looked like this:

Frequency	Description
151.040	Court Baliffs
151.100	County Sheriff/DOT
151.325	County Sheriff (Tactical)
154.160	County Fire (Dispatch)
154.205	County Fire Tactical (South)
154.220	County Fire Tactical (North)
154.785	Shelbyville Police
155.865	Shelbyville Street Department
158.730	County Sheriff (Dispatch)
158.850	County Jail
159.195	Shelbyville Fire

❖ Project Hoosier SAFE-T

The State of Indiana, through the Integrated Public Safety Commission (IPSC), operates a statewide public safety communications network called Project Hoosier SAFE-T (Safety Acting For Everyone – Together). The SAFE-T initiative started in 1997 with the goal of creating a statewide voice and data network for police, fire and emergency medical services at the state, county, and local level. After a series of planning sessions and studies, Indiana awarded an $82 million contract to Motorola in 1999 and by 2002 the counties of Allen, Fort Wayne and Johnson were operating on the new system. At the end of 2009, all 92 counties were signed up to use SAFE-T.

The original plan called for mobile coverage across 95% of the state from 126 repeater sites. There are now 149 sites tied into the system, having added in county towers and new repeater sites built with Federal grant money. System operating costs are offset, in part, by a $1.25 "Anti-Terrorism Fee" added to the cost of an Indiana driver's license.

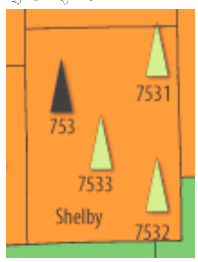
The entire system is currently undergoing rebanding due to frequency allocation changes ordered by the Federal Communications Commission (FCC). Indiana has a $21.6 million contract with Sprint/Nextel to cover the costs of retuning 52,000 portable and mobile radios as well as base station equipment. Seven radio shops around the state are performing this work and expect to be completed by the end of 2011.

SAFE-T supports both analog and APCO Project 25 (P25) digital radios, so to hear all of the activity you'll need a digital-capable scanner. Because the control channel uses the older, 3600-baud Motorola format, any digital scanner can successfully monitor the system.

❖ Shelby County, Indiana

For more than seven years, Shelby County had been expressing interest in joining SAFE-T but needed funding to purchase the necessary equipment. A series of grants, including $300,000 in 2007 and $260,000 in 2008 from the Federal government, eventually allowed the county to construct a local 800 MHz system using three repeater sites. By May of last year construction was complete and the three sites were integrated into SAFE-T, making Shelby County the last county in the metro Indianapolis area to join.

The county has four repeater sites, identified by number. The state tower is 753, while the three county towers are 7531, 7532 and 7533. Frequencies transmitted from these sites are 866.0625, 866.4375, 866.9375, 867.3125 and 868.9375 MHz. Talkgroups assigned to the county are listed below.



Decimal	Hex	Description
33856	844	County Operations 1
33872	845	County Operations 2
33888	846	County Operations 3
33904	847	County Operations 4
33920	848	County Operations 5
33936	849	County Operations 6
33952	84A	County Operations 7
33968	84B	County Operations 8
33984	84C	County Operations 9
34000	84D	County Operations 10
37296	91B	County Sheriff (Dispatch)
37312	91C	County Fire (Dispatch)
37328	91D	Shelbyville Police (Dispatch)
37344	91E	Shelbyville Fire and EMS (Dispatch)
37520	929	Countywide Interoperability
37536	92A	County Training 1
37552	92B	County Training 2
37568	92C	County Hospital
37584	92D	County Administration 2
37600	92E	County Administration 3
37616	92F	County Administration 4
37632	930	County Jail Operations
37648	931	County Sheriff (Investigations)
37664	932	County Emergency Management Agency

Because the system also carries activity for various state agencies, you may hear other traffic. For instance, Shelby County is in District 5 of the Indiana Department of Homeland Security, with the following talkgroup assignments.

Decimal	Hex	Description
1264	04F	Indiana DHS Emergency Operations Center
1280	050	Indiana DHS Operations 1
1296	051	Indiana DHS Operations 2
1312	052	Indiana DHS Fire Operations
1328	053	Indiana DHS Hazmat Operations
1344	054	Indiana DHS Newport Chemical Depot
1392	057	Indiana DHS Chemical Stockpile Preparedness
8064	1F8	Indiana DHS Dispatch
8080	1F9	Indiana DHS Car-to-Car
8096	1FA	Indiana DHS State Fire Marshal
39296	998	Indiana DHS Central Zone Operations
46368	B52	Indiana DHS North Zone Operations
53360	D07	Indiana DHS Southeast/Southwest Zone Operations

Shelby County lies within Indiana State Police Region 5, District 52.

Decimal	Hex	Description
4176	105	State Police District 52 (All Talk)
4192	106	State Police District 52 (Dispatch)
4208	107	State Police District 52 (Operations 1)
4224	108	State Police District 52 (Operations 2)
4240	109	State Police District 52 (Operations 3)

Shelby County is part of District 6 of the Indiana Department of Natural Resources.

Decimal	Hex	Description
912	039	Fire Operations
928	03A	Forestry Operations
1024	040	Fish and Wildlife
3584	0E0	General
7376	1CD	Indiana Conservation Officer (Dispatch)
7392	1CE	Indiana Conservation Officer (Headquarters)
7408	1CF	Indiana Conservation Officer (Operations 1)
7424	1D0	Indiana Conservation Officer (Operations 2)
8048	1F7	Law Enforcement District 6 Operations
8112	1FB	Law Enforcement (Investigations)
10544	293	Parks and Reservoirs (North)
14864	3A1	Law Enforcement (North Dispatch)
16336	3FD	Parks and Reservoirs (South)
20752	511	Law Enforcement (South Dispatch)

Shelby County is within the Greenfield District of the Indianapolis Department of Transportation.

Decimal	Hex	Description
1440	05A	Greenfield District (Districtwide)
1456	05B	Greenfield District (Materials)
1472	05C	Greenfield District (Traffic)
1488	05D	Greenfield District (Operations)
1504	05E	Greenfield District (Engineering)
1616	065	Greenfield Sub Operations
1632	066	Greenfield Sub Unit 1
1648	067	Greenfield Sub Unit 2
1664	068	Greenfield Sub Unit 3
1680	069	Greenfield Sub Unit 4
6416	191	Traffic Management Center, Indianapolis

❖ Dayton Hamvention

The annual Dayton Hamvention will take place on May 14, 15 and 16 in the city of Dayton in southwest Ohio. It is the largest amateur radio convention in the world, with technical forums and manufacturer exhibits open throughout the weekend. In addition, the outdoor flea market has more than 2,500 spaces, and as long as the weather is reasonable you can find bargains galore. You can get more information on the web at **www.hamvention.org**.

That's all for this month. More frequencies and scanner information is available on my web site at **www.signalharbor.com**. If I don't see you at the Dayton Hamvention you can always send me electronic mail at *danveeneman@monitoringtimes.com*. Until next month, happy scanning!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Q. *I'm new to shortwave listening, and I'm hearing a lot of electrical noise on my portable. The noise disappears when I shut off the circuit breaker to the house, but that's not very convenient! Would putting up and outdoor antenna connected to the radio by coaxial cable solve the problem? (Mike, email)*

A. It sure wouldn't hurt! If you unplug the radio from the power line and operate it from batteries, do you still hear the noise? If so, it's being picked up by the antenna rather than through the AC line. An outdoor antenna, fed to the radio by shielded coaxial cable, will definitely improve the situation. It will make signals stronger and will shield the incoming signals from the indoor noise sources.

Common sources of indoor electrical interference include fluorescent lights (switch them off to see if that's the problem), and control circuits in power supplies and appliances.

You can see an excellent source of of shortwave antennas, cables and lightning protectors at:
www.grove-ent.com/shortwavelongwaveantennas.html
www.grove-ent.com/coaxialcables.html

Q. *Why aren't there any HF walkie-talkies manufactured for the shortwave amateur bands? (Eric Hopkins, Ayer, MA)*

A. Low power at HF can be daunting. High-power stations would cause considerable interference (QRM); resonant antennas would be of enormous length and tuned, short antennas would have very restricted bandwidth; electrical and atmospheric noise is higher there than at VHF/UHF; and wide-reaching repeaters are in place everywhere for the myriad VHF/UHF hand-helds.

However, there actually is a 40 meter, AM mode, hand-held rig available from our own computer whiz, Brain Wood W0DZ, and he's even planning an 80 meter companion! Take a look at Brian's website:
http://www.dzkit.com/new_products.htm#ht7

But don't expect to work any long-haul DX!

Q. *Is the Uniden BCT-8 a good scanner, and can I use just a piece of wire for an antenna? (Shane Lacaze, Splendora, TX)*

A. Yes, it's a good scanner. The evolution of Uniden and GRE scanners has reached a performance plateau where the real differences are not in how well they receive a signal, but in the functions available. The major price drivers now are such features as trunk tracking, APCO P-25 digital decoding, wide frequency coverage, memory capacity, and alphanumeric displays.

And yes, a simple piece of wire can be an effective antenna, especially if it is the appropriate length for the favored frequency band. Nearly any antenna a foot or so in length will provide reception of the stronger, local VHF/UHF signals. But a well-designed antenna usually includes a "counterpoise" – an additional length of wire attached to the shield of your coax – or a reflective metal surface like a car body perpendicular to the vertical wire.

Q. *Just what is geothermal energy and how is it used? (Eric Hopkins, Ayer, MA)*

A. The deeper you dig in the earth, the warmer it gets. Most of the geothermal energy is used for heat pumps, providing space heating to homes, businesses and factories. Some of the hot gases and water are used to convert the heat into electric power by driving generators.

At present, the majority of geothermal pumps are located on the edges of tectonic plates (cracks in the earth's crust) where there are volcanoes, geysers and hot springs because hot liquids and gases are more readily reachable (closer to the earth's surface). There are, however, newer technologies that permit efficient energy production at lower temperatures, allowing wider geographical distribution of these systems.

Q. *Does the law of diminishing returns apply to antenna height? Are there conditions for which increased height won't increase reception? (Jack Bessler, Lafayette, IN)*

A. The answer is a qualified "yes," depending on the frequency and the coax.

At lower frequencies like HF (under 30 MHz – the lower the more so), signals have a tendency to follow the curvature of the earth, so the height isn't all that important, especially with vertical antennas, just so long as there aren't interfering structures in the near field. At higher frequencies (VHF/UHF), signals are more line of sight, so the higher the better to "see" over the horizon.

A rule of thumb is that when you double the height, you gain 3 dB (half an S unit). To get the whole S unit, you'd have to quadruple your height. If you started at ten feet, you'd have to put up a 40-foot tower for that S unit; if you started at 40 feet, you'd have to go 160 feet!

Clearly, the higher you go, the more coax you need; so choice of coax is critical – increasingly so as you go higher in frequency. If you use RG-58/U at those higher frequencies, going higher actually attenuates your signal! That's why cell phone towers use hard line, and why you shouldn't use RG-174/U for VHF/UHF even in a mobile installation!

Q. *I have a wide-frequency-coverage receiver and am considering one of three antennas for shortwave reception: the PAR End Fedz, the LF Engineering H-800, and the AOR SA7000 full-frequency whip. I have three close-by, high-power, MW broadcasters. Any recommendations? (Hal Bilodeau, Chicago, IL)*

A. The PAR (Grove ANT08) is an excellent, passive, wire antenna which gets rave comments from our shortwave listeners. The LF Engineering active antenna (Grove ANT15) is popular and effective when a larger wire antenna is impractical. Both deliver about the same signal levels to your receiver.

The key to overload immunity is in the third-order intermodulation specification for your receiver. It should not be a negative number; the higher positive number the better. If your local MW broadcasters are a problem, you can invoke the attenuator function on your radio or add an external wave trap or high-pass filter.

While the AOR (Grove ANT39) is much smaller, and is unamplified, modern receivers have high sensitivity which affords excellent reception of weak signals. Since your receiver has such a wide frequency range, it would seem a shame to feed it with a shortwave-only antenna. If you plan to do much VHF/UHF listening, the AOR would be a better choice. If you find that it doesn't do the job, you can add a wideband preamp – probably along with the filter for those nasty locals!

Another possibility would be to attach a multicoupler like the inexpensive Grove SPL-1 to the single antenna port, or even an antenna switch like the Grove SWC01 to accommodate two separate antennas for the HF and VHF/UHF bands.

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. Mail your questions along with a self-addressed stamped envelope in care of MT, or e-mail to bobgrove@monitoringtimes.com. (Please include your name and address.)

UTILITY WORLD

HF COMMUNICATIONS

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What's the World's Strangest "Numbers" Station?

A good friend of mine said in a letter to *MT* that she likes it when the magazine puts in a little weirdness along with the obscure long-wave radio beacons and digital noises. While I've never met a long-wave radio beacon or digital noise I didn't like, this seems like a good idea. Therefore, in Mary's honor, we'll do a long-overdue look at shortwave spy numbers weirdness this month.

I'm writing this during a different sort of weirdness. Where I live, it's called the Awards Season. Every week or so, people who've spent the past year fighting over your entertainment dollars pause to hand one another golden statuettes and pretend that their money-hungry industry is great art.

So be it. Welcome to the first-ever Strangest Numbers Station on Short Wave Award.

1. SK01

The first nominee is Cuba's bizarre SK01. Even the name is weird. It's the station's designator on the standard Control List kept by ENIGMA2000. This is the modern online version of the European Numbers Information Gathering and Monitoring Association, a very knowledgeable group which "meets" on Yahoo and produces a truly definitive newsletter.

The SK01 designation comes from PSK, the abbreviation for phase-shift keying. SK01 started out using a popular ham radio teleprinting mode called PSK31. Since this was the first time anyone had heard this outside amateur bands, it got attention in a hurry.

Early test messages and other characteristics made it obvious that SK01 was, and is, part of the same Cuban spy network that sends out the Spanish female voice (V02a), and the weird cut-numbers scheme in Morse code (M08a). Sometimes an SK01 will turn into one of these, in best Cuban "Oops, wrong mode" tradition.

Soon after SK01 got its name, the operators started testing other ham radio digital modes, before settling on one called RDFT, for Redundant Digital File Transfer. We know from an early identifier (long gone) that the software being used is DIGTRX, a free Windows ham download that was originally intended for digital slow-scan television.

RDFT makes a distinctive buzz. It was designed for upper-sideband (USB) mode, but SK01 often uses amplitude modulation (AM). When the data starts up, DIGTRX goes madly to work. If it doesn't crash (a big "if" on my computer), you suddenly have your file, just as if you'd downloaded it from the Internet.

The files, of course, are completely bizarre. This is Cuba, after all. They have the text (.txt) extension, but they are definitely not any kind of text that you'd ever open in Notepad. Go ahead and try. It won't hurt your computer, but since the files are binary data and not text at all, you'll get gibberish.

A dedicated listener, who goes by "westli" online, has put in a huge amount of time on SK01. I've merged the past few months of his hits into a table arranged by day and time in UTC (Coordinated Universal Time), and frequency in kilohertz (kHz).

This listener has even identified two different types of gibberish. One prints out as mostly "Asian characters" (Unicode?), while the other is just your standard screen garbage. Cuba just loves to give its numbers traffic weird differences that make it easier for our crypto agencies to analyze it. Odd, these people.

Cuban SK01 Schedule (Spring 2010)

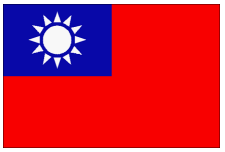
UTC	Mon	Tue	Wed	Thu	Fri	Sat	Sun
0500		5898	12120		5810		
0530	5898			13380			5810
0600	5800, 11435	5800	5810, 11435		5810, 11435	11435	5810
0730	5800		5810				5810
0800	8186	8180	8186	8180		8186	
0900	9063	5947, 8180	9063	8180		5930, 5947, 9063	
0930		5930, 5947	9040, 9063	5930		5930	
1000		8186	8186	8186			
1030		7890		7890			
1600	10715, 16178	10715, 16178	10715, 16178	10715, 16178	10715, 16178	10715	10715
1700	11435	11435	11435	11435	11435	11435	11435
1730	11435	10858, 11435	10858, 11435	10858, 11435	10858, 11435	10858, 11435	10858, 11435

2. Star Star Radio Station

Even the name is weird on this one. It doesn't seem to translate well from its native Mandarin Chinese. You'll see it listed as New Star Broadcasting, but the current consensus seems to be that a better translation from (phonetically) "Xing Xing Guangbo Diantai" is "Star Star Radio Station."

This compellingly strange broadcast (ENIGMA V13) is suspected to come from Taiwanese intelligence, possibly for operatives in Mainland China. At one time, it used to come up bright and early, at least in Beijing or Taipei time, and stay on pretty much all day.

In our morning, Pacific Time, it would come blasting into the Western US. I had my



Sony 2010 set to wake me up with its cheerful sound every day on 8300 kHz AM.

Either the sunspots changed, or this operation cut way back. At one time it was reported by listeners as broadcasting from 2300 to 1600 UTC. It had several numbered "programs," as they were called, with strong signals on 8300, 9725, 11430, 13750, and 15388 kHz AM. Transmissions started on the hour, and lasted up to 40 minutes, depending on content.

Every report I've seen for the past year or so mentions only 11430, and always with broadcasts starting at 1200 and 1300 UTC. I won't be waking up to that, given that it's four or five in the morning here.

ENIGMA2000 has a good recording from late 2009 at its excellent web site. Go to **www.apul64.dsl.pipex.com/enigma2000/** and click "Slavic & Other Languages" under "Sound Samples."

Star Star Radio starts off with pretty Chinese flute music, which is followed by *That Voice*. She's canned, of course, but you still want to reach right into your speaker and grab her. Numbers are usually a pretty grim business, but she is so bright and cheery that it's almost worth it being a spy.

What the cheerful Chinese lady is saying is a station identification, followed by a typical call-up block, with music between repetitions. She requests, quite politely, that the spies receive their messages in 4-figure groups. After sending these twice, she thanks everyone for listening, and wishes us all health and happiness before saying a pleasant goodbye.

The 11430 kHz signal does not seem as strong as before, making Star Star Radio a good catch. Once you've heard it, you won't forget it.

3. But the Winner Is...

Actually, the winner is none of these people, strange though they are. The award for Strangest Numbers Station on Short Wave goes to… the earphones please… the Cuban Babbler!

The Babbler, ENIGMA V21, is another one you'll never forget. That's good, because his live, invariably male, voice isn't heard a whole lot any more. The last hits that I know anything about were last fall, on 6416 kHz USB at 1040 UTC.

Fortunately, a couple of good recordings are online. One nice one is on Ary Boender's great Numbers and Oddities site, at **www.ary.luna.nl/**

Those who think the guy in the recording is a bit hard to understand don't realize how easy people have it these days. By Babbler standards, this speaker is a model in clear Spanish pronunciation. For one thing, it's actually possible to make out a tiny bit of the message content. This was not always the case.

Clearly, he's from V21's new school, in which they are obviously trained to "sing it out." Some of their announcers do just that, passing into something resembling Gregorian plainchant, or even melody of a sort. One gets the idea that, like good method actors, they are trying to feel it.

A typical string, as extracted from this recording by LU5EMM in Argentina, is "0433 526 287 1150 0641." One good guess is that these strings are some sort of formatted military data. They might even be time-stamped target plots of some sort, like the vaguely similar, 14-character strings passed in Morse code by the Russian Air Defense.

I've always wondered what the responsible agency is actually doing with the information, since no human brain can decipher most of it. Is it just training exercises?

You young whippersnappers should have heard this station in the late 1980s, the heyday of Western Hemisphere shortwave weirdness. At that time, V21 had a channel marker. Following the proper Russian tradition, Cuba used a completely bizarre noise for this. It ran 24/7, on another frequency somewhere around 6500 kHz. It faded up and down with the skip, sounding like a diesel generator on its last legs.

Every Western Hemisphere afternoon, the marker wouldn't exactly interrupt as much as it would turn down a couple of decibels, while the person they had at the time shouted above it. The term "shout" is not a figure of speech. This dude was really amped. He'd rattle off the stuff faster than anyone could ever hope to follow it, in a full yell.

Perhaps this person finally overdosed on stimulants, because he vanished. His replacement sounded a lot more stable. He wasn't any easier to understand, mind you, but he was in far less danger of spitting up a lung.

Meanwhile, that diesel engine noise droned on, for years as I recall.

Back in modern times, the rare V21 remains a prime numbers catch. Another place where people have snagged this one is on 6529 kHz USB, at 1400 UTC.

Try not to be totally weirded out until next month.

ABBREVIATIONS USED IN THIS COLUMN

AFB..... Air Force Base
ALE ..... Automatic Link Establishment
ATC..... Air Traffic Control
CAMSLANT ..... Communications Area Master Station, Atlantic
CAMSPAC ..... Communications Area Master Station, Pacific
CAP ..... US Civil Air Patrol
CW ..... On-off keyed "Continuous Wave" Morse telegraphy
DEA ..... US Drug Enforcement Administration
EAM..... Emergency Action Message
FAX ..... Radiofacsimile
FEMA ..... US Federal Emergency Management Agency
FSK ..... Frequency-Shift Keying
HFDL ..... High-Frequency Data Link
HF-GCS ..... High-Frequency Global Communication System
LDOC ..... Long-Distance Operational Control
LSB ..... Lower Sideband
M08a..... Cuban 3-message CW, ANDUWRIGMT for 1-0
M21..... Russian CW aircraft tracking, with Moscow time
MARS ..... US Military Auxiliary Radio System
MX..... Generic for Russian single-letter beacons/ markers
NASA..... US National Aeronautics and Space Administration
NAT ..... North Atlantic ATC, families A-F
NS/EP ..... National Security/Emergency Preparedness
OPBAT ..... DEA Operations, Bahamas and Tortugas
Pactor..... Packet Teleprinting Over Radio
RTTY ..... Radio Teletype
SECURE..... State Emergency Capability Using Radio Effectively
Selcal ..... Selective Calling
SESEF..... Shipboard Electronics Systems Evaluation Facility
Sitor-A/B ..... Simplex Telex Over Radio, mode A or B
STS ..... Space Transportation System ("Space Shuttle").
UK..... United Kingdom
Unid ..... Unidentified
US ..... United States
USS..... United States Ship
USAF..... US Air Force
USCG ..... US Coast Guard
Volmet..... Scheduled aviation "Flying Weather" broadcast
X06..... Old Russian "Mazielka" audio tone calling
XPA2 ..... New Russian Polytone, 20 audio tones, AM/USB

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations have their ENIGMA (European Numbers Information Gathering and Monitoring Association) designators in ().

502.4 G4JNT-UK experimental 600-meter beacon, Southampton, slow FSK using WSPR (Weak Signal Propagation Reporter), at 0226 (DL8AAM-Germany).

2142.5 ZLST: German Customs Control Post, Cuxhaven, ALE and data with ZHEL, Customs Boat Helgoland, also on 2673 and 3831, at 0025 (MPJ-UK).

2289.0 CVTNGA137P-Telecom company NS/EP portable station, Covington, GA, ALE sounding at 1358 (Jack Metcalfe-KY).

2598.0 VCP-Canadian Coast Guard, Placentia, NF, weather at 0053. VCM-St Anthony Coast Guard Radio, NF, weather at 0108. VOK-Labrador Coast Guard Radio, Goose Bay, weather at 0140 (MDMonitor-MD).

2749.0 VAR-Canadian Coast Guard, St John, NB, weather in English and French, at 0140 (MDMonitor-MD).

3170.0 MRDNCT196-NS/EP, CT, ALE sounding at 1406 (Metcalfe-KY).

3256.0 "P"-Russian military CW channel marker (MX), similar on 3291.0 and 3699.5, at 1843 (Ary Boender-Netherlands).

3299.0 AFF4VN-USAF MARS, Region 4 4S1 Net control, at 0142 (Mark Cleary-SC).

3308.0 AFA7KJ-USAF MARS, North Central NCM2 net 1159 (Cleary-SC).

3315.0 AFA3AJ-USAF MARS, VA, Northeast Area NE2S1 Net at 0039 (Cleary-SC).

3320.5 NNN0WBF-US Navy/ Marine Corps MARS, South Carolina 4G1B Net at 0101 (Cleary-SC).

3322.0 Unid-Russian Air Defense, formatted CW strings with time stamps (M21), at 1850 (Boender-Netherlands).

3390.0 NNN0ONX-US Navy/ Marine Corps MARS, GA, Region 4 4X9B Net at 0202 (Cleary-SC).

3658.0 "V"-Russian military CW channel marker (MX), at 1855 (Boender-Netherlands).

3810.0 HD2IOA-Naval Oceanographic Institute, Ecuador, new time signal format with pips and Spanish announcements every 10 seconds, at 0344 (PPA-Netherlands).

3890.0 UWS3-Kiev Radio, Ukraine, CW weather and then marker for listening on 4189 and 8357.5, at 2043 (ALF-Germany).

4002.9 AAM4RL-US Army MARS, Region 4 net, LSB at 0118 (Cleary-SC).

4003.0 AAR4FF-US Army MARS, LSB with unknown station at 0116 (Metcalfe-KY).

4013.5 NNN0BTJ-US Navy/ Marine Corps MARS, voice at 0117 (Metcalfe-KY).

4013.5 NNN0BTG-US Navy/ Marine Corps MARS, 4K2B Kentucky Net at 0105 (Cleary-SC).

4020.0 Ecologico Secondo-Unknown vessel, calling Ecologico Primero in Spanish, gave position 31 38 N by 15 24 W (near Canary Islands), at 0607 (ALF-Germany).

4026.9 AAR4TW-US Army MARS, Region 4 North Carolina Admin Net at 0004 (Cleary-SC).

4325.9 "R"-Russian military CW channel marker (MX), similar on 5465.9, at 1844 (Boender-Netherlands).

4465.0 RIT-Russian Navy, Severomorsk, weather for RLO, CW at 0405 (PPA-Netherlands).

4469.0 Goldenrod 595-CAP, control of Alabama Goldenrod Net, at 0100 (Cleary-SC).

4630.0 RSZ20-Russian government, saying "NIL" (no traffic) to 5 stations in FSK Morse, then into "dot" marker, at 0600 (ALF-Germany).

4681.0 AAA-Israeli Air Force, Tel Aviv, also on 5123, 5581, 6925, 7957, 8135, 8797, 8847, and 13367, ALE sounding at 1910 (PPA-Netherlands).

4742.0 Ascot 66-UK Royal Air Force C-17, tail number ZZ175, selcal check and weather request, at 0422 (PPA-Netherlands.).

4900.0 JCI-Saudi Arabian airfield status net, working RFI, ALE at 2138 (MPJ-UK).

4921.5 AAT6MY-US Army MARS, relaying software configuration to unheard station, LSB at 1903 (Metcalfe-KY).

5135.0 MA1NC-New Hampshire SECURE, Manchester, ALE sounding, also on 5192, at 2000 (MDMonitor-MD).

5258.0 BPLEZS-German Police Operations Center, Cuxhaven, working 25, Police Boat Bayreuth, ALE and data at 1703 (MPJ-UK).

5320.0 Sector Delaware Bay-USCG, calling Sector Hampton Roads at, 2221 (Cleary-SC).

5336.0 Unid-Russian intelligence "Polytone" (XPA2), long transmission at 2030 (Mike T-West Sussex, UK).

5441.0 "4-D-E"-UK military, working "9-O-W" at 2050 (PPA-Netherlands).

5517.0 Tripoli-African ATC net 2, Libya, position from Springbok 264 (South African Airways), 0127 (Prez-MD).

5598.0 Unid-Spanish Air Force ground station, passing weather and active channels to unknown aircraft, at 0216 (ALF-Germany).

5616.0 N8JQ-Cessna 750 Citation X bizjet, answered selcal GP-JQ from Gander, at 2354 (ALF-Germany).

5622.0 G-VEIL-Virgin Atlantic A340, flight VS0201, HFDL log-on with Krasnoyarsk, at 2043 (MPJ-UK).

5649.0 Unid-Atlantic ATC, selcalling CG-HL to T-235, a Royal Netherlands Air Force KDC-10-30CF tanker, at 1310 (Michel Lacroix-France).

5680.0 Kinloss Rescue-UK Royal Air Force, working Sea King helos Rescue 128, 169, and 193, at 1324 (Lacroix-France).

5696.0 CAMSLANT-USCG, VA, position from Coast Guard 2105 (HU-25D), at 1920 and 2011 (MDMonitor-MD). Coast Guard 6503-USCG HH-65C, reporting airborne at 1925 (Metcalfe-KY).

5708.0 100465-USAF C-5A, calling JDG, Diego Garcia, ALE at 2243 (Cleary-SC).

5711.0 Freedom Star-NASA Booster Recovery Vessel, working Cape Radio and Booster Recovery Director, for STS-130 launch, at 0359. Liberty Star, Booster Recovery Vessel, working BRD at 0359 (ALF-Germany).
5714.0 Xenon Hotel-French Air Force Falcon 50, working unknown Ajaccio station, at 1557 (Lacroix-France).
5785.0 BARBARISI-Italian Financial Police patrol boat Barbarisi, calling Gaeta, ALE at 0441 (PPA-Netherlands).
5801.0 Cuban CW cut number station (M08a), callup GTGIN UDURN ITDTN and into 5-figure-group messages, at 0559 (ALF-Germany).
6495.0 CFH-Canadian Forces Metoc Centre, Halifax, Nova Scotia, RTTY weather at 1930 (Prez-MD).
6628.0 Santa Maria-NAT-E, Canarias, position from KLM 794 at 0119 (Prez-MD).
6679.0 Honolulu-US Federal Aviation Agency North Pacific Volmet, aviation weather for Anchorage, Fairbanks, and Elmendorf, at 0255 (Prez-MD). [Honolulu broadcasts Alaska weather in the old Anchorage slot. -Hugh]
6700.0 Kenya Airways LDOC, Nairobi, working Kenya 524 at 0223 (ALF-Germany).
6700.0 DHO32-German Air Force, Wunstorf, working DHM91, Munster, at 1309 (Lacroix-France).
6761.0 Grits 27-USAF C-17A, working Steel 73, USAF Reserve tanker, at 1437 (Cleary-SC).
6803.1 MRTHFL200-NS/EP, Marathon, FL, working PNCOFL216, Pensacola, FL, and CLEVOH128, Cleveland, OH; ALE at 1410 (Metcalfe-KY).
6825.0 FAV22-French military Morse code practice station, Vernon, CW text at 1250 (MPJ-UK).
6921.0 COF-Algerian Air Force Headquarters, working CM3 and CM4, ALE at 2058 (ALF-Germany).
6935.0 Zero-British military, working Zero Charlie at 1125 (ALF-Germany).
6994.0 "Beacon Spain"-Unlicensed experimental beacon, CW marker with Hotmail address, at 0015 (ALF-Germany).
7018.0 REA4-Russian Air Force, strategic message in FSK Morse, at 1240 (MPJ-UK).
7480.1 BLWNMO108-NS/EP, Ballwin, MO, ALE sounding at 1502 (Metcalfe-KY).
7527.0 PAC-USCG CAMSPAC Point Reyes, CA, calling MAG (USCG Cutter Hamilton, WHEC 715), ALE and voice at 1350 (MDMonitor-MD).
7527.0 Sector Key West-USCG, working Coast Guard Rescue 6029, at 2136 (Cleary-SC).
7535.0 Charm-US Navy multipurpose amphibious assault ship USS Wasp (LHD 1) working Norfolk SESEF, at 1925 (Metcalfe-KY).
7602.0 0034MERCAP-CAP MidEastern Region, ALE sounding, also on 7665, 8012, 9047, 10162, 11402, and 12081, at 1430 (MDMonitor-MD).
7628.0 FPI-French Navy, Sainte-Assise, identified as "Papa India" while working "1-S-R" in French, at 1357 (ALF-Germany).
7632.0 AAR4QR-US Army MARS, taking check-ins for a SHARES (SHAred RESources) net, at 1616 (Cleary-SC).
7635.0 Hill CAP 42-WV CAP, net at 1505 (Cleary-SC).
7697.1 NEORLA204-NS/EP station, New Orleans, LA, ALE sounding at 1820 (Metcalfe-KY).
8009.4 WDB6052-US sloop Savage Son, Pactor-I call to WPUC469, SailMail, FL, at 0316 (ALF-Germany).
8067.0 WDE2368-US sailing vessel Just Imagine, calling WGM, CruiseEmail, FL, in Pactor-I at 0154 (ALF-Germany).
8096.0 "Maritime Mobile Service"-Informal net with chatter in Portuguese, at 2215 (Prez-MD).
8290.0 T8R1-Venezuelan Navy headquarters, calling 1W1S, Medium Landing Ship Capana, also on 8340, LSB ALE at 2330 (MDMonitor-MD).
8337.6 Shark 29-USCG vessel, clear and secure target tracking with Swordfish 28, USCG HU-25D, at 2131 (MDMonitor-MD).
8658.0 JFX-Kagoshima Prefectural Fishery, Japan, FAX in Japanese headed "JFX NOAA," at 1800 (Hugh Stegman-CA).
8829.0 Unid-Turkish Airlines LDOC, selcal and voice call in Turkish, no joy, at 1620 (Lacroix-France).
8834.0 9H-SNA-Comlux Malta flight XA9HSN, an A319, HFDL position at 1808 (PPA-Netherlands).
8864.0 N713CK-Kalitta Air B747 freighter, answered selcal JL-BS, at 1829 (PPA-Netherlands).
8879.0 Emirates 529, an A330 with registration A6-EAM, answering selcal AM-JR from Mumbai, at 1745 (Privat-France).
8888.0 Luanda-African ATC, net 4, Angola, getting course and position from Springbok 203 (South African Airways), at 2041 (Prez-MD).
8891.0 Aeroflot 322, a Boeing 767 registration VP-BDI, answered selcal CS-GQ from Reykjavik, at 0828 (Lacroix-France).
8903.0 Kinshasa-African ATC net 4, Congo, working unknown flight at 2250 (Prez-MD).
8906.0 Shanwick-Shannon/Prestwick ATC, selcal LS-DR to an Air Europa A330 registration EC-JZL, at 1551 (Lacroix-France).
8912.0 DCK-USCG Cutter Sanibel, ALE with Z03, USCG Sector SE New England, then clear and secure voice, at 1925 (MDMonitor-MD).
8918.0 New York, position from N904DS, a Bombardier D-700 bizjet, at 1822 (Allan Stern-FL).
8971.0 Tiger 02-US Navy P-3C, working Fiddle, FL, at 2204 (Cleary-SC).
8983.0 CAMSLANT-USCG, working Coast Guard 2003, an HC-130J, at 1456 (MDMonitor-MD).
8992.0 Andrews-USAF, Andrews AFB, MD, 2 EAMs and a SKYKING broadcast, at 1502 (ALF-Germany).
9016.0 Variable-US military, patch via Offutt HF-GCS to Fishboat, at 2108 (Cleary-SC).
9025.0 HAITI-Brazilian Air Force on Haiti earthquake relief, ALE sounding at 1550 (MDMonitor-MD).
9031.0 ASCOT 5628-UK Royal Air Force C-130J tail number ZH882, answered selcal DG-RS, then status for TASCOM (Terrestrial Air-Sea Communications), at 1810 (ALF-Germany).
9034.0 NOJ-USCG, Kodiak, AK, calling J18, an MH-60J, ALE at 0043 (Cleary-SC).
9043.0 BRD-NASA Booster Recovery Director, working Booster Recovery Vessel Freedom Star downrange for STS-130 launch, at 0658 (Stern-FL).
9110.0 NMF-USCG, Boston, MA, FAX wind and wave chart at 1858 (MDMonitor-MD).
9185.0 Aldera (sounded like)-Probable Mexican Navy, working 81 in Spanish, possibly Haiti related, at 2240 (MDMonitor-MD).
9197.0 Unid-Russian intelligence selcal system (X06), calling 164532, at 1835 (Mike T-UK).
9496.0 KSCYMO172-NS/EP, Kansas City, MO, ALE sounding at 1708 (Metcalfe-KY).
10024.0 Cenamer-South American ATC, Honduras, working unknown aircraft at 0840 (Lacroix-France).
10051.0 Gander Volmet, Newfoundland, aviation weather at 1722 (Stern-FL).
10096.0 Atlantico-South American ATC net 2, working KLM 714, at 2247 (MDMonitor-MD).
10242.0 D31-US Customs, raised OPB in ALE, then voice as Omaha 31 working Panther (OPBAT, Bahamas), at 2208 (MDMonitor-MD).
10536.0 CFH-Canadian Forces, Halifax, NS, RTTY weather followed by FAX, at 1352 (MPJ-UK).
10543.0 RCV-Russian Navy, Sevastopol, Ukraine, weather in CW for RKZ, at 1401 (MPJ-UK).
10780.0 Cape Radio-USAF, Cape Canaveral, FL, radio check with C-130 King 70, then into encrypted traffic, at 2110 (Stern-FL).
11002.0 CO-High Frequency Beacon Society, unlicensed CW experimental beacon, CO, at 0020 (JLM) [Got it here on 11002.69; typical whoopy keying. -Hugh]
11159.0 Offutt-USAF HF-GCS, NE, patch to Hoover Ops at Offutt AFB for Hoover 27, came from 11175, at 1951 (MDMonitor-MD).
11175.0 Navy YD 775-US Navy P-3C, raised Offutt HF-GCS on a general "Mainsail" call, then radio checks with Offutt using callsign S4JG, at 1520 (MDMonitor-MD).
11217.0 Andrews-USAF HF-GCS control, Andrews AFB, MD, patching Convoy 9618 to a military number for departure time, came from 11175, at 1805 (Stern-FL).
11232.0 Halifax Military-Canadian Forces, NS, selcalling AS-CM to Canforce 4150, a CC-150 (Canforce A310 conversion), tail number 15003, at 1412 (MDMonitor-MD). Dragnet Victor-USAF E-3, patch via Trenton to Dragnet Weapons, at 1947 (Cleary-SC).
11253.0 UK Royal Air Force Volmet, Wharton, UK at 1902 (MDMonitor-MD).
11300.0 Tripoli, African ATC net 3 with Lufthansa 572, position at 0000 (Prez-MD).
11330.0 New York, position from N388QS, a Cessna 680 Citation Sovereign bizjet, at 1706 (Stern-FL).
11345.0 Stockholm-Swedish LDOC, working unknown aircraft at 1310 (Lacroix-France).
12222.0 EST-US Customs Eastern Node, raised D45, a P-3, then clear and secure with Omaha 45, at 1454 (MDMonitor-MD).
12356.0 XVG-Haiphong Radio, Viet Nam, phone patch in English at 0842 (Lacroix-France).
12365.0 VMC-Charleville Meteo, Australia, weather at 1255 (Lacroix-France).
12603.5 SVO-Olympia Radio, Greece, Sitor-B news and currency exchange rates, at 1405 (MPJ-UK).
12631.0 KSM-Maritime Radio Historical Society, Bolinas, CA, with SITOR-B Pacific and Gulf Coast marine weather at 2309 (Ken Maltz-NY).
13146.0 Monaco Radio-Naya Maritime Communications, weather bulletin followed by interval signal, at 1603 (MPJ-UK).
13270.0 UP0090-United Parcel Service freighter, HFDL position for Hat Yai, Thailand, at 1541 (MPJ-UK).
13306.0 New York-NAT-C oceanic control, getting position and course from Condor 232, at 1552 (Prez-MD).
13321.0 A7-ADW-Qatar Airways A320, flight QR0520, HFDL position for Johannesburg, South Africa, at 1555 (MPJ-UK).
13528.0 "C"-Russian Navy CW cluster beacon (MX), Moscow, at 1000 (Boender-Netherlands).
13528.1 "A"-MX, Astrakhan, CW at 1000 (Boender-Netherlands).
13927.0 AFA6DD-USAF MARS, TX, working Reaper 41, a USAF B-2A, at 2224 (Stern-FL).
14360.0 CHVLNJ124-NS/EP, Cherryville, NJ, ALE sounding at 1810 (Metcalfe-KY).
14396.5 AAV4AR-Army MARS, taking SHARES National Net check-ins at 1624 (MDMonitor-MD).
14405.0 AFA3LK-USAF MARS, PA Transcon Space Support Net at 1617 (Cleary-SC).
14582.0 LNT-CAMSLANT, calling J42, a USCG MH-60J, ALE at 1945 (MDMonitor-MD).
14654.5 NORTHSTAR2-Possible US military at Vancouver Olympics, also on 19248.5, ALE sounding at 1800 (MDMonitor-MD).
14760.0 Dove 35-Possible US military, clear and secure with Bell 45, at 1736 (MDMonitor-MD).
14822.5 P1G-Lithuanian Navy, working S1B in ALE, at 1306 (MPJ-UK).
15658.0 051CDCS41-US Centers for Disease Control, OR, voice call WNG954, ALE text message with 031CDCC32, Reno, NV, also on 11485.0, at 1728 (Metcalfe-KY).
15867.0 TSC-US Customs Technical Service Center, FL, calling MS1, unknown land-mobile unit, also on 18594, ALE at 1847 (MDMonitor-MD).
16331.7 "D"-MX, Sevastopol, CW at 1000 (Boender-Netherlands).
16331.9 "S"-MX, Severomorsk, CW at 1000 (Boender-Netherlands).
16332.0 "C"-MX, Moscow, CW at 1000 (Boender-Netherlands).
20047.7 "D"-MX, Odessa, CW at 1414 (MPJ-UK).
20047.9 "S"-MX, Severomorsk, CW at 1414 (MPJ-UK).
20890.0 TSC-US Customs, ALE and voice with MS2 (mobile, not heard), moved to 8912, at 1933 (MDMonitor-MD).
20948.0 "C"-MX, Moscow, CW at 1414 (MPJ-UK).
21937.0 02-HFDL ground station, Molokai, HI, squitters and working several aircraft at 0025 (Stegman-CA).
22559.6 JFC-Misaki Fishery Radio, Japan, FAX fishing data in Japanese, simulcast on 16907.5, at 0030 (Stegman-CA).
23337.0 ADW-USAF, MD, ALE sounding at 1400 (MDMonitor-MD).

DIGITAL DIGEST

DIGITAL MODES ON HF

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Telephone Companies Use HF ALE?

This month we take a look at how AT&T's HF facilities fit into the National Security and Emergency Preparedness (NS/EP) network. But, before we do that, here's a quick update on other goings-on in the digital HF utility world.

❖ Venezuelan Navy Surprise

The Air Forces and Navies of many countries rushed to Haiti in January to help the islanders after the horrific earthquake. Along with this massive movement of people and supplies came plenty of HF radio traffic, some of it digital.

One particularly interesting find came from the Venezuelan Navy, whose ALE network we've featured on a number of occasions in this column. While their fondness for using super-long DTM messages over ALE to transmit various reports and bulletins is well-known, their use of MIL-188-110A high speed modems to transmit data is not. It was quite unexpected then to hear the HQ in Caracas (using identifier "CGA") and the Capana-class Landing Ship *Los Llanos* (using identifier "TT64") trading ALE calls followed by modem traffic.

Even more interesting in this case is the use of the same gateway software or protocol employed by units of the US National Guard, the Swiss Diplomatic Service and others. Despite most of the modem traffic being encrypted, listeners can at least identify the callsigns of the stations involved and a few internal email addresses.

Here's an example of one of the opening exchanges:

DATA RATE 600 SHORT INTERLEAVER
\\\"6þÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ8P46AG@ ç<¶'¾
[EOM]

DATA RATE 600 SHORT INTERLEAVER
\\\";CTT8PAG46O@ ç#7'a
[EOM]

Although it's jumbled, you can clearly see the letters of CGA and TT64 in the header. You can also see the email addresses of the sender and recipient in the following example:

DATA RATE 150 SHORT INTERLEAVER
\\\"TTC8 46AG`4çðäÌœV6 wmtuser@TT64.hfarmada.mil.ve4 EÒ
b8 wmtuser@CGA.hfarmada.mil.ve‹\ Uk"ªÆý«ü]S©JÑ•È pnà,¯dRé†FQAy*óå2Œ àqô×ßnÐ9s'É¹¹•žhö ×Ú{ucFA"|
‰ÅØÁ¯yÂ¨ÛÙüÎÀ¶[Bqë™ú¡_ R§žŽSx-cÛñ¤HÄ,Ûn™Ñ®Þ¦\ à ! = 3 v > ¿ ² ê X F Ã e ú ½ Ý R È , # p G - wÿÓ™&¼4ûÌÃŸÞù'é®'ô]ãæ9
[EOM]

A reminder of where you can hear the Venezuelan Navy:

4060, 4390, 5334, 5349, 5840, 5841, 6255, 6280, 6284, 6360, 6888, 6894, 6895, 6963, 7357, 8180, 8270, 8275, 8280, 8290, 8297, 8298, 8340, 8358, 8500, 8540, 8582, 8810, 9017, 9075, 9190, 9350, 9350, 9355, 9380, 9400, 10528, 10650, 10990, 12220, 12405, 12480, 12537, 13139, 13500, 14550, 14790, 17080, 19098, 19200, 20400 and 21000 kHz

Frequencies are mostly LSB, but sometimes USB is also used.

❖ AT&T on HF

I'm constantly amazed and surprised by the sheer number and variety of military and MOI (Ministries of the Interior) operations that find their way onto HF digital modes in the US. Many of these networks have automated link control and command using MIL-188-141A ALE over HF radio, mostly funded by the huge injection of federal cash that supported post-911 Homeland Security improvements. Some of these networks are very active, some sporadic.

One of the latter is operated by AT&T as part of the national NS/EP (National Security/ Emergency Preparedness) network. Organized in 1990, the NS/EP is designed to maintain a state of readiness for, and coordinate a response to national emergencies or crises whether they exist at the local, national or international level. In most cases, it is designed to work alongside, and if necessary back-up voice and data communications that would otherwise be carried by the PSTN (Public Switched Telecommunications Network).

Besides AT&T, other telephone companies participate in the NS/EP, including Verizon, Sprint, Qwest, and local Bell companies. Large power companies and other strategically important utilities also have networks of their own. In addition to operating on their own discrete channels, these stations can often be heard working with other agencies on SHARES channels. In 2006, AT&T's regional EOCs (Emergency Operations Centers) were located in:

Sacramento and San Diego, CA (covering CA and NV)
Dallas and San Antonio, TX (covering TX, KS, AR, OK and MO)
Hoffman Estates, IL (covering IL, WI, MI, OH and IN)
Meriden, CT (covering CT)

Here are the channels on which the AT&T network is known to operate:

2194, 2289, 3155, 3170, 4438, 5005, 6765, 6803.1, 7300, 7480.1, 7697.1, 9496, 10155, 11451, 12225, 14360, 14396.5 (Voice), 15175, 15605, 18035, 18063 and 20095 kHz USB

During the early part of 2010, the AT&T stations seem to be undergoing a typical regular change in identifier styles. Here are the currently heard stations and locations:

ANCHAK100	Anchorage, AK
ATLAGA104	Atlanta, GA
BDMNNJ112P	Bedminster, NJ
BLWNMO108	Ballwin, MO
CHGOIL120	Chicago, IL
CHLTNC116	Charlotte, NC
CHPNSC140M	Chapin, SC
CHPNSC141P	Chapin, SC
CHVLNJ124	Cherryville, NJ
CLVEOH12	Cleveland, OH
CVTNGA137P	Covington, GA
DNVRCO148	Denver, CO
HFESIL160	Hoffman Estates, IL
HSTNTX162	Houston, TX
KEYWFL168	Key West, FL
KSCYMO172	Kansas City, MO
LSAGCA184	Los Angeles, CA
LTRCAR176	Little Rock, AR
MRDNCT196	Meriden, CT
MRTHFL200	Marathon, FL
NEORLA204	New Orleans, LA
PHNXAZ212P	Phoenix, AZ
PNCOFL216	Pensacola, FL
PRCYHI220	Pearl City, HI
RENONV224	Reno, NV
SANDCA240	San Diego, CA
SCMTCA228	Sacramento, CA
SNRMCA244	San Ramon, CA
WNDRFL252	Windermere, FL
WPTNNJ256	Westampton, NJ

The station in Chapin, SC seems to initiate most of the East Coast and Mid West link checks. Here are the older-style identifiers used on ALE:

359WPLV	Pearl City, HI
ATTATLABASE171	Atlanta, GA
ATTCHGOPORT190	Chicago, IL
ATTCHPNSC01P148	Chapin, SC
ATTCLEVBASE182	Cleveland, OH
ATTCLEVOH02B138	Cleveland, OH
ATTCNY	Conyers, GA
ATTCNYRBASE180	Conyers, GA
ATTCNYRPORT130	Conyers, GA
ATTDLLBASE200	Dallas TX
ATTDNVRBASE150	Denver CO
ATTHFESBASE196	Hoffman Estates, IL
ATTHIGHMOBL203	Unknown
ATTHIGHPORT204	Unknown
ATTLNPTPORT209	Longport, NJ
ATTMDTWBASE210	Middletown, NJ
ATTMDTWBASE225	Middletown, NJ
ATTMDTWBASE235	Middletown, NJ
ATTMDTWPORT21	Middletown, NJ
ATTMIAMIPORT207	Miami, FL
ATTPHNXAZ01P255	Phoenix, AZ
ATTPRLCBASE220	Pearl City, HI
ATTPRLCHI02B249	Pearl City, HI
ATTPRLCHI249	Pearl City, HI
ATTRENOBASE175	Reno, NV
ATTRENOBASE225	Reno, NV
ATTWPTNBASE235	Westampton, NJ
WNIY791	Dallas, TX
WNKR877	San Diego, CA
WPDY885	Reno, NV
WPDY885	Reno, NV
WPEE982	Denver, CO

You can read some interesting notes with photos about the Cherryville, NJ location by consulting the link in the Resources section. Thanks to Jack Metcalfe for filling in some important gaps in this article.

Finally, thanks to all the readers who responded to my call for suggestions for articles in last month's column. I'll be sure to take as many as I can on-board and feature them in forthcoming issues. Until the next time.

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

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Good Tech Never Goes Bad

Sometimes a column just drops in your lap. A few days back, my brother in law Scott stopped by with a laptop bag slung over his shoulder. Scott is a trained and certified computer hardware repair guy. I thought he was about to show me one of his new toys.

He opened the case and pulled out a very clean but really old Toshiba Satellite 110CS laptop. He told me the laptop was given to him and he had no particular use for such an old machine. He wanted to know if I wanted it for parts for one or more of my many radio projects.

Now, if you have been reading my column for any length of time, you are well aware that I am unable to pass up any electronic device that might yield a few transistors, diodes, or even a good line cord that might be repurposed into yet another amateur radio project.

I thanked Scott and, later that evening, brought the Toshiba down to my basement workbench for its "autopsy." But, like those old scary stories, this corpse still had a pulse! I powered up the laptop and found it was about as pristine as if it was still sitting on a computer store shelf waiting for a customer to come along. It booted right up with Microsoft Windows 95; there was even some juice in the battery! It had 24 MB of RAM and a 810 MB hard drive: tiny by today's standards, but nothing to sneeze at back in the day. I couldn't help thinking, this thing probably sold for around $2400.00 new!

More importantly, back when this thing was new, I couldn't even begin to consider dropping that much cash on what was then a state of the art notebook computer. Here I had a perfect specimen of mid 1990's computer technology. Fifteen years old (over a century in dog years) is close to a millennium in personal computer years. Still, the laptop was just too darned nice to relegate to stripping down for the junk box. Toshibas of that era have a reputation of being built like battleships.

This got me thinking, and the neurons dedicated to amateur radio kicked in quite quickly. If I got on the air this evening using one of my fine old Heathkit QRP rigs – all far older than this little laptop – the person on the other end of the QSO would ooh and aah, complimenting me on my choice of grand old vintage radios. However, if during the QSO, I mentioned that I was logging on this old Toshiba Laptop, the OM, YL or XYL on the other side of my signal would probably say "What are you using that old thing for?"

Maybe it's time we show some love for these older PCs. I think, especially for hams and even other radio monitoring hobbyists, there is a lot of life left in an "antique" computer.

How much computer does a ham really need?

Well, starting from first principals, NONE whatsoever. Folks played radio for nearly a century before personal computers became an almost standard part of the radio shack. I often run across old timers on the air (and even a few young pups) who either do not own a computer or simply choose not to incorporate a computer into their radio hobby experience.

There is nothing in Part 95 that says anything about being required to use computers in your ham station. A personal computer is an accessory. It is strictly up to your personal preferences as to how much of a necessity it becomes. I can get along just fine with pencil and paper if need be. But, many hams like to play with computers.

In the very beginning of the personal computer revolution (call it the mid '70s), some hams were already using simple computing systems for logging and control applications. I even had a Commodore 64 wired up to do RTTY. This Toshiba that "fell into my lap" with its first generation Intel Pentium processor has way more power than that old Commodore's MOS Technology 6510 processor.

The Toshiba Satellite 110CS may be old and "obsolete" but hams can still get a lot of mileage out of it.

Oldies but goodies

If you use PCs for control applications in your shack, you may have discovered that newer is not always better. Current generation computers depend on Universal Serial Bus (USB) ports for all input and output activities. Older generation computers have serial and parallel I/O ports. These are often more useful to the radio hobbyist for two reasons.

First, the I/O process is done primarily through hardware and not software. That means that timing pulses are not routed through a software routine that can create problems.

Secondly, many fine used amateur radio transceivers use the serial port for direct and/or remote control. In other words, a 1990's PC would do a bang-up job of interfacing with a 1990's era radio. To use a more modern PC with a rig of that era would require, at minimum, a serial to USB converter cable and upgraded or modified drivers to get things happy together.

Operating on an older system

So, the laptop still has some kick to it, but how about the operating system? Microsoft stopped shipping Windows 95 in 2001 and stopped support in 2005. If I keep running this computer with this OS, I am, essentially, on my own. Or am I?

As hard as it may seem to hard core computer geeks, a lot of folks are still running older Microsoft Windows operating systems. When I look over the life cycle of the PCs that have come and gone through my shack, I probably ran Windows 95 longer than any other OS. If I didn't have need to run some more modern software applications for my "real world" employment, I could still easily write this column, send e-mail, surf the Web and perform all my ham radio related functions just fine under the Win95 environment.

Your other options would be to upgrade or change out the OS. This system has the minimal power to support Windows versions up through Windows 98 SE, at least. If you have a legal copy of that OS, it is just now going out of its support cycle with Microsoft, so you might be able to linger longer with a system like that.

Another possibility would be to find an acceptable version of the Linux OS. It takes a bit of effort to tweak Linux, but the increase in performance and stability over a similar era Windows OS might be worth it. Besides, it would be a fun project, and you would learn a lot about PC operating systems making the jump to Linux.

So, a quick trip around the World Wide Web led me to dozens of sites that continue to provide some level of support to the Win95 OS. Probably the most useful for getting an older system running right are the "driver" sites. Recovered and repurposed older PCs are often found in a "wiped" state. Even if you have a fresh copy of

a suitable OS, you may need to track down the proprietary drivers related to the hardware you are using.

Most of the big name PC manufacturers, to their credit, have a policy of keeping their older drivers available in the support sections of their Web sites. Toshiba has all the drivers I could want or need at their product support site **www.csd.toshiba.com.** Though I was fortunate that this laptop on my lap was in "like new" condition with all original drivers intact, I still made use of the site to get more recent driver updates that would assure better operation down the road.

Some more web browsing showed me the way to a number of Windows 95/98 "fan" sites with software resources and discussion forums. **www.window95.com/** is one prominent fan site and **www.freebyte.com/** has many novel programs designed to run under the Win95 OS. All the major freeware/shareware sites still carry a number of programs that will run on earlier Microsoft OS platforms.

❖ Software savvy

The big excitement for me, playing around with this laptop, was the return of a REAL DOS prompt. Later Microsoft products moved away from the MSDOS standard. True, a lot of new things were made possible because of this, but, for a ham who likes to get his hands dirty, programming in DOS using a BASIC interpreter was fun years ago, and – guess what? – it still is! I had disks and disks of simple and useful ham type programs I coded up with my own hot little hands. Bringing some of them back into use would be a blast.

Think of it as the computer software equivalent of melting solder and building your own radios. Sure, you can code with a modern computer, but nothing has the feel of nailing down your program at the command line.

So, once I got the laptop's basic (no pun intended) functions going, I dug around for a disk I hadn't thought of in a long time. My old, and long missed, friend and mentor Bill Cheek (who wrote for *Monitoring Times* until his untimely passing) was a fount of DOS and early Windows based knowledge. Back about the time that this Toshiba Laptop was leaving the factory, Bill sent me a disk of DOS based programs that became the "tools of the trade" for folks digging more deeply into their radios than the manufacturers ever intended.

The most basic (again, no pun intended) program was an MS-DOS Text Editor called QEDIT. QEDIT was the tool of choice for programming because of its low memory overhead (remember, these older computers have comparatively little teeny memories). It also gave you direct control of the I/O ports: Just the tool needed for fiddling the bits that make radios work.

QEDIT has come a long way. It is now a commercial product called The SemWare Editor Professional **www.semware.com/html/tsepro44new.php.** But, if you have an old system, you can still find the original program out there on the web and it runs just fine. Getting it back up into this laptop gave me a chance to reread the old e-mails I printed out from Bill and think many warm thoughts about the times we worked together.

You will find hundreds of useful and free ham related software programs that would run on older computers at the AC6V Web site **www.ac6v.com/software.htm**. You can spend hours digging through the files there. But allow me to give you a few suggestions to get started.

Let's take a look at logging software, probably the most common reason for hams to have a PC in their shack. If you are looking to do logging, you might want to try XMLOG, a Windows based program that will work all the back through Win 95 **www.xmlog.com**/. Another Win95 supported logging program is Logger32 **www.logger32.net/**.

If you want to go with a DOS based logger look no further than SwissLog **www.informatix.li/english/Frame_EN.htm**. Swiss log has been around since 1987 and still remains very popular.

If you want to try to duplicate my efforts in this column, a quick search of eBay finds Toshiba Satellite 110CS units at a "Buy It Now" price ranging from $40 to $80 dollars. (Less if you want to get into the bidding process.) Another web search shows that memory and hard drive upgrades are still available, as are replacement BIOS and main power batteries. There is no reason that this laptop can't be kept running for many years to come. "Shrink Wrap" copies of the Windows 95 operating system can be found on several Web sites for less than $15.

So, while other folks are dropping mega bucks to get computerized, a dedicated ham with a little time and talent can spend less than $100 and use his or her other disposable income to improve his or her signal.

PUBLICATION OF THE MONTH

This month I have a CD for you to check out.

The 2009 ARRL PERIODICALS ON CD-ROM
$24.95 ARRL Order No. 1486
ISBN 978-0-87259-148-6
The American Radio Relay League
225 Main Street, Newington, CT 06111-1494
www.arrl.org/shop; 1-888-277-5289

I have made a point of getting the annual ARRL Periodicals CD ROM since the ARRL first started putting them out in 1995 (interestingly enough, the year of the Toshiba Laptop we were talking about earlier).

Over the years, the League has made steady improvements as new document management tools became available. You can search the full text of every article by entering titles, call signs, names – any word. The League has electronically published every word, picture and graphic that appeared in the year's *QST*, *National Contest Journal* and *QEX - Forum for Communications Experimenters* magazines. They also include all the contest results for the year, as well as all the ARRL Section reports.

The CD will work with Windows based PCs (Windows 200 or higher; I guess I won't be running this disk on that old Toshiba. It does not have a CD ROM player on it anyway) and Apple systems running Max OS X. The CD requires the installation of Adobe Acrobat Reader, a free program available online from **www.adobe.com**. The periodicals can be printed out or copied to other locations and applications.

I have developed a little tradition since those first CDs came my way. As each new year becomes available on CD, I take all those hard copy magazines and put them in the hands of folks who might get bitten by the ham radio bug. I have brought more than a few folks into the amateur radio fraternity this way. I recycle and I reduce my storage needs, all at the same time. The 2009 Periodicals CD is superlative.

Well, I hope you are enjoying the growing number of sunspots as much as I am. The bands are definitely coming back. I'll be looking for you on the bottom end of 40 meters. Have fun!

GETTING STARTED

THE BEGINNER'S CORNER

Ken Reitz, KS4ZR
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OTA DTV Update and Finding Entertainment on Shortwave

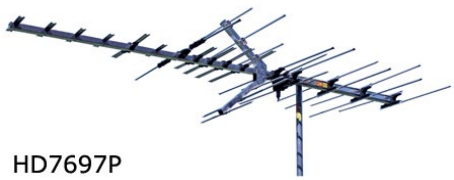
The transition to Over-the-Air (OTA) Digital Television (DTV) was officially finished nearly a year ago and it didn't take long before competing interests were clamoring for a piece of the vacated spectrum real estate – what everyone assumes will be a golden goose. A newly realigned Federal Communications Commission, charged by the president to come up with a plan for a rural broadband initiative, would play dealer at the gaming table, and entrepreneurs from all manner of electronic interests from cell phone companies to TV conglomerates want into the casino.

The statistics, as provided by the FCC and the National Telecommunications and Information Agency (NTIA), the federal office responsible for the DTV transition, show that there are 114.5 million total TV households of which 12.6 million are identified as OTA-TV households. The agency also noted that, at the end of the DTV coupon program, 64 million coupons were requested and 34.8 million coupons were actually redeemed.

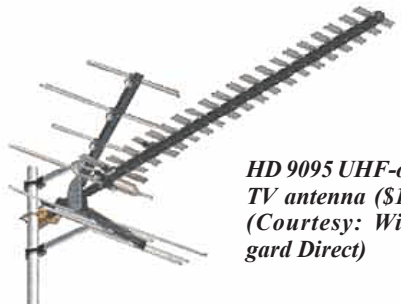
New Winegard HD7694P VHF/UHF TV antenna ($105), with an estimated 45 mile range, covers channels 7-69. (Courtesy: Winegard Direct)

But, in the aftermath of the DTV transition, when it became apparent that the FCC was interested in procuring vast swaths of bandwidth in order to allow new and wonderful broadband technologies to move forward, the number most frequently referred to in press stories was those 12.6 million U.S. households. The inference was that the vast majority of Americans watch network and local TV fare via cable-TV or satellite-TV and this OTA-only group was marginal and could be dismissed or at least bought off by government subsidies that would allow them to sign up to cable-TV or satellite-TV.

What appeared to be left out were the number of U.S. TV households that watch *both* OTA-TV *and* either cable-TV or satellite-TV. These households include those that have one or more TV sets in other rooms, not connected to either a cable-TV or satellite-TV source; households that have TV sets in vacation homes or RVs not served by cable or satellite TV; and those such as mine that choose to watch OTA-TV in addition to satellite-TV, because neither cable nor satellite-TV are required by the FCC to carry HD versions of local channels or multicast HD2 or HD3 channels. That means that viewers like me, who want to watch the local networks in HD, in addition to watching the multicast channels or out-of-market channels (by simply rotating my outdoor antenna to another direction), are not counted as OTA-TV households.



HD 7697P VHF/UHF TV antenna ($152), with an estimated range of 60 miles VHF and 50 miles UHF. (Courtesy: Winegard)



HD 9095 UHF-only TV antenna ($120) (Courtesy: Winegard Direct)

Furthermore, since the bulk of the enormous flat-screen TV sales generated during the DTV transition had built-in DTV tuners, that 34.8 million coupon redemption figure looms even larger, since none of the new sets required outboard digital tuners. I believe that the number of OTA-TV households has been underreported and the question is: Why?

Initially, the FCC had floated the idea of shunting OTA-TV stations onto some other frequency band and possibly adopting a different signal transport system, but reaction to that plan was so fierce that the commission quickly backtracked and now says it want a "voluntary" giveback of spectrum from stations not using what they're allocated and to "repack" the allocations.

❖ Tuning in OTA-TV

The realignment of the broadcast TV band basically knocked out the bottom six channels, but channel assignment is mostly irrelevant now. For example, if you're used to watching ABC network on channel 3, you still see the programming on your DTV set as channel 3, but the actual FCC assignment could be channel 42 or 37 – it doesn't matter. It was the least the FCC could do to avoid wholesale mayhem and wailing and gnashing of teeth on the part of viewers. Once you've asked your DTV set to scan the airwaves for your local channels, they'll all dutifully line up like the old days. And, you can edit the reception list so that channels you don't watch can be eliminated from the line-up.

In the last year, several new VHF/UHF-TV antennas, most notably from Winegard, have been introduced that will substantially improve reception. These antennas are designed specifically for channels 7-13 on what remains of the VHF-TV band and 14-69 on the UHF-TV band. Since these antennas don't have to try to pick up channels 2-6, they're noticeably less wide.

Winegard SS2000 Square Shooter amplified antenna ($144) mounts just about anywhere, indoors or out with a range of 40-50 miles. (Courtesy: Winegard Direct)

Of special interest to those in apartments or places with restrictive covenants is Winegard's Square Shooter SS2000. It's built around their original SS1000, but with a 12 dB amplifier built in. It's designed for UHF reception, and, though the amplifier will pass VHF signals, don't expect the same performance on those channels as on UHF.

The SS2000 is a directional antenna, so you'll have to determine which direction to orient the antenna for best results. It comes with mounting hardware, similar to that used on small dish satellite-TV systems. Using the mounting post will make it much easier to focus on the best direction for maximum signal.

❖ Where's the Transmitter?

TV transmitters are scattered all over. They can be in any direction around a major

metro area. That means that you may need to rotate your antenna for best reception results. With luck, you may not need an antenna rotator to tune in all your local stations, but it could make all the difference in being able to maintain a solid digital signal without dropouts.

But, how can you find out exactly where all your local transmitters are? Luckily, there's a great web site maintained by the FCC that's easy to use and tells you all you need to know about your local TV stations. To find out which TV stations you should be able to receive from your location go here: **www.fcc.gov/bureaus/mb/engineering/maps/index.html?zipCode=**. Simply enter your Zip code in the box at the top, and a list of stations that you should be able to receive will appear on the left side of the page. This list shows the station's call sign, network affiliation, estimated signal strength in bars, virtual channel assignment, and band (VHF Hi/Lo or UHF).

There will also be a Google map on the right which will indicate your location by the familiar red Google map pin. By clicking on any of the stations in the list on the left, the map will change to show the location of the actual transmitter site of that station and a dark line between it and your location. The list then changes to show the actual RF channel of the station selected; the compass direction to the tower, and received power listed in -dBm.

Further clicking on the "gain/loss map," as indicated, will bring up an official FCC map showing the coverage area of the station and other pertinent information based on that station's license such as power output and antenna height above average terrain (HAAT). It's a wealth of information that will help you position your antenna and learn just how much more of an antenna system you'll need to lock a distant TV signal.

❖ Future Spectrum Use

There are quite a few deep-pocketed money interests in this country that hope to cash in on two new revenue streams: rural broadband Internet access and mobile digital TV. The rural broadband push is an effort to bring areas of the country – not currently wired for broadband Internet service – the chance to catch up. This plan will require billions of dollars in federal money and gobs of bandwidth. We've seen how the FCC, in conjunction with cable-TV and satellite-TV interests, hopes to accomplish this. Even now, there are on-going experiments using existing technology that allow for high-speed Internet access in parts of what used to be the VHF-TV band, now known as "white spaces." It's not clear, though, exactly where the money will come from.

And, for reasons yet explained, we are told that Americans are going to be spending more time looking at digital TV signals while mobile. That's the assumption of those writing the new broadcast spectrum rules. Maybe traffic will move so slowly that we'll be able to push our seats back and tune into to re-runs of *America's Got Talent* or *Who Wants to be a Millionaire* while waiting for our lane to start

moving. Or, that we'll become so amazingly talented that we can drive, chat on our phones, text our friends *and* watch sitcoms or TV chat shows while driving. Regardless of how or why it will happen, it will happen.

❖ Entertainment on Shortwave

MT reader Marc Ehrlich wrote that he was in the market for a shortwave radio and was interested in the Grundig G6. He commented, "Is there a shortwave radio station that has some music or comedians on it rather than boring newscasts or one sermon after another? It seems to me a lot of shortwave stations have gone out of business in favor of paid-for Internet subscriptions."

It's the saga of this age: Shortwave radio is considered old-age technology and entities that made their reputations on HF (BBC World Service is the most famous example) have opted for a future of subscription broadcasting whether it's on Sirius/XM or your local public radio station. If you want to listen, you have to pay. Of course, if you have a good enough receiver and a big enough antenna you can still catch the BBCWS broadcasts to Africa here in North America.

A lot has changed on the shortwave bands in the last 10 years, and much of it, from the shortwave listener's perspective, for the worse. Most well known international broadcasters such as BBWS, Deutsche Welle, Radio Netherlands Worldwide, etc. have stopped broadcasting to North America or, in some cases, left HF altogether. While there are several more U.S.-based shortwave stations broadcasting now than there were 10 years ago, the majority of the programming is religious. That's because independent shortwave broadcasters have to pay their bills each month and selling programming by the hour is a way to do that.

Music on shortwave suffers from the effects of wave propagation, atmospheric noise and interference to an extent that FM and even AM stations don't endure. That makes listening to music on shortwave, for many, less than enjoyable.

But, if you're interested in world music from all cultures and can get over the warbling audio, there's still a lot to hear, particularly from South America, Africa and the Mideast. But, you have to do a lot of hunting around. It's kind of like gold mining; you've got to move a lot of earth to get to the nuggets. To start your mining, pay attention MT's monthly *Programming Spotlight* column, as well as the shortwave guide on page 34 of *MT,* the *MTXtra* foreign language guide on page 48, and comprehensive frequency guide available to *MT Express* subscribers.

The most unusual shortwave station on the air today is WBCQ "The Planet," also known as Free Speech Radio. They operate on four different frequencies with schedules that may be found at **www.wbcq.com**. Click on "schedule". WBCQ airs a wide variety of programming including some very funny shows; programs about shortwave listening; HF pirate radio activity, and much more.

One thing to know is that reception on most small shortwave radios, such as the G6, is improved dramatically when attached to an outside antenna. But on some, particularly the cheapest of these sets, reception is actually degraded using an external antenna, as the strong signals swamp the front end of the receiver.

The Grundig G6 is a very popular radio and has been widely reviewed. One place to look for well-informed reviews is e-Ham.com. I found 29 reviews for the G6 and it received an average of 4 out of 5 stars in ratings. To read them all go here: **www.eham.net/reviews/detail/7534**. Another thing to know is that these reviews are quite subjective. Each person has his or her own criteria for performance and standards of reception so, one person may rate it a 1 star and the next a 5. Only by reading them all do you get a sense of the worth to attribute to the whole of the reviews.

Monitoring Times Assistant Editor, and consummate shortwave radio reviewer, Larry Van Horn, reviewed the G6 in the January 2009 issue of *MT* and was more critical. He gave the radio 2-1/4 stars out of 5. You can read his review on the *MT* web site in pdf format here: **http://monitoringtimes.com/mtfirstlook-G6-Aviator.pdf**.

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

Fred Waterer
fredwaterer@monitoringtimes.com
www.doghousecharlie.com/radio

Hooray for Hollywood!

The film industry has come a long way in 115 years from *L'arroseur arrosé* (or translated into English, "The Waterer Watered," what a catchy title!) a short film about the old hose gag (a gardener is using a hose, a boy steps on the hose, gardener peers into said hose, whereupon the boy steps off, squirting the man in the face and making the career of Benny Hill). Quaint by today's standards, it was the *Avatar* of its day.

There has always been a symbiotic relationship between radio and film. Radio was used to promote films and film stars almost from the beginning. Radio would often be pumped into theaters between features. For many years, the popular Lux Radio Theatre created radio versions of the latest films.

And then there is the film critic, many of whom became stars in their own right. In light of the recent Academy Awards ceremony, I thought we'd shine the *Programming Spotlight* this month on film criticism and movie reviews, among other topics.

BBC - The Film Programme

This BBC Radio 4 program is probably the best of the bunch. Host Francine Stock manages to interview top actors and filmmakers in every episode. Just a few recent ones include Leonardo DiCaprio, *Lord of the Rings* director Peter Jackson, and actor Morgan Freeman on playing Nelson Mandela.

This half hour packs a lot into each broadcast. Not strictly a movie review program, it provides a lot of background information on "how they do that", from setting the mood with music to acting techniques. And the movies they do review are not limited to Hollywood, but include the latest European films, too. If you have an interest in films, this is the place to start.

The Film Programme is heard at 1630 UTC Fridays or on demand at any time at **www.bbc.co.uk/programmes/b006r5jt**

The Film Programme also maintains an extensive archive, and is in fact one of the few BBC programs that allow you to listen to past programs going back, not weeks but years. This archive can be accessed at **www.bbc.co.uk/radio4/features/the-film-programme/recommendations/** It is a treasure trove of film reviews and information.

Radio Australia/ABC – Movie Time

Heard on Radio National and Radio Australia, the program presents another viewpoint on the cinema world. Hosted by Julie Rigg, it's another program that reminds the listener that films are made outside of Hollywood, too. Rigg has covered film for the ABC as a broadcaster and critic since 1991. Recent topics included the travails of an arrested filmmaker in Iran and a variety of movie reviews.

She does not pull her punches when it comes to having opinions about films: if she likes it she tells you and if she doesn't like it…she tells you! And she tends to cover a lot of films that I haven't seen, but would like to, after hearing her comments. More movie reviews are presented here than on the BBC program. It was nice to hear reviews for one of the foreign films from Argentina, recently nominated for an Academy Award. One wouldn't hear that on most American or Canadian programs.

Segments include Trash & Treasure, in which critics are invited to discuss an underrated, under appreciated, or over-hyped film.

Jason Di Rosso also contributes to the program and occasionally sits in when Julie is away.

The program can be heard on shortwave on UTC Sundays at 0330 and 0630, and UTC Fridays at 1405. 15240 kHz for the Sunday broadcasts and 9590 kHz on Fridays may be your best bets. Consult Gayle Van Horn's *Shortwave Guide* for up to date or alternate frequencies. The most recent four or five episodes can be heard on demand at **www.abc.net.au/rn/movietime/**

Like the BBC, there is also an extensive archive of material from the show at **www.abc.net.au/rn/movietime/index/** featuring reviews of many films, presented over the past few years, minus the audio.

Radio New Zealand - At The Movies

This program is presented by Simon Morris. Simon's name has popped up in this column before, as he is the co-host of *Matinee Idle*, the delightful RNZ National summer show. Simon pretty much sticks to movie reviews, each week discussing and sharing his opinions of a number of films. Many of the films are obscure, at least in North America, but that is not a bad thing.

One film he reviewed was Norwegian, about the German occupation of that country during the war. Like the Argentine film discussed by Julie Rigg, I now want to see this one. Simon makes you *want* to see (or in a few cases) avoid the films he discusses. Funny and clever he is, and he knows his stuff. A good listen indeed!

At the Movies is heard Wednesdays at 730pm local, 0630 UTC, during *Nights with Bryan Crump*, Sundays at 1pm local, 0000 UTC during *The Arts on Sunday* with Lynn Freeman, and 1220 am local Tuesdays (1120 UTC Mondays) during the *All Night Programme.*

US, WBEN - The Movie Show

This is perhaps the funniest, and for those outside Southern Ontario/Western New York region probably the most obscure, movie show. Which is too bad. Co-hosted by WBEN (and Buffalo) broadcast legend Sandy Beach and movie reviewer "Cinema Bob" Stilson, it can be heard Fridays between 5 and 6 pm Eastern Time on WBEN 930, or online at **www.wben.com** The program is usually repeated on Sunday evenings during the "Best of WBEN" programming block between 7 and 10pm Sunday nights.

Bob Stilson is an excellent movie reviewer, and he has an amazing sense of humor. The chemistry he has with Sandy Beach makes this one of my highlights of the week. As the only one hour show in the genre, Cinema Bob has the time to review just about every current film showing in Western NY. Sometimes Bob's movie reviews or segments of the show are posted as audio files on the WBEN website as well.

Taken by themselves, any one of these programs is very good. Taken all together, they give the listener a broad overview of current films, film news and the state of the film industry.

And, if you are tired of Hollywood and the hype machine, one can always return to the roots of film: ***The Waterer and the Watered*** (love that name!)…but be advised, while this is a comedy short, the boy who plays the joke does get spanked at the end. The birth of film violence! **www.youtube.com/watch?v=Ei6nJfXAuHQ**

❖ Social Media

I was reading Skip Arey's excellent *On the Ham Bands* column for March, and I'd like to echo some of his comments on the usefulness of social media sites on the internet, such as Facebook, myspace and Twitter. These are not only handy for radio hams, but for anyone who enjoys radio.

I'm not a "bandwagon jumper," so when Facebook first started showing up on my radar, I resisted signing up, assuming it was just a bunch of kids enjoying the fad of the month. A friend kept pestering me to join, so to get her off my back, I created an account, with a bunch of

silly personal details (I believe it still says I am a retired Swiss navy admiral). But as I played around with it, and as it became a bigger phenomenon, I really came to enjoy the Facebook experience. And I also discovered that it has many useful applications for the radio fan.

First it provides an opportunity to network with others in the hobby community. Many familiar names in the DX community have Facebook pages, including people like Victor Goonetillike, Alokesh Gupta, Richard Cuff, John Figliozzi, Maryanne Kehoe, to name a few. Many of the columnists and contributors here at *Monitoring Times* also have Facebook pages.

Second, many broadcasters have Facebook pages, where they not only discuss what they are working on as broadcasters, but you also get a taste of their other interests too. It's a great opportunity to keep up to date with people like Keith Perron of the new *Happy Station* program.

Then there are the fan pages and groups. Many stations, programs and personalities have Facebook pages. Just a few of these include Deutsche Welle, Radio France Internationale, Radio Prague, Radio Taiwan International, Radio Romania International and many more. Programs with pages include VoA's *Sonny Side of Sports*, *The State We're In* from Radio Netherlands and *Spark* from CBC Radio. There are also groups dedicated to preserving stations, like the Save Radio Prague group, or the Save Radio New Zealand group, which they recently pointed out, now has more fans than the New Zealand Prime Minister!

The Radio 4VEH, The Evangelistic Voice of Haiti page was heartbreaking to read after the devastating earthquake that hit that country.

Other social networking sites are also useful. The Studio 15 program of Polish Radio has a myspace page, but it hasn't been updated since May 2009. Twitter is a useful little website, which I use mostly for news. I get news updates, and program updates from BBC, DW, RFI and ABC Australia, among others.

Many times, I have discovered a useful tip from a DX friend, a link to a program, heads up on an upcoming show or a news report from a broadcaster, that I would have missed otherwise, thanks to these social networks. Facebook and Twitter I use almost every day to enhance my listening, trade puns with Skip Arey and learn more about my friends. They are both excellent resources, but with the caveat that what you post online can be visible to a wide audience. A little tinkering with the privacy settings at the beginning is prudent indeed.

❖ Pick of the Month

Talk Radio One

It is billed as "entertaining, informative, irreverent talk radio." I stumbled onto this via, well, Facebook, a few weeks ago. I had "friended" Regan Burns, an actor and comedian who does movie reviews on *The Marc Germain Show*. You may remember Regan from a short-lived game show called "Oblivious." He also plays the obnoxious son-in-law on the Capital One commercials, who shows up ready to celebrate ALL the holidays at once. Burns posted to Facebook one night that he would be on *Talk Radio One* in a few minutes so I dialed it up. I've tuned in every week since.

It's an eclectic mix of personalities. Apparently Germain has a background in LA Radio at KFI and KABC. Dan Avey, who seems to be an older gentleman, joins him. Regan Burns does movie reviews, as mentioned, and Dina Losito makes up the fourth member of the crew. They seem to agree to disagree on a lot of things, Dina seems quite liberal, and Dan seems quite conservative, without a lot of shouting over each other. It's talk with a difference. I haven't listened to other shows at other times, but I quite enjoy what I have heard. **www.talkradioone.com/**

❖ What's New

Voice of Russia - Road to Victory

On March 1, 2010, the Voice of Russia began a new series entitled *Road to Victory*, dedicated to the 65th anniversary of the victory of Soviet arms over Hitler's armies in the "Great Patriotic War", the war we know as World War II. Presented by Olga Troshina, the program looks to be quite interesting, relying on first hand accounts of veterans and witnesses to the conflict.

The first episode included memories from Carl Watts, who was too young to have been a combatant, grew up in Canada, and may be the only person who was ever a member of both the Royal Canadian Air Cadets and the Red Air Force! As near as I can tell, the program is only available online. Listen at **http://english.ruvr.ru/radio_broadcast/4877630/**

Nash Holos, Finally Friday and The Stuph File

Three new programs are available from Keith Perron's PCJ Media. Keith is known for reviving the *Happy Station* program. So far these programs appear to be online only, available for download, or subscription through iTunes.

Nash Holos (Our Voice in Ukrainian) is a bilingual Ukrainian themed program originating in Vancouver, BC. The program is hosted by Paulette ("Pawlina") Demchuk MacQuarrie

Finally Friday is a music program catering to listeners' requests, based in Capetown, South Africa. The music spans the 1950s to the 1990s. It is hosted by Neil Hendrickse. A casual tuning of the program included music from Katrina and the Waves and some other tunes not familiar to me but quite enjoyable, with quite a variety of styles from "easy listening" to dance to rock to pop. I have subscribed to the program using iTunes and will be listening as new episodes come out.

The Stuph File is an eclectic program featuring "interviews and odd news." It is hosted by Peter Anthony Holder who seems to have had quite a career in the Montreal region. The most recent episode included interviews with a sports psychologist who has worked with Olympians, and a guy who started a website contest for potential employers worthy of hiring *him*! Interesting stuff.

You can access links to **Nash Holos, Finally Friday** and **The Stuph File** via the PCJ Media website at **www.pcjmedia.com/**

Deutsche Welle - Quadriga

New to the DW radio programming lineup, **Quadriga** appears to originate at DW-TV. DW Radio is rebroadcasting the audio of this program, billed as "The International Talk Show." Episodes in March looked at tackling speculators on the financial markets, and the elections in Iraq. Kind of like a European version of the US Sunday TV talk shows.

Quadriga may be heard for Africa on 6180, 7430, 9700 and 9825 kHz at 0530 UTC Saturdays or 9735 kHz at 2130 also on UTC Saturdays. It can also be heard on demand at the DW website at **www.dw-world.de/dw/0,,4703,00.html**

James Dobson Signs Off

In late February, James Dobson did his final broadcast of the **Focus on the Family** program. Reportedly new leadership at Focus on the Family is looking to soften the group's message. Dobson has been the show's host for three decades, heard on numerous radio stations in the US and Canada and on shortwave.

There has been some speculation as to whether he was retiring or he was eased out the door by the board. Reportedly he is launching a new program with his son as co-host, perhaps competing for the same audience as **Focus on the Family**. It will be interesting to follow this story. By the way, I was tipped off to this story via Twitter!

How to Use the Shortwave Guide

0000-0100 twhfa USA, Voice of America 5995am 6130ca 7405am 9455af

① ② ⑤ ③ ④ ⑥ ⑦

Convert your time to UTC.

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Standard Time) 5, 6, 7 or 8 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all *dates*, as well as times, are in UTC; for example, a show which might air at 0030 UTC *Sunday* will be heard on *Saturday* evening in America (in other words, 7:30 pm Eastern, 6:30 pm Central, etc.).

Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. English broadcasts are listed by UTC time on ① , then alphabetically by country ③, followed by the station name ④. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not *daily*, the days of broadcast ⑤ will appear in the column following the time of broadcast, using the following codes:

Codes	
s/Sun	Sunday
m/Mon	Monday
t	Tuesday
w	Wednesday
h	Thursday
f	Friday
a/Sat	Saturday
occ:	occasional
DRM:	Digital Radio Mondiale
irreg	Irregular broadcasts
vl	Various languages
USB:	Upper Sideband

Choose the most promising frequencies for the time, location and conditions.

The frequencies ⑥ follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions. But they can also change in response to short-term conditions, interference, equipment problems, etc. Our frequency manager coordinates published station schedules with confirmations and reports from her monitoring team and *MT* readers to make the Shortwave Guide up-to-date as of one week before print deadline.

To help you find the most promising signal for your location, immediately following each frequency we've included information on the target area ⑦ of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

Target Areas
- af: Africa
- al: alternate frequency (occasional use only)
- am: The Americas
- as: Asia
- ca: Central America
- do: domestic broadcast
- eu: Europe
- me: Middle East
- na: North America
- pa: Pacific
- sa: South America
- va: various

Mode used by all stations in this guide is AM unless otherwise indicated.

MT MONITORING TEAM

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Additional Contributors to This Month's Shortwave Guide:

Thank You to …

BCL News; DX Asia; British DX Club; Cumbre DX; DSWCI-DX Window, Hard-Core DX; Radio Bulgaria DX Mix News; Media Broadcast, WWDXC- BC DX, Top News; World DX Club/Contact; World Radio TV Handbook.

Alexey Zinevich; Alokesh Gupta, New Delhi, India; Ron Howard, Asilomar Beach, CA; Ivo Ivanov; Bulgaria; Jaisakthivel, Chennai, India; Mike Barraclough, UK; Rachel Baughn/MT; Rich D' Angelo/NASWA Flash Sheet, NASWA Journal; PTSW; Tom Taylor, UK; Wolfgang Büeschel, Germany.

Shortwave Broadcast Bands

kHz	Meters
2300-2495	120 meters (Note 1)
3200-3400	90 meters (Note 1)
3900-3950	75 meters (Regional band, used for broadcasting in Asia only)
3950-4000	75 meters (Regional band, used for broadcasting in Asia and Europe)
4750-4995	60 meters (Note 1)
5005-5060	60 meters (Note 1)
5730-5900	49 meter NIB (Note 2)
5900-5950	49 meter WARC-92 band (Note 3)
5950-6200	49 meters
6200-6295	49 meter NIB (Note 2)
6890-6990	41 meter NIB (Note 2)
7100-7300	41 meters (Regional band, not allocated for broadcasting in the western hemisphere) (Note 4)
7300-7350	41 meter WARC-92 band (Note 3)
7350-7600	41 meter NIB (Note 2)
9250-9400	31 meter NIB (Note 2)
9400-9500	31 meter WARC-92 band (Note 3)
9500-9900	31 meters
11500-11600	25 meter NIB (Note 2)
11600-11650	25 meter WARC-92 band (Note 3)
11650-12050	25 meters
12050-12100	25 meter WARC-92 band (Note 3)
12100-12600	25 meter NIB (Note 2)
13570-13600	22 meter WARC-92 band (Note 3)
13600-13800	22 meters
13800-13870	22 meter WARC-92 band (Note 3)
15030-15100	19 meter NIB (Note 2)
15100-15600	19 meters
15600-15800	19 meter WARC-92 band (Note 3)
17480-17550	17 meter WARC-92 band (Note 3)
17550-17900	17 meters
18900-19020	15 meter WARC-92 band (Note 3)
21450-21850	13 meters
25670-26100	11 meters

Notes

Note 1 Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.

Note 2 Broadcasters can use this frequency range on a (NIB) non-interference basis only.

Note 3 WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007

Note 4 WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide

0000 UTC - 8PM EDT / 7PM CDT / 5PM PDT

0000	0020		Japan, NHK World/ Radio Japan				5920eu
			5960eu	6145na	13650as		17810as
0000	0030		Australia, HCJB Global		15400as		
0000	0030		Egypt, Radio Cairo7580na				
0000	0030		Thailand, Radio Thailand World Service				9680na
0000	0030		USA, Voice of America		7405as		
0000	0030		USA, Voice of America/Special English				6180as
			9325as	9620as	9715as		11695as
			12005as	15185as	15205as		15290as
			17820as				
0000	0045		India, All India Radio		6055as		7305as
			9705as	11645as			
0000	0045		USA, WYFR/Family Radio Worldwide				6085na
			11720sa				
0000	0057		Canada, Radio Canada International				9880as
0000	0057		China, China Radio International				6005na
			6020na	6180na	7350as		7425as
			9425as	9570as	11650as		11885as
			11730as	11790as			
0000	0100	twhfas	Albania, Radio Tirana		7425na		
0000	0100		Anguilla, Worldwide Univ Network				6090am
0000	0100		Australia, ABC NT Alice Springs				4835do
0000	0100		Australia, ABC NT Katherine		5025do		
0000	0100		Australia, ABC NT Tennant Creek				4910do
0000	0100		Australia, Radio Australia		9660as		12080pa
			13690pa	15240pa	17715pa		17750as
			17665as	17795pa			
0000	0100		Bahrain, Radio Bahrain		6010me		9745al
0000	0100		Bulgaria, Radio Bulgaria		5900na		7400na
0000	0100		Canada, CFRX Toronto ON		6070na		
0000	0100		Canada, CFVP Calgary AB		6030na		
0000	0100		Canada, CKZN St John's NF		6160na		
0000	0100		Canada, CKZU Vancouver BC		6160na		
0000	0100		Germany, Deutsche Welle		9885as		15595as
			17525as				
0000	0100		Malaysia, RTM/Traxx FM		7295do		
0000	0100		New Zealand, Radio NZ International				15720pa
0000	0100	DRM	New Zealand, Radio NZ International				17675pa
0000	0100		Russia, Voice of Russia		6240eu		7250eu
0000	0100		Spain, Radio Exterior de Espana				6055na
0000	0100		UK, BBC World Service		5970as		6195as
			7360as	9410as	9740as		13735as
			15335as	15360as			
0000	0100		USA, American Forces Network				4319usb
			5446usb	5765usb	6350usb		7812usb
			10320usb	12133usb	12759usb		13362usb
0000	0100		USA, EWTN/WEWN Vandiver AL				15610af
0000	0100		USA, WBCQ Monticello ME		5110am		7415am
0000	0100		USA, WHRI Cypress Creek SC		5875na		7385na
0000	0100		USA, WINB Red Lion PA		9265ca		
0000	0100		USA, WJHR International Milton FL				15550usb
0000	0100	vl	USA, WRMI Miami FL		9955va		
0000	0100		USA, WTJC Newport NC		9370na		
0000	0100		USA, WTWW Lebanon TN		5755na		
0000	0100		USA, WWCR Nashville TN		5070na		7465na
			9980na	13845na			
0000	0100		USA, WWRB Manchester TN		3185na		3215na
			5050am	5745af			
0000	0100		USA, WYFR/Family Radio Worldwide				5950na
			7360ca	9505na	9595na		15440na
0000	0100		Zambia, 1 Africa Radio/CVC		4965af		
0005	0100	twhfa	Canada, Radio Canada International				9755na
0010	0100	m	Greece, Voice of Greece		7475va		9420va
0030	0100		Australia, Radio Australia		15415as		
0030	0100		Thailand, Radio Thailand World Service				12095na
0030	0100	fas	UK, Bible Voice Broadcasting		6030as		
0030	0100		USA, Voice of America		6170va		
0030	0100		USA, Voice of America/Special English				6170as
0030	0100		Uzbekistan, CVC Intl/ The Voice Asia				7395as

0100 UTC - 9PM EDT / 8PM CDT / 6PM PDT

0100	0104		Canada, Radio Canada International				9755na
0100	0127		Czech Republic, Radio Prague		7355na		
0100	0127		Slovakia, Radio Slovakia International				6040na
			9440sa				
0100	0130		Australia, Radio Australia		9660as		12080pa
			13690pa	15240pa	15415as		17715pa
			17750as	17795pa			
0100	0130		Vietnam, Voice of Vietnam		6175na		
0100	0156		Romania, Radio Romania International				6145na
			9800na				
0100	0157		Canada, Radio Canada International				6040as
			6165as				
0100	0157	DRM	China, China Radio International				6080na
0100	0157		North Korea, Voice of Korea		7140as		9345as
			9730as	11735sa	13760sa		15180sa
0100	0200		Anguilla, Worldwide Univ Network				6090am
0100	0200		Australia, ABC NT Alice Springs				4835do
0100	0200		Australia, ABC NT Katherine		5025do		
0100	0200		Australia, ABC NT Tennant Creek				4910do
0100	0200		Australia, HCJB Global		15400as		
0100	0200		Bahrain, Radio Bahrain		6010me		9745al
0100	0200		Canada, CFRX Toronto ON		6070na		
0100	0200		Canada, CFVP Calgary AB		6030na		
0100	0200		Canada, CKZN St John's NF		6160na		
0100	0200		Canada, CKZU Vancouver BC		6160na		
0100	0200		China, China Radio International				6005as
			6020eu	6080eu	6175as		7350as
			9570na	9580as	11650as		11730as
			11885as				
0100	0200		Cuba, Radio Havana Cuba		6000na		6140na
0100	0200		Malaysia, RTM/Traxx FM		7295do		
0100	0200		New Zealand, Radio NZ International				15720pa
0100	0200	DRM	New Zealand, Radio NZ International				17675pa
0100	0200		Russia, Voice of Russia		6240eu		7250eu
0100	0200		Sri Lanka, SLBC	6005as		9770as	15745as
0100	0200		Taiwan, Radio Taiwan International				11875as
0100	0200		UK, BBC World Service		5940as		5970as
			9410as	9740as	12020as		12070as
			15335as	15360as	17615as		
0100	0200		Ukraine, Radio Ukraine International				7440na
0100	0200		USA, American Forces Network				4319usb
			5446usb	5765usb	6350usb		7812usb
			10320usb	12133usb	12759usb		13362usb
0100	0200		USA, EWTN/WEWN Vandiver AL				11520me
0100	0200		USA, Voice of America		7325va		9435va
			11705va				
0100	0200		USA, WBCQ Monticello ME		5110am		7415am
0100	0200		USA, WHRI Cypress Creek SC		5875na		7385na
0100	0200		USA, WINB Red Lion PA		9265ca		
0100	0200		USA, WJHR International Milton FL				15550usb
0100	0200	vl	USA, WRMI Miami FL		9955va		
0100	0200		USA, WRNO New Orleans LA		7505am		
0100	0200		USA, WTJC Newport NC		9370na		
0100	0200		USA, WTWW Lebanon TN		5755na		
0100	0200		USA, WWCR Nashville TN		5070na		5935na
			7490na	9980na			
0100	0200		USA, WWRB Manchester TN		3185na		5050am
			5745af				
0100	0200		USA, WYFR/Family Radio Worldwide				7455na
			9505na	15440na			
0100	0200		Uzbekistan, CVC Intl/ The Voice Asia				7395as
0100	0200		Zambia, 1 Africa Radio/CVC		4965af		
0105	0110	m	Greece, Voice of Greece		7475va		9420va
			12105va				
0105	0200		Canada, Radio Canada International				9755na
0130	0145	twhfas	Albania, Radio Tirana		6130na		
0130	0158	mtwhfa	Serbia, International Radio of Serbia				6190na
0130	0200		Iran, Voice of Islamic Rep. of Iran				6120na
			7250na				
0130	0200	ta	USA, Voice of America/Special English				5960ca
			7405ca				
0140	0200		Vatican City State, Vatican Radio				5895as
			7335as				

0200 UTC - 10PM EDT / 9PM CDT / 7PM PDT

0200	0204		Canada, Radio Canada International				9755na
0200	0227		Czech Republic, Radio Prague		7355na		
0200	0227		Iran, Voice of Islamic Rep. of Iran				6120na
			7250na				
0200	0230		Thailand, Radio Thailand World Service				15275na
0200	0230		Uzbekistan, CVC Intl/ The Voice Asia				7395as
0200	0257		China, China Radio International				9550as
			11785as	13640as	15435as		
0200	0257		North Korea, Voice of Korea		13650as		15100as
0200	0258	DRM	Germany, Deutsche Welle		15205eu		
0200	0300		Anguilla, Worldwide Univ Network				6090am
0200	0300	twhfa	Argentina, Radio Nacional RAE				15345am
0200	0300		Australia, ABC NT Alice Springs				4835do
0200	0300		Australia, ABC NT Katherine		5025do		
0200	0300		Australia, ABC NT Tennant Creek				4910do
0200	0300		Australia, HCJB Global		15400as		
0200	0300		Australia, Radio Australia		9660pa		12080pa
			13690pa	15240pa	15415as		15515pa
			17750as	21725pa			
0200	0300		Bahrain, Radio Bahrain		6010me		9745al
0200	0300		Canada, CFRX Toronto ON		6070na		
0200	0300		Canada, CFVP Calgary AB		6030na		
0200	0300		Canada, CKZN St John's NF		6160na		

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0200	0300		Canada, CKZU Vancouver BC	6160na		
0200	0300		Cuba, Radio Havana Cuba	6000na	6140na	
0200	0300		Egypt, Radio Cairo6270na			
0200	0300		Malaysia, RTM/Traxx FM	7295do		
0200	0300		New Zealand, Radio NZ International			15720pa
0200	0300	DRM	New Zealand, Radio NZ International			17675pa
0200	0300		Philippines, PBS/ Radyo Pilipinas			11880me
			15285me	17770me		
0200	0300		Russia, Voice of Russia	6240eu	7250eu	
0200	0300	DRM	Russia, Voice of Russia	15735as		
0200	0300		South Korea, KBS World Radio			9580sa
0200	0300		Sri Lanka, SLBC 6005as	9770as	15745as	
0200	0300		Taiwan, Radio Taiwan International			5950na
			9680ca			
0200	0300		Uganda, UBC Radio	4976do		
0200	0300		UK, BBC World Service	5940as	6005af	
			6195me	9410as	15310as	
0200	0300		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0200	0300		USA, EWTN/WEWN Vandiver AL			11520me
0200	0300		USA, KJES Vado NM	7555na		
0200	0300		USA, WBCQ Monticello ME	5110am	7415am	
0200	0300		USA, WBCQ Monticello ME	5110am	7415am	
0200	0300		USA, WHRI Cypress Creek SC	5875na	7385na	
0200	0300		USA, WINB Red Lion PA	9265ca		
0200	0300		USA, WJHR International Milton FL			15550usb
0200	0300	vl	USA, WRMI Miami FL	9955va		
0200	0300		USA, WRNO New Orleans LA	7505am		
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WTWW Lebanon TN	5755na		
0200	0300		USA, WWCR Nashville TN	3215na	5070na	
			5890na	5935na		
0200	0300		USA, WWRB Manchester TN	3185na	5050am	
			5745af			
0200	0300		USA, WYFR/Family Radio Worldwide			4985na
			5930sa	5985na	6890na	7455na
			9505na	9525na		
0200	0300		Zambia, 1 Africa Radio/CVC	4965af		
0215	0230		Nepal, Radio Nepal	5005as		
0230	0255	Sun	China, Voice of the Strait	4940do	9505do	
0230	0300		Sweden, Radio Sweden	6010na	11550as	
0230	0300		Uzbekistan, CVC Intl/ The Voice Asia			11970as
0230	0300		Vietnam, Voice of Vietnam	6175na		
0245	0300	twhfas	Albania, Radio Tirana	6130eu		
0250	0300		Vatican City State, Vatican Radio			6040am
			7305am			

0300 UTC - 11PM EDT / 10PM CDT / 8PM PDT

0300	0315	Sun	Swaziland, TWR Africa	3200af		
0300	0330		Croatia, Voice of Croatia	7375va		
0300	0330		Egypt, Radio Cairo6270na			
0300	0330		Philippines, PBS/ Radyo Pilipinas			11880me
			15285me	17770me		
0300	0330		Sri Lanka, SLBC 6005as	9770as	15745as	
0300	0330		Vatican City State, Vatican Radio			7360af
			9660af			
0300	0357		China, China Radio International			6190na
			9460na	9690na	9790as	
0300	0357		North Korea, Voice of Korea	7140as	9345as	
			9730va			
0300	0400		Anguilla, Worldwide Univ Network			6090am
0300	0400		Australia, ABC NT Alice Springs			4835do
0300	0400		Australia, ABC NT Katherine	5025do		
0300	0400		Australia, ABC NT Tennant Creek			4910do
0300	0400		Australia, Radio Australia	9660as	12080pa	
			13690pa	15240pa	15415as	15515pa
			17750as	21725pa		
0300	0400		Bahrain, Radio Bahrain	6010me	9745al	
0300	0400		Bulgaria, Radio Bulgaria	5900na	7400na	
0300	0400	twhfas	Canada, CBC NQ SW Service	9625na		
0300	0400		Canada, CFRX Toronto ON	6070na		
0300	0400		Canada, CFVP Calgary AB	6030na		
0300	0400		Canada, CKZN St John's NF	6160na		
0300	0400		Canada, CKZU Vancouver BC	6160na		
0300	0400		Cuba, Radio Havana Cuba	6000na	6140na	
0300	0400		Germany, Deutsche Welle	12005as	15595as	
0300	0400	Sun	Greece, Voice of Greece	7475va	9420va	
0300	0400		Malaysia, RTM/Traxx FM	7295do		
0300	0400		New Zealand, Radio NZ International			15720pa
0300	0400	DRM	New Zealand, Radio NZ International			17675pa
0300	0400		Oman, Radio Oman	15355af		
0300	0400		Russia, Voice of Russia	6240eu	7250sa	
			12030eu	12040eu	13735eu	
0300	0400	DRM	Russia, Voice of Russia	15735as		
0300	0400		South Africa, Channel Africa	3345af	6120af	
0300	0400		Taiwan, Radio Taiwan International			5950na
			15320as			
0300	0400		Uganda, UBC Radio	4976do		
0300	0400		UK, BBC World Service	3255af	6005af	
			6105af	6145af	6190af	6195as
			7255af	7445af	9410as	12095as
			15310as	17790as		
0300	0400		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0300	0400		USA, EWTN/WEWN Vandiver AL			11520me
0300	0400		USA, Voice of America	4930af	6080af	
			9885af	15580af		
0300	0400		USA, WBCQ Monticello ME	5110am	7415am	
0300	0400		USA, WHRI Cypress Creek SC	5875na	7385na	
0300	0400		USA, WJHR International Milton FL			15550usb
0300	0400	vl	USA, WRMI Miami FL	9955va		
0300	0400		USA, WRNO New Orleans LA	7505am		
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WTWW Lebanon TN	5755na		
0300	0400		USA, WWCR Nashville TN	3215na	4840na	
			5890na	5935na		
0300	0400		USA, WWRB Manchester TN	3185na	5050am	
			5745af			
0300	0400		USA, WYFR/Family Radio Worldwide			7455na
			9505na	9930ca	9985eu	
0300	0400		Zambia, 1 Africa Radio/CVC	4965af		
0300	4000		Uzbekistan, CVC Intl/ The Voice Asia			11970as
0330	0400	twhfas	Albania, Radio Tirana	6150na		
0330	0400	Sun	Sri Lanka, SLBC 6005as	9770as	15745as	
0330	0400		Sweden, Radio Sweden	6010na		
0330	0400		UK, BBC World Service	11945af		
0330	0400		Vietnam, Voice of Vietnam	6175na		
0340	0400		Vatican City State, Vatican Radio			9545as
0345	0400	vl/Sat/Sun	Uganda, UBC Radio	4976do		

0400 UTC - 12AM EDT / 11PM CDT / 9PM PDT

0400	0427		Czech Republic, Radio Prague	7345na		
0400	0430		France, Radio France International			7315af
			9805af			
0400	0445		USA, WYFR/Family Radio Worldwide			7445na
			9505na			
0400	0455		Turkey, Voice of Turkey	6020va	6040me	
			7240na			
0400	0456		Romania, Radio Romania International			6130na
			7310na	9690as	11895as	
0400	0457		China, China Radio International			6190na
			9460na	13620as	15120as	17725as
			17855as			
0400	0458		New Zealand, Radio NZ International			15720pa
0400	0458	DRM	New Zealand, Radio NZ International			17675pa
0400	0500		Anguilla, Worldwide Univ Network			6090am
0400	0500		Australia, ABC NT Alice Springs			4835do
0400	0500		Australia, ABC NT Katherine	5025do		
0400	0500		Australia, ABC NT Tennant Creek			4910do
0400	0500		Australia, Radio Australia	9660pa	12080pa	
			13690pa	15240pa	15515pa	17750as
			21725pa			
0400	0500		Bahrain, Radio Bahrain	6010me	9745al	
0400	0500	twhfas	Canada, CBC NQ SW Service	9625na		
0400	0500		Canada, CFRX Toronto ON	6070na		
0400	0500		Canada, CKZN St John's NF	6160na		
0400	0500		Canada, CKZU Vancouver BC	6160na		
0400	0500		Cuba, Radio Havana Cuba	6000na	6140na	
0400	0500		Germany, Deutsche Welle	6180af	7240af	
			12045af	15400af		
0400	0500		Malaysia, RTM/Traxx FM	7295do		
0400	0500		Russia, Voice of Russia	6240ca	12030na	
			12040na	13735eu		
0400	0500	DRM	Russia, Voice of Russia	15735as		
0400	0500		South Africa, Channel Africa	7230af		
0400	0500	Sun	Sri Lanka, SLBC 6005as	9770as	15745as	
0400	0500		Uganda, UBC Radio	4976do		
0400	0500		UK, BBC World Service	3255af	6005af	
			6190af	7255af	7445af	9410as
			11945af	12035af	15310as	15360as
			17790as			
0400	0500		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0400	0500		USA, EWTN/WEWN Vandiver AL			11520me
0400	0500		USA, Voice of America	4930af	4960af	
			6080af	9885af	15580af	
0400	0500		USA, WBCQ Monticello ME	5110am	7415am	
0400	0500		USA, WHRI Cypress Creek SC	5875na	7385na	

0400	0500	Sat	USA, WHRI Cypress Creek SC	9640af		
0400	0500		USA, WJHR International Milton FL	15550usb		
0400	0500	vl	USA, WRMI Miami FL	9955va		
0400	0500		USA, WRNO New Orleans LA	7505am		
0400	0500		USA, WTJC Newport NC	9370na		
0400	0500		USA, WTWW Lebanon TN	5755na		
0400	0500		USA, WWCR Nashville TN	3215na	4840na	
			5890na	5935na		
0400	0500		USA, WWRB Manchester TN	3185na		
0400	0500		USA, WYFR/Family Radio Worldwide	6915na		
			9680na	9715na		
0400	0500		Uzbekistan, CVC Intl/ The Voice Asia	11970as		
0400	0500		Zambia, 1 Africa Radio/CVC	4965af	5915af	
0430	0457		Czech Republic, Radio Prague	9855va		
0430	0500	twhfas	Albania, Radio Tirana	6100na		
0430	0500		Australia, Radio Australia	15415as		
0430	0500	mtwhf	Swaziland, TWR Africa	3200af	4775af	
0455	0500		Nigeria, Voice of Nigeria/External Service	15120eu		
0459	0500		New Zealand, Radio NZ International	11725pa		
0459	0500	DRM	New Zealand, Radio NZ International	13730pa		

0500 UTC - 1AM EDT / 12AM CDT / 10PM PDT

0500	0507	twhfas	Canada, CBC NQ SW Service	9625na		
0500	0530	mtwhf	France, Radio France International	7315af		
			9805af	11995af		
0500	0530	DRM	France, Radio France International	11995af		
0500	0530		Germany, Deutsche Welle	6180af	7430af	
			9700af	9825af		
0500	0530		Japan, NHK World/ Radio Japan	5975eu		
			6110na	9770va	15325as	17810as
0500	0530		Vatican City State, Vatican Radio	7360af		
			9660af	11625af		
0500	0600		Anguilla, Worldwide Univ Network	6090am		
0500	0600		Australia, ABC NT Alice Springs	4835do		
0500	0600		Australia, ABC NT Katherine	5025do		
0500	0600		Australia, ABC NT Tennant Creek	4910do		
0500	0600		Australia, Radio Australia	9660pa	12080pa	
			13630as	13690pa	17750as	
0500	0600		Bahrain, Radio Bahrain	6010me	9745al	
0500	0600		Bhutan, Bhutan Broadcasting Service	6035as		
0500	0600		Canada, CFRX Toronto ON	6070na		
0500	0600		Canada, CKZN St John's NF	6160na		
0500	0600		Canada, CKZU Vancouver BC	6160na		
0500	0600		China, China Radio International	5960na		
			6190af	7220as	11880as	15350as
			15465as			
0500	0600	Sat/Sun	Clandestine, Sudan Radio Service/ SRS	13720af		
0500	0600		Cuba, Radio Havana Cuba	6000na	6010na	
			6060na	6140na		
0500	0600		Malaysia, RTM/Traxx FM	7295do		
0500	0600		New Zealand, Radio NZ International	11725pa		
0500	0600	DRM	New Zealand, Radio NZ International	13730pa		
0500	0600		Nigeria, Voice of Nigeria/External Service	15120eu		
0500	0600		Russia, Voice of Russia	9855na	9840na	
			12030na			
0500	0600	DRM	Russia, Voice of Russia	15735as		
0500	0600		South Africa, Channel Africa	7230af		
0500	0600		Swaziland, TWR Africa	3200af	4775af	
			6120af	9500af		
0500	0600		Taiwan, Radio Taiwan International	5950na		
0500	0600		Uganda, UBC Radio	4976do		
0500	0600		UK, BBC World Service	3255af	3995eu	
			5875eu	6005af	6190af	7255af
			9410as	11765af	11945af	12095eu
			15310as	15360as	17640af	17790as
0500	0600	smtwhf	UK, BBC World Service	15420af		
0500	0600		USA, American Forces Network	4319usb		
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0500	0600		USA, EWTN/WEWN Vandiver AL	11520me		
0500	0600		USA, Voice of America	4930af	6080af	
			9885af	15580af		
0500	0600		USA, WBCQ Monticello ME	5110am	7415am	
0500	0600	Sun	USA, WHRI Cypress Creek SC	11565va		
0500	0600		USA, WHRI Cypress Creek SC	5875na	7385af	
0500	0600		USA, WJHR International Milton FL	15550usb		
0500	0600	vl	USA, WRMI Miami FL	9955va		
0500	0600		USA, WTJC Newport NC	9370na		
0500	0600		USA, WTWW Lebanon TN	5755na		
0500	0600		USA, WWCR Nashville TN	3215na	4840na	
			5890na	5935na		
0500	0600		USA, WWRB Manchester TN	3185na		
0500	0600		USA, WYFR/Family Radio Worldwide	6915na		
			9680na			
0500	0600		Uzbekistan, CVC Intl/ The Voice Asia	11970as		
0500	0600		Zambia, 1 Africa Radio/CVC	4965af	7160af	
0515	0530		Rwanda, Radio Rwanda	6055do		
0530	0600		Thailand, Radio Thailand World Service	11730va		

0600 UTC - 2AM EDT / 1AM CDT / 11PM PDT

0600	0615	Sat/Sun	South Africa, TWR	11640af		
0600	0615	Sat/Sun	Swaziland, TWR Africa	11640af	6120af	
			9500af			
0600	0620		Vatican City State, Vatican Radio	4005eu		
			5965eu	7520eu		
0600	0630	Sat/Sun	Australia, Radio Australia	15180as	15290as	
			15415as			
0600	0630	mtwhf	France, Radio France International	9765af		
			13680af	15160af	15605af	
0600	0630	DRM	France, Radio France International	9765af		
			15160af			
0600	0630		Germany, Deutsche Welle	7325af	15275af	
0600	0630		Laos, Lao National Radio	7145as		
0600	0630		Uzbekistan, CVC Intl/ The Voice Asia	11970as		
0600	0645	mtwhf	South Africa, TWR	11640af		
0600	0645	mtwhf	Swaziland, TWR Africa	11640af		
0600	0657		China, China Radio International	6115af		
			11750af	11770as	11880as	13645as
			15145as	15350as	15465as	17505va
			17540as	17710as		
0600	0658		New Zealand, Radio NZ International	11725pa		
0600	0658	DRM	New Zealand, Radio NZ International	13730pa		
0600	0700		Anguilla, Worldwide Univ Network	6090am		
0600	0700		Australia, ABC NT Alice Springs	4835do		
0600	0700		Australia, ABC NT Katherine	5025do		
0600	0700		Australia, ABC NT Tennant Creek	4910do		
0600	0700		Australia, Radio Australia	9660pa	12080pa	
			13630as	13690pa	15160pa	15240pa
			17750as			
0600	0700		Bahrain, Radio Bahrain	6010me	9745al	
0600	0700		Canada, CFRX Toronto ON	6070na		
0600	0700		Canada, CFVP Calgary AB	6030na		
0600	0700		Canada, CKZN St John's NF	6160na		
0600	0700		Canada, CKZU Vancouver BC	6160na		
0600	0700		Cuba, Radio Havana Cuba	6000na	6010na	
			6060na	6140na		
0600	0700		Greece, Voice of Greece	7475eu	9420eu	
			12105eu			
0600	0700		Malaysia, RTM/Traxx FM	7295do		
0600	0700		Malaysia, RTM/Voice of Malaysia	6175as		
			9750as	15295as		
0600	0700		Nigeria, Voice of Nigeria/External Service	15120eu		
0600	0700		Russia, Voice of Russia	9855na	9840na	
			12070na			
0600	0700	mtwh	Slovakia, IRRS/Euro Gospel Radio	5990va		
0600	0700		South Africa, Channel Africa	7230af	15255af	
0600	0700		Uganda, UBC Radio	7195do		
0600	0700		UK, BBC World Service	3995eu	5875eu	
			6005af	6190af	9860af	11760as
			11765af	12015af	12095eu	15310as
			17640af	17790as		
0600	0700	Sat/Sun	UK, BBC World Service	15420af		
0600	0700	DRM	UK, BBC World Service	3995eu		
0600	0700		Ukraine, Radio Ukraine International	7440na		
0600	0700		USA, American Forces Network	4319usb		
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0600	0700		USA, EWTN/WEWN Vandiver AL	11520me		
0600	0700		USA, Voice of America	6080af	9885af	
			15580af			
0600	0700		USA, WBCQ Monticello ME	5110am	7415am	
0600	0700		USA, WHRI Cypress Creek SC	5875na	7465na	
			9615af			
0600	0700		USA, WJHR International Milton FL	15550usb		
0600	0700	vl	USA, WRMI Miami FL	9955va		
0600	0700		USA, WTJC Newport NC	9370na		
0600	0700		USA, WTWW Lebanon TN	5755na		
0600	0700		USA, WWCR Nashville TN	3215na	4840na	
			5890na	5935na		
0600	0700		USA, WWRB Manchester TN	3185na		
0600	0700		USA, WYFR/Family Radio Worldwide	5745sa		
			6000ca	9680na	9985eu	11530va
0600	0700		Zambia, 1 Africa Radio/CVC	6065af	13590af	
0630	0656		Romania, Radio Romania International	7370eu		
			17780pa	21600pa		
0630	0656	DRM	Romania, Radio Romania International	6020eu		
0630	0700		Australia, Radio Australia	15415as		
0630	0700		Uzbekistan, CVC Intl/ The Voice Asia	15700as		
0630	0700		Vatican City State, Vatican Radio	7360af		

			9660af	11625af		
0645	0700	Sun	Germany, TWR Europe	6105eu		
0645	0700	Sun	Monaco, TWR Europe	9800eu		
0659	0700		New Zealand, Radio NZ International	9765pa		
0659	0700	DRM	New Zealand, Radio NZ International	9870pa		

0700 UTC - 3AM EDT / 2AM CDT / 12AM PDT

0700	0705		Croatia, Voice of Croatia	6165eu		
0700	0727		Slovakia, Radio Slovakia International 15460va			13715va
0700	0730	mtwhf	France, Radio France International			15605af
0700	0730	Sun	UK, Bible Voice Broadcasting	5945eu		
0700	0745		USA, WYFR/Family Radio Worldwide 5950na			5745sa
0700	0750	Sun	Germany, TWR Europe	6105eu		
0700	0750	mtwhf	Germany, TWR Europe	6105eu		
0700	0750	mtwhf	Monaco, TWR Europe	9800eu		
0700	0757		China, China Radio International			11785as
			11880as	13645as	15125eu	15350as
			15465as	17505as	17540as	17710as
0700	0800		Anguilla, Worldwide Univ Network			6090am
0700	0800		Australia, ABC NT Alice Springs			4835do
0700	0800		Australia, ABC NT Katherine	5025do		
0700	0800		Australia, ABC NT Tennant Creek			4910do
0700	0800		Australia, Radio Australia	9475as		9660pa
			9710as	11945pa	12080pa	13630as
			15160pa	15240pa		
0700	0800		Bahrain, Radio Bahrain	6010me		9745al
0700	0800	m	Belgium, TDP Radio	6015eu		
0700	0800		Canada, CFRX Toronto ON	6070na		
0700	0800		Canada, CFVP Calgary AB	6030na		
0700	0800		Canada, CKZN St John's NF	6160na		
0700	0800		Canada, CKZU Vancouver BC	6160na		
0700	0800		Cuba, Radio Havana Cuba	6060na		
0700	0800	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0700	0800	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0700	0800	DRM	Germany, Deutsche Welle	3995eu		6130eu
0700	0800		Greece, Voice of Greece	12105va		
0700	0800		Malaysia, RTM/Traxx FM	7295do		
0700	0800		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0700	0800		Myanmar, Myanma Radio	9730do		
0700	0800		New Zealand, Radio NZ International			9765pa
0700	0800	DRM	New Zealand, Radio NZ International			9870pa
0700	0800		Palau, T8WH/WHRI/Sound of Hope Radio 13840as			
0700	0800	DRM	Russia, Voice of Russia	11635eu		
0700	0800		Russia, Voice of Russia	17665pa		17805pa
0700	0800		South Africa, Channel Africa	9625af		
0700	0800		Swaziland, TWR Africa	6120af		
0700	0800		Uganda, UBC Radio	7195do		
0700	0800		UK, BBC World Service	6190af		9860af
			11760me	11765af	13820af	15310af
			15400af	15575as	17790as	17830af
0700	0800	Sat/Sun	UK, BBC World Service	15420af		
0700	0800	Sat	UK, Bible Voice Broadcasting	5945eu		
0700	0800		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0700	0800		USA, EWTN/WEWN Vandiver AL			11520me
0700	0800		USA, WBCQ Monticello ME	5110am		7415am
0700	0800		USA, WHRI Cypress Creek SC	5875na		7385na
			7465eu			
0700	0800	Sun	USA, WHRI Cypress Creek SC	11565va		
0700	0800		USA, WJHR International Milton FL			15550usb
0700	0800	vl	USA, WRMI Miami FL	9955va		
0700	0800		USA, WTJC Newport NC	9370na		
0700	0800		USA, WTWW Lebanon TN	5755na		
0700	0800		USA, WWCR Nashville TN	3215na		4840na
			5890na	5935na		
0700	0800		USA, WWRB Manchester TN	3185na		
0700	0800		USA, WYFR/Family Radio Worldwide			5950na
			6915na	7455na	9495ca	11580va
0700	0800		Uzbekistan, CVC Intl/ The Voice Asia			15700as
0700	0800		Zambia, 1 Africa Radio/CVC	6065af		13590af
0715	0750	Sat	Germany, TWR Europe	6105eu		
0715	0750	Sat	Monaco, TWR Europe	9800eu		
0730	0745		Vatican City State, Vatican Radio			4005eu
			5965eu	7250eu	9645eu	11740eu
			15595eu			
0730	0800		Australia, HCJB Global	11750as		
0730	0800		Bulgaria, Radio Bulgaria	5900eu		7400eu
0730	0800		Clandestine, Cotton Tree News			11875af
0745	0800	f	UK, Bible Voice Broadcasting	5945eu		

0800 UTC - 4AM EDT / 3AM CDT / 1AM PDT

0800	0827		Czech Republic, Radio Prague	7345eu		
0800	0830		Australia, ABC NT Alice Springs			4835do
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek			4910do
0800	0830		Myanmar, Myanma Radio	9730do		
0800	0830	Sun	UK, Bible Voice Broadcasting	5945eu		
0800	0845	Sat	UK, Bible Voice Broadcasting	5945eu		
0800	0845		USA, WYFR/Family Radio Worldwide			11580va
0800	0857		China, China Radio International			9415as
			11785as	11880as	15350as	15465as
			15625as	15465as	15625as	17490eu
			17540as			
0800	0900		Anguilla, Worldwide Univ Network			6090am
0800	0900		Australia, HCJB Global	11750pa		
0800	0900		Australia, Radio Australia	5995pa		9475as
			9580pa	9590pa	9710pa	11945pa
			12080pa	13630as		
0800	0900		Bahrain, Radio Bahrain	6010me		9745al
0800	0900	t	Belgium, TDP Radio	6015eu		
0800	0900		Bhutan, Bhutan Broadcasting Service			6035as
0800	0900		Canada, CFRX Toronto ON	6070na		
0800	0900		Canada, CFVP Calgary AB	6030na		
0800	0900		Canada, CKZN St John's NF	6160na		
0800	0900		Canada, CKZU Vancouver BC	6160na		
0800	0900		China, Guangxi FBS/Beibu Bay Radio 9820as			5050as
0800	0900		Cuba, Radio Havana Cuba	6060na		
0800	0900	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0800	0900	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0800	0900	DRM	Germany, Deutsche Welle	9610eu		13810eu
			12005as			
0800	0900		Malaysia, RTM/Traxx FM	7295do		
0800	0900		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0800	0900		New Zealand, Radio NZ International			9765pa
0800	0900	DRM	New Zealand, Radio NZ International			9870pa
0800	0900		Nigeria, Voice of Nigeria/External Service			9690af
0800	0900		Palau, T8WH/WHRI/Sound of Hope Radio 13840as			
0800	0900	DRM	Russia, Voice of Russia	11635eu		
0800	0900		Russia, Voice of Russia	17650af		17665af
			17805af			
0800	0900	Sat	South Africa, Amateur Radio Mirror Intl			7205af
			17860af			
0800	0900	Sun	South Africa, Amateur Radio Mirror Intl			17860af
0800	0900		South Africa, Channel Africa	9625af		
0800	0900		South Korea, KBS World Radio			9570as
0800	0900		Uganda, UBC Radio	7195do		
0800	0900		UK, BBC World Service	6190af		9860af
			11760me	15310as	15400af	15575as
			17640af	17790as	17830af	21470af
0800	0900		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0800	0900		USA, EWTN/WEWN Vandiver AL			11520me
0800	0900		USA, KNLS Anchor Point AK	11765as		
0800	0900		USA, WBCQ Monticello ME	5110am		7415am
0800	0900		USA, WHRI Cypress Creek SC	5875na		7385na
			7465eu			
0800	0900	mtwh	USA, WHRI Cypress Creek SC	11565va		
0800	0900	Sun	USA, WHRI Cypress Creek SC	5875va		
0800	0900		USA, WJHR International Milton FL			15550usb
0800	0900	vl	USA, WRMI Miami FL	9955va		
0800	0900		USA, WTJC Newport NC	9370na		
0800	0900		USA, WTWW Lebanon TN	5755na		
0800	0900		USA, WWCR Nashville TN	3215na		4840na
			5890na	5935na		
0800	0900		USA, WWRB Manchester TN	3185na		
0800	0900		USA, WYFR/Family Radio Worldwide			5950na
			6915na	7455na		
0800	0900		Uzbekistan, CVC Intl/ The Voice Asia			15700as
0800	0900		Zambia, 1 Africa Radio/CVC	6065af		13590af
0820	0900	smtwhf	Guam, KTWR/TWR	15170as		
0830	0900		Australia, ABC NT Alice Springs			2310do
0830	0900		Australia, ABC NT Katherine	2485do		
0830	0900		Australia, ABC NT Tennant Creek			2325do
0830	0900	mtwhfa	Guam, KTWR/TWR	11840pa		

0900 UTC - 5AM EDT / 4AM CDT / 2AM PDT

0900	0910	mtwhfa	Guam, KTWR/TWR	11840pa		
0900	0930		Australia, HCJB Global	11750pa		
0900	0930		Japan, NHK World/ Radio Japan			9625pa
			9825pa	11815as	15590as	
0900	0930		Uzbekistan, CVC Intl/ The Voice Asia			15700as

0900	0957		China, China Radio International			9415as
			15210va	15270eu	15350as	17490eu
			17570eu	17690va	17750as	
0900	0959		Germany, Deutsche Welle		15640as	17820as
0900	1000		Anguilla, Worldwide Univ Network			6090am
0900	1000		Australia, ABC NT Alice Springs			2310do
0900	1000		Australia, ABC NT Katherine		2485do	
0900	1000		Australia, ABC NT Tennant Creek			2325do
0900	1000		Australia, Radio Australia		9475as	9580pa
			9590pa	11945pa		
0900	1000		Bahrain, Radio Bahrain		6010me	9745al
0900	1000	w	Belgium, TDP Radio		6015eu	
0900	1000		Canada, CFRX Toronto ON		6070na	
0900	1000		Canada, CFVP Calgary AB		6030na	
0900	1000		Canada, CKZN St John's NF		6160na	
0900	1000		Canada, CKZU Vancouver BC		6160na	
0900	1000		China, Guangxi FBS/Beibu Bay Radio			5050as
			9820as			
0900	1000		Cuba, Radio Havana Cuba		6060na	
0900	1000	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0900	1000	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0900	1000	2nd Sun	Germany, Blue Star Radio		6140eu	
0900	1000		Malaysia, RTM/Traxx FM		7295do	
0900	1000		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0900	1000		New Zealand, Radio NZ International			9765pa
0900	1000	DRM	New Zealand, Radio NZ International			9870pa
0900	1000		Nigeria, Voice of Nigeria/External Service			9690af
0900	1000		Palau, T8WH/WHRI/Sound of Hope Radio			
			13840as			
0900	1000		Russia, Voice of Russia		17605af	17665af
			17805af			
0900	1000	3rd Sat	Slovakia, IRRS/Radio City		9510va	
0900	1000	1st Sat	Slovakia, IRRS/Radio Joystick		9510va	
0900	1000		South Africa, Channel Africa		9625af	
0900	1000		Tajikistan, Voice of Tajik/External Svc			7245va
0900	1000		Uganda, UBC Radio		7195do	
0900	1000	DRM	UK, BBC World Service		9610eu	13810eu
0900	1000		UK, BBC World Service		6190af	6195as
			9740as	9860af	11760me	15310as
			15400af	15575as	17640af	17760as
			17830af	21470af		
0900	1000		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0900	1000		USA, EWTN/WEWN Vandiver AL			9390as
0900	1000		USA, WBCQ Monticello ME		5110am	7415am
0900	1000		USA, WHRI Cypress Creek SC		5875na	7385na
			7465eu			
0900	1000	Sun	USA, WHRI Cypress Creek SC		11565va	
0900	1000		USA, WJHR International Milton FL			15550usb
0900	1000	vl	USA, WRMI Miami FL		9955va	
0900	1000		USA, WTJC Newport NC		9370na	
0900	1000		USA, WTWW Lebanon TN		5755na	
0900	1000		USA, WWCR Nashville TN		3215na	4840na
			5890na	5935na		
0900	1000		USA, WWRB Manchester TN		3185na	
0900	1000		USA, WYFR/Family Radio Worldwide			5950na
			6915na	7455na	9465as	
0900	1000		Zambia, 1 Africa Radio/CVC		6065af	13590af
0930	1000		Saudi Arabia, BSKSA/Saudi Radio			15250af

1000 UTC - 6AM EDT / 5AM CDT / 3AM PDT

1000	1005		Croatia, Voice of Croatia		11675va	
1000	1025		China, Voice of the Strait		4940do	9505do
1000	1029		Czech Republic, Radio Prague		21745af	
1000	1030	Sat/Sun DRM	Bulgaria, Radio Bulgaria		11900eu	
1000	1030		Vietnam, Voice of Vietnam		9840as	12020as
1000	1057		China, China Radio International			5955na
			7215as	11640as	13590as	13720va
			15190as	15210as	15350as	17490eu
			17690va			
1000	1057		Netherlands, R Netherlands Worldwide			6040va
			9720as	12065as		
1000	1057		North Korea, Voice of Korea		11710sa	11735as
			13650as	15180sa		
1000	1058		New Zealand, Radio NZ International			9765pa
1000	1100		Anguilla, Worldwide Univ Network			11775am
1000	1100		Australia, ABC NT Alice Springs			2310do
1000	1100		Australia, ABC NT Katherine		2485do	
1000	1100		Australia, ABC NT Tennant Creek			2325do
1000	1100		Australia, Radio Australia		9475as	9580pa
			9590pa	11945pa		
1000	1100		Bahrain, Radio Bahrain		6010me	9745al
1000	1100	h	Belgium, TDP Radio		6015eu	
1000	1100		Canada, CFRX Toronto ON		6070na	
1000	1100		Canada, CFVP Calgary AB		6030na	
1000	1100		Canada, CKZN St John's NF		6160na	
1000	1100		Canada, CKZU Vancouver BC		6160na	
1000	1100		Cuba, Radio Havana Cuba		6060na	
1000	1100	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
1000	1100	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1000	1100	3rd Sun	Germany, European Music Radio			6140eu
1000	1100	4th Sun	Germany, Radio Gloria International			6140eu
1000	1100		India, All India Radio		7270as	13710pa
			15235as	15260as	17800as	17895pa
1000	1100		Indonesia, Voice of Indonesia		9526va	11785al
1000	1100		Malaysia, RTM/Traxx FM		7295do	
1000	1100	DRM	New Zealand, Radio NZ International			9870pa
1000	1100		Nigeria, Voice of Nigeria/External Service			9690af
1000	1100		Palau, T8WH/WHRI/Sound of Hope Radio			
			13840as			
1000	1100		Russia, Voice of Russia		7205af	17650af
			17665af	17805af		
1000	1100		South Africa, Channel Africa		9625af	
1000	1100		Uganda, UBC Radio		7195do	
1000	1100	Sat/Sun	UK, BBC World Service		15400af	17830af
1000	1100	DRM	UK, BBC World Service		9545eu	13810eu
1000	1100		UK, BBC World Service		6190af	6195as
			9545eu	9740as	9860af	11760me
			11895as	15310as	15575as	17640af
			17790as	21470af		
1000	1100		Ukraine, Radio Ukraine International			9950eu
1000	1100		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1000	1100		USA, EWTN/WEWN Vandiver AL			9390as
1000	1100		USA, KNLS Anchor Point AK		11765as	
1000	1100		USA, WBCQ Monticello ME		5110am	7415am
1000	1100		USA, WHRI Cypress Creek SC		7385na	7520eu
1000	1100	Sun	USA, WHRI Cypress Creek SC		11565va	
1000	1100		USA, WINB Red Lion PA		9265ca	
1000	1100		USA, WJHR International Milton FL			15550usb
1000	1100	vl	USA, WRMI Miami FL		9955va	
1000	1100		USA, WTJC Newport NC		9370na	
1000	1100		USA, WTWW Lebanon TN		5755na	
1000	1100		USA, WWCR Nashville TN		4840na	5890na
			5935na	9985na		
1000	1100		USA, WWRB Manchester TN		3185na	
1000	1100		USA, WYFR/Family Radio Worldwide			5950na
			6890na	6915na	7455na	9460as
			9465as			
1000	1100		Zambia, 1 Africa Radio/CVC		6065af	13590af
1015	1045	Sun	UK, Bible Voice Broadcasting		5910as	
1030	1100		Australia, HCJB Global		15400as	
1030	1100		Iran, Voice of Islamic Rep. of Iran			15460as
			17660as			
1030	1100		Mongolia, Voice of Mongolia		12085as	
1030	1100	Sun	Slovakia, IRRS/Euro Gospel Radio			9510va
1059	1100		New Zealand, Radio NZ International			13660pa

1100 UTC - 7AM EDT / 6AM CDT / 4AM PDT

1100	1105	mtwhf	Croatia, Voice of Croatia		7370va	
1100	1105		Pakistan, PBC/ Radio Pakistan		15100eu	17700eu
1100	1127		Iran, Voice of Islamic Rep. of Iran			15460as
			17660as			
1100	1130	Sat/DRM	South Korea, KBS World Radio			9760eu
1100	1130		Vietnam, Voice of Vietnam		7285as	
1100	1145		USA, WYFR/Family Radio Worldwide			5950na
			6000ca			
1100	1157		China, China Radio International			5955as
			5960na	6060as	9570as	11650as
			11795as	13590va	13645eu	13665eu
			13720as	17490va		
1100	1158	DRM	New Zealand, Radio NZ International			9870pa
1100	1200		Anguilla, Worldwide Univ Network			11775am
1100	1200		Australia, ABC NT Alice Springs			2310do
1100	1200		Australia, ABC NT Katherine		2485do	
1100	1200		Australia, ABC NT Tennant Creek			2325do
1100	1200		Australia, HCJB Global		15400as	
1100	1200		Australia, Radio Australia		5995pa	6020pa
			9475as	9560pa	9580pa	9590pa
			11945pa	12080pa	17880as	
1100	1200		Bahrain, Radio Bahrain		6010me	9745al
1100	1200	f	Belgium, TDP Radio		6015eu	
1100	1200	Sat/Sun	Canada, CBC NQ SW Service		9625na	
1100	1200		Canada, CFRX Toronto ON		6070na	
1100	1200		Canada, CFVP Calgary AB		6030na	
1100	1200		Canada, CKZN St John's NF		6160na	
1100	1200		Canada, CKZU Vancouver BC		6160na	
1100	1200	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
1100	1200	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af

SHORTWAVE GUIDE

1100	1200	DRM	Germany, Deutsche Welle	9545eu	13810eu
1100	1200		Malaysia, RTM/Traxx FM	7295do	
1100	1200		New Zealand, Radio NZ International		13660pa
1100	1200		Nigeria, Voice of Nigeria/External Service		9690af
1100	1200		Palau, T8WH/WHRI/Sound of Hope Radio		
			13840as		
1100	1200		Russia, Voice of Russia	7205af	
1100	1200		Saudi Arabia, BSKSA/Saudi Radio		15250af
1100	1200	Sun	Slovakia, IRRS/Euro Gospel Radio		9510va
1100	1200		South Africa, Channel Africa	9625af	
1100	1200		Taiwan, Radio Taiwan International		7445as
			11715as		
1100	1200		Uganda, UBC Radio	7195do	
1100	1200	Sat/Sun	UK, BBC World Service	15400af	
1100	1200		UK, BBC World Service	6190af	6195as
			9545eu	9605as	9740as	9860af
			11760me	11895as	15310as	15575as
			17640af	17790as	17830as	21470af
1100	1200		USA, American Forces Network		4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1100	1200		USA, EWTN/WEWN Vandiver AL		9390as
1100	1200		USA, WBCQ Monticello ME	5110am	7415am
1100	1200		USA, WHRI Cypress Creek SC	5875na	7385na
			7520eu		
1100	1200		USA, WINB Red Lion PA	9265ca	
1100	1200		USA, WJHR International Milton FL		15550usb
1100	1200	vl	USA, WRMI Miami FL	9955va	
1100	1200		USA, WTJC Newport NC	9370na	
1100	1200		USA, WTWW Lebanon TN	5755na	
1100	1200		USA, WWCR Nashville TN	4840na	5890na
			5935na	9985na	
1100	1200		USA, WWRB Manchester TN	3185na	
1100	1200		USA, WYFR/Family Radio Worldwide		6890na
			7455na	9670as	11725ca	11830sa
1100	1200		Zambia, 1 Africa Radio/CVC	6065af	13590af
1105	1200	Sun	Greece, Voice of Greece	9420va	15650va
1115	1130	mtwhf	UK, Bible Voice Broadcasting	5945as	
1115	1200		UK, Bible Voice Broadcasting	5945as	
1115	1200	Sat	UK, Bible Voice Broadcasting	5945as	
1130	1145	f	USA, Eternal Good News	15525as	
1130	1157		Czech Republic, Radio Prague	9880eu	
1130	1200	f	Vatican City State, Vatican Radio		15595as
			17765as		
1130	1200		Vietnam, Voice of Vietnam	9840as	12020as
1145	1200		Australia, HCJB Global	15340as	

1200 UTC - 8AM EDT / 7AM CDT / 5AM PDT

1200	1230		France, Radio France International		21620af
1200	1230		Germany, AWR Europe	15435as	
1200	1230		Japan, NHK World/ Radio Japan		6120na
			9625as	9695as	9790eu	
1200	1230		Saudi Arabia, BSKSA/Saudi Radio		15250af
1200	1245		USA, WYFR/Family Radio Worldwide		6890na
1200	1256		Romania, Radio Romania International		11970eu
			15105eu	15430af	17760af	
1200	1257		China, China Radio International		5955as
			7250as	9460as	9600as	9645as
			9730va	9760as	11650as	11690as
			11760va	11980as	12015as	13665eu
			13790eu	17490eu		
1200	1258		New Zealand, Radio NZ International		13660pa
1200	1300		Anguilla, Worldwide Univ Network		11775am
1200	1300		Australia, ABC NT Alice Springs		2310do
1200	1300		Australia, ABC NT Katherine	2485do	
1200	1300		Australia, ABC NT Tennant Creek		2325do
1200	1300		Australia, HCJB Global	15340as	
1200	1300		Australia, Radio Australia	5995pa	6020pa
			9475as	9560pa	9580pa	9590pa
			11945pa	17880as	17880as	
1200	1300		Bahrain, Radio Bahrain	6010me	9745al
1200	1300	Sat	Belgium, TDP Radio	6015eu	
1200	1300	Sat/Sun	Canada, CBC NQ SW Service	9625na	
1200	1300		Canada, CFRX Toronto ON	6070na	
1200	1300		Canada, CFVP Calgary AB	6030na	
1200	1300		Canada, CKZN St John's NF	6160na	
1200	1300		Canada, CKZU Vancouver BC	6160na	
1200	1300	Sat/Sun	Equatorial Guinea, Radio East Africa		15190af
1200	1300	mtwhf	Ethiopia, Radio Ethiopia/National Service		5990do
			7110do	9704do		
1200	1300	DRM	Germany, Deutsche Welle	9545eu	13810eu
1200	1300		Malaysia, RTM/Traxx FM	7295do	
1200	1300		Nigeria, Voice of Nigeria/External Service		9690af
1200	1300		Palau, T8WH/WHRI/Sound of Hope Radio		
			13840as		
1200	1300		Russia, Voice of Russia	7340af	7350af
			9695af	11660af		
1200	1300	Sun	Slovakia, IRRS/Euro Gospel Radio		9510va
1200	1300		South Korea, KBS World Radio		9650na
1200	1300		Uganda, UBC Radio	7195do	
1200	1300		UK, BBC World Service	5875as	6190af
			6195as	9545eu	9605as	9740as
			9860af	11760me	15310as	15575as
			17640af	17790as	17830af	21470af
1200	1300		Ukraine, Radio Ukraine International		9950eu
1200	1300		USA, American Forces Network		4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1200	1300		USA, EWTN/WEWN Vandiver AL		9390as
1200	1300		USA, KNLS Anchor Point AK	11765as	12105as
1200	1300		USA, Voice of America	7575va	9640va
			11705va	11730va	11750va	
1200	1300		USA, WBCQ Monticello ME	5110am	7415am
1200	1300		USA, WHRI Cypress Creek SC	7385na	15665va
1200	1300		USA, WINB Red Lion PA	9265ca	
1200	1300		USA, WJHR International Milton FL		15550usb
1200	1300	vl	USA, WRMI Miami FL	9955va	
1200	1300		USA, WTJC Newport NC	9370na	
1200	1300		USA, WTWW Lebanon TN	9480na	
1200	1300		USA, WWCR Nashville TN	4775na	5935na
			9980na	15825na		
1200	1300		USA, WWRB Manchester TN	9385am	
1200	1300		USA, WYFR/Family Radio Worldwide		7455na
			11530ca	11970am		
1200	1300		Zambia, 1 Africa Radio/CVC	6065af	13590af
1215	1300		Egypt, Radio Cairo	17835as	
1230	1300		Bangladesh, Bangladesh Betar		7250as
1230	1300		Thailand, Radio Thailand World Service		9720va
1230	1300		Vietnam, Voice of Vietnam	9840as	12020as

1300 UTC - 9AM EDT / 8AM CDT / 6AM PDT

1300	1330		Egypt, Radio Cairo	17835as	
1300	1345		USA, WYFR/Family Radio Worldwide		7455na
			11970na		
1300	1357		China, China Radio International		5995as
			7300na	9570na	9730as	9765va
			9870as	11760as	11885as	11900eu
			11980as	13790eu	15230na	17490va
1300	1357		North Korea, Voice of Korea	9335na	11710na
			13760eu	15245eu		
1300	1400		Anguilla, Worldwide Univ Network		11775am
1300	1400		Australia, ABC NT Alice Springs		2310do
1300	1400		Australia, ABC NT Katherine	2485do	
1300	1400		Australia, HCJB Global	15340as	15400as
1300	1400		Australia, Radio Australia	5995pa	6020pa
			9560pa	9580pa	9590pa	
1300	1400		Bahrain, Radio Bahrain	6010me	9745al
1300	1400	Sun	Belgium, TDP Radio	6015na	
1300	1400	Sat/Sun	Canada, CBC NQ SW Service	9625na	
1300	1400		Canada, CFRX Toronto ON	6070na	
1300	1400		Canada, CFVP Calgary AB	6030na	
1300	1400		Canada, CKZN St John's NF	6160na	
1300	1400		Canada, CKZU Vancouver BC	6160na	
1300	1400	Sat/Sun	Equatorial Guinea, Radio East Africa		15190af
1300	1400	DRM	Germany, Deutsche Welle	9545eu	13810eu
1300	1400		Indonesia, Voice of Indonesia	9526va	11785al
1300	1400		Malaysia, RTM/Traxx FM	7295do	
1300	1400		New Zealand, Radio NZ International		6170pa
1300	1400		Nigeria, Voice of Nigeria/External Service		9690af
1300	1400		Poland, Polish Radio	11675eu	11860eu
1300	1400		Russia, Voice of Russia	7205af	
1300	1400		South Korea, KBS World Radio		9570as
			9770as		
1300	1400		Tajikistan, Voice of Tajik/External Svc		7245va
1300	1400		Uganda, UBC Radio	4976do	
1300	1400		UK, BBC World Service	5875as	6190af
			6195as	9410as	9545eu	9740as
			9860af	11760me	11835as	15310as
			15420af	15575eu	21470af	
1300	1400		USA, American Forces Network		4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1300	1400		USA, EWTN/WEWN Vandiver AL		13835eu
1300	1400		USA, Voice of America	7575va	9640va
			9760va	11705va		
1300	1400		USA, WBCQ Monticello ME	5110am	7415am
1300	1400		USA, WHRI Cypress Creek SC	9840na	15665va
1300	1400		USA, WINB Red Lion PA	9265ca	
1300	1400		USA, WJHR International Milton FL		15550usb
1300	1400	vl	USA, WRMI Miami FL	9955va	
1300	1400		USA, WTJC Newport NC	9370na	

1300	1400		USA, WTWW Lebanon TN	9480na		
1300	1400		USA, WWCR Nashville TN	4775na	9980na	
			13845na	15825na		
1300	1400		USA, WWRB Manchester TN	9385am		
1300	1400		USA, WYFR/Family Radio Worldwide		6025as	
			7560as	9310na	11830na	11620as
			11830na	11855na		
1300	1400		Zambia, 1 Africa Radio/CVC	6065af	13590af	
1310	1340		Japan, NHK World/ Radio Japan		9875as	
1330	1400	mta	Guam, KSDA/ AWR	11860as		
1330	1400		India, All India Radio	9620as	11620as	
			13710as			
1330	1400		Laos, Lao National Radio	7145as		
1330	1400		Sweden, Radio Sweden	7405as		
1330	1400		Turkey, Voice of Turkey	12035eu	15300as	
1330	1400		Vietnam, Voice of Vietnam	9840as	12020as	

1400 UTC - 10AM EDT / 9AM CDT / 7AM PDT

1400	1415	Sun	Germany, Pan American Broadcasting		13645as	
1400	1425	mh	Guam, KTWR/TWR	9975as		
1400	1425		Turkey, Voice of Turkey	12035eu	15300as	
1400	1429		Czech Republic, Radio Prague	11600as		
1400	1430		Australia, HCJB Global	15400as		
1400	1430	`	Japan, NHK World/ Radio Japan		5995as	
			9875as	11705na	11780eu	21560va
1400	1430		Thailand, Radio Thailand World Service		9725va	
1400	1430	Sun	United Arab Emirates, FEBA Radio		12025as	
1400	1435	twfas	Guam, KTWR/TWR	9975as		
1400	1457		China, China Radio International		5955na	
			6075na	7300na	7325na	9460as
			9560as	9700as	9765va	9870as
			11665as	13675eu	13685eu	13740na
			15230af	17630af		
1400	1459		Netherlands, R Netherlands Worldwide		12080va	
			15595va			
1400	1500		Anguilla, Worldwide Univ Network		11775am	
1400	1500		Australia, ABC NT Alice Springs		2310do	
1400	1500		Australia, ABC NT Katherine	2485do		
1400	1500		Australia, ABC NT Tennant Creek		2325do	
1400	1500		Australia, Radio Australia	5995pa	6080pa	
			7240pa	9590pa		
1400	1500		Bahrain, Radio Bahrain	6010me	9745al	
1400	1500	DRM	Belgium, TDP Radio/Disco Palace		6015eu	
1400	1500		Bhutan, Bhutan Broadcasting Service		6035as	
1400	1500	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1400	1500		Canada, CFRX Toronto ON	6070na		
1400	1500		Canada, CFVP Calgary AB	6030na		
1400	1500		Canada, CKZN St John's NF	6160na		
1400	1500		Canada, CKZU Vancouver BC	6160na		
1400	1500	Sat/Sun	Equatorial Guinea, Radio East Africa		15190af	
1400	1500		Germany, CVC Intl-Christian Vision		17770af	
1400	1500		India, All India Radio	9620as	11620as	
			13710as			
1400	1500		Libya, LJB/Voice of Africa	17725af	21695af	
1400	1500		Malaysia, RTM/Traxx FM	7295do		
1400	1500		New Zealand, Radio NZ International		6170pa	
1400	1500		Nigeria, Voice of Nigeria/External Service		9690af	
1400	1500		Oman, Radio Oman	15140va		
1400	1500	DRM	Russia, Voice of Russia	5905eu		
1400	1500		Russia, Voice of Russia	7205af	7340af	
			11660af	12055af		
1400	1500		South Africa, Channel Africa	9625af		
1400	1500		Uganda, UBC Radio	4976do		
1400	1500		UK, BBC World Service	5875as	5975as	
			6190af	6195as	9410as	9545as
			9625as	9740as	9860af	11760as
			15420af	17640af		
1400	1500	DRM	UK, BBC World Service	9545eu	13590eu	
1400	1500	Sat	UK, Bible Voice Broadcasting	13730as		
1400	1500		United States, Overcomer Ministries		6110eu	
			13810va			
1400	1500		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1400	1500		USA, EWTN/WEWN Vandiver AL		13835eu	
1400	1500		USA, KJES Vado NM	11715na		
1400	1500		USA, KNLS Anchor Point AK	11765as		
1400	1500		USA, Voice of America	4930af	6080af	
			7575va	9760va	9930va	11985va
			12150va	15205va	15580af	17650af
			17715af			
1400	1500		USA, WBCQ Monticello ME	5110am	7415am	
1400	1500		USA, WHRI Cypress Creek SC	9840na	17540af	
1400	1500		USA, WINB Red Lion PA	13570ca		
1400	1500		USA, WJHR International Milton FL		15550usb	
1400	1500	vl	USA, WRMI Miami FL	9955va		
1400	1500		USA, WTJC Newport NC	9370na		
1400	1500		USA, WTWW Lebanon TN	9480na		
1400	1500		USA, WWCR Nashville TN	4775na	9980na	
			13845na	15825na		
1400	1500		USA, WWRB Manchester TN	9385am		
1400	1500		USA, WYFR/Family Radio Worldwide		6225as	
			9485as	9770as	11560na	11855na
			13695na	11565na	17760na	
1400	1500		Zambia, 1 Africa Radio/CVC	6065af	13650af	
1400	1557		China, China Radio International		5955as	
			6095as	7325as	7405as	9435na
			9870as	13685as	13740na	17630va
1405	1500	Sat	Greece, Voice of Greece	9420eu		
1415	1430		Germany, Pan American Broadcasting		13645as	
1415	1430		Nepal, Radio Nepal	5005as		
1415	1500	Sun	UK, Bible Voice Broadcasting	13730as		
1425	1455	mtwhf	Swaziland, TWR Africa	6025af		
1430	1445	Sun	Germany, Pan American Broadcasting		13645as	
1430	1500		Australia, Radio Australia	9475as	11660as	
1430	1500		China, CPBS/CNR Business Radio		6155do	
			7245do	7315as	7335as	7375as
			9820as	9775as		
1430	1500		Sweden, Radio Sweden	9400as		

1500 UTC - 11AM EDT / 10AM CDT / 8AM PDT

1500	1510	mtwhfa	Turkmenistan, Turkmen Radiosi		5015eu	
1500	1515	Sun	UK, Bible Voice Broadcasting	12035af		
1500	1530		Australia, HCJB Global	15340as		
1500	1530	Sat/Sun	Clandestine, Sudan Radio Service/ SRS		17745af	
1500	1530		Guam, KSDA/ AWR	11720as		
1500	1530		UK, BBC World Service	9410af	11860af	
			15105af			
1500	1530		Vietnam, Voice of Vietnam	7285as	9840as	
			12020as			
1500	1545		USA, WYFR/Family Radio Worldwide		15210sa	
1500	1550		New Zealand, Radio NZ International		6170pa	
1500	1557		Canada, Radio Canada International		9635as	
			11975as			
1500	1557		China, China Radio International		5955as	
			6060as	6100as	7235as	7255as
			7420as	7435as	9435as	9525eu
			9570as	9600na	11650as	
1500	1557		Libya, LJB/Voice of Africa	17725af	21695af	
1500	1557		Netherlands, R Netherlands Worldwide		12080as	
			15595va			
1500	1557		North Korea, Voice of Korea	9335na	11710na	
			13760eu	15245eu		
1500	1600		Anguilla, Worldwide Univ Network		11775am	
1500	1600		Australia, ABC NT Alice Springs		2310do	
1500	1600		Australia, ABC NT Katherine	2485do		
1500	1600		Australia, Radio Australia	5995pa	6080pa	
			7240pa	9475as	9590pa	11660as
1500	1600		Bahrain, Radio Bahrain	6010me	9745al	
1500	1600	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1500	1600		Canada, CFRX Toronto ON	6070na		
1500	1600		Canada, CFVP Calgary AB	6030na		
1500	1600		Canada, CKZN St John's NF	6160na		
1500	1600		Canada, CKZU Vancouver BC	6160na		
1500	1600	Sat/Sun	Equatorial Guinea, Radio East Africa		15190af	
1500	1600		Germany, CVC Intl-Christian Vision		17770af	
1500	1600		Malaysia, RTM/Traxx FM	7295do		
1500	1600		Myanmar, Myanma Radio	5985as		
1500	1600		Russia, Voice of Russia	4975me	7260af	
			9660af			
1500	1600	DRM	Russia, Voice of Russia	5905eu		
1500	1600		South Africa, Channel Africa	9625af		
1500	1600		Uganda, Dunamis Shortwave	4750af		
1500	1600		Uganda, UBC Radio	4976do		
1500	1600		UK, BBC World Service	5875as	5975as	
			6190af	6195as	7395as	9740as
			9855as	9860af	12095af	15400af
			15420af	17640af		
1500	1600	DRM	UK, BBC World Service	5790eu	13590eu	
1500	1600		United States, Overcomer Ministries		6110eu	
			13810va	17485eu		
1500	1600		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1500	1600		USA, EWTN/WEWN Vandiver AL		15610me	
1500	1600		USA, KJES Vado NM	11715am		
1500	1600		USA, Voice of America	4930af	6080af	
			7545va	9310va	9685va	9930va
			11525va	11765va	12150va	15580af
			17715af	17895af		
1500	1600		USA, Voice of America/Special English		6140va	
			7520va	9760va	15460va	

1500	1600		USA, WBCQ Monticello ME	5110am	7415am	
			9955na			
1500	1600		USA, WHRI Cypress Creek SC	9840na		
1500	1600	mtwhfa	USA, WHRI Cypress Creek SC	21640af		
1500	1600		USA, WINB Red Lion PA	13570ca		
1500	1600		USA, WJHR International Milton FL			15550usb
1500	1600	vl	USA, WRMI Miami FL	9955na		
1500	1600		USA, WTJC Newport NC	9370na		
1500	1600		USA, WTWW Lebanon TN	9480na		
1500	1600		USA, WWCR Nashville TN	4775na	9980na	
			13845na	15825na		
1500	1600		USA, WWRB Manchester TN	9385am		
1500	1600		USA, WYFR/Family Radio Worldwide		6280as	
			9495as	11565na	11855na	11985as
			12015as	13790as	17760na	
1500	1600		Zambia, 1 Africa Radio/CVC	6065af	13650af	
1515	1530		Vatican City State, Vatican Radio		7585as	
			9310as	11850as	13765as	
1515	1545	Sat	UK, Bible Voice Broadcasting	12035as		
1525	1600	Sat/Sun	Swaziland, TWR Africa	6025af		
1530	1545		India, All India Radio	7255as	9620as	
			9820as	9910as		
1530	1600	mtwhfa	Albania, Radio Tirana	13640na		
1530	1600		Germany, AWR Europe	15255as		
1530	1600		Iran, Voice of Islamic Rep. of Iran		6160as	
			7380as			
1530	1600		Mongolia, Voice of Mongolia	9665as		
1530	1600		Sweden, Radio Sweden	9360va		
1530	1600	Sat	UK, BBC World Service	9410af	11860af	
			15105af			
1530	1600	Sun	UK, Bible Voice Broadcasting	13590me		
1530	1600	h	UK, Bible Voice Broadcasting	12035as		
1530	1600	Sat	Vatican City State, Vatican Radio		7585as	
			11850as	13765as		
1545	1600	mtwhfa	UK, Bible Voice Broadcasting	13590me		
1551	1600		New Zealand, Radio NZ International		7440pa	
1551	1600	DRM	New Zealand, Radio NZ International		6170pa	

1600 UTC - 12PM EDT / 11AM CDT / 9AM PDT

1600	1610		Pakistan, PBC/ Radio Pakistan	7535me	11565af	
			15100va			
1600	1615	f	UK, Bible Voice Broadcasting	13590me		
1600	1620	t	UK, Bible Voice Broadcasting	13590me		
1600	1625	Sat/Sun	Swaziland, TWR Africa	6025af		
1600	1627		Iran, Voice of Islamic Rep. of Iran		6160as	
			7380as			
1600	1630	Sun	Germany, Pan American Broadcasting		11900as	
1600	1630		Guam, KSDA/ AWR	11720as	11805as	
1600	1630		Myanmar, Myanma Radio	9730do		
1600	1630	Sat	USA, Voice of America	11750af		
1600	1630		Vietnam, Voice of Vietnam	7220me	7280eu	
			9550me	9730va		
1600	1645		USA, WYFR/Family Radio Worldwide		11565na	
			11830na	17760na		
1600	1657		North Korea, Voice of Korea	9990va	11545va	
1600	1700		Anguilla, Worldwide Univ Network		11775am	
1600	1700		Australia, ABC NT Alice Springs		2310do	
1600	1700		Australia, ABC NT Katherine	2485do		
1600	1700		Australia, Radio Australia	5995pa	6080pa	
			7240pa	9475as	9710pa	11660as
1600	1700		Bahrain, Radio Bahrain	6010me	9745al	
1600	1700	Sat	Canada, CBC NQ SW Service	9625na		
1600	1700		Canada, CFRX Toronto ON	6070na		
1600	1700		Canada, CFVP Calgary AB	6030na		
1600	1700		Canada, CKZN St John's NF	6160na		
1600	1700		Canada, CKZU Vancouver BC	6160na		
1600	1700		Egypt, Radio Cairo12170af			
1600	1700		Ethiopia, Radio Ethiopia/External Service		7165va	
			9560af			
1600	1700		France, Radio France International		15605af	
1600	1700		Germany, CVC Intl-Christian Vision		17770af	
1600	1700		Germany, Deutsche Welle	6170as	9485as	
			9540as	15410as		
1600	1700		Malaysia, RTM/Traxx FM	7295do		
1600	1700		New Zealand, Radio NZ International		7440pa	
1600	1700	DRM	New Zealand, Radio NZ International		6170pa	
1600	1700		Russia, Voice of Russia	4975me	6130eu	
			7305af	9470va	11630af	
1600	1700		South Korea, KBS World Radio		9515eu	
1600	1700		Taiwan, Radio Taiwan International		11550as	
			13840as			
1600	1700		Uganda, Dunamis Shortwave	4750af		
1600	1700		Uganda, UBC Radio	4976do		
1600	1700		UK, BBC World Service	3255af	3995eu	
			5790eu	5975as	6190af	7255as
			9740as	11860af	12095eu	13820af
			15400af	15420af	17640af	
1600	1700	DRM	UK, BBC World Service	3995eu	5790eu	
1600	1700	Sat	UK, BBC World Service	9410af	15105af	
1600	1700	Sun	UK, Bible Voice Broadcasting	13590me		
1600	1700		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1600	1700		USA, EWTN/WEWN Vandiver AL		15610me	
1600	1700		USA, KJES Vado NM	11715am		
1600	1700		USA, Voice of America	4930af	6080af	
			6225af	15580af	17715af	17895af
1600	1700		USA, Voice of America/Special English		9395va	
			13600va	15445va		
1600	1700		USA, WBCQ Monticello ME	5110am	7415am	
			9955na			
1600	1700		USA, WHRI Cypress Creek SC	9840na	21640af	
1600	1700		USA, WINB Red Lion PA	13570ca		
1600	1700		USA, WJHR International Milton FL		15550usb	
1600	1700	vl	USA, WRMI Miami FL	9955na		
1600	1700		USA, WTJC Newport NC	9370na		
1600	1700		USA, WTWW Lebanon TN	9480na		
1600	1700		USA, WWCR Nashville TN	4775na	9980na	
			13845na	15825na		
1600	1700		USA, WWRB Manchester TN	9385am		
1600	1700		USA, WYFR/Family Radio Worldwide		5960na	
			6085af	9445af	9795af	11740af
			11830eu	13695eu	17690eu	18980eu
			21455eu			
1600	1700		Zambia, 1 Africa Radio/CVC	6065af	13650af	
1600	1757		China, China Radio International		6060af	
			6100as	7235as	7255as	7420as
			7435as	9435as	9525eu	9570as
			9600eu	11650va		
1605	1700		Canada, Radio Canada International		9610na	
1605	1700	DRM	Canada, Radio Canada International		9800na	
1615	1630	mtwhf	Swaziland, TWR Africa	6130af		
1615	1700	Sun	UK, BBC World Service	9410af	11860af	
			15105af			
1615	1700		UK, Bible Voice Broadcasting	13590me		
1630	1700		China, Xizang People's BS/Tibet		6200do	
1630	1700		Guam, KSDA/ AWR	11740as		
1630	1700	Sun	UK, Bible Voice Broadcasting	9460me		
1640	1650	mtwhfa	Turkmenistan, Turkmen Radiosi		4930eu	
1645	1700	mw	UK, Bible Voice Broadcasting	9460me		

1700 UTC - 1PM EDT / 12PM CDT / 10AM PDT

1700	1704		Canada, Radio Canada International		9610na	
1700	1704	DRM	Canada, Radio Canada International		9800na	
1700	1720	t	UK, Bible Voice Broadcasting	9460me		
1700	1727		Czech Republic, Radio Prague	5930eu		
1700	1730		Croatia, Voice of Croatia	6165va		
1700	1730		Sweden, Radio Sweden	7465va		
1700	1745		UK, BBC World Service	9410af	11860af	
1700	1745		USA, WYFR/Family Radio Worldwide		18980eu	
1700	1750		New Zealand, Radio NZ International		7440pa	
1700	1750	DRM	New Zealand, Radio NZ International		6170pa	
1700	1757		China, China Radio International		6090af	
			6100as	6140as	6165af	7205af
			7255af	7335as	7410eu	7420af
			7425eu	7435va	9570eu	
1700	1800		Anguilla, Worldwide Univ Network		11775am	
1700	1800		Australia, ABC NT Alice Springs		2310do	
1700	1800		Australia, ABC NT Katherine	2485do		
1700	1800		Australia, Radio Australia	5995pa	6080pa	
			9475as	9580pa	9710pa	11880pa
1700	1800		Bahrain, Radio Bahrain	6010me	9745al	
1700	1800	Sat	Canada, CBC NQ SW Service	9625na		
1700	1800		Canada, CFRX Toronto ON	6070na		
1700	1800		Canada, CFVP Calgary AB	6030na		
1700	1800		Canada, CKZN St John's NF	6160na		
1700	1800		Canada, CKZU Vancouver BC	6160na		
1700	1800		Egypt, Radio Cairo12170af			
1700	1800		Equatorial Guinea, Radio Africa		7190af	
			15190af			
1700	1800		Germany, CVC Intl-Christian Vision		17770af	
1700	1800		Kuwait, Radio Kuwait	11990va		
1700	1800		Malaysia, RTM/Traxx FM	7295do		
1700	1800		Nigeria, Voice of Nigeria/External Service		15120af	
1700	1800		Russia, Voice of Russia	4975me	7240af	
			7305af	9470va		
1700	1800		South Africa, Channel Africa	15235af		
1700	1800		Swaziland, TWR Africa	3200af		
1700	1800		Taiwan, Radio Taiwan International		15690af	
1700	1800		Tajikistan, Voice of Tajik/External Svc		7245va	
1700	1800		Uganda, Dunamis Shortwave	4750af		
1700	1800		Uganda, UBC Radio	4976do		

1700	1800		UK, BBC World Service	3255af	3995eu	
			5975as	6190af	7355as	12095af
			13820af	15400af	15420af	17830af
1700	1800	DRM	UK, BBC World Service	3995eu		
1700	1800	Sat	UK, Bible Voice Broadcasting	9460me		
1700	1800	Sun	UK, Bible Voice Broadcasting	9460me		
1700	1800		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1700	1800		USA, EWTN/WEWN Vandiver AL			15610me
1700	1800		USA, Voice of America	6080af	6225af	
			13710af	15580af	17895af	
1700	1800		USA, WBCQ Monticello ME	5110am	7415am	
			9955na			
1700	1800		USA, WHRI Cypress Creek SC	9840na	21640af	
1700	1800		USA, WINB Red Lion PA	13570ca		
1700	1800		USA, WJHR International Milton FL			15550usb
1700	1800	vl	USA, WRMI Miami FL	9955va		
1700	1800		USA, WTJC Newport NC	9370na		
1700	1800		USA, WTWW Lebanon TN	9480na		
1700	1800		USA, WWCR Nashville TN	9980na	12160na	
			13845na	15825na		
1700	1800		USA, WWRB Manchester TN	9385am		
1700	1800		USA, WYFR/Family Radio Worldwide			13695af
			17555na	21045as	21455eu	21680af
1700	1800		Zambia, 1 Africa Radio/CVC	4965af	13590af	
1705	1800		Canada, Radio Canada International			9610na
1705	1800	DRM	Canada, Radio Canada International			9800na
1717	1730		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu	7290eu	9645eu
1720	1740	Sat/Sun	USA, Voice of America/Studio 7			4930af
			12080af	15775af		
1730	1757		Slovakia, Radio Slovakia International			5915eu
			6055eu			
1730	1800		Clandestine, Sudan Radio Service/ SRS			9840af
1730	1800		UK, Bible Voice Broadcasting	13590me		
1730	1800	Sun	UK, Bible Voice Broadcasting	9430me		
1730	1800	mtwhf	USA, Voice of America/Studio 7			4930af
			12080af	15775af		
1730	1800		Vatican City State, Vatican Radio			9755af
			11625af	13765af		
1745	1800		Bangladesh, Bangladesh Betar			7250as
1745	1800	DRM	India, All India Radio	9950eu		
1745	1800		India, All India Radio	6180eu	7410eu	
			11935af	15075af		
1751	1800		New Zealand, Radio NZ International			9765pa
1751	1800	DRM	New Zealand, Radio NZ International			9890pa

1800 UTC - 2PM EDT / 1PM CDT / 11AM PDT

1800	1804		Canada, Radio Canada International			9610na
1800	1804	DRM	Canada, Radio Canada International			9800na
1800	1815	mtwhf	Moldova, (Transnistria) Radio PMR			6240eu
1800	1815	Sat	UK, Bible Voice Broadcasting	7365as		
1800	1827		China, China Radio International			6020eu
1800	1827		Czech Republic, Radio Prague	5930eu		
1800	1830	w	Austria, AWR Europe	9755af		
1800	1830	DRM	Romania, Radio Romania International			5895eu
1800	1830		South Africa, AWR 3215af	3345af	9610af	
1800	1830		UK, BBC World Service	5975as	7260as	
			7355as			
1800	1830	Sun	UK, Bible Voice Broadcasting	13590me		
1800	1830		UK, Bible Voice Broadcasting	13590me		
1800	1830	fa	UK, Bible Voice Broadcasting	9430me		
1800	1830		USA, Voice of America	4930af	6080af	
			11975af	12080af	13710af	15580af
			15775af	17895af		
1800	1830	Sat/Sun	USA, Voice of America	4930af		
1800	1830		Vietnam, Voice of Vietnam	5955eu		
1800	1850		New Zealand, Radio NZ International			9765pa
1800	1856		Romania, Radio Romania International			7215eu
1800	1856	DRM	Romania, Radio Romania International			6065eu
1800	1857		China, China Radio International			6100eu
			7265eu	7405eu		
1800	1857		Netherlands, R Netherlands Worldwide			6020af
			11655af	12045af		
1800	1857		North Korea, Voice of Korea	13760eu	15245eu	
1800	1859		Canada, Radio Canada International			9740af
			11845af	13650af	15365af	17790af
1800	1900		Anguilla, Worldwide Univ Network			11775am
1800	1900	mtwhf	Argentina, Radio Nacional RAE			15345eu
1800	1900		Australia, ABC NT Alice Springs			2310do
1800	1900		Australia, ABC NT Katherine	2485do		
1800	1900		Australia, Radio Australia	6080pa	7240pa	
			9475as	9580pa	9710pa	11880pa
1800	1900		Bahrain, Radio Bahrain	6010me	9745al	
1800	1900		Bangladesh, Bangladesh Betar			7250eu
1800	1900		Canada, CFRX Toronto ON	6070na		
1800	1900		Canada, CFVP Calgary AB	6030na		
1800	1900		Canada, CKZN St John's NF	6160na		
1800	1900		Canada, CKZU Vancouver BC	6160na		
1800	1900		Equatorial Guinea, Radio Africa			7190af
			15190af			
1800	1900		Germany, CVC Intl-Christian Vision			17770af
1800	1900	DRM	Germany, Deutsche Welle	3995eu		
1800	1900	DRM	India, All India Radio	9950eu		
1800	1900		India, All India Radio	9445af	11935af	
			15075af			
1800	1900		Kuwait, Radio Kuwait	11990va		
1800	1900		Malaysia, RTM/Traxx FM	7295do		
1800	1900	DRM	New Zealand, Radio NZ International			9890pa
1800	1900		Nigeria, Voice of Nigeria/External Service			15120af
1800	1900		Poland, Polish Radio	9650eu		
1800	1900	DRM	Poland, Polish Radio	6130eu		
1800	1900		Russia, Voice of Russia	4975me	7240af	
			7270me	7305af	7330eu	
1800	1900	fas	Slovakia, IRRS/Euro Gospel Radio			6170va
1800	1900		South Africa, TWR 9500af			
1800	1900		South Korea, KBS World Radio			7235eu
1800	1900		Swaziland, TWR Africa	3200af		
1800	1900		Taiwan, Radio Taiwan International			6155eu
1800	1900		Uganda, Dunamis Shortwave	4750af		
1800	1900		Uganda, UBC Radio	4976do		
1800	1900		UK, BBC World Service	3255af	3995eu	
			5875eu	5945as	5955as	6190af
			7390eu	11810af	12095af	13820af
			15400af	15420af		
1800	1900	Sat	UK, Bible Voice Broadcasting	6110me	9460me	
1800	1900	Sun	UK, Bible Voice Broadcasting	9460me	9430me	
1800	1900	Sun	UK, Bible Voice Broadcasting	9510af		
1800	1900		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1800	1900		USA, EWTN/WEWN Vandiver AL			15610me
1800	1900		USA, WBCQ Monticello ME	5110am	7415am	
			9955na			
1800	1900		USA, WHRI Cypress Creek SC	9840na	21640af	
1800	1900		USA, WINB Red Lion PA	13570ca		
1800	1900		USA, WJHR International Milton FL			15550usb
1800	1900	vl	USA, WRMI Miami FL	9955ca		
1800	1900		USA, WTJC Newport NC	9370na		
1800	1900		USA, WTWW Lebanon TN	9480na		
1800	1900		USA, WWCR Nashville TN	9980na	12160na	
			13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9385am		
1800	1900		USA, WYFR/Family Radio Worldwide			6045af
			6915na	7395af	9895af	13695na
			15115af	17535na	17555na	
1800	1900		Zambia, 1 Africa Radio/CVC	4965af	13590af	
1830	1845		Rwanda, Radio Rwanda	6055do		
1830	1900		Bulgaria, Radio Bulgaria	6200eu	7400eu	
1830	1900	DRM	Bulgaria, Radio Bulgaria	9700eu		
1830	1900		UK, BBC World Service	6005af	9410af	
1830	1900	f	UK, Bible Voice Broadcasting	9460me		
1830	1900	Sun	UK, Bible Voice Broadcasting	6110me		
1830	1900		USA, Voice of America	4930af	6080af	
			11975af	13710af	15580af	17895af
1845	1900	mtwhf	Moldova, (Transnistria) Radio PMR			6240eu
1851	1900		New Zealand, Radio NZ International			11725pa

1900 UTC - 3PM EDT / 2PM CDT / 12PM PDT

1900	1915	Sun	UK, Bible Voice Broadcasting	9460af	9510af	
1900	1930		Germany, Deutsche Welle	6150af	11795af	
			17865af			
1900	1930	Sat	UK, Bible Voice Broadcasting	9470me		
1900	1930		Vietnam, Voice of Vietnam	7280eu	9730eu	
1900	1935	DRM	New Zealand, Radio NZ International			9890pa
1900	1945	DRM	India, All India Radio	9950eu		
1900	1945		India, All India Radio	9445af	11935af	
			15075af			
1900	1945		USA, WYFR/Family Radio Worldwide			6085na
			15565as			
1900	1957		China, China Radio International			7285eu
			7295va	9440va		
1900	1957		Netherlands, R Netherlands Worldwide			7425af
			12045af	12080af		
1900	1957		North Korea, Voice of Korea	7100af	9975va	
			11910af	11535va		
1900	2000		Anguilla, Worldwide Univ Network			11775am
1900	2000		Australia, ABC NT Alice Springs			2310do
1900	2000		Australia, ABC NT Katherine	2485do		
1900	2000		Australia, Radio Australia	6080pa	7240pa	
			9500as	9580pa	9710pa	11880pa

1900	2000		Bahrain, Radio Bahrain	6010me	9745al	
1900	2000		Belgium, TDP Radio	17755na		
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St John's NF	6160na		
1900	2000		Canada, CKZU Vancouver BC	6160na		
1900	2000		Egypt, Radio Cairo11510af			
1900	2000		Equatorial Guinea, Radio Africa			7190af
			15190af			
1900	2000		Germany, CVC Intl-Christian Vision			17770af
1900	2000	DRM	Germany, Deutsche Welle	3995eu		
1900	2000		Kuwait, Radio Kuwait	11990va		
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		New Zealand, Radio NZ International			11725pa
1900	2000		Nigeria, Voice of Nigeria/External Service			15120af
1900	2000		Russia, Voice of Russia	4975me	5985me	
			7290me	7330eu		
1900	2000	fas	Slovakia, IRRS/Euro Gospel Radio			6170va
1900	2000	mtwhf	Spain, Radio Exterior de Espana			9605af
			9665eu			
1900	2000		Swaziland, TWR Africa	3200af		
1900	2000		Thailand, Radio Thailand World Service			7570eu
1900	2000		Uganda, UBC Radio	4976do		
1900	2000		UK, BBC World Service	3255af	5875eu	
			5955as	6005af	6190af	7390eu
			9410af	9835af	11810af	12095af
1900	2000	Sun	UK, Bible Voice Broadcasting	6030af		
1900	2000		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1900	2000		USA, EWTN/WEWN Vandiver AL			15610af
1900	2000		USA, KJES Vado NM	15385va		
1900	2000		USA, Voice of America	4930af	4940af	
			6080af	11975af	13710af	15580af
			17895af			
1900	2000		USA, Voice of America/Special English			9585va
			12020va			
1900	2000		USA, WBCQ Monticello ME	5110am	7415am	
			9955na			
1900	2000		USA, WHRI Cypress Creek SC	9840na	15665af	
1900	2000		USA, WINB Red Lion PA	13570ca		
1900	2000		USA, WJHR International Milton FL			15550usb
1900	2000	vl	USA, WRMI Miami FL	9955ca		
1900	2000		USA, WTJC Newport NC	9370na		
1900	2000		USA, WTWW Lebanon TN	9475na		
1900	2000		USA, WWCR Nashville TN	9980na	12160na	
			13845na	15825na		
1900	2000		USA, WWRB Manchester TN	9385am		
1900	2000		USA, WYFR/Family Radio Worldwide			3230af
			6020af	6915af	7395af	9480af
			9885af	13695na	15115af	17535na
			17555na			
1900	2000		Zambia, 1 Africa Radio/CVC	4965af	13590af	
1905	1915		Croatia, Voice of Croatia	6165va		
1905	1920	Sat	Mali, ORTM Du Mali	5995do		
1905	2000	m	South Africa, Amateur Radio Mirror Intl			3215af
1930	1945	mtwhf	Moldova, (Transnistria) Radio PMR			6240eu
1930	1945	Sat	UK, Bible Voice Broadcasting	6030eu		
1930	1957		Slovakia, Radio Slovakia International			5915eu
			7345eu			
1930	1958		Serbia, International Radio of Serbia			6100eu
1930	2000	Sun	Germany, Pan American Broadcasting			6020af
1930	2000		Iran, Voice of Islamic Rep. of Iran			6010eu
			6040eu	7320eu	9855af	11695af
1930	2000		South Africa, RTE Radio One	6225af		
1930	2000		Turkey, Voice of Turkey	6050eu		
1930	2000	f	UK, Bible Voice Broadcasting	9470me		
1936	1950	DRM	New Zealand, Radio NZ International			11675pa
1945	2000	mtwhas	Albania, Radio Tirana	11635eu		
1945	2000	mtwhf	UK, Bible Voice Broadcasting	11830af		
1951	2000	DRM	New Zealand, Radio NZ International			11675pa

2000 UTC - 4PM EDT / 3PM CDT / 1PM PDT

2000	2005	m	South Africa, Amateur Radio Mirror Intl			3215af
2000	2015	Sun	Germany, Pan American Broadcasting			6020af
2000	2025		Turkey, Voice of Turkey	6050eu		
2000	2027		Iran, Voice of Islamic Rep. of Iran			6010eu
			6040eu	7320eu	9855af	11695af
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu	13640na	
2000	2030		Egypt, Radio Cairo11510af			
2000	2030	Sat	Germany, Pan American Broadcasting			6020af
2000	2030		South Africa, RTE Radio One	6225af		
2000	2030		Swaziland, TWR Africa	3200af		
2000	2030	w	UK, Bible Voice Broadcasting	9880af		
2000	2030		USA, Voice of America	4930af	4940af	
			6080af	11975af	13710af	15580af
2000	2030		Vatican City State, Vatican Radio			7365af
			9755af	11625af		
2000	2045	h	Rwanda, Radio Rwanda	6055do		
2000	2045		USA, WYFR/Family Radio Worldwide			5745eu
2000	2050		New Zealand, Radio NZ International			11725pa
2000	2057		China, China Radio International			5960eu
			5985af	7415va	7285eu	7295eu
			9440eu	9600af	11640af	13630af
2000	2057		Germany, Deutsche Welle	6150af	11795af	
			11865af			
2000	2057		Netherlands, R Netherlands Worldwide			7425af
			11655af	21525af		
2000	2100		Anguilla, Worldwide Univ Network			11775am
2000	2100		Australia, ABC NT Alice Springs			2310do
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek			2325do
2000	2100		Australia, Radio Australia	9500as	11650pa	
			11660pa	11880pa		
2000	2100	Sat/Sun	Australia, Radio Australia	6080pa	7240pa	
			12080pa			
2000	2100		Bahrain, Radio Bahrain	6010me	9745al	
2000	2100	DRM	Belgium, TDP Radio/Disco Palace			17755na
2000	2100		Canada, CFRX Toronto ON	6070na		
2000	2100		Canada, CFVP Calgary AB	6030na		
2000	2100		Canada, CKZN St John's NF	6160na		
2000	2100		Canada, CKZU Vancouver BC	6160na		
2000	2100		Equatorial Guinea, Radio Africa			7190af
			15190af			
2000	2100		Germany, CVC Intl-Christian Vision			17770af
2000	2100		Indonesia, Voice of Indonesia	9526va	11785al	
2000	2100		Kuwait, Radio Kuwait	11990va		
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100	DRM	New Zealand, Radio NZ International			11675pa
2000	2100		Nigeria, Voice of Nigeria/External Service			15120af
2000	2100		Russia, Voice of Russia	7330af		
2000	2100	fas	Slovakia, IRRS/Euro Gospel Radio			6170va
2000	2100		Uganda, UBC Radio	4976do		
2000	2100		UK, BBC World Service	3255af	6005af	
			6190af	9410af	9615af	11810af
			12095af	15400af		
2000	2100		Ukraine, Radio Ukraine International			7510eu
2000	2100		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
2000	2100		USA, EWTN/WEWN Vandiver AL			15610af
2000	2100		USA, KJES Vado NM	15385ca		
2000	2100		USA, WBCQ Monticello ME	5110am	7415am	
			9955na			
2000	2100	mtws	USA, WHRI Cypress Creek SC	7520eu		
2000	2100	fas	USA, WHRI Cypress Creek SC	15665af		
2000	2100	Sun	USA, WHRI Cypress Creek SC	9575va		
2000	2100		USA, WINB Red Lion PA	13570ca		
2000	2100		USA, WJHR International Milton FL			15550usb
2000	2100	vl	USA, WRMI Miami FL	9955ca		
2000	2100		USA, WTJC Newport NC	9370na		
2000	2100		USA, WTWW Lebanon TN	9475na		
2000	2100		USA, WWCR Nashville TN	9980na	12160na	
			13845na	15825na		
2000	2100		USA, WWRB Manchester TN	9385am		
2000	2100		USA, WYFR/Family Radio Worldwide			6020na
			6260eu	6915eu	9480af	9610af
			9630af	15115af	15195ca	17535ca
			17555ca	17575ca		
2000	2100		Zambia, 1 Africa Radio/CVC	9505af		
2000	2105		Uganda, UBC Radio	4976do		
2030	2045		Thailand, Radio Thailand World Service			9535eu
2030	2100		Cuba, Radio Havana Cuba	11760am		
2030	2100		Sweden, Radio Sweden	9490af		
2030	2100		USA, Voice of America	7405as		
2030	2100	Sat/Sun	USA, Voice of America	4940af		
2030	2100		Vietnam, Voice of Vietnam	7220me	7280eu	
			9550me	9730eu		
2045	2100		India, All India Radio	6180eu	7410eu	
			9445eu	11620pa	11715pa	
2045	2100	DRM	India, All India Radio	9950eu		
2045	2100	DRM	Vatican City State, Vatican Radio			9800am
2050	2100		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu		
2051	2100		New Zealand, Radio NZ International			17675pa

2100 UTC - 5PM EDT / 4PM CDT / 2PM PDT

2100	2120		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu		
2100	2127		China, China Radio International			7250af
			11640af	13630af		
2100	2127		Czech Republic, Radio Prague	5930va		

2100	2130	mtwhfa	Albania, Radio Tirana	7430eu	9895eu	
2100	2130		Australia, ABC NT Alice Springs	2310do		
2100	2130		Australia, ABC NT Alice Springs	2310do		
2100	2130		Australia, ABC NT Katherine	2485do		
2100	2130		Australia, ABC NT Tennant Creek	2325do		
2100	2130		Austria, AWR Europe	11955af		
2100	2130	Sat	Canada, CBC NQ SW Service	9625na		
2100	2130		Cuba, Radio Havana Cuba	11760am		
2100	2145		USA, WYFR/Family Radio Worldwide	6915na		
			15115af	17535na	17555na	
2100	2150	DRM	New Zealand, Radio NZ International	11675pa		
2100	2157		China, China Radio International	5960eu		
			6135af	7205eu	7225af	7325af
			7405af	7415af	9600af	
2100	2157		Germany, Deutsche Welle	9735as	11865af	
			15640af			
2100	2157		North Korea, Voice of Korea	13760eu	15245eu	
2100	2200		Angola, Radio Nacional de Angola	7217do		
2100	2200		Anguilla, Worldwide Univ Network	11775am		
2100	2200		Australia, Radio Australia	9500as	9660pa	
			11695as	12080pa	13630pa	15515pa
2100	2200		Bahrain, Radio Bahrain	6010me	9745al	
2100	2200		Belarus, Radio Belarus	6155eu	7360as	
			7390eu			
2100	2200		Canada, CFRX Toronto ON	6070na		
2100	2200		Canada, CFVP Calgary AB	6030na		
2100	2200		Canada, CKZN St John's NF	6160na		
2100	2200		Canada, CKZU Vancouver BC	6160na		
2100	2200		Equatorial Guinea, Radio Africa	7190af		
			15190af			
2100	2200		India, All India Radio	11620pa	11715pa	
2100	2200	DRM	India, All India Radio	9950eu		
2100	2200		Malaysia, RTM/Traxx FM	7295do		
2100	2200		New Zealand, Radio NZ International	17675pa		
2100	2200	f	Slovakia, IRRS/Euro Gospel Radio	6170va		
2100	2200		Syria, Radio Damascus	9330eu	12085as	
2100	2200	DRM	UK, BBC World Service	3995eu		
2100	2200		UK, BBC World Service	3255af	3915as	
			5875as	5965as	6005af	6190af
			6195as	7445af	9410af	9915af
			12095af			
2100	2200		USA, American Forces Network	4319usb		
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
2100	2200		USA, EWTN/WEWN Vandiver AL	15610af		
2100	2200		USA, Voice of America	6080af	7405as	
			15580af			
2100	2200		USA, WBCQ Monticello ME	5110am	7415am	
			9955am			
2100	2200	mtwhfa	USA, WHRI Cypress Creek SC	9525va		
2100	2200	fas	USA, WHRI Cypress Creek SC	15665af		
2100	2200		USA, WINB Red Lion PA	9265ca		
2100	2200		USA, WJHR International Milton FL	15550usb		
2100	2200	vl	USA, WRMI Miami FL	9955ca		
2100	2200		USA, WTJC Newport NC	9370na		
2100	2200		USA, WTWW Lebanon TN	9475na		
2100	2200		USA, WWCR Nashville TN	7465na	9980na	
			12160na	13845na		
2100	2200		USA, WWRB Manchester TN	3215na	9385am	
2100	2200		USA, WYFR/Family Radio Worldwide	5950na		
			6240eu	9480af	15115af	15195af
2100	2200		Zambia, 1 Africa Radio/CVC	9505af		
21000	2200		Japan, NHK World/ Radio Japan	13640pa		
2115	2200		Egypt, Radio Cairo6270eu			
2130	2156		Romania, Radio Romania International	6115na		
			7380eu	9755na		
2130	2156	DRM	Romania, Radio Romania International	6030eu		
2130	2200		Australia, ABC NT Alice Springs	4835do		
2130	2200		Australia, ABC NT Katherine	5025do		
2130	2200	mtwhfa	Canada, CBC NQ SW Service	9625na		
2130	2200		China, China Radio International	7365eu		
			7415as			
2130	2200		Guam, KSDA/ AWR	11850as		
2130	2200		Sweden, Radio Sweden	7425af		
2130	2200		Turkey, Voice of Turkey	9610va		
2151	2200	DRM	New Zealand, Radio NZ International	15720pa		

2200 UTC - 6PM EDT / 5PM CDT / 3PM PDT

2200	2215	smtwh	Moldova, (Transnistria) Radio PMR	6240na		
2200	2225		Turkey, Voice of Turkey	9610va		
2200	2228		Serbia, International Radio of Serbia	6100eu		
2200	2230		India, All India Radio	11620pa	11715pa	
2200	2230	DRM	India, All India Radio	9950eu		
2200	2230		South Korea, KBS World Radio	3955eu		
2200	2235		New Zealand, Radio NZ International	17625pa		
2200	2235	DRM	New Zealand, Radio NZ International	15720pa		
2200	2245		Egypt, Radio Cairo6270eu			
2200	2245		USA, WYFR/Family Radio Worldwide	17690af		
2200	2257		China, China Radio International	5915na		
2200	2300		Anguilla, Worldwide Univ Network	6090am		
2200	2300		Australia, ABC NT Alice Springs	4835do		
2200	2300		Australia, ABC NT Katherine	5025do		
2200	2300		Australia, HCJB Global	15525as		
2200	2300		Australia, Radio Australia	9660pa	12010as	
			12040as	13630pa	15230pa	15240as
			15515pa	15560pa		
2200	2300		Bahrain, Radio Bahrain	6010me	9745al	
2200	2300		Belarus, Radio Belarus	6155eu	7360as	
			7390eu			
2200	2300		Bulgaria, Radio Bulgaria	6200eu	7400eu	
2200	2300	smtwhf	Canada, CBC NQ SW Service	9625na		
2200	2300		Canada, CFRX Toronto ON	6070na		
2200	2300		Canada, CFVP Calgary AB	6030na		
2200	2300		Canada, CKZN St John's NF	6160na		
2200	2300		Canada, CKZU Vancouver BC	6160na		
2200	2300	DRM	Canada, Radio Canada International	9800na		
2200	2300		Equatorial Guinea, Radio Africa	7190af		
			15190af			
2200	2300		Malaysia, RTM/Traxx FM	7295do		
2200	2300		Palau, T8WH/WHRI/Sound of Hope Radio			
			12040as			
2200	2300	Sat/Sun	Spain, Radio Exterior de Espana	6125eu		
2200	2300		Uganda, UBC Radio	4976do		
2200	2300		UK, BBC World Service	3915as	5875as	
			5910af	6135as	6195as	9740as
			9915af	12095af		
2200	2300	DRM	UK, BBC World Service	3995eu		
2200	2300		Ukraine, Radio Ukraine International	5830eu		
2200	2300		USA, American Forces Network	4319usb		
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
2200	2300		USA, EWTN/WEWN Vandiver AL	15610af		
2200	2300		USA, Voice of America	5895va	6070va	
			7220va	7405as	7425va	7480va
			9490va	11560va		
2200	2300		USA, WBCQ Monticello ME	5110am	7415am	
			9955am			
2200	2300		USA, WHRI Cypress Creek SC	9615af		
2200	2300		USA, WINB Red Lion PA	9265ca		
2200	2300		USA, WJHR International Milton FL	15550usb		
2200	2300	vl	USA, WRMI Miami FL	9955ca		
2200	2300		USA, WTJC Newport NC	9370na		
2200	2300		USA, WTWW Lebanon TN	9480na		
2200	2300		USA, WWCR Nashville TN	7465na	9980na	
			12160na	13845na		
2200	2300		USA, WWRB Manchester TN	3215na	5050am	
			5745af	9385am		
2200	2300		USA, WYFR/Family Radio Worldwide	5950na		
			11740na	15440na		
2215	2230		Croatia, Voice of Croatia	3985va		
2230	2257		Czech Republic, Radio Prague	7355af		
2230	2300		Guam, KSDA/ AWR	15320as		
2230	2300		USA, Voice of America/Special English	5890va		
			7230va	9780va		
2236	2300		New Zealand, Radio NZ International	15720pa		
2236	2300	DRM	New Zealand, Radio NZ International	17675pa		
2245	2300		India, All India Radio	6055as	7305as	
			9705as	11645as		
2245	2300	smtwh	Moldova, (Transnistria) Radio PMR	6240na		

2300 UTC - 7PM EDT / 6PM CDT / 4PM PDT

2300	0000		Anguilla, Worldwide Univ Network	6090am		
2300	0000		Australia, ABC NT Alice Springs	4835do		
2300	0000		Australia, ABC NT Katherine	5025do		
2300	0000		Australia, HCJB Global	15525as		
2300	0000		Australia, Radio Australia	9660pa	12010as	
			12040as	13690pa	15230pa	15560pa
			17796pa			
2300	0000		Bahrain, Radio Bahrain	6010me	9745al	
2300	0000	smtwhf	Canada, CBC NQ SW Service	9625na		
2300	0000		Canada, CFRX Toronto ON	6070na		
2300	0000		Canada, CFVP Calgary AB	6030na		
2300	0000		Canada, CKZN St John's NF	6160na		
2300	0000		Canada, CKZU Vancouver BC	6160na		
2300	0000		Cuba, Radio Havana Cuba	13790sa		
2300	0000		Egypt, Radio Cairo7580na			
2300	0000		India, All India Radio	6055as	7305as	
			9705as	11645as		
2300	0000		Malaysia, RTM/Traxx FM	7295do		
2300	0000		New Zealand, Radio NZ International	15720pa		
2300	0000	DRM	New Zealand, Radio NZ International	17675pa		
2300	0000		Palau, T8WH/WHRI/Sound of Hope Radio			

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			12040as			
2300	0000		Russia, Voice of Russia		7250na	
2300	0000		UK, BBC World Service	3915as		5875as
			6135as	6195as	7385as	9740as
			11955as			
2300	0000		USA, American Forces Network			4319usb
			5446va	5765va	6350va	7812va
			10320va	12133va	12759va	13362va
2300	0000		USA, EWTN/WEWN Vandiver AL			15610af
2300	0000		USA, Voice of America		6070va	7220va
			7265va	7405va	7480va	9490va
			9580va	11560va		
2300	0000		USA, WBCQ Monticello ME		5110am	7415am
2300	0000		USA, WHRI Cypress Creek SC		5875na	
2300	0000		USA, WINB Red Lion PA		9265ca	
2300	0000		USA, WJHR International Milton FL			15550usb
2300	0000	vl	USA, WRMI Miami FL		9955ca	
2300	0000		USA, WTJC Newport NC		9370na	
2300	0000		USA, WTWW Lebanon TN		9480na	
2300	0000		USA, WWCR Nashville TN		5070na	7465na
			9980na	13845na		
2300	0000		USA, WWRB Manchester TN		3215na	5050am
			5745af	9385am		
2300	0000		USA, WYFR/Family Radio Worldwide			5950na
			9430ca	15400ca	15440na	
2300	2330		Australia, Radio Australia		15240as	
2300	2330		USA, Voice of America/Special English			6180as
			7460va	11840va		
2300	2345		USA, WYFR/Family Radio Worldwide			9430sa
			11740na	15400sa	15440na	
2300	2345	DRM	Vatican City State, Vatican Radio			7370am
2300	2355		Turkey, Voice of Turkey		5960va	
2300	2356		Romania, Radio Romania International			5915as
			6015va	7220eu	7300as	
2300	2357		China, China Radio International			5915as
			5990na	6040na	6145na	7350as
			7415as	9610as	11790va	11970va
2315	2330		Croatia, Voice of Croatia		7375va	
2330	0000		Australia, Radio Australia		15415as	17750as
2330	0000		UK, BBC World Service		6170as	
2330	0000		USA, Voice of America/Special English			6180as
			7460va	11655va	11840va	13640va
2330	0000		Vietnam, Voice of Vietnam		9840as	12020as
2330	2345	smtwh	Moldova, (Transnistria) Radio PMR			6240na
2330	2357		Czech Republic, Radio Prague		5930na	
2345	0000		Australia, HCJB Global		15400as	

MT SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana .....**http://rtsh.sil.at/**
Angola, Radio Nacional de Angola.....**www.rna.ao/**
Anguilla, Worldwide Univ Network .....**www.worldwideuniversitynetwork.com/**
Argentina, Radio Nacional RAE.....**www.radionacional.com.ar/**
Australia, ABC NT Alice Springs.....**www.abc.net.au/radio/**
Australia, ABC NT Katherine.....**www.abc.net.au/radio/**
Australia, ABC NT Tennant Creek .....**www.abc.net.au/radio/**
Australia, HCJB Global .....**www.hcjb.org/**
Australia, Radio Australia .....**www.abc.net.au/ra/**
Austria, AWR Europe **www.awr2.org/**
Bahrain, Radio Bahrain.....**www.radiobahrain.fm**
Bangladesh, Bangladesh Betar .....**www.betar.org.bd/**
Belarus, Radio Belarus .....**www.radiobelarus.tvr.by/eng/**
Belgium, TDP Radio .....**www.airtime.be/schedule.html**
Belgium, TDP Radio/Disco Palace .....**www.airtime.be/schedule.html**
Bhutan, Bhutan Broadcasting Service .....**www.bbs.com.bt/**
Bulgaria, Radio Bulgaria .....**www.bnr.bg/**
Canada, CBC NQ SW Service.....**www.cbc.ca/north/**
Canada, CFRX Toronto ON .....**www.cfrb.com**
Canada, CFVP Calgary AB.....**www.classiccountryam1060.com**
Canada, CKZN St John's NF .....**www.cbc.ca/listen/index.html**
Canada, CKZU Vancouver BC.....**www.cbc.ca/bc**
Canada, Radio Canada International .....**www.rcinet.ca/**
China, China Radio International .....**www.cri.cn/**
China, Guangxi FBS/Beibu Bay Radio .....**www.gxradio.com/index/index.asp**
China, Voice of the Strait.....**www.vos.com.cn**
Clandestine, Cotton Tree News.....**www.cottontreenews.org/**
Clandestine, Sudan Radio Service/ SRS ....**www.sudanradio.org/**
Croatia, Voice of Croatia .....**www.hrt.hr/**
Cuba, Radio Havana Cuba .....**www.radiohc.cu/**
Czech Republic, Radio Prague .....**www.radio.cz/**
Egypt, Radio Cairo.....**www.sis.gov.eg/**
Ethiopia, Radio Ethiopia/External Service..**www.erta.gov.et**
France, Radio France International.....**http://rfienglish.com**
Germany, AWR Europe.....**www.awr2.org/**
Germany, Blue Star Radio .....**www.mvbalticradio.de**
Germany, CVC Intl-Christian Vision .....**www.christianvision.com/**
Germany, Deutsche Welle .....**www.dw-world.de/**
Germany, European Music Radio.....**www.emr.org.uk/**
Germany, Pan American Broadcasting .....**www.radiopanam.com/**
Germany, Radio Gloria International .....**www.radiopanam.com/**
Germany, TWR Europe.....**www.twr.org**
Greece, Voice of Greece .....**www.voiceofgreece.gr/**
Guam, KSDA/ AWR **www.awr2.org/**
Guam, KTWR/TWR .....**www.twr.org/**
India, All India Radio .....**www.allindiaradio.org/**
Indonesia, Voice of Indonesia .....**www.voi.co.id**
Iran, Voice of Islamic Rep. of Iran .....**www.irib.ir/English/**
Japan, NHK World/ Radio Japan.....**www.nhk.or.jp/english/**
Kuwait, Radio Kuwait.....**www.media.gov.kw/**
Laos, Lao National Radio .....**www.lnr.org.la**
Libya, LJB/Voice of Africa .....**www.voiceofafrica.com.ly**
Malaysia, RTM/Traxx FM.....**www.traxxfm.net/index.php**
Malaysia, RTM/Voice of Malaysia.....**www.rtm.gov.my**
Mali, ORTM Du Mali .....**www.ortm.ml**
Monaco, TWR Europe .....**www.twr.org/**
Mongolia, Voice of Mongolia.....**www.mnb.mn**
Nepal, Radio Nepal .....**www.radionepal.org/**
Netherlands, R Netherlands Worldwide ....**www.radionetherlands.nl/**
New Zealand, Radio NZ International .....**www.rnzi.com**
Nigeria, Voice of Nigeria/External Service **www.voiceofnigeria.org**
Oman, Radio Oman.....**www.oman-tv.gov.om**
Pakistan, PBC/ Radio Pakistan.....**www.radio.gov.pk**
Palau, T8WH/WHRI/Sound of Hope Radio**www.whr.org/**
Philippines, PBS/ Radyo Pilipinas.....**www.pbs.gov.ph/**
Poland, Polish Radio .....**www.polskieradio.pl**
Romania, Radio Romania International ....**www.rri.ro/**
Russia, Voice of Russia .....**www.ruvr.ru/**
Rwanda, Radio Rwanda .....**www.orinfor.gov.rw/radiorwanda.eng.html**
Saudi Arabia, BSKSA/Saudi Radio.....**www.saudiradio.net/**
Serbia, International Radio of Serbia.....**www.glassrbije.org**
Slovakia, IRRS/Euro Gospel Radio.....**www.nexus.org**
Slovakia, IRRS/Radio City .....**www.nexus.org**
Slovakia, IRRS/Radio Joystick .....**www.nexus.org**
Slovakia, Radio Slovakia International.....**www.rsi.sk**
South Africa, AWR.....**www.awr2.org/**
South Africa, RTE Radio One **www.rte.ie/radio1/**
South Africa, Amateur Radio Mirror Intl ....**www.sarl.org.za**
South Africa, Channel Africa.....**www.channelafrica.org**
South Africa, TWR .....**www.twr.org/**
South Korea, KBS World Radio .....**http://rki.kbs.co.kr/english/**
Spain, Radio Exterior de Espana .....**www.ree.rne.es/**
Sri Lanka, SLBC .....**www.slbc.lk**
Swaziland, TWR Africa .....**www.twr.org.za**
Sweden, Radio Sweden .....**www.sr.se/rs/english/**
Syria, Radio Damascus.....**www.rtv.gov.sy/**
Taiwan, Radio Taiwan International .....**http://english.rti.org.tw/**
Thailand, Radio Thailand World Service ...**www.hsk9.com/**
Turkey, Voice of Turkey.....**www.trt.net.tr**
Uganda, Dunamis Shortwave .....**www.biblevoice.org/stations/east-africa**
Uganda, UBC Radio .....**www.ubconline.co.ug**
UK, BBC World Service.....**www.bbc.co.uk/worldservice/**
UK, Bible Voice Broadcasting.....**www.biblevoice.org/**
Ukraine, Radio Ukraine International .....**www.nrcu.gov.ua/**
United Arab Emirates, FEBA Radio .....**www.febaradio.info**
United States, Overcomer Ministries.....**www.overcomerministry.org/**
USA, American Forces Network .....**http://myafn.dodmedia.osd.mil/**
USA, Eternal Good News .....**www.oldpaths.net/Works/Radio/Wilshire**
USA, EWTN/WEWN Vandiver AL .....**www.ewtn.com**
USA, KNLS Anchor Point AK.....**www.knls.org/**
USA, Voice of America .....**www.voanews.com/**
USA, Voice of America/Special English.....**www.voanews.com/**
USA, Voice of America/Studio 7.....**www.voanews.com/english/africa/zimbabwe**
USA, WBCQ Monticello ME.....**www.wbcq.com/**
USA, WHRI Cypress Creek SC .....**www.whr.org/**
USA, WINB Red Lion PA .....**www.winb.com/**
USA, WRMI Miami FL.....**www.wrmi.net/**
USA, WTJC Newport NC.....**www.fbnradio.com/**
USA, WTWW Lebanon TN.....**www.wtww.us**
USA, WWCR Nashville TN.....**www.wwcr.com**
USA, WWRB Manchester TN.....**www.wwrb.org/**
USA, WYFR/Family Radio Worldwide .....**www.worldwide.familyradio.org**
Uzbekistan, CVC Intl/ The Voice Asia .....**www.christianvision.com/**
Vatican City State, Vatican Radio.....**www.vaticanradio.org**
Vietnam, Voice of Vietnam.....**www.vovnews.vn**
Zambia, 1 Africa Radio/CVC.....**www.1africa.tv**

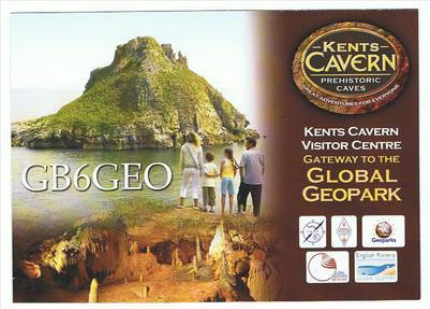
Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

Calling All Hams and Shortwave Listeners

Radio stations from around the world will be exchanging greetings over the airwaves with the English Riviera Global Geopark in May, as amateur radio operators transmit live from Kents Cave in Torquay.

Using a special event call sign, GB6GEO will establish contact with other radio stations around Britain, Europe, and around the world from a base set up outside the entrance to Kents Cave in Devon's internationally famous Stone Age cave and gateway to the English Riviera Global Geopark.

There are now 53 Geoparks around the world, but this special radio event is being coordinated from Kents Cavern. Visitors will be able to link up with several other Geoparks by radio over the weekend, including Araipe, Brazil; Kanawinka in Australia, Langkawi, Malaysia; the Petrified Forest of Levsvos Geopark in Greece, the Brecon Beacons in Wales; Terra Vita, Germany; Hateg Country Dinosaur Geopark Romania; Naturtejo Geopark Portugal, and the Copper Coast Geopark in Southern Ireland.



Many Geoparks also have show caves and those participating so far include: Smoo Cave in the North West Highlands in Scotland, Marble Arch Caves in Northern Ireland and Unicorn Cave in the Harz Mountains in Germany. With the event now global, the event will occur from 0900 on Saturday May 22, through the night to 1600 UTC on Sunday, May 23, 2010.

The English Riviera Geopark is offering a special commemorative *European Geoparks Network* radio amateur certificate for contacts with GB6GEO (instant qualifier), or two Geopark stations excluding GB6GEO. This award will also apply to shortwave listeners for stations heard. The certificate is endorsed by H.R.H. The Duke of Edinburgh, with his words of congratulations. Certificates will cost UK £2.50 each, Europe €4.0, and the rest of the world 5.00 US. The Certificate Manager is Martin Foster G3VOF (see contact info below).

There is also a special glossy souvenir QSL card for this event, promoting the English Riviera Geopark. All QSL cards will automatically be sent out via the bureau, or send an SASE in the United Kingdom. If you live outside the U.K., please send an addressed envelope and sufficient funds for return postage, if you would like a card direct. QSL via G3VOF, Martin Foster, 1, Clavering Court, Lincombe Drive, Torquay, TQ1 2HH England. Questions may be sent to his email address *martin@riviera.fm*

Additional event updates and frequency information will be posted via a GB6GEO search at **www.qrz.com**

❖ Palestine E4X Operation

Dates for the upcoming E4X operation have been announced. Activity will take place between May 28-June 6, 2010. The operators mentioned are: Antonio /AE5RM (Team Leader), Roberto /EA2RY, Fernando/EA5FX, Manuel/EA7AJR, Jose/EA7KW, Florent/F5CWU, Alain/F6ENO, Bernard/F9IE, Fabrizio/IN3ZNR and Valery/UT7CR. Operations will be on 160-6 meters including 30/17/12 meters using CW, SSB, and RTTY with at least three stations on the air at the same time on different bands and modes. QSL via EA5RM, Antonio Gonzalez, P.O. Box 930, E-03200 Elche, Spain. A band and mode survey is being taken on their web page at **www.dxfriends.com/e4x/index.php**

❖ QSLing Bahrain

Dave, EI3IO, is expected to be active as A92IO from Sar, Northern Region, Kingdom of Bahrain (AS-002) until at least August 2011. His focus will be on 80-10, and 160 meters. QSL direct to: Dave Court, P.O. Box 31183, Budaiya, Bahrain or to: Dave Court EI3IO, Connogue, River Lane, Shankill, Co Dublin, Ireland. Consult his web page at: **http://A92.ath.cx**

❖ Hams still raving

Amateur radio operators continue to rave over *World Radio Online*, the first wide-distribution general amateur radio interest magazine, published exclusively online, by CQ Communications. Topics from recent issues included *Hamfest* and *Special Events, DX Predictions, Contest Calender, Trail-Friendly Radio, Two Seasoned Hams Help a Friend in Need* and more. Issues are free, and monthly editions are available in a downloadable PDF file. Back issues for 2009 can be purchased for $ 15.00 on CD. To find out what you've been missing go to **www.cq-amateur-radio.com/**

❖ Design QSLs your way

The popularity of designing one's own QSL card has doubled among creative operators. VA3HJ has announced that QslDesignAndPrint, version 1.4.6 is now available for designing and printing QSL cards, as well as designing cards for a professional printer. Cards may contain images, text fields for call signs, location, greetings, and up to five contacts may be printed on a card. Program information and sample images may be found at **www.va3hj.ca**

❖ Portishead Radio Calling

To mark the 10th anniversary of the closure of the world's largest maritime radio station, Portishead Radio/GKA, a special call sign GB10GKA has been granted. GB10GKA is being activated for a period of one month April 30-May 27, 2010. Hours of operation depend on the individual operator's free time; however, it is intended that the call sign will be active extensively throughout the licensed period. Operation will be primarily on Morse code. QSLs are from the Royal Society of Great Britain (RSGB) **www.rsbg.org/**

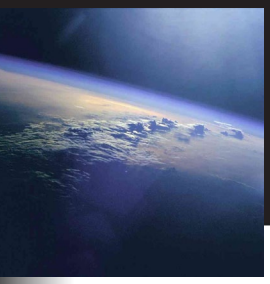
❖ Special events set for June

Operators WB2REM and KD2JA, will be active as VP5/WB2REM and VP5/KD2JA, from Providenciales (NA-002), Caicos Islands on June 10-17. They will operate on CW and SSB on 160-6 meters, and will participate in the ARRL June VHF Contest (June 12-14) as VQ5M. Operation for the contest will be on 6 meters SSB and CW only. QSL via KD2JA Glenn Belkin, 8575 South Tropical Trail, Merritt Island, FL 32952 USA.

Eight operators from the Grantham Amateur Radio Club will be active as OZ/G0GRC from Fyn Island (EU-172) on June 18-23. All of the contacts will be confirmed automatically via ARRL **www.arrl.org**. Direct QSLs may be directed to G0RCI Alan Gibson, 1 Oakleigh Road, Grantham, Grantham NG31 7NN England.

❖ Dayton Hamvention...a must-see

If amateur radio just sounds interesting, or if you're an active operator, might I suggest the Dayton Hamvention, May 14-16, 2010? Forums cover all aspects of amateur radio, flea markets, exams, exhibitors and more to keep you busy at the annual mega fest. To learn more go to: **www.hamvention.org**



MTXtra
Shortwave Broadcast Guide

ARABIC/SPANISH

The following language schedule is extracted from our new *MTXtra Shortwave Broadcast Guide* pdf which is a free download to all *MTXpress* subscribers. This new online *Shortwave Broadcast Guide* has more than 9,100 station entries that include all languages being broadcasts via shortwave radio worldwide, sorted by time and updated monthly.

1800 UTC - 2PM EDT / 1PM CDT / 11AM PDT

1800	1857	Algeria, Radio Algerienne	9390af		
1800	1900	Bahrain, Radio Bahrain	9745me		
1800	1900	Clandestine, Radio Nacional De La 6297af	RASD		
1800	1900	Egypt, Radio Cairo/Waadi El Nile	9250af		
1800	1900	India, All India Radio 9905me	6280me	7305me	
1800	1900	Iran, VOIRI/ IRIB	6065va		
1800	1900	Kuwait, Radio Kuwait	15495af		
1800	1900	Morocco, RDTV Marocaine	15345af		
1800	1900	Oman, Radio Sultanate of Oman	15140va		
1800	1900	Russia, Voice of Russia 5965eu 7400va	5850me 6020va	6060va 11795af	5945me 7345va
1800	1900	Saudi Arabia, BSKSA/General Program 9870eu	9555af		
1800	1900	Saudi Arabia, BSKSA/Program 2	9580va		
1800	1900	Saudi Arabia, BSKSA/Qu'ran Program 11915af	11820eu 11930af		
1800	1900	Spain, Radio Exterior de Espana	11765me		
1800	1900	Sudan, Rep of Sudan Radio/Omdurman	7200do		
1800	1900	Sweden, IBRA Radio	9635af		
1800	1900	Tunisia, RDTV Tunisienne 12005me	7225af	9725eu	
1800	1900	UK, BBC World Service 7375me	5790va	6195me	
1800	1900	USA, WYFR/Family Radio Worldwide 9660va	9845va	7220va	
1830	1900	Austria, AWR Europe	9605af		
1830	1900	China, China Radio International 11640af	13685af	7430va	
1845	1900	Jordan, Radio Jordan	9830eu		

1900 UTC - 3PM EDT / 2PM CDT / 12PM PDT

1900	1957	Algeria, Radio Algerienne	7455af	9390af	
1900	1930	Armenia, Public Radio of Armenia	4810me		
1900	2000	Bahrain, Radio Bahrain	9745me		
1900	1930	China, China Radio International 11640af	13685af	7430va	
1900	2000	Clandestine, Radio Nacional De La 6297af	RASD		
1900	2000	Egypt, Radio Cairo6290eu			
1900	2000	Egypt, Radio Cairo/Voice of the Arabs	11925af		
1900	2000	Egypt, Radio Cairo/Waadi El Nile	9250af		
1900	1930	Germany, AWR Europe	11760af		
1900	2000	Germany, AWR Europe	11955af		
1900	1930	Germany, FEBA Radio	7235af		
1900	1945	India, All India Radio 9905me	6280me	7305me	
1900	2000	Iran, VOIRI/ IRIB	6065va		
1900	2000	Jordan, Radio Jordan	9830eu		
1900	2000	Kuwait, Radio Kuwait	15495af		
1900	2000	Morocco, RDTV Marocaine	15345af		
1900	1957	Netherlands, R Netherlands Worldwide 11830af	9895af		
1900	2000	Oman, Radio Sultanate of Oman	15140va		
1900	2000	Russia, Voice of Russia 6020eu	5965va 7345va	5975me 7400va	
1900	2000	Rwanda, FEBA Radio	9550me		
1900	2000	Saudi Arabia, BSKSA/General Program 9870eu	9555af		
1900	2000	Saudi Arabia, BSKSA/Program 2	9580va		
1900	2000	Saudi Arabia, BSKSA/Qu'ran Program 11915af	11820eu 11930af		
1900	2000	South Korea, KBS World Radio	5935va		
1900	2000	mtwhf	Spain, Radio Exterior de Espana 12030me	7270af	
1900	2000		Sudan, Rep of Sudan Radio/Omdurman	7200do	
1900	1930		Sweden, IBRA Radio	9635af	
1900	2000		Tunisia, RDTV Tunisienne 12005me	7225af	9725eu
1900	2000		UK, BBC World Service 6195me	5790va 7375me	6030me 9915af
1900	2000		USA, WYFR/Family Radio Worldwide	5745va	
1930	2000	Sun	Germany, Pan American Broadcasting	6020af	

2000 UTC - 4PM EDT / 3PM CDT / 1PM PDT

2000	2057		Algeria, Radio Algerienne	7455af	7455af
2000	2100		Bahrain, Radio Bahrain	9745me	
2000	2059		Canada, Radio Canada International 11865va	13650va	9710va
2000	2100		China, China Radio International 6185af	7275af	6100af
2000	2100		Clandestine, Radio Nacional De La 6297af	RASD	
2000	2100		Egypt, Radio Cairo6290eu	6860pa	
2000	2100		Egypt, Radio Cairo/Voice of the Arabs	11925af	
2000	2100		Egypt, Radio Cairo/Waadi El Nile	9250af	
2000	030	Sat	Germany, Pan American Broadcasting	6020af	
2000	2015	Sun	Germany, Pan American Broadcasting	6020af	
2000	2027		Iran, VOIRI/ IRIB	6065va	
2000	2100		Jordan, Radio Jordan	9830eu	
2000	2100		Kuwait, Radio Kuwait	15495af	
2000	2100		Morocco, RDTV Marocaine	15345af	
2000	2057		Netherlands, R Netherlands Worldwide	5935af	
2000	2100		Oman, Radio Sultanate of Oman	15140va	
2000	2100		Russia, Voice of Russia 7345va	5965me	5975me
2000	2030		Rwanda, FEBA Radio	9550me	
2000	2100		Saudi Arabia, BSKSA/General Program 9870eu	9555af	
2000	2100		Saudi Arabia, BSKSA/Program 2	9580va	
2000	2100		Saudi Arabia, BSKSA/Qu'ran Program 11915af	11820eu 11930af	
2000	2100	mtwhf	Spain, Radio Exterior de Espana 12030me	7270af	
2000	2100	Sat/Sun	Spain, Radio Exterior de Espana	7270af	
2000	2100		Sudan, Rep of Sudan Radio/Omdurman	7200do	
2000	2100		Tunisia, RDTV Tunisienne 9725eu	7225eu 12005me	7345af
2000	2100		UK, BBC World Service 6195me	5790va 7375me	6030me 9915af
2000	2100		USA, WYFR/Family Radio Worldwide 6010va	9465va	9630af 17690va
2005	2100		Canada, Radio Canada International	9610na	
2030	2100		Cuba, Radio Havana Cuba	11770eu	
2030	2100		Iran, VOIRI/ IRIB	3985as	6065as

2100 UTC - 5PM EDT / 4PM CDT / 2PM PDT

2100	2200		Bahrain, Radio Bahrain	9745me	
2100	2104		Canada, Radio Canada International	9610na	
2100	2200		China, China Radio International 6185af	7275af	6100af
2100	2200		Clandestine, Radio Nacional De La 6297af	RASD	
2100	2200		Egypt, Radio Cairo6290eu	6860pa	
2100	2200		Egypt, Radio Cairo/Voice of the Arabs	11925af	
2100	2200		Egypt, Radio Cairo/Waadi El Nile	9250af	
2100	2200		Iran, VOIRI/ IRIB	3985as	6065as
2100	2115		Jordan, Radio Jordan	9830eu	
2100	2200		Kuwait, Radio Kuwait	15495af	
2100	2200		Morocco, RDTV Marocaine	15345af	

2100	2200		Oman, Radio Sultanate of Oman	15140va
2100	2200		Saudi Arabia, BSKSA/General Program 9870eu	9555af
2100	2200		Saudi Arabia, BSKSA/Program 2	9580va
2100	2200		Saudi Arabia, BSKSA/Qu'ran Program 11915af 11930af	11820eu
2100	2200	Sat/Sun	Spain, Radio Exterior de Espana	7270af
2100	2200		Sudan, Rep of Sudan Radio/Omdurman	7200do
2100	2145		Sweden, IBRA Radio	12025va
2100	2110		Tunisia, RDTV Tunisienne 12005me	7225af 9725eu
2100	2200		Tunisia, RDTV Tunisienne	7345af
2100	2145		UK, HCJB Global	12025af
2100	2200		USA, WYFR/Family Radio Worldwide 11665va	6010af
2140	2200		Vatican City State, Vatican Radio 585eu 7250eu	4005eu

2200 UTC - 6PM EDT / 5PM CDT / 3PM PDT

2200	2300		Bahrain, Radio Bahrain	9745me
2200	2300		Clandestine, Radio Nacional De La RASD 6297af	
2200	2300		Egypt, Radio Cairo6290eu	
2200	2300		Egypt, Radio Cairo/Voice of the Arabs	11925af
2200	2300		Egypt, Radio Cairo/Waadi El Nile	9250af
2200	2300		Iran, VOIRI/ IRIB 3985as	6065as
2200	2300	DRM	Kuwait, Radio Kuwait	11675va
2200	2300		Kuwait, Radio Kuwait	15495af
2200	2257		Netherlands, R Netherlands Worldwide	9895af
2200	2300		Saudi Arabia, BSKSA/General Program 9870eu	9555af
2200	2300		Saudi Arabia, BSKSA/Qu'ran Program 11915af 11930af	11820eu
2200	2230		Sudan, Rep of Sudan Radio/Omdurman	7200do
2200	2300		Tunisia, RDTV Tunisienne	7345af
2200	2300		USA, WYFR/Family Radio Worldwide 15115va	5960va

2300 UTC - 7PM EDT / 6PM CDT / 4PM PDT

2300	0000		Bahrain, Radio Bahrain	9745me
2300	0000		Egypt, Radio Cairo6290eu	
2300	0000		Egypt, Radio Cairo/Voice of the Arabs	11925af
2300	0000		Iran, VOIRI/ IRIB 3985as	6065as
2300	0000	DRM	Kuwait, Radio Kuwait	11675va
2300	0000		Tunisia, RDTV Tunisienne	7345af
2330	0000		Egypt, Radio Cairo9360sa	9250sa

MT SPANISH SHORTWAVE BROADCAST GUIDE

0000 UTC - 8PM EDT / 7PM CDT / 5PM PDT

0000	0100	Sat/Sun	Argentina, Radio Nacional RAE 11710am	6060am
0000	0100		Bolivia, Radio Eco 4409do	
0000	0100		Bolivia, Radio Estambul	4498do
0000	0100		Bolivia, Radio Nacional de Huanuni	5967do
0000	0100		Bolivia, Radio San Jose	5580do
0000	0100		Bolivia, Radio San Miguel	4699do
0000	0100		Bolivia, Radio Tacana	4781do
0000	0100		Bolivia, Radio Virgen de Remedios	4834do
0000	0100		Bolivia, Radio Yura4716do	
0000	0100		Bulgaria, Radio Bulgaria	7300sa 7300sa
0000	0059		Canada, Radio Canada International 11990sa	9640sa
0000	0100		Chile, La Voz Crista	9745sa 17680sa
0000	0100		China, China Radio International 9590sa 9800sa	5990ca 15120sa
0000	0100		Clandestine, Radio Republica	9810ca
0000	0100		Colombia, La Voz de tu Conciencia 5910al	6010do
0000	0100		Colombia, La Voz del Guaviare	6035do
0000	0100		Colombia, Radio Marfil Estereo 6010al	5910do
0000	0100		Cuba, Radio Havana Cuba 6140na 13770sa	6060am 9600sa 11690sa 6120am 11760am
0000	0100		Cuba, Radio Rebelde	5025na
0000	0027		Czech Republic, Radio Prague	5930sa 7420sa
0000	0100		Dominican Rep. R Amanecer Internacional 6025va	
0000	0100		Ecuador, HCJB Global	6050sa
0000	0100		Ecuador, Radio Quito	4919do
0000	0100		Honduras, HRMI/ Radio Misiones Intl	3340do
0000	0100		Honduras, Radio Luz y Vida	3250do
0000	0100		Mexico, XEOI/Radio Mil	6010do
0000	0100		Mexico, XERTA/Radio Transcontinental	4800do
0000	0100		Mexico, XEXQ/Radio Universidad	6045do
0000	0057		Netherlands, R Netherlands Worldwide 9865sa 9895sa	6165ca
0000	0100		North Korea, Voice of Korea 15180am	11735am 13760am
0000	0100		Peru, Radio Bethel 5949do	
0000	0100		Peru, Radio Bolivar	5460do
0000	0100	Sun	Peru, Radio Cusco 6195do	
0000	0100		Peru, Radio La Reyna de la Selva	5485do
0000	0100		Peru, Radio La Voz De Bolivar	5460do 4755al
0000	0100		Peru, Radio La Voz de la Selva	4824do
0000	0100		Peru, Radio La Voz de las Huarinjas	5059do
0000	0100		Peru, Radio Libertad de Junin	5039do
0000	0100		Peru, Radio Maranon	4835do
0000	0100		Peru, Radio Melodia	5940do
0000	0100		Peru, Radio Rasuwilca	4805do
0000	0100		Peru, Radio San Antonio	4940do
0000	0100		Peru, Radio San Nicolas	5470do
0000	0100		Peru, Radio Santa Monica	4965do
0000	0100		Peru, Radio Santa Rosa	6047do
0000	0100		Peru, Radio Super Sensacion	6536do
0000	0100	twhfas	Peru, Radio Tarma 4775do	
0000	0100		Peru, Radio Union 6114do	
0000	0100		Peru, Radio Vision 4790do	
0000	0056		Romania, Radio Romania International 9525ca 9665ca 11960ca	5960ca
0000	0100		Russia, Voice of Russia	9965sa
0000	0010		Spain, Radio Exterior de Espana 9535ca 9620sa 9765sa	6125sa 11680sa
0000	0100		Uruguay, Radio Sarandi	6045do
0000	0100		USA, EWTN/WEWN Vandiver AL 11870sa	5810ca
0000	0100		USA, KVOH Rancho Simi CA	17775ca
0000	0100		USA, Radio Marti 6030ca 7365ca	9825ca
0000	0100		USA, WYFR/Family Radio Worldwide 5985ca 9355ca 11855am 15440am	5980ca 13615sa
0000	0100		Venezuela, Radio Amazonas	4940do
0030	0100		Iran, VOIRI/ IRIB 7225sa	9680sa
0045	0100		Egypt, Radio Cairo6270na	9360sa 9915sa

0100 UTC - 9PM EDT / 8PM CDT / 6PM PDT

0100	0200	Sat/Sun	Argentina, Radio Nacional RAE 11710am	6060am
0100	0200		Bolivia, Radio Eco 4409do	
0100	0200		Bolivia, Radio Estambul	4498do
0100	0200		Bolivia, Radio Nacional de Huanuni	5967do
0100	0200		Bolivia, Radio San Jose	5580do
0100	0200		Bolivia, Radio San Miguel	4700do
0100	0200		Bolivia, Radio Tacana	4781do
0100	0200		Bolivia, Radio Yura4716do	
0100	0130		Canada, Radio Canada International	6100ca
0100	0200		China, China Radio International 9665sa 9710sa	9590sa
0100	0200		Clandestine, Radio Republica	9810ca
0100	0200		Colombia, La Voz de tu Conciencia 5910al	6010do
0100	0200		Colombia, La Voz del Guaviare	6035do
0100	0200		Colombia, Radio Marfil Estereo 6010al	5910do
0100	0200		Cuba, Radio Havana Cuba 6120ca 6140na 11760sa 13770sa	6060am 6110am 9600sa 11690sa
0100	0200		Cuba, Radio Rebelde	5025na
0100	0200		Dominican Rep. R Amanecer Internacional 6025va	
0100	0200		Ecuador, HCJB Global	6050sa
0100	0200		Ecuador, Radio Quito	4919do
0100	0200		Egypt, Radio Cairo6270na	9360sa 9915sa
0100	0130		France, Radio France Internationale	5995sa
0100	0200		Honduras, HRMI/ Radio Misiones Intl	3340do
0100	0200		Honduras, Radio Luz y Vida	3250do
0100	0200		Mexico, XEOI/Radio Mil	6010do
0100	0200		Mexico, XERTA/Radio Transcontinental	4800do
0100	0200		Mexico, XEXQ/Radio Universidad	6045do
0100	0157		Netherlands, R Netherlands Worldwide 9895sa	6165ca
0100	0200		Peru, Radio Bethel 5949do	

SHORTWAVE GUIDE

0100	0200		Peru, Radio Bolivar	5460do		
0100	0200	Sun	Peru, Radio Cusco 6195do			
0100	0200		Peru, Radio La Reyna de la Selva			5485do
0100	0200		Peru, Radio La Voz De Bolivar	5460do		4755al
0100	0200		Peru, Radio La Voz de la Selva	4824do		
0100	0200		Peru, Radio La Voz de las Huarinjas			5059do
0100	0200		Peru, Radio Libertad de Junin	5039do		
0100	0200		Peru, Radio Maranon	4835do		
0100	0200		Peru, Radio Melodia	5940do		
0100	0200		Peru, Radio San Antonio	4940do		
0100	0130		Peru, Radio San Nicolas	5470do		
0100	0200		Peru, Radio Santa Monica	4965do		
0100	0200		Peru, Radio Santa Rosa	6047do		
0100	0200	twhfas	Peru, Radio Tarma 4775do			
0100	0200		Peru, Radio Union 6114do			
0100	0200		Peru, Radio Vision 4790do			
0100	0200		Peru, Radio Vision 4790do			
0100	0200		Russia, Voice of Russia	6135sa	6185sa	
			7210sa	7280ca	7290sa	7300sa
			9880sa	9965sa		
0100	0200		South Korea, KBS World Radio			9580sa
0100	0200		Spain, Radio Exterior de Espana			6055na
			6125sa	9535ca	9620sa	9765sa
			11680sa			
0100	0200		Uruguay, Radio Sarandi	6045do		
0100	0200		USA, EWTN/WEWN Vandiver AL			5810ca
			11870sa			
0100	0200		USA, KVOH Rancho Simi CA	9975ca		
0100	0200		USA, KVOH Rancho Simi CA	9975ca		
0100	0200		USA, WYFR/Family Radio Worldwide			5985ca
			9355ca	9525am	9985sa	11855am
			11885sa			
0100	0200		USA, WYFR/Family Radio Worldwide			5985ca
			11835ca	11855ca	15215sa	15255sa
			17750sa			
0100	0200		Vatican City State, Vatican Radio			7305am
			9610am	11910am		
0100	0200		Venezuela, Radio Amazonas	4940do		
0130	0157		Czech Republic, Radio Prague	7355ca		

0200 UTC - 10PM EDT / 9PM CDT / 7PM PDT

0200	0300	Sat	Argentina, Radio Nacional RAE			15345am
0200	0300	Sun	Argentina, Radio Nacional RAE			6060am
			11710am			
0200	0300		Bolivia, Radio Estambul	4498do		
0200	0230		Bolivia, Radio San Jose	5580do		
0200	0300		Bolivia, Radio San Miguel	4699do		
0200	0300		Bolivia, Radio Tacana	4781do		
0200	0300		Bulgaria, Radio Bulgaria	7300sa		9400sa
0200	0259		Canada, Radio Canada International			9800ca
0200	0300		China, China Radio International			9710sa
0200	0300		Clandestine, Radio Republica	9810ca		
0200	0300		Colombia, La Voz de tu Conciencia			6010do
			5910al			
0200	0300		Colombia, La Voz del Guaviare			6035do
0200	0300		Colombia, Radio Marfil Estereo			5910do
			6010al			
0200	0300		Cuba, Radio Havana Cuba	6060am		6110am
			6120ca	6140na	9600sa	11690sa
			11760am	13770sa	13790sa	
0200	0300		Cuba, Radio Rebelde	5025na		
0200	0300		Dominican Rep. R Amanecer Internacional			
			6025va			
0200	0300		Ecuador, HCJB Global	6050sa		
0200	0300		Ecuador, Radio Quito	4919do		
0200	0300		Honduras, HRMI/ Radio Misiones Intl			3340do
0200	0300		Honduras, Radio Luz y Vida	3250do		
0200	0227		Iran, VOIRI/ IRIB	7225sa		9680sa
0200	0300		Mexico, XEOI/Radio Mil	6010do		
0200	0300		Mexico, XERTA/Radio Transcontinental			4800do
0200	0300		Mexico, XEXQ/Radio Universidad			6045do
0200	0300		Netherlands, R Netherlands Worldwide			6165ca
0200	0300		North Korea, Voice of Korea	11735am		13760am
			15180am			
0200	0300		Peru, Radio Bethel 5949do			
0200	0300		Peru, Radio Bolivar	5460do		
0200	0300		Peru, Radio Cusco 6195do			
0200	0300		Peru, Radio La Reyna de la Selva			5485do
0200	0300		Peru, Radio La Voz De Bolivar	5460do		4755al
0200	0300		Peru, Radio La Voz de la Selva	4824do		
0200	0300		Peru, Radio Maranon	4835do		
0200	0300		Peru, Radio Melodia	5940do		
0200	0300		Peru, Radio Santa Monica	4965do		
0200	0300		Peru, Radio Santa Rosa	6047do		
0200	0300	twhfas	Peru, Radio Tarma 4775do			
0200	0300		Peru, Radio Union 6114do			
0200	0300		Peru, Radio Vision 4790do			
0200	0300		Russia, Voice of Russia	6135sa		7210sa
			7280ca	7290sa	7335ca	9475sa
			9880sa	9965sa		
0200	0230		South Korea, KBS World Radio			9560na
0200	0300		Spain, Radio Exterior de Espana			3350ca
			6055na	6125sa	9535ca	9620sa
			9765sa			
0200	0300		Taiwan, Radio Taiwan International			7570sa
			9840sa			
0200	0255		Turkey, Voice of Turkey	9410va		9650va
0200	0300		Uruguay, Radio Sarandi	6045do		
0200	0300		USA, EWTN/WEWN Vandiver AL			5810ca
			11870sa			
0200	0300		USA, KVOH Rancho Simi CA	9975ca		
0200	0300		USA, Radio Marti	6030ca	7365ca	9825ca
0200	0300		USA, WYFR/Family Radio Worldwide			9355ca
			9985ca	11825sa	13615am	
0200	0300		USA, WYFR/Family Radio Worldwide			9355ca
			9985ca	11825sa	13615am	
0200	0300		Venezuela, Radio Amazonas	4940do		
0230	0300		Iran, VOIRI/ IRIB	7225sa		
0230	0257		Slovakia, Radio Slovakia International			6080sa
			9440sa			

0300 UTC - 11PM EDT / 10PM CDT / 8PM PDT

0300	0400		Bolivia, Radio Estambul	4498do		
0300	0400		China, China Radio International			9665sa
0300	0400		Clandestine, Radio Republica	9810ca		
0300	0400		Colombia, La Voz de tu Conciencia			6010do
			5910al			
0300	0400		Colombia, Radio Marfil Estereo			5910do
			6010al			
0300	0400		Cuba, Radio Havana Cuba	6060am		6110am
			6120ca	6140na	9600sa	11690sa
			11760am	13770sa	13790sa	
0300	0400		Cuba, Radio Rebelde	5025na		
0300	0327		Czech Republic, Radio Prague	7345sa		
0300	0400		Dominican Rep. R Amanecer Internacional			
			6025va			
0300	0400		Ecuador, HCJB Global	6050sa		
0300	0400		Ecuador, Radio Quito	4919do		
0300	0400		Honduras, HRMI/ Radio Misiones Intl			3340do
0300	0400		Honduras, Radio Luz y Vida	3250do		
0300	0327		Iran, VOIRI/ IRIB	7225sa		
0300	0400		Mexico, XEOI/Radio Mil	6010do		
0300	0400		Mexico, XERTA/Radio Transcontinental			4800do
0300	0400		Mexico, XEXQ/Radio Universidad			6045do
0300	0357		Netherlands, R Netherlands Worldwide			6165ca
0300	0400		Peru, Radio Cusco 6195do			
0300	0330		Peru, Radio La Voz De Bolivar	5460do		4755al
0300	0400		Peru, Radio Melodia	5940do		
0300	0400		Peru, Radio Santa Monica	4965do		
0300	0400		Peru, Radio Santa Rosa	6047do		
0300	0400	twhfas	Peru, Radio Tarma 4775do			
0300	0400		Peru, Radio Union 6114do			
0300	0400		Peru, Radio Vision 4790do			
0300	0356		Romania, Radio Romania International			6140ca
			9635ca	9765ca	11825ca	
0300	0400		Russia, Voice of Russia	6135sa		6185sa
			7210sa	7280ca	7335ca	9475sa
			9965sa			
0300	0400		Spain, Radio Exterior de Espana			3350ca
			6055na	6125sa	9535ca	9620sa
			9765sa			
0300	0400		Uruguay, Radio Sarandi	6045do		
0300	0400		USA, EWTN/WEWN Vandiver AL			5810ca
			11870sa			
0300	0400		USA, KVOH Rancho Simi CA	9975ca		
0300	0400		USA, Radio Marti	6030ca	7365ca	7405ca
			9825ca			
0300	0400		USA, WYFR/Family Radio Worldwide			5985ca
			6855am	7570ca	9355ca	9525am
			9680am	11855am		
0300	0330		Vietnam, Voice of Vietnam/Overseas Service			
			6175na			
0305	0400		Canada, Radio Canada International			9755na
0320	0400		Vatican City State, Vatican Radio			6040am
			7305am			

0400 UTC - 12AM EDT / 11PM CDT / 9PM PDT

0400	0404		Canada, Radio Canada International			9755na
0400	0500		Colombia, La Voz de tu Conciencia			6010do
			5910al			
0400	0500	Sat/Sun	Colombia, La Voz del Guaviare			6035do
0400	0500		Colombia, Radio Marfil Estereo			5910do
			6010al			
0400	0500		Cuba, Radio Havana Cuba	6060am		6110am
			6120ca	6140na	9600sa	11690sa
			11760am	13790sa		
0400	0500		Cuba, Radio Rebelde	5025na		
0400	0500		Ecuador, HCJB Global	6050sa		
0400	0500		Ecuador, Radio Quito	4919do		
0400	0500		Honduras, HRMI/ Radio Misiones Intl			3340do
0400	0430		Japan, NHK World/ Radio Japan			6195sa
0400	0500		Mexico, XEOI/Radio Mil	6010do		
0400	0500		Mexico, XERTA/Radio Transcontinental			4800do
0400	0500		Mexico, XEXQ/Radio Universidad			6045do
0400	0500		Peru, Radio Melodia	5940do		
0400	0500		Peru, Radio Santa Monica	4965do		
0400	0500		Peru, Radio Santa Rosa	6047do		
0400	0500		Peru, Radio Union 6114do			
0400	0500		Peru, Radio Vision 4790do			
0400	0500		Russia, Voice of Russia	6135sa		6185sa
			7210sa	7280ca	7335ca	9475sa
			9965sa			
0400	0500		Spain, Radio Exterior de Espana			3350ca
			5965sa	6055na	6125sa	9535ca
			9620sa	9765na		
0400	0500		Taiwan, Radio Taiwan International			6890ca
			11885ca			
0400	0500		Uruguay, Radio Sarandi	6045do		
0400	0500		USA, EWTN/WEWN Vandiver AL			5810ca
			11870sa			
0400	0500		USA, KVOH Rancho Simi CA	9975ca		
0400	0500		USA, Radio Marti	6030ca	7365ca	7405ca
0400	0500		USA, WYFR/Family Radio Worldwide			5985ca
			7730ca	9355ca	9985ca	11855am
0400	0430		Vietnam, Voice of Vietnam/Overseas Service			
			6175na			

0500 UTC - 1AM EDT / 12AM CDT / 10PM PDT

0500	0600		Colombia, La Voz de tu Conciencia			6010do
			5910al			
0500	0600	Sat/Sun	Colombia, La Voz del Guaviare			6035do
0500	0600		Colombia, Radio Marfil Estereo			5910do
			6010al			
0500	0600		Cuba, Radio Havana Cuba	6120ca		6150am
			11760am			
0500	0600		Cuba, Radio Rebelde	5025na		
0500	0600		Ecuador, Radio Quito	4919do		
0500	0600		Honduras, HRMI/ Radio Misiones Intl			3340do
0500	0530		Japan, NHK World/ Radio Japan			6195ca
0500	0600		Mexico, XEOI/Radio Mil	6010do		
0500	0600		Mexico, XERTA/Radio Transcontinental			4800do
0500	0600		Peru, Radio Melodia	5940do		
0500	0600		Peru, Radio Santa Monica	4965do		
0500	0600		Peru, Radio Santa Rosa	6047do		
0500	0600		Peru, Radio Union 6114do			
0500	0600		Peru, Radio Vision 4790do			
0500	0600		Russia, Voice of Russia	6135sa		6185sa
			7210sa	7280ca	7335ca	9475sa
			9965sa			
0500	0600		Spain, Radio Exterior de Espana			3350ca
			5965sa	6055na	9765na	11895me
0500	0600	mtwhf	Spain, Radio Exterior de Espana			12035eu
0500	0600	DRM	Spain, Radio Exterior de Espana			9780eu
0500	0600		Uruguay, Radio Sarandi	6045do		
0500	0600		USA, EWTN/WEWN Vandiver AL			7555ca
			11870sa			
0500	0600		USA, KVOH Rancho Simi CA	9975ca		
0500	0600		USA, Radio Marti	6030ca	7365ca	
0500	0600		USA, WYFR/Family Radio Worldwide			6000ca
			9355eu	9545am	9715am	
0530	0600		Iran, VOIRI/ IRIB	13710va	15320va	

0600 UTC - 2AM EDT / 1AM CDT / 11PM PDT

0600	0700		China, China Radio International			15135eu
0600	0700		Colombia, La Voz de tu Conciencia			6010do
			5910al			
0600	0700	Sat/Sun	Colombia, La Voz del Guaviare			6035do
0600	0700		Colombia, Radio Marfil Estereo			5910do
			6010al			
0600	0700		Cuba, Radio Havana Cuba	6120ca		6150am
			11760am			
0600	0700		Cuba, Radio Rebelde	5025na		
0600	0700		Ecuador, Radio Quito	4919do		
0600	0700		Honduras, HRMI/ Radio Misiones Intl			3340do
0600	0627		Iran, VOIRI/ IRIB	13710va	15320va	
0600	0700		Mexico, XEOI/Radio Mil	6010do		
0600	0700		Mexico, XERTA/Radio Transcontinental			4800do
0600	0700		Peru, Radio Melodia	5940do		
0600	0700		Peru, Radio Santa Monica	4965do		
0600	0700		Peru, Radio Santa Rosa	6047do		
0600	0700		Peru, Radio Union 6114do			
0600	0700		Peru, Radio Vision 4790do			
0600	0700		South Korea, KBS World Radio			6045eu
0600	0700		Spain, Radio Exterior de Espana			5965sa
			11895me	12035eu		
0600	0700	DRM	Spain, Radio Exterior de Espana			9780eu
0600	0700		Taiwan, Radio Taiwan International			5950na
0600	0700		Uruguay, Radio Sarandi	6045do		
0600	0700		USA, EWTN/WEWN Vandiver AL			7555ca
			11870sa			
0600	0700		USA, KVOH Rancho Simi CA	9975ca		
0600	0700		USA, Radio Marti	6030ca	7365ca	
0600	0700		USA, WYFR/Family Radio Worldwide			6855am
			9545am	9715am		

SKY SURFING

RADIO FROM THE OUTER REACHES

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Working Your First Amateur Radio Satellite (Part III)

I trust by now a number of you are "up and running" on our FM birds and are having fun collecting new "grid squares" or "working DX" with this (for you) newfound part of our wonderful hobby. However, my hunch is that your arm is probably getting tired while working these satellites using just a small, portable, handheld radio and a handheld Yagi of some sort.

With the approach of warmer weather, no doubt you'd like to begin investigating a more permanent antenna array for your satellite station. For beginners on a budget, I suggest you consider some form of omnidirectional antenna. That's because their use tremendously simplifies building your satellite station, as no rotors, cross booms, or rotor interfaces are needed.

But, unfortunately, as we have discussed, not all omnidirectional antennas are suitable for satellite work. So, this month I'll once again offer some tips to help you optimize your base station antennas for the satellites.

More Satellite Antenna Considerations

Contrary to what you might have heard from well meaning veteran satellite ops (that only a cross-polarized set of multi-element Yagi antennas mounted on a non-metallic cross boom will do), I know from my own personal experiences that such talk is largely bunkum. That is, just as with most other pursuits in amateur radio, while the "ultimate" satellite base station antenna array may sport one or more circularly polarized Yagi antennas all mounted on a fiberglass cross boom and turned by an (expensive!) commercial alt-azimuth rotator, you can usually still get excellent results on the LEO birds for a whole lot less time, money and effort.

If you already have a VHF and UHF base station set up for scanning or for use on the amateur bands, you probably also have an external VHF or UHF antenna of some sort connected to it. Unfortunately, the gain of most of these terrestrial antennas occurs at the point in a satellite's orbit where it is farthest away from you, and its downlink signal is at its weakest.

What's more, as the satellite rises above your horizon, it will gradually move outside the beam width of most terrestrially optimized antennas to the point that, when it is directly overhead, you may not hear the satellite…and it may not hear you…*at all!*

Remember, too, that amateur radio satellites are both tumbling and spinning in space. As we discussed in previous columns, cross polarizing a linear antenna results in a *huge* loss of gain. This means that, if the antenna on the satellite is horizontally polarized and your antenna on the Earth is vertically polarized, you may not receive much of anything on the ground, no matter how much power is being transmitted to or from the satellite.

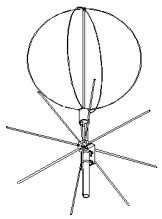
To help minimize these problems, satellite builders usually incorporate what are called "circularly polarized" antennas into their satellites. This helps minimize the effects of antenna cross-polarization losses on the ground as the satellite moves through space. That's because the difference between right-hand circular polarization and left-hand circular polarization is only about 3 dB.

Thankfully, there are a couple of relatively simple, omnidirectional antennas that are also specifically designed to achieve this high angle, circular signal polarization pattern without *also* costing you a fortune or making your home look like a NASA tracking station!

Scrambled Eggs, Anyone?

One relatively inexpensive omnidirectional base station antenna that is useful for LEO satellite work is called an "Eggbeater." The Eggbeater antenna looks a lot like its namesake, an ordinary kitchen eggbeater. It's composed of two full-wave loops of wire (or some other rigid metal material) fed 90 degrees out of phase with each other. Some designs even sport parasitic reflector elements underneath the array to give the antenna more elevated gain.

At the horizon, the eggbeater exhibits a horizontally polarized linear pattern, which also makes it useful for weak signal VHF or UHF terrestrial work. However, at higher elevations, the antenna exhibits an ever more right-hand circular radiation pattern, which makes it *ideal* for satellite work.



Adding ground plane elements under the "Eggbeater" increases the overall upward gain of the antenna. (Courtesy: M2 Antennas)

Gerald Brown, K5OE, has published an excellent Web article on how to "home brew" satellite-optimized eggbeater antennas at: **http://victrolla.homeip.net/wo5s/junkpile/432/eggbeater2.pdf.** Eggbeaters are also available from commercial antenna manufacturers such as M2 Antennas of Fresno, California (**www.m2inc.com).**

A Quadrifilar *WHAT?*

Another omnidirectional antenna design suitable for satellite work is a "Quadrifilar Helix" (or "Quadrafilar Helicoidal") antenna. A Quadrafilar Helix antenna consists of four quarter-wavelength or half-wavelength elements fed with a 90-degree phase difference. The polarization is circular, and the beam widths are often greater than 90 degrees, which means this antenna will cover a HUGE chunk of the sky.

These antennas are also relatively small and fairly easy to build out of common materials such as copper tubing and PVC pipe. However, element lengths and spacing have to be *very* precise in order to achieve a truly circularly polarized pattern.

The Quadrafilar Helix antenna is a relatively easy to build, omnidirectional antenna that can be optimized for both amateur radio and weather satellite work. (Courtesy: Bob Cash, N8IMO)

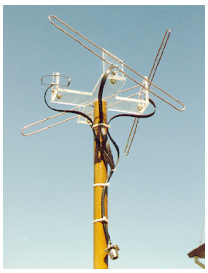
A number of ham operators (and others who are also interested in weather satellite reception) offer design tips and construction details for these antennas via various Web sites including **www.n8imo.com/qha_4.html** and **http://perso.wanadoo.es/dimoni/ant_qha.htm.** Yet another Web site on the subject, **(www.jcoppens.com/ant/qfh/calc.en.php)** sports a helpful online calculator where element lengths and spacing for these antennas can be calculated simply by entering the desired resonant frequency.

The Lindenblad

Yet another omnidirectional antenna design that can be useful for satellite work is the Lindenblad. The antenna is named for Nils Lindenblad of the Radio Corporation of America (RCA) who, back in the early 1940s, began experimenting with antenna designs that might be useful for the emerging television broadcast industry. The antenna uses four dipoles spaced equally around a 1/3-wavelength circle with each element canted at a 30-degree angle from horizontal.

Like the Quadrafilar Helix, construction articles on how to "roll your own" Lindenblad

abound on the Internet. Howard Sodja, W6SHP, optimized the Lindenblad design for satellite work in a series of articles for the AMSAT *Journal* in the early 1990s. The articles can still be found in the AMSAT Web archives at: **www.amsat.org/amsat/articles/w6shp/lindy.html.**



The Lindenblad antenna is yet another, relatively easy to build omnidirectional antenna suitable for satellite work. (Courtesy: AMSAT)

In addition, AMSAT's current Vice President of Engineering, Tony Monteiro, AA2TX, has written extensively on the Lindenblad design. Construction details of his 70cm version of the Lindenblad appeared in the Proceedings for the 2006 AMSAT Annual Meeting and Space Symposium at: **www.qsl.net/nwlarn/sat/70ParaLindy.pdf.**

❖ Directional Antennas

As the name implies, directional antennas focus RF energy in one direction. Not only do these antennas allow you to transmit your signal to satellites that are farther away from you, they also help your ground station pick up weaker signals, provided that the antennas are pointed in the right direction. As all satellite work is weak signal work, *anything* that boosts an already weak satellite downlink signal is a good thing.

Many satellite operators use some form of "Yagi" antenna in their Earth stations. The design is named for its Japanese inventors Shintaro Uda and Hidetsugu Yagi who collaborated on the antenna design in the 1920s. It consists of one or more dipoles that are fed with RF and act as "driven elements." Parasitic (that is, non-fed) elements (called "reflectors") are then mounted in back of the driven element and one or more parasitic elements (called "directors") are mounted in front. The whole array is then mounted on a cross boom of some sort.

Yagi antennas can be either linear or circularly polarized. Yagis with only one row of elements are linearly polarized (either horizontal or vertical depending on which way you mount them). However, Yagis with two rows offset by a 90-degree phase difference are circularly polarized (either right-hand or left-hand, looking down the antenna from the rear).

As I've discussed, for satellite communication, circular polarization is desirable because the difference in loss between right-hand (RHCP) and left-hand (LHCP) circular polarization is only about 3 dB. And while this loss represents about half of your uplink or downlink signal, remember that the difference between horizontal and vertical polarization is theoretically infinite. In the real world, however, the difference between horizontal and vertical polarization is around 30 to 40 dB. But that's *still* over a thousand times more loss than the difference between RHCP and LHCP!

Also, the number of elements on a Yagi is directly proportional to its gain. More elements means more gain. However, as in most other things in life, there's a tradeoff between gain and beam width. That is, the higher the gain, the narrower the beam width. So, while a 40-element Yagi may provide excellent gain, it becomes quite another matter to keep it continually pointed directly at a satellite that's rapidly moving across the sky.

Satellite antennas don't need to be fancy to be effective. Here, a pair of vertically polarized, "home brew" Yagi antennas made from bits of wire and wood are mounted on a wooden cross boom. (Courtesy: AMSAT)

The bottom line here is that, while circularly polarized Yagi beam antennas are absolutely wonderful for "full coverage" satellite work (and I've used my share of them over the years) they are absolutely *not* essential. I've still achieved consistently good results, particularly on the LEO birds, using any number of simple, linearly polarized Yagi beams.

That's probably because most of our satellites use circularly polarized antennas for their downlinks and they also rotate and tumble through space. So, the practical effects of cross polarization are at least partially minimized by these two factors. This also means that the amount of time when the satellite's antenna and your antenna are both *truly* cross polarized will usually be so brief that the momentary drop in signal strength will most often be imperceptible to your ear.

You can find any number of "cheap and easy" Yagi antenna designs and construction details on the Internet. A collection of three such articles by Richard Crow, N2SPI, ran in the AMSAT *Journal* in 2006 and have since been re-published on the AMSAT Web site at: **www.amsat.org/amsat-new/information/faqs/crow/index.php.**

❖ Feed Lines for Satellite Work

Most veteran satellite operators know that otherwise excellent antennas can be rendered quite useless if they are linked to your station equipment with poor quality feed line. The feed line is what connects your antenna to your radio. And, while the proverbial "wet noodle" feed line might work well for local VHF/ UHF repeater or scanner activity, many of them are *not at all* suited for the satellite work, because it is weak signal work.

The principal concern with feed lines is *loss*, and every feed line has it to some degree. That is, if you insert 50 Watts into a feed line at your station, you'll have *less* than 50 Watts once your signal gets to your antenna. The rest of the power is lost somewhere in the feed line, usually in the form of heat.

Unfortunately, these characteristics also apply to signal reception as well. And because the signal from one of our satellites is *already* weak when it strikes your antenna, it follows that you can ill afford to waste *any* of that RF heating up your feed line. What's more, those losses usually go up as the line length and operating frequencies being transmitted or received increase.

So, most of us working the birds these days are using some form of coaxial cable (or simply "coax") for feed line. There are about as many varieties of coax as there are companies manufacturing them. However, most of us use some form of "low loss" coaxial cable such as Belden 9913 or Times LMR 400 as opposed to lengths of RG-58, RG-8X. RG-213 or RG-8 used in most other amateur radio work.

Satellite operators use low loss coax cable in their Earth stations because, as the name implies, this coax exhibits much lower losses (particularly at VHF and UHF frequencies) than those used for other (primarily HF) amateur activities. For many years, I've used a variety of Belden 9913 coax for my various satellite stations. It exhibits a relatively low loss (on the order of about 2.6 dB at 400 MHz) per 100 feet) which is roughly half that of a similar length of RG-8 coax (about 4.1 dB).

The magic number to keep in mind when comparing feed lines is 3 dB. That's because, for every 3 dB of loss, roughly *half* of your signal is being wasted in the feed line. So, in the example above, at frequencies close to our uplink and downlink frequencies (400 MHz), using a 100-foot length of RG-8 means that *well* more than half of your uplink power (or downlink signal) will be lost in the coax.

Unfortunately, for all of its low loss attributes, Belden 9913 also has a dark side. Because the dielectric in this coax is largely made up of air, it tends to attract moisture. And even though you can try your best to completely seal connection points from the elements, over time, the normal heating and cooling of the atmosphere *will* result in moisture getting into the cable. For this reason, veteran satellite operators sometimes (derisively) refer to 9913 and its variants as "garden hose."

Fortunately, a newer brand of cable on the market, called Times LMR 400, offers about the same loss characteristics as Belden 9913 at about the same price, but without the "garden hose" issue. An excellent discussion on various types of transmission lines (including their loss characteristics) can be found at: **www.hamuniverse.com/coaxdata.html.**

❖ Looking Ahead

In future columns, I'll continue our discussion of innovative ways to optimize your satellite base station as well as bring you up to date on all of the latest happenings in the amateur satellite world. I'll also share some history about how our OSCAR satellites and the AMSAT organization came to be. See you then!

MILCOM
MONITORING MILITARY COMMUNICATIONS

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Monitoring the Civil Air Patrol

The radio communications systems and frequencies used by various government and military civilian auxiliary services continue to change as their agency affiliations and missions change within the government organizational structure. One of those major movers is an auxiliary service that we have discussed in the past in this column – the Civil Air Patrol (CAP).

In the past in this column, I have documented the changeover by the CAP to a narrowband VHF system. Based on monitoring and information in the public domain, it has taken more time to accomplish than was originally intended by CAP communications officials at Maxwell AFB, Alabama.

Recently, a good friend of this column, Bill Dunn, posted the following announcement to an Internet scanner newsgroup:

"I have been collecting the new radio frequencies/channels for Civil Air Patrol at **http://wiki.radioreference.com/index.php/Civil_Air_Patrol.** I have been posting only new information and have removed anything prior to October 2009. I am looking for others to monitor their areas for CAP activity. Weekends are usually when CAP holds their FTX/SAREX events and you can easily find the frequencies, PL/Digital tones, etc. information for your CAP local repeaters. Additionally, during weekends is when the Wings/Squadrons in many states conduct their VHF radio nets and that is also when we can find out the repeater sites/names to add to the monitoring list.

"The old channel plan, listed at the address above, has been officially eliminated by CAP management and all radios are supposed to have implemented the new narrowband plan.

"All the new narrowband repeaters (output frequencies are 148.1250 and 148.1500 MHz) are dual mode, meaning that they use CTCSS tones in the analog mode or, if the mission dictates, the P25 digital mode (NAC codes). Input frequencies to the repeater outputs have changed as well and they no longer use 143.7500 and 143.9000 MHz. (*The new inputs in the majority of the country are 143.550 and 143.500 MHz. Border areas may be using 139.875 and 143.600 MHz - LVH*)

"Also, CAP repeaters near Canada seem to have alternate repeater input frequencies, so as to not interfere with Canadian users."

Courtesy USAF CAP

Based on extensive monitoring and study, the frequency/designator list below is believed to be the current loadout of the ground radios used by the CAP nationwide. And, before the CAP community has a major hemorrhage as usual and sends the Feds to knock down our door, let me hasten to add that the information presented in this column has come from open sources we found on various Internet websites and from Milcom monitors in various areas of the country. *Absolutely no internal CAP classified sources were used* to compile the frequency list below.

National CAP Plan
(Supposedly Zone 1 in all the new ground-only radios)

141.5750 Simplex	127.3 Hz	Command Control<Command Control 1>
141.0000 Simplex	131.8 Hz	Command Control <Command Control 2>
149.2750 Simplex	141.3 Hz	Air-to-Air <Air 1>
150.5625 Simplex	151.4 Hz	Air-to-Air <Air 2>
150.2250 Simplex	162.2 Hz	CAP Guard Channel <Guard 1>
139.8750 Simplex	173.8 Hz	Tactical/Miscellaneous use <TAC 1>
148.1250 Simplex	100.0 Hz	Primary Talk-Around <PA TA>
148.1500 Simplex	100.0 Hz	Secondary Talk-Around <PB TA>
148.1375/143.6250	203.5 Hz	Airborne/Tactical Repeater <R-67>
148.1375/143.6250	192.8 Hz	Airborne/Tactical Repeater <R-68>
148.1375/143.6250	131.8 Hz	Airborne/Tactical Repeater <R-69>
148.1375/143.6250	162.2 Hz	Airborne/Tactical Repeater <R-70>
148.1250/143.5500	203.5 Hz	Airborne/Tactical Repeater <R-63>
148.1500/143.7000	203.5 Hz	Airborne/Tactical Repeater <R-64>

The remainder of the zones in these new radios appears to have the setup that follows:

- Zones 2 and 3 are supposed to be used for local options and have been used for the old band plan up to this point.
- Zones 4 and 5 will have appropriate interoperability frequencies programmed, according to where the radio will be used (e.g., law enforcement, fire/rescue, etc.)
- Zone 7 appears to have selected US Coast Guard marine frequencies and the National Weather Service frequencies programmed in it.
- Zone 8 Analog repeater designators 1-16
- Zone 9 Analog repeater designators 17-32
- Zone 10 Analog repeater designators 33-48
- Zone 11 Analog repeater designators 49-64
- Zone 12 P25 repeater designators 1-16
- Zone 13 P25 repeater designators 17-32
- Zone 14 P25 repeater designators 33-48
- Zone 15 P25 repeater designators 49-64
- Zone 16 National Plan (see Zone 1), but set up for P25 mode communications

Table 1: Zone 8 - 15 Compiled Repeater Frequency Table

Repeater Output/Input	CTCSS PL tone	Analog Desig	P25 NAC	P25 Desig
Zones 8 and 12				
148.1250/143.5500	110.9	R01	455	R01P
148.1500/143.7000	162.2	R02	656	R02P
148.1250/143.5500	136.5	R03	555	R03P
148.1500/143.7000	74.4	R04	3E8	R04P
148.1250/143.5500	79.7	R05	31D	R05P
148.1500/143.7000	71.9	R06	2CF	R06P
148.1250/143.5500	85.4	R07	356	R07P
148.1500/143.7000	67.0	R08	29E	R08P
148.1250/143.5500	156.7	R09	61F	R09P
148.1500/143.7000	192.8	R10	788	R10P
148.1250/143.5500	123.0	R11	4CE	R11P
148.1500/143.7000	173.8	R12	6CA	R12P
148.1250/143.5500	91.5	R13	393	R13P
148.1500/143.7000	167.9	R14	68F	R14P
148.1250/143.5500	69.3	R15	2B5	R15P
148.1500/143.7000	136.5	R16	555	R16P
Zones 9 and 13				
148.1250/143.5500	82.0	R17	339	R17P
148.1500/143.7000	88.5	R18	375	R18P
148.1250/143.5500	94.8	R19	3B4	R19P
148.1500/143.7000	141.3	R20	585	R20P
148.1250/143.5500	141.3	R21	585	R21P
148.1500/143.7000	69.3	R22	2B5	R22P
148.1250/143.5500	71.9	R23	2CF	R23P
148.1500/143.7000	127.3	R24	4F9	R24P
148.1250/143.5500	107.2	R25	430	R25P
148.1500/143.7000	146.2	R26	5B6	R26P
148.1250/143.5500	146.2	R27	5B6	R27P
148.1500/143.7000	156.7	R28	61F	R28P
148.1250/143.5500	173.8	R29	6CA	R29P
148.1500/143.7000	97.4	R30	3CE	R30P
148.1250/143.5500	114.8	R31	47C	R31P
148.1500/143.7000	110.9	R32	455	R32P
Zones 10 and 14				
148.1250/143.5500	88.5	R33	375	R33P
148.1500/143.7000	91.5	R34	393	R34P
148.1250/143.5500	97.4	R35	3CE	R35P
148.1500/143.7000	85.4	R36	356	R36P
148.1250/143.5500	151.4	R37	5EA	R37P
148.1500/143.7000	123.0	R38	4CE	R38P
148.1250/143.5500	162.2	R39	656	R39P
148.1500/143.7000	82.5	R40	339	R40P

148.1250/143.5500	103.5	R41	40B	R41P
148.1500/143.7000	77.0	R42	302	R42P
148.1250/143.5500	74.4	R43	2E8	R43P
148.1500/143.7000	114.8	R44	47C	R44P
148.1250/143.5500	77.0	R45	302	R45P
148.1500/143.7000	151.4	R46	5EA	R46P
148.1250/143.5500	167.9	R47	68F	R47P
148.1500/143.7000	131.8	R48	526	R48F

Zones 11 and 15

148.1250/143.5500	131.8	R49	526	R49P
148.1500/143.7000	103.5	R50	40B	R50P
148.1250/143.5500	100.0	R51	3E8	R51P
148.1500/143.7000	78.7	R52	31D	R52P
148.1250/143.5500	192.8	R53	788	R53P
148.1500/143.7000	100.0	R54	3E8	R54P
148.1250/143.5500	67.0	R55	29E	R55P
148.1500/143.7000	107.2	R56	430	R56P
148.1250/143.5500	118.8	R57	4A4	R57P
148.1500/143.7000	118.8	R58	4A4	R58P
148.1250/143.5500	186.2	R59	746	R59P
148.1500/143.7000	94.8	R60	3B4	R60P
148.1250/143.5500	127.3	R61	4F9	R61P
148.1500/143.7000	186.2	R62	746	R62P
148.1250/143.5500	203.5	R63	7F3	R63P
148.1500/143.7000	203.5	R64	7F3	R64P

I am sure that there are still some minor tweaks that need to be made to the list above, but this is the best information that we have as of press time. If you hear any activity on the frequencies I have listed above, I would love to hear from you and I will pass that information on to Bill for the list he is keeping online.

❖ CAP and the HF Spectrum

The VHF spectrum is not the only place you will hear CAP communications. This auxiliary is also an active player in the HF radio spectrum. In addition to nationwide assignments and an ALE network of frequencies, most of the activity you will observe will be on regional assignments where regional/state wing nets meet on a regular basis. Table 2 has a breakdown of the known HF assignments that we have been able to uncover.

Recently the CAP aircraft callsign was changed by the FAA from "CAPFLIGHT" to simply "CAP" (followed by the 3 or 4 digit number). Apparently, that callsign CAP had been in use by a now defunct regional carrier.

A complete list of CAP callsigns and additional information is available on our *Milcom Monitoring Post* blog at **http://mt-milcom.blogspot.com/2009/05/civil-air-patrol-monitoring-news-and.html** and a sampler of CAP HF nets is listed in Table 3.

That will do it for this month. Until next time 73 and good hunting.

Table 2: CAP HF Frequencies (kHz)

• CAP Nationwide ALE Network (ALE/USB, freqs in kHz)
2011.0 3204.0 4477.0 4522.0 4585.0 5006.0 5447.0 6773.0 6806.0 7602.0 8012.0 9047.0 10162.0 11402.0 12081.0 13415.0 14357.0 15602.0 17412.0 19814.0

• ALE Addresses Observed on the CAP ALE Network:

0002SCCAP	Wing Vice Commander	South Carolina
0004IACAP	Wing Communications Officer	Iowa
0004ILCAP	Wing Communications Officer	Illinois
0004SCCAP	Wing Communications Officer	Lexington, SC
0004WICAP	Wing Communications Officer	Wisconsin
0011ARCAP	Wing Unit	Arkansas
001NHQCAP	Civil Air Patrol Commander	Maxwell AFB, AL

Courtesy USAF CAP

002NHQCAP	Civil Air Patrol Headquarters	Maxwell AFB, AL
0032WICAP	Wing Unit	Wisconsin
0032WVCAP	Wing Unit	West Virginia
0033COCAP	Wing Unit	Colorado
0034MERCAP	Middle East Region Unit	Middle East Region
0041MICAP	Wing Frequency Manager	Michigan
0041WICAP	Wing Frequency Manager	Wisconsin
0042MICAP	Wing Chief of Communications Plans	Michigan
0043ILCAP	Wing Unit	Illinois
0048FLCAP	Wing Unit	Florida
004MERCAP	Middle East Region Communications Officer	Middle East Region
004NVCAP	Wing Communications Officer	Nevada
004RMRCAP	Rocky Mountain Region Communications Officer	Rocky Mountain Region
004SERCAP	Southeast Region Communications Officer	Southeast Region
004SWRCAP	Southwest Region Communications Officer	Southwest Region
004WICAP	Wing Communications Officer	Wisconsin
0081ILCAP	Wing Unit	Illinois
009NHQCAP	National HQ Special Assistant/Communications ALE Address	
0100PRCAP	Wing Unit	Puerto Rico
0112GACAP	Wing Unit	Georgia
011ARCAP	Wing Unit	Arkansas
0196NECAP	Wing Unit	Nebraska
0202SERCAP	Southeast Region Unit	Southeast Region
0204MICAP	Wing Unit	Michigan
022NHQCAP	National Operations Center (NOC)	Maxwell AFB, AL
0272HICAP	Wing Unit	Hawaii
027HICAP	Wing Unit	Hawaii
028NHQCAP	National Headquarters Historian ALE Address	
0303WACAP	Wing Unit	Washington
0314MICAP	Wing Unit	Michigan
031NHQCAP	National Commander's Staff	Maxwell AFB, AL
033NHQCAP	National Technical Center (NTC)	Richmond, VA
034MERCAP	Middle East Region Unit	Middle East Region
0355OKCAP	Wing Unit	Oklahoma
037RMRCAP	Rocky Mountain Region Unit	Rocky Mountain Region
040NHQCAP	National Headquarters Assistant Chief of Communications ALE Address	
042RMRCAP	Rocky Mountain Region Unit	Rocky Mountain Region
042SERCAP	Southeast Region Unit	Southeast Region
0431ILCAP	Wing Unit	Illinois
043MERCAP	Middle East Region Unit	Middle East Region
043NHQCAP	National Headquarters ALE Address	
043SERCAP	Southeast Region Unit	Southeast Region
044NCRCAP	North Central Region Unit	North Central Region
046NHQCAP	National Technical Center (NTC)	Richmond, VA
047NHQCAP	National Technical Center (NTC)	Richmond, VA
047SERCAP	Southeast Region Unit	Southeast Region
054NHQCAP	National Headquarters ALE Address	
060PCRCAP	Pacific Coast Region Unit	Pacific Region
062NHQCAP	National Headquarters National Communications Volunteer Staff ALE Address	
064NHQCAP	National Headquarters National Communications Volunteer Staff ALE Address	
078NVCAP	Wing Unit	Nevada
0775NVCAP	Wing Unit	Nevada
0902ALCAP	Wing Unit	Alabama
094ALCAP	Wing Unit	Alabama
100NDCAP	Wing Unit	North Dakota
100NERCAP	Northeast Region Unit	Northeast Region
100SWRCAP	Southwest Region Unit	Southwest Region
101NCRCAP	North Central Region Unit	North Central Region
101NERCAP	Northeast Region Unit	Northeast Region
101SWRCAP	Southwest Region Unit	Southwest Region
104MERCAP	Middle East Region Unit	Middle East Region
112GACAP	Wing Unit	Georgia
201SERCAP	Southeast Region Unit	Southeast Region
900NHQCAP	National Headquarters ALE Address	
901NHQCAP	National Headquarters ALE Address	
909NHQCAP	National Headquarters ALE Address	
951NHQCAP	National Headquarters ALE Address	
952NHQCAP	National Headquarters ALE Address	
971NHQCAP	National Headquarters ALE Address	
991NHQCAP	National Headquarters ALE Address	
998NHQCAP	National Headquarters ALE Address	
999NHQCAP	National Headquarters ALE Address	
1000SWRCAP	Southwest Region Unit	Southwest Region
AVS	National Headquarters Special Use Tactical Callsign ALE Address	
RIC	Region 2 MER/CAP National Technology Center Richmond, VA	

• CAP Regional and State Wing Voice Frequencies (USB mode)

4466.0	Northeast Region Primary/Southeast Region Secondary
4469.0	Southeast Region Primary/Northeast Region Secondary
4504.0	Great Lakes Region Primary/North Central Region Primary
4509.0	North Central Region Secondary
4582.0	Middle East Region Secondary Pacific Region Secondary
4585.0	Middle East Region Primary/Pacific Region Primary
4601.0	Rocky Mountain Region Primary/Great Lakes Region Secondary
4604.0	Great Lakes Region Primary/Rocky Mountain Region Secondary
4627.0	Southwest Region Primary
4630.0	Southwest Region Seconday

• CAP Nationwide Voice Frequencies (USB mode)
2371.0 2374.0 7341.0 7635.0 (National Calling Frequency) 7920.0 14902.0 (National Calling Frequency) 18205.0 20873.0
Note: 26617.0 and 26620.0 have been removed from CAP per a FCC notice.

Table 3: CAP HF Radio Net Sampler

(All times are UTC and frequencies in kHz)
This net list is courtesy of GrayGhost in the Midwest United States.

0001	4506.0	Missouri Wing CAP Net (Mon - Fri)
0030	4604.0	Great Lakes Region – Illinois Wing CAP Net (Mon - Fri) "Red Fox"
0100	4601.0	Rocky Mountain Region – Colorado Wing HF Net (Thu)
0200	4601.0	Rocky Mountain Region CAP Net (Wed)
0200	4604.0	Michigan Wing CAP Net (Mon - Fri) "Red Robin"
1230	4469.0	Florida Wing CAP Net
1300	4585.0	North Carolina Wing CAP Net
1400	4585.0	Middle East Region CAP Net
1400	4506.0	Nebraska Wing CAP Net (Mon - Fri) "Red Cloud"
1430	4604.0	Great Lakes Region CAP Net (Mon - Fri) "Blue Lake"
2230	4604.0	Great Lakes Region – Indiana Wing CAP Net (Mon - Fri) "Red Fire"
2300	4604.0	Great Lakes Region – Kentucky Wing CAP Net
2330	4604.0	Great Lakes Region – Ohio Wing CAP Net "Columbus"
2330	4506.0	North Central Regional CAP Net (Mon - Fri)

FED FILES

GOVERNMENT COMMUNICATIONS

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Super Bowl XLIV Wrap Up

One again, the early months of the year found me at the site of the championship game of the National Football League, the Super Bowl. My regular job has me doing broadcast television engineering work behind the scenes of events such as these and a side benefit is being able to catch some interesting federal scanner traffic, too.

Super Bowl XLIV in Miami, Florida presented not only the opportunity to monitor the federal response to a large media special event, but had an added bonus of the NFL Pro Bowl in the same stadium the week before. While the Pro Bowl was not considered a National Security Special Event, it did give all the agencies a chance for a "dry run" rehearsal before the big weekend.

National Security Special Events were actually established back in 1998 by President Clinton. These events are coordinated by the US Secret Service and involve federal, state and local agencies responding as needed to provide security, intelligence information and public safety personnel. These special events include political conventions, foreign government visits and large public events that can represent potential targets for terrorism.

Although the Secret Service is the lead agency for these events, the FBI provides much of the counter-terrorism tactical response. Many of the active radio frequencies appeared to be part of spectrum utilized by the FBI and the Justice Department. The first Super Bowl to be considered a NSSE was Super Bowl XXXVI in New Orleans in February of 2002.

All of the local, state and federal agencies that were responding to the sporting events this year were housed in a Joint Operations Center, sometimes referred to as the "JOC" over the air. Speculation by local listeners was that the JOC was located at the Broward County Emergency Operations Center, but authorities were not announcing the location publicly.

Surprisingly there was a lot of clear radio traffic this year. The last couple of Super Bowl events had better than 90% of the radio traffic encrypted. In particular, the CBP Customs air operations coordinating live video feeds were heard for over a week prior to Super Bowl Sunday. Over the days prior to both the Pro Bowl and Super Bowl games, the CBP OMAHA helicopters made multiple test runs of their live video feeds down-linked from the airborne cameras to the Joint Operations Center. The JOC was sometimes referred to as "The Village," and the operators there used the call sign of "X-RAY 6000" or X-RAY 6001".

There were also new frequencies heard in use that local monitors have not heard before. Searching the federal bands during the run-up to such events can reveal all sorts of testing of radios channels that may rarely be used other than for things such as this. Many of the frequencies on which tests were heard prior to the Super Bowl were never heard from again. Possibly they were testing back-up or special operations channels that would only be needed in case of emergencies.

As in past Super Bowls, I was located right next to the stadium for most of my on-scene monitoring, but the UHF band was so full of activity that trying to search the 406-420 MHz band for federal traffic was problematic. All of my radios were picking up so many images and front-end overload from the dozens of UHF business frequencies in use at the stadium.

The federal VHF spectrum was full of activity during the weeks leading up to Super Sunday. Some activity was on known federal channels in the Miami area, but some new and unidentified channels were active as well.

Stepping briefly into the territory of Larry Van Horn's *Milcom* column – As in other Super Bowls since 9/11, this game featured a Combat Air Patrol flight of F-16 fighters from Shaw AFB stationed overhead during the game. They were in place to respond to the unthinkable in case of a terrorist attack. Interestingly, the Shaw fighters flew two "practice" missions over the Miami area in the days prior to Super Sunday. Local listeners were clued in to the missions very early in the morning due to the visiting fighters using a frequency that is also used by aircraft from Homestead Joint Reserve Base in Homestead, Florida.

During the game itself, the F-16 fighters used the PITTMAN call sign and flew along with both fixed wing and helicopter assets from Customs and Border Patrol Air Marine. The CBP aircraft used their usual OMAHA call sign. Both the PITTMAN and OMAHA aircraft were in contact with DEERHUNTER, the call sign of the Eastern Air Defense Sector of NORAD. For more information on monitoring NORAD, check the June 2009 *Milcom* column or the *Milcom* blog (**http://mt-milcom-blogspot.com**).

During the game, NATION 99, a KC-135 tanker, refueled the F-16's multiple times. CASPER and ZEAL call signs were heard talking to CBP Air Marine units at several points during the game, but I was unable to figure out who they were. Finally about 10:45 PM, after the end of the game, the fighters declared "Nose Cold" and broke off the CAP flight to return home. OMAHA helicopters continued to provide video for some time as the stadium emptied.

So here is a compiled list of active frequen-

cies heard during my two week stay in South Florida. Not all of these frequencies were necessarily used exclusively for the Super Bowl. This combines some material provided to me from other local listeners:

123.0250	AM	DHS CBP Air Marine-helicopter multicom
136.3750	AM	DHS CBP Air Marine
148.1250	91.5	Civil Air Patrol repeater-also reported as P-25 with N393
149.4500	N167	Unknown agency-simplex at stadium with clear radio checks
163.1000	N167	Multiple agencies-possible Federal Common
163.1250	100.0	DHS Customs & Border Protection-input to 168.8250
163.1875	N167	FBI
163.5375	P-25	Unknown agency
163.6500	100.0	CBP Border Patrol
163.8625	N167	FBI
163.8875	N167	FBI
164.4000	N001	US Secret Service PAPA
164.4500	CSQ	Environmental Protection Agency-simplex
164.5375	N293	Unknown agency
164.6500	N001	US Secret Service TANGO
164.9625	100.0	DHS CBP Air Marine TAC 21
165.1625	100.0	Unknown agency, possibly CBP
165.2125	N001	US Secret Service MIKE
165.2375	100.0	DHS CBP NET 1
165.2875	N650	DOJ Bureau of Alcohol Tobacco Firearms and Explosives
165.3125	N293	US Coast Guard NET 121, Sector Miami
165.7875	N001	US Secret Service BAKER
166.4375	100.0	DHS CBP-input to 165.2375 repeater
166.5875	100.0	DHS CBP
167.2625	N167	FBI COMMAND POST
167.5125	N167	FBI
167.5375	N167	FBI-SIERRA units
167.6625	N167	FBI
167.7375	N167	FBI
167.7625	N167	FBI
168.1625	100.0	US Postal Service-South Florida
168.1625	107.2	US Postal Service-South Florida
168.1625	123.0	US Postal Service-South Florida
168.8750	100.0	DHS CBP-Border Patrol repeater
169.4500	100.0	DHS CBP NET 2-many of the OMAHA air units heard here
170.8875	N167	FBI-Confirmed as patch from local "SRT" units
170.9125	N167	FBI
171.2000	N293	
171.4375	N653	Federal Interoperability patch to local Broward & Dade County
171.9500	N293	
171.9875	N167	FBI-SQUAD 2
172.0375	N167	
172.1875	N167	
172.2875	N167	
172.8750	N293	FAA
228.9000	AM	Shaw F-16 PITTMAN CAP Flight
252.8000	AM	Coast Guard SHARK 97 reference SMASHER on HF
260.9000	AM	Shaw F-16 PITTMAN CAP Flight
282.8000	AM	Pro Bowl-fly by during national anthem
345.0000	AM	USCG Miami Air Operations
407.7750	N482	US Postal Inspection Service-mobile command unit at stadium
407.9375	P-25	Unknown agency
411.1125	D051	Unknown agency
412.5500		Unknown agency
413.0250	N293	Unknown agency
414.4250	P-25	Unknown agency
415.2000	192.8	DHS Federal Protective Service

❖ CBP, ICE and the D-NET Channels

In the March *Fed Files*, I revealed some of the frequencies used by the Immigrations and Customs Enforcement (ICE) division of the Department of Homeland Security. While we don't yet have a "channel plan" for these ICE frequencies, we do know that they have access to some of the same frequencies utilized by the Customs and Border Protection directorate of DHS. ICE units can utilize the nationwide repeater network that is operated by the CBP National Law Enforcement Communications Center in Orland, Florida, often heard on the air as CHARLIE 100.

Recently some scanner listeners from the Northeast US have indicated there are some radio channels being referred to as "D-NET." The D-NET channels appear to be many of the same frequencies utilized by CBP units and referred to by NET numbers.

But why the D-NET label? No one can say for sure at this time, but the original thought that the "D" means digital is not necessarily the case. The D-NET channels have been seen programmed in CBP radios in analog mode as well as in P-25 digital mode. Could the D possibly stand for DHS, and might be available for all DHS agencies? We'll have to see.

So here are the D-NET channels that have been confirmed as being used the Customs and Border Patrol units:

CHANNEL	BASE	PL	MOBILE	PL
DNET 1	165.2375	100.0	166.4375	100.0
DNET 2	169.4500	100.0	171.0750	100.0
DNET 11	165.6875	100.0	170.1000	100.0
DNET 33	169.5500	100.0	170.1000	100.0
DNET 36	170.7250	100.0	173.5000	100.0
DNET 37	165.6875	100.0	170.1000	100.0
DNET 53	168.0000	100.0	170.0750	100.0
DNET 54	164.6250	100.0	170.0750	100.0
DNET 55	165.2375	100.0	166.4375	100.0
DNET 56	163.4500	100.0	166.4375	100.0
DNET 57	165.2375	100.0	166.4375	100.0
DNET 58	165.2375	100.0	166.4375	100.0
DNET 59	165.2375	100.0	166.4375	100.0
DNET 60	165.2375	100.0	166.4375	100.0
DNET 61	165.2375	100.0	166.4375	100.0
DNET 62	165.2375	100.0	166.4375	100.0
DNET 63	165.2375	100.0	166.4375	100.0
DNET 64	165.2375	100.0	166.4375	100.0
DNET 65	165.2375	100.0	166.4375	100.0
DNET 66	166.2000	100.0	173.5000	100.0
DNET TEST	164.9250	100.0	172.5625	100.0

Now, here are the APCO P-25 D-NET and D-TAC channels that have been identified. Note that some of the labels are different from the analog channels and I have not confirmed a few of the P-25 NAC values:

CHANNEL	BASE	NAC	MOBILE	NAC
DNET 1	165.2375	N301	166.4375	N325
DNET 2	169.4500	N301	171.0750	N325
DNET 7	165.4625	N301	166.5875	N325
DNET 9	165.6875	N301	166.4375	N325
DNET 33	169.5500	N301	170.1000	N325
DNET 36	170.7250	N301	173.5000	N325
DNET 47	165.2375	N301	172.3500	N325
DNET 52	165.2375	N301	166.8750	N325
DNET 53	168.0000	N001	170.0750	N001
DNET 54	164.6250	?	170.0250	N001
DNET 55	165.2375	?	166.4375	N324
DNET 56	163.4500	?	166.4375	N325
DNET 57	165.2375	N001	166.4375	N001
DNET 58	165.2375	N002	166.4375	N002
DNET 59	165.2375	N003	166.4375	N003
DNET 60	165.2375	N004	166.4375	N004
DNET 61	165.2375	N005	166.4375	N005
DNET 62	165.2375	N006	166.4375	N006
DNET 63	165.2375	N001	166.4375	N007
DNET 64	165.2375	N001	166.4375	N009
DNET 65	165.2375	N001	166.4375	N008
DNET 66	166.2000	N301	173.5000	N325
DNET171	173.8625	N003	166.4375	N001

In addition to the D-NET channels, there are apparently D-TAC channels. As with some other agency channel plans, the NET frequency indicates a repeater, while a TAC channel is usually simplex.

DTAC 1	165.2375	N301
DTAC 2	169.4500	N301
DTAC 3	165.6875	N301
DTAC 4	164.6000	N301
DTAC 5	165.4625	N301
DTAC 6	165.4875	N301
DTAC 10	165.4125	N301

If anyone hears reference to the D-NET channels, please let us know at the Fed Files!

❖ Getting It Together

I wanted to take a moment to thank everyone for their help in collecting and sharing monitoring information for events such as the Super Bowl. Gatherings such as these are often overwhelming to monitor, even with multiple radios. One can really benefit from networking with other scanner listeners in the area, and the Internet is a great way to meet and keep in contact with people from all over the country that may share your scanning interests.

Scanning or amateur radio groups can often provide a good platform for sharing monitoring information. In some cases, these groups are simply loose collections of radio fans that get together when they can. Other groups are much more organized, with regularly scheduled events or get-togethers. There have been several monitoring groups that have especially generous with information. Some have requested to remain anonymous, but others maintain a fairly public face.

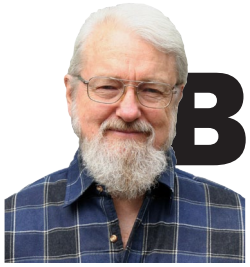
The Three Rivers Area Monitoring Association

(http://groups.yahoo.com/group/TRAMAlist/?yguid=165995769) has a Yahoo group and operates a weekly "scanner-net" on a local 2-meter amateur repeater in the Pittsburgh area. The Yahoo Groups pages are filled with different scanner related groups, so be sure to look around.

Intercepts Northwest, now known as Intercept Radio

(www.interceptradio.com/intercept/index.html) has a great web site with a frequency database and forums that allows listeners all across the country to exchange information and keep in touch with what's going on in other areas.

That's all for this edition of the *Fed Files*. We'll be back in July with more!



BOATS, PLANES, AND TRAINS

PLANES

Iden Rogers
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What is Ground Control?

Air Traffic Controllers do their best to keep aircraft moving as expeditiously as possible, both in the air and on the ground while maintaining safe separation between them. They communicate with pilots by radio which can be heard on scanners that include the 118-137 MHz VHF aircraft band.

In that band as we listen to our scanners, we are able to hear controllers in airport Towers, at Terminal Radar Approach Control (TRACON) facilities, and at Air Route Traffic Control Center (ARTCC) facilities – scanner antenna and receiving location permitting.

It may be more common to think of airliners in flight than moving on airport surfaces, but one category of controller is concerned with just that – Ground Control. This controller is in the Tower cab overlooking the airport area along with the Tower Controller (Local Controller). It is his or her responsibility to smoothly route aircraft on the ground prior to take off and after landing to where they need to go without running them into each other or anything else. In addition, this controller talks to airport service and emergency vehicle drivers who wish to transition the taxiways or runways.

Let's take a look!

Sacramento International Airport (SMF)

To help explain Ground Control, SMF will be the example airport and one that this column editor can receive from home. SMF is not the busiest airport, but does rank 37th in terms of passenger "enplanement" statistics for U.S. airports. It should serve well, since it has parallel runways, sufficient complexity, and an understandable airport diagram.

❖ Frequencies

Airport Ground Control frequencies are typically in the 121.600 - 121.925 MHz range and often, but not always, one of these: 121.6, 121.7, 121.8, or 121.9.

It is common and accepted for the Tower Controller to omit the "121" for Ground Control frequencies in the 121 MHz range when handing off to Ground Control. Example: *Southwest Twenty-Two Ninety-Seven, contact Ground point seven.*

To find the Ground Control frequency for any towered airport, go to **www.airnav.com/airports/** and enter the three- or four-letter airport code, the city, or airport name. On the desired airport page, scroll down to "Airport Communications." For SMF, it is called "Capitol Ground," the radio call.

Some large airports have more than one Ground Control frequency. Los Angeles International (LAX) is an example: "LOS ANGELES GROUND: 121.65 (NORTH-CMPLX), 121.75 (SOUTH CMPLX)."

A large metro-area airport may also have Ramp Control or Gate Control frequencies in addition to Ground Control. These are used for aircraft control on the ramp areas next to terminal buildings and out to the taxiways. McCarran International Airport (LAS) is an example: "RAMP CON: 124.4 TERMINALS A; B; C & CHARTER INTL GATES. 127.9 D GATES AND CARGO RAMP. 129.175 A, B, C GATES AND CHARTER INTL GATES."

Seattle-Tacoma International Airport (SEA) offers an example of both Ramp Control and Gate Control – "GATE CTL: 126.25, NORTH RAMP/CARGO: 126.87 NON FAA FREQ, SOUTH RAMP: 122.27 NON FAA FREQ."

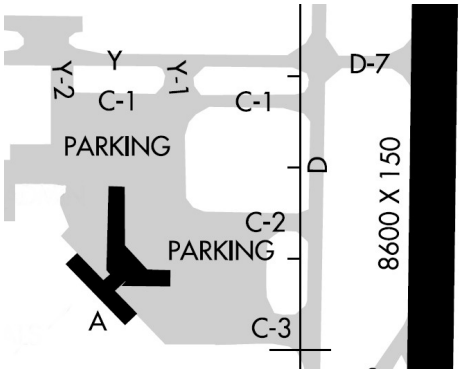
Terms

- "Gate" is a passenger loading area.
- Omitted last "5" – The frequencies 126.87 and 122.27, above, are actually 126.875 and 122.275. It is common and accepted for controllers to omit the last 5 when it is the third digit after the decimal.

❖ Airport Diagrams

To make sense of the Ground Controller's instructions to aircraft, it is essential to have the airport diagram at hand for the airport that you are listening to. For this article to be best understood, have the SMF airport diagram on screen or printed out.

To find an FAA airport diagram, go to **www.airnav.com/airports/** and navigate to the desired airport page, and then go to the small airport diagram on the right and click on "Download PDF." Save it and even print it out for easy access.



This is a small part of the FAA airport diagram for Sacramento International Airport which shows the Terminal A area and nearby taxiways. Runway 16L/34R is at the right. (Courtesy: FAA)

On the SMF airport diagram, you will see "A" and "D" and spoken "Alpha" and "Delta." These are the long taxiways that run the full lengths of Runways 16R/34L and 16L/34R respectively.

D-3, D-5, D-7, D-9, and D-11 are short taxiways between long Taxiway D and Runway 16L/34R, see the FAA airport diagram.

Also, some non-FAA Internet sites for commercial airports can be found that will have detailed terminal area gate diagrams which can supplement the FAA airport diagrams. For SMF, as an example, see: **www.sacairports.org/int/parking/airport.html.** When the map comes up, click on it, and a nice large and detailed map will appear. Sometimes it can take some Google searching to find such maps.

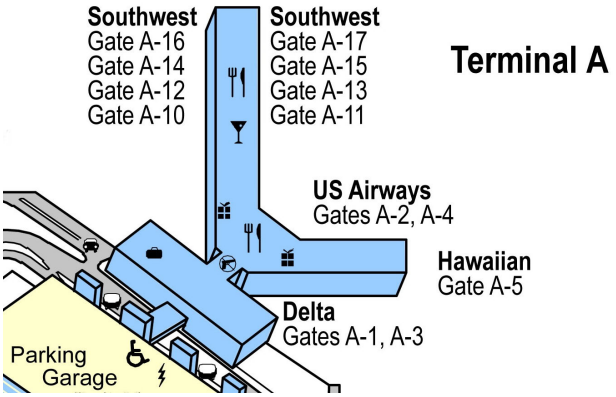
❖ Communications Examples

The following exchange was initiated by a departing airliner on the Ground Control frequency wishing to taxi: *Southwest Two Sixty-Nine, taxi.* Ground Control: *Southwest Two Sixty-Nine, taxi to Runway One Six Left via Charlie Two and Delta.* Pilot readback: *Charlie Two, Delta, Sixteen Left, Southwest Two Sixty-Nine.*

The airliner will leave from the Southwest Airlines gate / ramp area (shown on the parking map at the link just above) using Taxiway C-2 and then left on Taxiway D to the end of Runway 16L (shown on the FAA airport diagram). From there the plane will be handed off to the Tower.

Example of an arriving airliner just handed off from the Tower after landing on Runway 16L: *Good evening, Southwest Twenty-Two Ninety-Seven is cleared for Eleven.* Ground Control: *Southwest Twenty-Two Ninety-Seven, Capitol Ground, taxi to the ramp via Delta and Charlie Two.* Pilot readback: *Delta and Charlie Two, to the ramp, Southwest Twenty-Two Ninety-Seven.*

There are times when an airliner will be instructed by the Tower to land on the runway most distant from its gate assignment. An example: *Capitol Ground, Delta Fifteen Fifty-Three is clearing the end of Sixteen Right.* Ground Control: *Delta Fifteen Fifty-Three, Capitol Ground, taxi to the ramp via Alpha, Yankee, Delta, Charlie Three.* This is to say that Taxiway Yankee (perpendicular to the parallel runways) can also be used to cross between Taxiways Alpha and Delta as needed.



This is a small part of the Sacramento International Airport aircraft parking map which shows the Gates for Terminal A. (Courtesy: County of Sacramento)

A departing aircraft can be instructed to use the most distant runway as well. Airliner: *Delta Twenty-One Sixty-Two, taxi.* Ground Control: *Delta Twenty-One Sixty-Two, taxi Runway One Six Right via Charlie Three, Delta, Yankee, Whisky, Alpha.* In this case, Taxiway Whisky was called out, most likely because Taxiway Yankee was occupied between Yankee Two and Alpha.

Listening to both Ground Control and the Tower at a busy airport can get confusing, but when traffic is lighter, listening to both can help round out the picture for arriving and departing aircraft.

Terms

- "Handoff" is the passing of an aircraft from one controller and frequency to another controller and frequency.
- *Cleared for Eleven* in this case is Gate 11. See the aircraft parking map at the above link and you will see Terminal A, Southwest, and Gate A-11.
- *Hold short* means to stop short and stay put of whatever the Controller says. Example, *Runway Three Four Right, taxi via Yankee, Yankee One, hold short of Delta*. In this case, a plane would be leaving the north part of Terminal A parking on Taxiway Y-1, turning right on Taxiway Y, and stopping short and clear of Taxiway D until further instructions.
- For official phraseology, see *Taxi and Ground Movement Procedures* **www.faa.gov/air_traffic/publications/atpubs/ATC/atc0307.html#atc0307.html.1**

ATIS

ATIS (Automatic Terminal Information Service) is a prerecorded, repeating, and periodically updated broadcast. The information is used by arriving and departing pilots. The broadcasts save time for the controllers since they don't have to repeat the info over and over to pilots and it reduces frequency congestion.

Following is an example of an ATIS broadcast from SMF which gives an idea of what is included. SMF ATIS is on 126.75, but ATIS frequencies for other airports may be found at AirNav.com.

Sacramento International Airport Information Bravo. Two One Five Three Zulu. Wind two niner zero at three. Visibility niner. Sky clear below one two thousand. Temperature one three. Dewpoint eight. Altimeter three zero zero seven. Simultaneous visual approaches in use landing Runways One Six Right and Left. Clearance Delivery is on one two one point seven. Metering in effect for Los Angeles International Airport, San Francisco International Airport. Use caution for bird activity in the vicinity of the airport. Advise on initial contact that you have Information Bravo.

ATIS recordings proceed through the alphabet as they are updated. The next one after Bravo will be Charlie. SMF uses only Alpha through Mike before restarting again at Alpha to avoid potential conflicts with nearby Sacramento Executive Airport (SAC) ATIS broadcasts November through Zulu, even though on different frequencies. Neighboring airports in other areas may do a similar thing with their ATIS broadcast version identifiers.

With regard to ATIS, you might hear something like this from a departing airliner: *United Four Four Eight, Gate 36 push, with Bravo.* Ground Control: *United Four Four Eight, push back your discretion.* Pilot readback: *Push, Four Four Eight.*

Terms:

- *Zulu* is 24 hour international time based on the time at Greenwich, England, also called GMT and UTC.
- *Niner* is used for nine to make it harder to confuse with certain other numbers especially during times of poorer reception.
- *Temperature one three. Dewpoint eight.* No, there was no major freeze in Sacramento, these are temperatures in Celsius.
- *Altimeter* is the barometric pressure setting used to calibrate an aircraft altimeter in the cockpit via a small front panel knob. In this case, the setting was 30.07 inches of mercury. The barometric pressure varies throughout the day and from area to area, thus the requirement for the calibration in order to produce a correct altitude readout.
- *Landing Runways One Six Right and Left* means that the runways in use are the stated runways as opposed to Runways 34L and 34R. Looking at the airport diagram may make that clearer. The runway numbers are close to the Magnetic compass headings of 160° and 340°, thus the runway numbers of 16 and 34.
- *Clearance Delivery* is the function where the flight route clearance is issued prior to taxiing. These can be interesting and tell the details of the route after departure. They can be fast moving and it can take practice to understand them. In the above ATIS broadcast, it was being pointed out that this function was on the Ground Control frequency rather than on the published Clearance Delivery frequency of 121.1. During times of heavier air traffic, these functions would be each on its own frequency. Some airports will combine Tower and Ground Control functions on the Tower frequency during periods of low traffic.
- *Metering in effect* means that flights may delayed to regulate arrivals at the destination airport, providing a more manageable arrival flow.
- The *with Bravo* tells Ground Control that the pilot has listened to and understood the information contained in ATIS broadcast Bravo, which was current at that time. If the pilot did not say *with Bravo*, or something similar, the Ground Controller might say – *Verify that you have Bravo.*
- *Pushback* is when a plane is pushed backwards from its parking spot with the use of a specialized tractor. The tractor operator talks to the pilot via a wired headset plugged into the aircraft. For some great images of pushback tractors, go to **http://images.google.com/ and enter "pushback tractors" in the search box.**
- *Back Taxi* – If you hear this expression, it means to enter the runway via a specified taxiway rather than at the runway end where the takeoff roll usually begins. Once on the runway, the plane taxis opposite to the traffic flow direction to the beginning of the runway, or to a point as directed, and turns around on the runway to take off. It can also mean for a landing plane to turn around on the runway after stopping and then go back to a specified taxiway to exit the runway.
- *Gate Hold Procedures in effect* means that aircraft may be held at the gate whenever departure delays are expected to exceed fifteen minutes.

ASDE-X

About thirty-five large and busy U.S. airports have ASDE-X (Airport Surface Detection Equipment, Model X) to assist Ground Control. Its purpose is to detect and display service vehicles and aircraft on the ground with the goal of eliminating collisions and quickly getting them where they need to go. ASDE-X is particularly useful at night and during periods of poor visibility.

As the FAA describes it, "The data that ASDE-X uses come from surface movement radar located on the air traffic control tower or remote tower, multilateration sensors, ADS-B (Automatic Dependent Surveillance-Broadcast) sensors, the terminal automation system, and aircraft transponders. By fusing the data from these sources, ASDE-X is able to determine the position and identification of aircraft and transponder-equipped vehicles on the airport movement area, as well as of aircraft flying within five miles of the airport."

ASDE-X equipped airports will include that fact in their ATIS broadcasts. It is also mentioned in AirNav.com airport information.

Closing thought

Though you may live far from SMF, perhaps some of the info presented here will help you to decipher interesting Ground Control communications at a commercial airport near you. See you next time!

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
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Mailbag and Loggings Galore!

Spring is one of my favorite times of the year. Not only is the natural world coming back into bloom, but it also allows for outside antenna work and repairs to be made after the ravages of winter. High on my project list this spring is a broadband (40-500 kHz) shielded loop antenna for outdoor mounting. The ability to "turn a deaf ear" to local noise can be a big help in being able to hear signals on longwave.

During my visit to the Winter SWL Fest in March, many listeners spoke of their challenges in dealing with noise. Although I began building this antenna quite some time ago, hearing these comments jump-started my interest in the project, and it has been moved to the front of my bench. I will report on my progress over the next few issues, and tell how the antenna works out for me.

Would you like a preview of the project? Check out the excellent article at **http://tinyurl.com/ygt39z7**. I plan to make some minor changes to the design shown there, but it is essentially what I'm working toward. When I get the basic antenna working, I plan to add a "sense" whip antenna that will provide a uni-directional response pattern. Conventional loops have a *bi-directional* pattern, providing two nulls 180 degrees apart.

Speaking of the Winter SWL Fest, it was great to see so many *Below 500 kHz* readers there, including Greg Majewski, Dean Bianco, Tony Straka, Tracy Wood, Jeff Miller, Bill Oliver, and many others. If you've never been to the Fest before, consider giving it a try next year. Full information can be found online at **www.winterswlfest.com**.

❖ Active Antennas

I have long promoted using active antennas for longwave reception. Many newcomers to LF try to use the same "random length" wire antenna they use for shortwave, and while it may work in low-noise locations, it often results in little more than a few local stations or static being heard.

There are several commercial active antennas available, including the popular L-400B from LF Engineering Co. (see *MT* review at **http://tinyurl.com/y9zb2td**). I know that not everyone has the budget for a commercial antenna, especially if longwave is only a "sideline" activity. So, how about building one? A simple design, complete with a printed circuit board (PCB) design, can be found at **http://tiny.cc/KEBjh**. The author, Adrian Knott of the UK, states that the frequency coverage is approximately 10 kHz to 200 kHz, but changes in the filter components should allow reception well above this range. Time to experiment!

Your editor at the Winter SWL Fest, taking time out for a photo with Bill Oliver, Publisher of the LWCA's Lowdown Journal. Photo by Jeff Miller, N2AWA.

❖ Opening the Mailbag – Mystery Beacon

Al Bauernschmidt, N3KPJ (PA) writes: "First, let me tell you how much I enjoy the *Below 500 kHz* column. It's the first thing that I read when the magazine arrives. Keep it up. Now, here is the main reason for writing. On the morning of 1/29/10 at 1055 UTC, I copied a beacon on 503.75 kHz that was sending the ID of 'NID.' I checked my online sources and came up with a location of China Lake, CA., but all of the sites I looked at gave conflicting frequency information.

"According to what I have seen, this beacon is *not* listed with the frequency that I received it on. The listings say it is a TACAN channel. At first I thought that I had copied the wrong ID. But, after listening to it for 10 minutes I am sure of what I heard. Am I looking at outdated information or is this accurate? It isn't often that we hear a west coast beacon here in PA, so I was pretty excited to snag this one. Any help would be appreciated. Again, thanks for a great column and I look forward to hearing from you."

Hello Al, it's good to hear from you, and thanks for your kind words about the column. Reader response is what keeps us going!

I believe you have heard the station "NEED" rather than "NID." I say this because the TACAN system operates from 960-1215 MHz, not on longwave, and several 500 kHz amateur experimenters have reported NEED on or around 505 kHz. Its exact location is unknown, but it is believed to be near Norfolk, VA. It may be run by the military for training exercises. I encourage readers to send in reception reports, and bearings, if possible, so we can positively locate this signal.

❖ Winchester, VA Update

Perry Craybill (VA) reports that the Cogan NDB on 364 kHz has been deactivated, per the Manager of the Winchester Regional Airport. The antenna and equipment have been removed from the site. Runway 14 has ILS and GPS capability. As far as is known, the Linden VORTAC is still available as a Navaid for Winchester.

St. Lawrence Ice Breakers

During the winter, I noticed several loggings of ZG on 410 kHz. It turns out that this is the ID of an NDB aboard the CCGS Ice Breaker *Pierre Radisson* working on the St. Lawrence River.

According to Jacques d'Avignon (VE-3VIA), this ship, along with the Griffon (XF), Des Groseillers (WF), and perhaps others, were working to keep the river and Great Lakes open during the winter months. NDBs are used to help guide helicopters traveling between land and the ships. Jacques also suggests checking 413 kHz for ice breaker activity. For your reference next winter, he notes the following websites where more information can be found…

Ship callsign info: **www.dxinfocentre.com/ndb.htm**
Ship working locations: **www.marinfo.gc.ca/en/Glaces/activite_ice_Qbc.asp**

500 kHz Puzzler

Mark Burns (IN) writes: "For a few days (actually nights) I have been hearing the following on 500 kHz: Dit (pause) dot (pause) dit (odd noise) then dit, then silence for a few seconds until the cycle repeats. Any ideas on what this might be?"

Thanks for writing, Mark. There are many amateur experimenters just above that freq. (~505-510 kHz), and also a mystery beacon (NEED – see comments earlier), but I do not know what the signal could be that you're hearing. 500 kHz is still technically allocated to marine use, so perhaps this is some type of navigational aid. The odd noise *could* be a retransmission of GPS location data or some other telemetry. Please keep me posted on any future loggings of this signal.

Intercepts

This month's loggings are courtesy of the following readers: Greg Burnett (MI), John Collins (NH) and Russ Hill (MI). All contributors are identified by their initials in Table 1. Loggings are welcome from all readers and will be printed as space permits. Please e-mail them to the address shown in the masthead.

TABLE 1. SELECTED LOGGINGS

FREQ	ID	ST/PRV/ITU	CITY	BY
200	UAB	BC	Anahim Lake	J.C. (NH)
212	VP	IN	Valparaiso	J.C. (NH)
220	TUI	BRA	Tucurui	J.C. (NH)
221	BO	TN	Bristol	J.C. (NH)
223	DM	MI	Detroit	J.C. (NH)
224	BH	AL	Birmingham	J.C. (NH)
227	UZ	SC	Rock Hill	J.C. (NH)
230	QB	QC	Quebec	G.B. (MI)
232	CO	IN	Indianapolis	J.C. (NH)
233	QN	ON	Nakina	G.B. (MI)
235	URT	BRA	Uruburetama	J.C. (NH)
240	TIR	BRA	Tirios	J.C. (NH)
241	HF	ON	Hearst	G.B. (MI)
243	YVB	QC	Bonaventure	G.B. (MI)
244	DG	QC	Chute Des Passes	G.B. (MI)
244	TH	MB	Thompson	G.B. (MI)
245	CRR	MT	Circle	R.H. (MI)
245	LFB	TN	Lafayette	J.C. (NH)
247	YLH	ON	Landsdowne House	G.B. (MI)
248	UL	QC	Mont	G.B. (MI)
248	WG	MB	Winnipeg Int'l	G.B. (MI)
250	FO	MB	Flin Flon	G.B. (MI)
258	ZSJ	ON	Sandy Lake	G.B. (MI)
260	YAT	ON	Wapisk	G.B. (MI)
263	ZQT	ON	Superior	G.B. (MI)
264	ZPB	ON	Sachigo Lake	G.B. (MI)
266	YFH	ON	Fort Hope	G.B. (MI)
268	UBY	CUB	Bayamo	J.C. (NH)
269	UDE	MB	Delta	G.B. (MI)
273	DOM	DMA	Marigot	J.C. (NH)
273	ZV	QC	Sept Iles	G.B. (MI)
274	RG	MN	Red Wing	J.C. (NH)
278	NM	QC	Matagami	G.B. (MI)
281	DEQ	AR	DeQueen	J.C. (NH)
284	QD	MB	The Pas	G.B. (MI)
289	YLQ	QC	La Tuque	G.B. (MI)
300	YIV	MB	Island Lake	G.B. (MI)
300	YOG	ON	Ogoki Post	G.B. (MI)
303	YPP	QC	Parent	G.B. (MI)
305	YQ	MB	Churchill	G.B. (MI)
317	VC	SK	La Ronge	G.B. (MI)
317	ZMX	QC	Janvier	G.B. (MI)
320	TY	TX	Tyler	R.H. (MI)
323	KR	QC	Squaw	G.B. (MI)
326	MA	TX	Midland	R.H. (MI)
326	YQK	ON	Kenora	G.B. (MI)
327	POR	POR	Porto	J.C. (NH)
328	YTL	ON	Big Trout Lake	G.B. (MI)
329	PMV	NE	Plattsmouth	J.C. (NH)
330	SJ	PTR	San Juan	J.C. (NH)
332	DN	IL	Julip	R.H. (MI)
332	QT	ON	Thunder Bay	G.B. (MI)
332	SBU	MN	Blue Earth	R.H. (MI)
332	SG	WI	Green Bay	R.H. (MI)
332	YFM	QC	La Grande 4	G.B. (MI)
334	YER	ON	Fort Severn	G.B. (MI)
336	BV	QC	Champlain	G.B. (MI)
338	CYR	GA	Cairo	J.C. (NH)
338	ZEM	QC	Eastmain	G.B. (MI)
339	UCU	CUB	Santiago De Cuba	J.C. (NH)
340	YY	QC	Mont Joli	G.B. (MI)
341	MYZ	KS	Marysville	J.C. (NH)
343	ZBM	QC	Bromont	G.B. (MI)
344	GNC	TX	Seminole	R.H. (MI)
344	ZIY	CYM	Grand Cayman	J.C. (NH)
346	VU	NC	Albermarle	.H. (MI)
346	YXL	ON	Sioux Lookout	G.B. (MI)
348	ZUL	QC	Rockland	G.B. (MI)
350	DF	NL	Deer Lake	G.B. (MI)
351	YKQ	QC	Waskaganish	G.B. (MI)
353	DWL	NE	Gothenburg	R.H. (MI)
355	YWP	ON	Webequie	G.B. (MI)
356	AY	NL	St Anthony	G.B. (MI)
359	NA	GRL	Narsarsuaq (Kitaa)	J.C. (NH)
359	YQZ	BC	Quesnel	J.C. (NH)
359	YQZ	BC	Quesnel	R.H. (MI)
360	PN	QC	Port Menier	G.B. (MI)
368	ZP	BC	Sandspit	J.C. (NH)
368	ZP	BC	Sandspit	R.H. (MI)
370	GR	QC	Grindstone	G.B. (MI)
370	YBV	MB	Berens River	G.B. (MI)
371	GW	QC	Jarpik	G.B. (MI)
373	YXK	QC	Rimouski	G.B. (MI)
375	VM	ISL	Vestmannaeyar	J.C. (NH)
376	YAG	ON	Fort Frances	G.B. (MI)
378	RJ	QC	Roberval	G.B. (MI)
382	YPL	ON	Pickle Lake	G.B. (MI)
383	PGR	AR	Paragould	R.H. (MI)
385	QV	SK	Yorkton	R.H. (MI)
385	YNC	QC	Wemindji	G.B. (MI)
386	D8	QC	Dolbeau-St-Felicien	G.B. (MI)
388	AM	FL	Tampa	R.H. (MI)
388	MM	AB	Fort McMurray	R.H. (MI)
389	YWB	BC	Kelowna	J.C. (NH)
390	JT	NL	Stephenville	G.B. (MI)
391	BHN	MO	Fort Leonard Wood	R.H. (MI)
392	ML	QC	Charlevoix	G.B. (MI)
394	AI	IN	Anderson	R.H. (MI)
394	DC	BC	Dawson Creek	R.H. (MI)
394	MK	TN	Jackson	R.H. (MI)
395	JM	ND	Jamestown	J.C. (NH)
396	YPH	QC	Inukjuak	G.B. (MI)
400	UWI	GA	Whitefield	J.C. (NH)
401	YPO	ON	Peawanuck	G.B. (MI)
404	MOG	CA	Montague	J.C. (NH)
404	OLF	MT	Wolf Point	J.C. (NH)
407	CM	IL	Champaign	J.C. (NH)
410	ZG	CAN	CCGS-Pierre Radisson	J.C. (NH)
413	YHD	ON	Dryden	G.B. (MI)
414	IEB	MO	Lebanon	J.C. (NH)
505	NEED	AL	Ft. Rucker	J.C. (NH)
520	BHZ	BRA	Belo Horizonte	J.C. (NH)
526	ZLS	BAH	Stella Maris	J.C. (NH)

For a complete list of ITU Codes, see **www.wordiq.com/definition/ITU_letter_codes**

See you next month!

Dan Farber, AC0LW
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HOW'S IT HANGIN' ?
Erecting Wire Antennas

Today was the day, I told myself. No more putting it off. Dan, you've got to get that dipole up before you get any fatter and lazier. Once again I found myself confronted with the uncomfortable, ancient truth that you can only accomplish so much by studying charts, text, and pictures, and eventually you have to grasp tools and materials and actually *do* something.

It's not like I'd never erected a wire dipole before. I've put up many over the years, in all lengths and heights, indoors and outdoors, whatever the moment demanded. What had changed for the worse over the years was yours truly. Long gone was the teenager that could effortlessly climb a tree and hang the end of a dipole or longwire.

To bridge the gap in human capability, I'd been looking long and hard at the claims made for a deceptively simple product – the E-Z-Hang System, which is basically a marriage of a slingshot and a fishing reel, with various weights and other accouterments (see photo).

The E-Z Hang system – simple, elegant, and straightforward. (Photo by author)

Doesn't look too difficult, I thought. An ordinary snap swivel is tied to the end of the fishing line, and a bright yellow weight clipped to it. The weight is placed in the slingshot pouch, the operator takes careful aim at a trajectory that will pass over the tree in question, makes sure the lock is released on the reel, and fires away.

An "intermediate line," the bright orange line seen in the photo, is tied to the fishing line at the weight end, the intermediate line is reeled in over the tree to ground level, and the desired lanyard, tied to the antenna's end insulator, is tied to the intermediate and hauled up over the tree. Tie off the lanyard high enough in the tree to discourage vandals, repeat at the other end, and your trusty dipole is up and ready to haul in all the DX you can stomach!

I'll admit I was a bit apprehensive. I hadn't used a slingshot since I was a kid, and the sorry condition of my left elbow, shattered two years previously, had me wondering if this aging left-hander stood much chance of putting up a dipole unassisted. Sure, the advertising and testimonials for the E-Z-Hang said it was a piece of cake, but they probably weren't talking about middle-aged, overweight, semi-crippled users. Were they? I fully expected to get winded just carrying the stuff out into the back and front yards, let alone blazing away like some modern-day David with not-so-Goliath trees.

Well, folks, I'm here to tell you, the E-Z-Hang really made a believer out of me, and I am the eternal skeptic who views all claims with profound suspicion. With no help, no practice, and absolutely no problems, the E-Z-Hang and I got my dipole up in the trees and ready to go in about 45 minutes. Let me walk you through my process, and then see if you don't agree that putting up a wire antenna on your property will be a piece of cake.

❖ First, the Antenna

I made things easy on myself by using a pre-assembled dipole from MFJ Enterprises, their model MFJ-1777. This is a 102 foot long dipole, center fed with 100 feet of ladder line. The assembly includes their excellent center insulator (see photo) and regular ceramic end insulators. There's nothing magical about the 102 foot length, beyond the fact that it fits neatly between a tree in my front yard and another tree in my back yard that are 110 feet apart.

As I discussed last month, the ladder line feed makes the actual dipole length largely irrelevant, other than the fact that it is at least a quarter-wavelength long at the lowest desired frequency – that is to say, at least 68 feet long at 3.5MHz (the bottom of the 80-meter band). The distance between the two trees you have available is the only determining factor.

MFJ's excellent center insulator on the job. (Photo by author)

❖ Then the Launcher

I went to E-Z Hang's website and ordered the basic kit, using my debit card. In a couple of days FedEx brought it in a box to my front door, and I was ready for business.

My station is in my basement right under a window, so I started by carrying the whole antenna assembly up onto the roof, and throwing the roll of ladder line over the roof edge directly above said window, laying the center insulator on the roof on an imaginary line running roughly between the two trees. Then I tossed the two antenna ends off the roof, one in front, one in back, toward the two 35-foot tall trees I would use.

After climbing back down the ladder to ground level – and letting my portly carcass catch its breath – it was time for the real adventure, using my brand-new E-Z Hang to put the two dipole ends up at the two trees. Like I said, I was nervous. I hadn't fired a slingshot since Lyndon Johnson was president, and my bum wing made the task sound tricky. But having invested in all these materials, it was too late to back out now. I studied the front yard tree, visualized a trajectory that would put the bright yellow weight, and the line attached to it, over the top of the tree, and fired away.

Bulls eye! To my delight, the weight sailed right over the top of the tree and dropped in the yard on the other side of the tree. Setting my E-Z Hang down right where I'd stood to fire it, I grabbed the spool of bright orange "intermediate line" and stuck its convenient spike in the ground right where the weight had fallen, unclipped the weight, and tied the orange line to the snap swivel with a simple knot.

I wrapped a turn or two of black tape around the knot for streamlining, walked back to the E-Z Hang, and started cranking the fishing reel. In moments the end of the orange line was strung over the tree and in my hands.

Taking a 35-foot length of 1/8" nylon rope I'd bought, I tied one end securely to the antenna end insulator and the other to the orange line at the spool, again taping the knot for streamlining. Finally, I hauled on the far end of the orange line until the end insulator was about four feet from the tree. Using my extension ladder placed against the trunk of the tree, I climbed up about 20 feet and tied the far end of the nylon rope securely around the trunk of the tree, after untying the orange line from it. Halfway home already!

Now it was a simple matter to move to the back yard and repeat the process for the other end of the dipole, using a second 35-foot length of nylon rope. Again, the slingshot put the weight

right over the tree on the first try. Two for two – not bad for a shattered elbow.

As I hauled the nylon rope up and over the tree with the orange line, the whole dipole rose majestically into the air like the sail of a ship. I was thrilled to see how easily that big ol' dipole could be erected by one person, quickly and easily. Climbing the extension ladder one last time, I tied this second nylon rope securely to the trunk of the tree, and I was done.

When I walked back up to the house, I was delighted to see the ladder line dropping straight down from the center insulator to my basement window. The whole process, beginning to end, had taken about 45 minutes.

After another brief pause to let my heart rate drop back to something near normal, I cut off the excess ladder line coiled on the ground at my basement window, routed the stub through the plywood sheath that I had replaced the glass with (makes it harder for thieves to steal my rig), and hooked it up to the BALANCED output of my trusty MFJ 969 tuner.

❖ On the Air

Firing up my Yaesu FT-897D transceiver, I began to scan the bands. The results were marvelous. On every band between 7 and 54 MHz I could hear, and work, hams all over the nation and all over the world. Even on 80 meters (3.5MHz) the dipole, although very short and very low to the ground at this frequency, worked hams all over the region and out to 1000 miles and more. I also found that I could use the antenna on 160 meters (1.8 MHz) by making the "tee vertical" configuration I described last month – tie the ladder line wires together and feed the splice from the WIRE output of the tuner. Again, I reached out all over the nation and the hemisphere.

The dipole is also an excellent SWL antenna. I routinely pull in broadcasts from all over the world on whatever frequencies are open. With my cold-water pipe ground right at my operating position, the dipole is fairly to very quiet on receive. On the higher frequencies, say 30 meters (10 MHz) and above, the dipole's length and height give it considerable gain and directivity.

Finally, the dipole has proven to be very durable. Since I didn't use any springs or pulleys at the ends, I was apprehensive at first about our famous Midwest weather bringing down the antenna. But it has survived everything that the four seasons here in Kansas can throw at it, with flying colors. And if it can survive here in the land of Oz, I don't doubt it will do well in the normal weather the rest of you live in.

So, friends, if you have the real estate, the trees, and the freedom from antenna restrictions available to you, I strongly urge you to consider this route. It's a lot easier than you might have thought. If a portly, out-of-shape baby boomer with a bad elbow can do it, you surely can, too.

I'd like to commend E-Z Hang, and MFJ Enterprises, for their excellent products, and their prompt delivery of the items I ordered, as well as Associated Radio, the local ham store where I bought the nylon rope I used. Here's the contact information for the three vendors:

www.ezhang.com or (540) 286-0176
www.mfjenterprises.com or (662) 323-5869
www.associatedradio.com or 1-800-497-1457

There went your last excuse. You now have vendor contact information and my step-by-step method to hang wire antennas. Now, get out there and put up some wire! Be careful, follow all safety protocols, and I'll see you next time with more antenna adventures. Happy operating!

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

Marc Ellis, N9EWJ
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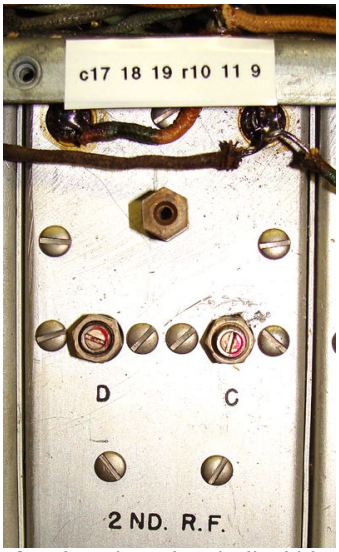
The BC-344 Restoration Continues

More from John Stoll

In the last issue, we ran several interesting restoration tips e-mailed by reader John Stoll and promised to discuss more of John's letter this time. John is a believer in stocking his workshop with inexpensive Heath and Eico test gear. His array includes an audio generator, r.f. generator, signal tracer, capacitor checker, bridge, and two vtvms. Most, or all, were purchased on e-Bay and he estimates that his total cost was about $125.00, including shipping. In spite of the fact that most of these items were built from kits, he has found little wrong with them.

One exception was an Eico 950B bridge. It turned out to be a nightmare of poor wiring, modified wiring, and shifted resistor values. John eventually got it working within specs and feels that the education he received in trouble-shooting the problems was well worth the unit's $17.00 price tag. On top of that, the bridge incorporates a continuously-variable d.c. supply that he finds invaluable for testing and re-forming electrolytic capacitors.

Currently, John is working on two recently-acquired tube testers, a Precision 10-12 and a Jackson 637. He has started to replace shipping damage, which seems do-able, and is cleaning tube socket contacts with Craig's Deoxit. After that, his hope and expectation is that both testers will be fully functional. He doesn't plan to tamper with any factory adjustments.



Overhanging chassis lip hid a solder bridge shorting out one of the terminals at top of second r.f. can. Note replacement component label (see text).

Replacing Capacitors

Reader Harrison Church, noting that last February's column ("Capacitors and their Replacement") didn't discuss how to *physically* remove and replace the capacitors, wondered when or if I would get around to that.

His question focuses on a columnist's dilemma. How often, if at all, should he repeat material covered in earlier columns? Unlike the author of a book, who can make sure that his content is well-balanced and not repetitious, the columnist is writing for a mixed audience, some of whom have seen his earlier work and some of whom have not.

We have indeed spent some time discussing the physical replacement of capacitors in an earlier column – but here's a quick recap for Harrison and other readers who may have missed that original discussion. In my shop, I first explore the possibility of removing the leads of the old capacitors from their terminals. Desoldering braid (a lightweight copper braided tape) can be used to remove much of the solder.

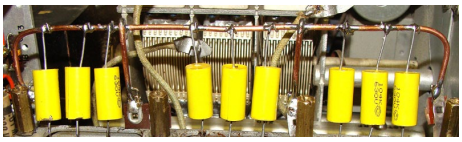
Simply place the tape on the joint and your soldering iron on the tape. The iron heats the tape and the joint and the molten solder is drawn into the tape. Repeat, using fresh areas of the tape, until the joint is reasonably free of solder and the lead can be disengaged and removed. A 5-foot spool of the tape is available at Radio shack (catalogue # 64-2090) for about $4.00.

However, sometimes the terminal in question is in an inaccessible position or surrounded by wiring so dense that the soldering iron can't be inserted without causing damage. Another possible difficulty is that there might be several other leads attached to the terminal – requiring the application of so much heat that the terminal, other components, or the insulation of surrounding wires could be damaged.

In these cases, it is much less damaging to the radio to clip out the old capacitor, leaving its leads in place, and attach the new capacitor to the old leads. A very neat way to do this is to use "butt connectors" (the non-insulated kind). These are really intended for joining two wires using a crimping tool, but they take solder very well. A 20-pack is available at Radio Shack (Catalog #: 64-3036) for a few dollars. Simply insert the wires to be joined into opposite sides of the connector, apply heat, and let the solder flow in.

Another Micamold?

I also heard recently from Jim Falls, who has been a regular correspondent on the BC-344 restoration and on previous projects. Jim confirmed my expectation that there might be at least one of those iffy Micamold capacitor to be found inside an i.f. can, In his case, the first i.f. can. That one shorted out in his BC-312 (the high-frequency, dynamotor-operated version of my BC-344) while he was operating in the ARRL's "Straight Key Night" event. The BC-312 receiver is very similar, both electrically and mechanically to my BC-344.



Frame made of well-supported stiff copper wire anchors replacement r.f. tube shelf capacitors and provides grounding point for top leads.

Just like the Micamolds I encountered in the BC-344's front end cans, Jim found this one so buried that he had to be satisfied with abandoning it in place after disconnecting it. And he had to resort to some ingenious work-arounds to get the new cap connected to the old wiring. Something else to look forward to!

Last Month's BC-344 Progress

By the end of the last work session, I had removed and replaced the Micamold paper capacitors in the oscillator section, the first and second r.f. cans and the first detector can. And I had also removed, but not yet replaced, the three oil-filled caps (containing three 0.1 uF caps each) on the r.f. deck. At the time, I didn't have enough new 0.1 uF caps to replace them, so I put that chore aside and began looking at the capacitors in the other sections of the radio.

The wiring associated with the i.f., audio, and cw oscillator stages was accessed by turning the radio upside down and swinging the power supply assembly out of the way on the heavy hinge provided. Only one Micamold was visible, and I expect to replace that. The remaining caps, and there were relatively few, were metal oil-filled units – all reasonably accessible should replacement be necessary. I decided to take a chance on those – figuring I could easily spot any bad ones through standard troubleshooting tactics.

Before turning the set right side up again to replace the r.f. tube shelf capacitors and check the i.f. cans, I decided to have a look at the electrolytic capacitors inside the power

supply. If they had been accessible, I would have simply replaced them on sight. But since they were buried, I decided to try re-forming them, a process involving the application of a gradually increasing d.c. voltage of the correct polarity – see last month's column for a more detailed explanation.

In doing this, I hadn't disconnected the B plus connection from the power supply to the receiver, and by not doing so I had initiated a smoke test before I had intended to. And the test was positive! I soon saw a delicate tendril of smoke arising from the vicinity of one of the cans and quickly turned off the power.

I completed the capacitor re-forming with the B plus disconnected and it seemed to go well. Then I went after that short in the B plus line. At the end of the work session, I believed I had isolated the short somewhere inside the second r.f. can. But this was a hollow victory because it meant that I would have to remove the can once more so I could find and clear the problem.

One learns to be philosophical about setbacks like this, I told myself, as I began the routines necessary to disconnect the can electrically and mechanically. I won't repeat those procedures here, but they are fully discussed in the March column.

❖ Pressing On!

As I had hoped, the removal of the bandswitch actuating shaft (which passes through the can) and the electrical disconnection of the can went very quickly indeed. Because of my past experience with the shaft, removal took a fraction of the time. And disconnecting the five or six connecting leads took no time at all.

Readers of the March column will recall that the leads were originally wired so tightly to the tiny holes in their terminals that I had to clip the leads to remove them. When it came time to replace them, the holes were unusable and I had to simply bend the terminals over the wires as best I could and flow in solder to make the mechanical, as well as the electrical, connection. Of course that meant that their removal was a simple matter of reheating and gentle pulling.

With the can out of the radio, the terminal that had been shorted to ground was shorted no longer! It happened to be one of two terminals located under the lip of the main chassis. In making the connection to it, I must have created a solder bridge to ground. And though I had checked for that on discovering the short, the overhanging lip had obscured the problem.

I was very pleased that the fault could be cleared so easily and that I was spared the additional work of opening the can to see if I had created a short when changing the capacitors. I quickly installed the can back in the set and restored the wiring and the actuating shaft. Checking the resistance to ground at a few typical tube pins, I found that the values now matched those called for in the technical manual.

I was now home free and I could slide the r.f. tube shelf back into position and reinstall it – once I had reconnected the lead I had disconnected last month to isolate the short. And here I hadn't followed my own good advice about keeping proper records. The fact is, sure as I was that I would remember it, I now had no recollection of the location from which I had removed the lead. It could have been under the tube shelf or at any of the other locations within reach of that wire.

Bottom leads of replacement r.f. tube shelf capacitors are soldered to cut-off terminals of original can capacitor sections.

Luckily, one of the progress photos I had taken for the March article showed the wire and the solder lug, half-hidden under the tube shelf, where it had been connected. Now I could connect the wire and install the shelf.

In trying to solve this problem, I realized how very important the provided component labels are in troubleshooting this type of densely wired set. Resistor and capacitor labels had been printed on the cases of the oil-filled capacitor cans that I had removed from the tube shelf for replacement – but luckily had not yet thrown away. I also had pictures taken during the removal.

Using that information, I re-created the labels, using a handy gadget that prints on adhesive-backed tapes, and affixed these tapes at appropriate spots on the chassis lip. Now, my capacitor order having arrived, I was ready to install the replacements for the nine capacitors in the cans.

❖ Needed – A Contraption

Replacing those nine capacitors , installed in three metal cans, turned out to be a bit of a project. One side of each capacitor was grounded to the can – and so all of the ground connections were taken care of simply by screwing the cans to the chassis. The other sides of the capacitors, brought out to individual terminals, were connected to the various circuit points.

In removing these capacitors from the r.f. shelf, I had unscrewed them and cut away each terminal as close to the can as possible. I wanted to leave as much terminal as possible still attached to the wiring so that I could use it as a connection point for the replacement capacitors. But what to do about grounding the other side?

The new capacitors would be sticking straight up over their connection points in the circuitry. Their free ends would all need to be grounded – but how? I decided that I needed a frame made of stiff copper wire. The frame would be grounded to terminal lugs that I would install under the r.f. shelf mounting screws and it would be run parallel to the shelf and over the tops of the nine capacitors and serve as a grounding point for the free ends.

Searching through odds and ends of wire and cable in my shop, I found a length of #12 UF (underground feeder) Romex. It contained the stiffest copper wire I've ever seen – stiffer, even, than the #12 wire I'm used to working with in household Romex and BX. Separating a single length of wire from the cable, and then from its plastic insulation, was quite a job. The usual wire-stripping tools didn't make a dent, but I eventually came up with a foot or so of what I needed.

The picture I'm including shows the structure of the frame and how the capacitors are attached. It is a very rigid assembly, being supported at both ends as well as by two intermediate risers that, like the ends, are fastened to grounded terminal strips. In installing the bottom leads of the nine capacitors I did have to be very careful not to de-solder any of the leads already connected to the terminal fragments. But things seemed to go well and I think I managed to stay out of trouble. Time will tell!

When I had completed the installation, I once again checked resistance to ground at a couple of test points and was pleased to find that I had managed to make the changes without causing another short in the B plus line. And while this wholesale capacitor replacement was a lot of work, I was glad that I had done it. If one of the capacitor sections in the original cans had developed leakage or a short, diagnosis would have been extremely difficult given the virtually inaccessible wiring of the r.f. tube shelf. And, once diagnosed, finding a spot for a replacement capacitor would have been equally difficult.

See you next time when, with fingers crossed, and given no more setbacks, we should be able to fire up the BC-344 for the first time.

"Sky-Wires & Inhalers"

Part 8: One Low-Pass Filter Coming Up

By Walter Lindenbach

(Note from Walt: If you want to build this filter, read the whole article first.)

Last time, Bill described a low-pass filter to eliminate FM and TV signals from the HF band, and he gave Chuck a shopping list so that they could make one. Chuck came into Bill's workshop, and put a bag on the bench.

"There are the goods," he said proudly, "all found."

"Good stuff!" replied Bill, "let's have a look."

Chuck took out a small plastic bag labeled "82 pF."

"But Chuck, we need 160 pF."

❖ Good Things Come in Pairs

"Yes, I know, but I couldn't find that size, so I thought two 82 pF capacitors in parallel would do. Okay?"

"Sure, that's okay. The manufacturing tolerance is ±5% and two 82 pF capacitors in parallel come to 164 pF, which is only 2.4% high. Where did you get them?"

"Allied Electronics1. They had the best price – $0.64 each. The only ones I could find were rated at 500 VDC. That seems a bit high."

"No matter. It won't do any harm. Generally, capacitors with a higher voltage rating have less leakage. But that doesn't apply to mica capacitors because their leakage is so low already.

"We'll want four parallel pairs – is that right? We better have a look at the schematic drawing again. You have it?"

"Yup, right here." Chuck reached into his folder and pulled out Figure 1.

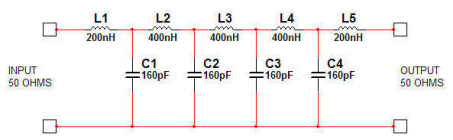


Figure 1: Low-Pass Filter Schematic Drawing

"Here's a little detail about putting things in parallel,"Bill continued. "Rather than twisting the leads together over the whole length, just put a few turns of the lead of one capacitor around the other capacitor lead right at the body. Like this."

Bill took two capacitors and twisted their leads. They are shown in Figure 2.

"There. Now the leads can be soldered at the twists, and the leads sticking out sideways can be nipped off. What else ya' got there? Teflon® washers? Good."

"Bill, I'm not sure they're Teflon®."

"That's okay, so long as they are non-metallic and are of the No. 6-32 hardware size. That means 0.3 inches outside diameter, 0.150 inches inside diameter, and 0.075 inches thick. What's next?"

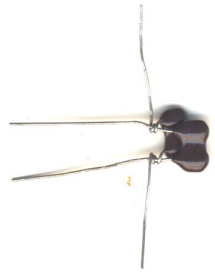


Figure 2: Capacitors in Parallel

❖ And Here's the Housing

Chuck reached for the bag and pulled out a small aluminum box with BNC connectors on the ends. It looked like this:

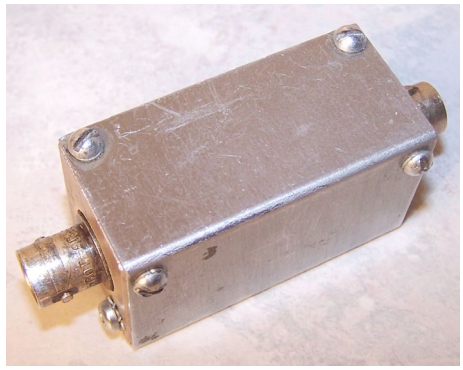


Figure 3: Filter Enclosure

"I got it from Fair Radio2, just like you said last time. There is a good guy by the name of Gary who knew just what I was after."

"That's good. Anything else?"

"Well, you said last time that we need No. 28 enamel-insulated magnet wire, but that you have it here."

"Sure 'nuff," replied Bill, "Okay, let's put it together. First, the coils.

"We need two coils of 200 nH – that's the same as 0.2 uH y'know – and they can be made with 17 turns on a Teflon washer. If we add up the sides of the washer, they come to about 0.442 inches – we'll say half an inch per turn – so that makes 8.5 inches. And then we should add a couple of inches for the leads, so that comes to a total of 12.5 inches. Oh, let's take a 15-inch length so there are no nasty surprises."

So, Bill put a washer on a 15-inch length of No. 28 magnet wire, and it looked like this:

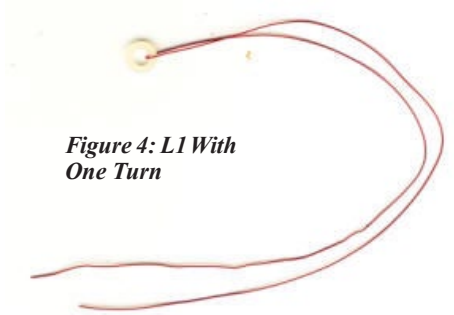


Figure 4: L1 With One Turn

And when he had wound half the turns, it looked like this:

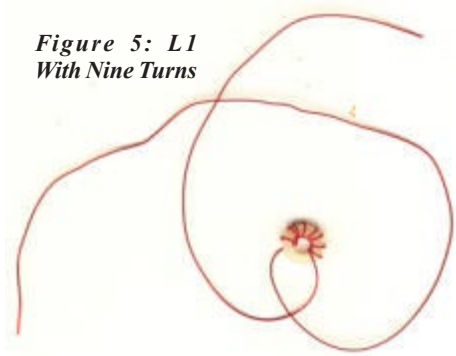


Figure 5: L1 With Nine Turns

Then he wound the rest of the turns and put a dab of rubber cement on the ends where they came away from the washer, to keep them in place. Then he trimmed and tinned the leads and labeled it "L1" with a bit of masking tape.

Figure 6: L1 Complete

❖ You Mean Anything Will Do?

"Very nice," said Chuck, "and you believe this coil now has an inductance of 200 nH, yes?"

"Nope!"

"No? Well then wha --"

"No, all I know is that it has an inductance that is suitable for your filter. The filter requirements are not tight, and this coil will fit them.

"But, you want to know what the inductance really is? Okay."

Bill took out his grid dip meter, soldered the 164 pF capacitor that they had made with two 82 pF capacitors in parallel, and measured the resonant frequency. It was 24.3 MHz.

"Somehow Bill, I have a feeling you are about to write an equation. Isn't that odd?"

"Good! You're getting used to it. We need one." And Bill took a paper and wrote Equation 1.

$$L = \frac{1}{(2\pi f)^2 C} \Rightarrow \frac{1}{[(2)(3.1416)(24.3e6)]^2 [164e-12]}$$
$$= \frac{1}{3.823e6} \Rightarrow 2.616e-7 \Rightarrow 261.6nH$$

"That's pretty high, Bill. We wanted 200 nH. Don't you think that could push the cutoff frequency down into the HF band?"

"Could. There are two things that we can do: spread out the turns, or take turns off. The turns are spread out about as much as they can be already, so we'd better take turns off."

"Okay, but do we just take out some turns and measure the resonant frequency again? Seems tedious. Oh I know. You're going to write another neat little equation that will bail us out. Right?"

"Sure: I just pull 'em out of my hat!" replied Bill, and wrote Equation 2.

$$A_L = \frac{L}{N^2} \Rightarrow \frac{261.6e-9}{17^2}$$
$$= 9.052e-10 \Rightarrow 0.0905nH$$

"AL means inductance per turn," Bill continued.

Minus 51 Turns?

"So, we want 61.6 nH less," said Chuck, reaching for Bill's calculator, but then –

" Bill, this is ridiculous! If I divide 61.6 by 0.9, it comes to 68 turns. There are only 17 turns on the washer now! That means minus 51 turns!"

"Pretty bad, isn't it?" replied Bill, smiling wryly. "Look at the equation again. There's a square term in there, so let's do it like this."

"We want 200 nH and we found that our washer gives us 0.905 nH per turn. So let's see how many turns we ought to have."

$$N = \sqrt{\frac{L}{A_L}} \Rightarrow \sqrt{\frac{200e-9}{9.052e-10}}$$
$$= \sqrt{2.209e2} \Rightarrow 14.86$$

"Yeah!" Chuck was smiling broadly. "We want about 15 turns, not 17, so we'll take off two turns."

When they did that, the resonant frequency was 27.5 MHz. Then Chuck worked out the inductance using Equation 1 and got 204 nH.

He made another inductor in the same way and labeled it L5 according to the schematic diagram, Figure 1.

"Now we need L2, L3 and L4, and they are each 400 nH. How many turns do we need, Bill?"

"Well, we can assume that the AL number, that's the inductance per turn, that we found for L1 is the place to start." And he wrote out Equation 4.

$$L = \frac{1}{(2\pi f)^2 C} \Rightarrow \frac{1}{[(2)(3.1416)(24.3e6)]^2 [164e-12]}$$
$$= \frac{1}{3.823e6} \Rightarrow 2.616e-7 \Rightarrow 261.6nH$$

Tuning Gets the Answer

Chuck wound 21 turns of No. 28 wire on another Teflon washer, soldered the 164 pF capacitor across the terminals and measured the resonant frequency with Bill's grid dip meter. It was 21.88 MHz. Then, using Equation 1, he calculated that the inductance was 322.6 nH.

"Oh mercy! That's way too low, Bill. How did we get so far down?"

"Perhaps you wind coils differently than I do. We'll have to work out the AL factor – inductance per turn – again."

Using Equation 2, Chuck found the AL factor to be 0.73 nH per turn. Then, using Equation 3, he found that 23 turns should give 400 nH inductance. Fortunately there was just enough wire in the leads to add two turns.

Measuring the resonant frequency with the 164 nF capacitor and Bill's grid dip meter, he read 19.9 MHz. Then, using Equation 1 again, he found the inductance to be 390 nH.

"That's good," said Bill, "now label it L2, and then L3 and L4 can be made the same way."

So they finished the next two coils.

"Can we put it together now?"

"Betcha! Let's just look at one of Walt's filters before we start, and I'll mention a couple of things."

Figure 7: Walt's Filter

"Notice the copper bar that runs the length of the filter? It's a piece of No. 10 wire, and it is soldered on to two solder lugs that are fastened with screws to the ends of the box.

"Use sharp-edged biting lock-washers under the screws and make them really tight. The effectiveness of the filter depends largely on the quality of the ground.

"But before doing that, solder the parallel capacitor pairs,C1, C2, C3, and C4, to the copper ground bus-bar. They can be spaced over the length of the busbar, but with extra room at the ends where the BNC connectors are.

"Then connect L1 from the center pin of the BNC connector to capacitor C1. Be sure it is one of the 200 nH coils. Then connect one of the 400 nH coils, L2, between C1 and C2, another one between C2 and C3, and the last one between C3 and C4.

"Finally, the second 200 nH coil, L5, goes between C4 and the second BNC connector center pin."

"And that's it!" sang out Chuck, "I've gotta run, but I've got the picture and I'll put it together at home.

If It Isn't One Thing, It's Another!

"Oh, before I forget, a new AM radio station has just gone on the air a few blocks from my place. It turns up all over the lower half of HF band!"

"Just fine!" replied Bill sarcastically, "But keep calm. I know something that will fix it."

"You're thinking of another kind of filter?" asked Chuck.

"Could be. Now, you put the low pass filter together, and next time we'll test it."

"Oh wow! Sounds neat! I wonder what you're cooking up now. G'nite."

"G'nite."

REFERENCES

(1) Cornell-Dubilier Type CD15ED820JO3F: 82 pF, 500 V, ±5% tolerance. Available from Allied Electronics, **www.alliedelec.com**, phone number: 1-800-433-5700. Price: $.64

(2) The cases to be used for the low-pass filter are Type CN223, available from Fair Radio Sales Co. (**www.fairradio.com**) for $9.50 each.

(3) "Grid Dip Meter"; also called "Gate Dip Oscillator" or "Base Dip Oscillator".

Walter Lindenbach can be reached at *lindenbachw@shaw.ca*. If you have questions about making filters or other subjects that Bill and Chuck are talking about, send me a note. I will reply.

GLOBALNET

Exploring the World of Internet Radio and Television

Loyd Van Horn, W4LVH
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Radio aus Deutschland!

As a child of the Cold War, there are a few mental images that I have associated with certain words and phrases: I hear the word *wall*, I think of Berlin. I hear *Star Wars* and I can't help but think of the elaborate anti-nuclear missile defense system. I hear *Central Europe*, I think of Germany.

Lately, when I think of *Internet radio*, I have been thinking about Germany, too. A friend of mine is currently living in Germany, and thanks to our discussions, I started having the urge to tune in broadcasts from Deutschland.

Many who got their start in radio by listening to shortwave broadcasts, are probably quite familiar with Deutsche Welle. The German international broadcaster was among my first targeted attempts to pull in foreign radio signals when I began in the hobby more than 20 years ago. But I always wished that I could also tune in to domestic broadcasts – not only of local German radio stations, but those of many of the countries I would later hear.

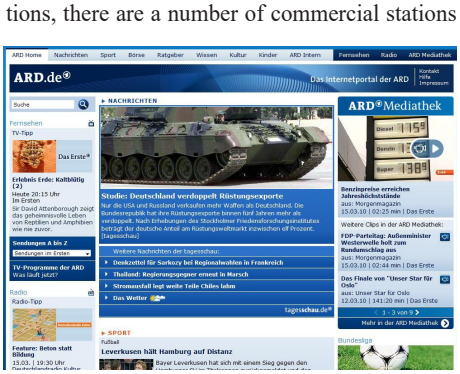
A quick turn of the Internet radio dials makes that possible.

A quick trip to RadioTime or Reciva will show that there are a large number of domestic German stations available on the Internet (nearly 1,500 on Reciva alone). Many broadcast only in German, but you will find the occasional English-speaking station if you search diligently enough.

A good place to start when listening to any country is their national network. In Germany, that is Deutschlandradio. The national service operates three networks, one of which (Deutschlandradio Wissen) just began this year on DAB and online as an educational channel targeting students.

In addition, there is ARD, the organization that operates Deutsche Welle and a large assortment of radio and television stations in Germany. ARD also controls Deutschlandradio. Programming is often regulated by the stations themselves, and each member station will often share programming with each other (especially at night).

In addition to the national networks and stations, there are a number of commercial stations in Germany as well. There are a few national commercial stations such as RTL Radio, Radio Melodie and Klassik Radio. In addition to these national stations, many smaller local stations in cities such as Hamburg, Saarland and Berlin can be found online.



The best bet in finding German stations is to usually start with the larger cities and then work to smaller ones, using services such as RadioTime and Reciva. As with most any country on the planet, a city with a moderate to larger sized university is a great place to find an eclectic mix of programming content.

So, if you are craving music and content from the country that brought you bratwurst and lederhosen, the choices are many. Start with the national networks and stations, as these usually have the most reliable streams. Good luck in your search and hopefully soon you will be listening to music auf Deutsch!

❖ BBC may break out the axe

The tough economic times are even hitting the big guns, it seems. It was recently announced that the BBC would be cutting out two of its Digital Audio Broadcast stations and would cease hosting a significant number of Web sites as well.

On the radio side, the biggest cuts are to the BBC's Asian Radio Network and BBC 6 Music. Both are slated to end broadcasts at the end of 2011 after a review of the BBC's operations deemed cuts were necessary. At least on the side of the popular 6 Music station, the BBC logged nearly 8,000 complaints from angry listeners in early March, showing their support for the station.

The BBC, for its part, promises listeners they are listening to their cries. In what they are calling a "public consultation period," the BBC (partially led by the DJs from the stations in question) has invited listeners to weigh in on the decision to cut the stations from the broadcast stable.

❖ Performance Royalty Fight gets 'blown up'

In the ongoing battle between record labels and broadcasters over a bill before Congress that would force radio stations to pay an additional "per-performance" royalty in addition to their annual fees paid to song publishers, record label activists recently turned to a giant inflatable pig to get their message across.

The message: "Big radio is being 'piggish'." By all accounts, the early-March protest

constituted nearly five people and one large pig outside of the National Association of Broadcasters building in Washington D.C. The NAB seemed amused by the protest, buying sausage pizzas for the handful of protesters.

The protesters tried to tie "big radio" in with the recent onslaught of "bailouts" of big corporations during the economic downturn.

Record labels and artists are claiming that radio is getting a free ride by playing the artists' music, not paying them a dime, but generating millions in revenue for themselves. Radio counters by stating they do in fact pay annual fees to song publishing companies such as BMI and ASCAP (which divide a percentage of those fees to the songwriters) and that by playing their music, radio is giving musicians free advertising.

There is concern among broadcasters that if the performance royalty bill passes Congress, the raised fees would cripple an already hurting industry.

A similar battle a few years back over royalties paid by Internet radio stations almost put Pandora out of business during its formative stages when the royalty amounts increased.

Artists such as Bono and Dionne Warwick have jumped into the battle, with Warwick recently appearing before Congress to boost support for the bill.

As both a musician and a former broadcaster, I am greatly torn on this issue. Yes, I want to see musicians get their fair share, but without the free promotion of artists by radio stations, many artists would likely not be successful anyway. Also, if you force the hand of radio stations to pay for the music they play, they are going to fill their broadcasts with either talk/sports radio or well established acts. Upcoming and local musicians will be the ones left out in the cold, as program directors won't want to take a chance paying for music that is unproven.

Either way this shakes out, there are some pretty nasty wounds being opened in this battle that could create tension for quite sometime between radio and artists.

❖ O'Meara making waves again

Mike O'Meara – half of the formerly nationally syndicated, sometimes controversial *Don and Mike* radio program based out of Washington D.C. – not too long ago found himself out of a job. His program was cut when the flagship station changed formats.

Normally, in radio, you pick up your family and move to another market or get out of the industry all together when this happens. But O'Meara decided to embrace the Internet as his new venue.

Now, from his living room, Mike O'Meara has launched a highly popular radio program in podcast form. Spurred largely by his famous name in the D.C. area (and to those of us who tuned in Don and Mike's show back when it was on), O'Meara now has one of the top rated iTunes podcasts along with advertisers to pay for the

show.

O'Meara says that 67 percent of his listening audience is in the advertiser-friendly 25-44 year-old age group. What's more, rather than advertising on a radio station which grabs whoever might be listening at the time, O'Meara says his advertisers love that his audience actively seeks out his program specifically for the purpose of listening.

Could this be the new frontier of talk radio hosts and "shock-jock" programs? Howard Stern has already jumped to satellite radio, could podcasting be next?

My own experience in this has been perhaps an indicator as well. Here in South Carolina, I have become a big fan of the *Ace and TJ* show, based out of WNKS - 95.1 'Kiss FM' in Charlotte, NC. However, since Ace and TJ begin their broadcast day at 6:00 in the morning, and my schedule often has me rising from my slumber long after the show has ended, the only way I can keep up with the show's hi jinx is to download their daily podcast. In the case of Ace and TJ, they provide their entire show, all four hours, for download from their Web site.

This way, I can listen to their program on my own time, wherever I might be, even in areas not friendly to radio reception or listening. Each of the segments is preceded and closed by an advertising announcement, so there is money to be made from the podcast.

So if you have ever thought you would be an amazing talk radio or morning show host, go buy yourself some equipment and start up a daily podcast. Who knows, maybe you will be the next big thing in radio, right from *your* living room.

❖ Internet radio makes inroads in cars

Recently, Pandora announced that it was working with automakers such as Ford to include Pandora-equipped radios in their vehicles.

Now, RadioTime, another Internet radio service, has announced deals with automakers to bring their service into your automobile.

RadioTime, which like Reciva and others acts as a gateway to tens of thousands of streaming radio stations (including domestic stations from around the world), has partnered with BMW to bring the world's first Internet radio equipped vehicle to the road.

Here is how it will work. Currently, to get Internet radio in your vehicle, you have to have a smartphone such as a Blackberry or iPhone and connect that through your vehicle sound system. To change stations, you have to use the controls on the phone itself. This can be very hazardous to do while driving.

With BMW's MINI system, you can connect your iPhone to a USB port in the automobile streaming the stations through your phone, but the interface for controlling the application is run through your steering wheel. An easy-to-read monitor on the dashboard makes changing stations much less of a distraction from driving.

With automakers still debating on how to proceed with a fully-functional Internet connection in their vehicles, this could be a much easier and cost-effective way for them to provide the increasingly popular Internet radio services to their customers, in-car.

RadioTime says it is working with other automakers to bring the technology to more drivers.

❖ GlobalNet Mailbag

I have been getting in some great emails from readers, but feel bad that I haven't had a chance to include their comments and questions in the column. So this month, I dig deep into the mailbag and pull out one of the recent ones.

Loyd, I read your column every month. I'm interested in trying Internet radio but I don't want to buy an Internet radio. That is, I'd like something that I could simply attach to my existing stereo system. I guess I'm saying I just want a tuner. I don't want to buy something with speakers and its own audio system. I get the impression from reading your column that they want me to buy a radio set. Am I missing something? By the way, do you get decent stereo sound from these things?

Thanks, Victor - Lebanon, PA

Victor, there are a few tuner-only Internet radio devices on the market. One that sticks out is the Logitech Squeezebox Touch. As a matter of fact, Logitech makes several good tuner-only devices you may want to check out. Some can be a bit pricey, but if you search you can find some deals (Aluratek makes a relatively inexpensive tuner for home theater use).

Stereo sound will vary from unit to unit and of course, according to the quality of connection to your home stereo system (and your WiFi network). But in most cases, streams from big stations (BBC, US domestic stations, etc.) tend to be nearly FM quality or better.

The good thing about many of the Internet radio units *with* speakers is that they always have an output jack that allows you to run the audio through your home stereo system, while still giving you speakers to use in other rooms of the house, if you wish. Just something to remember.

Thanks for reading!

GLOBALNET LINKS

Deutschlandradio - **www.dradio.de/**
RadioTime – **www.radiotime.com**
Reciva – **www.reciva.com**
BBC logs just under 8,000 complaints - **www.guardian.co.uk/media/2010/mar/12/bbc-complaints-close-6music**
BBC to make cuts to DAB service - **www.radio-survivor.com/2010/03/14/bbc-pruning-back-digital-radio-service/**
Giant pig used in royalty war protest - **www.betanews.com/article/Giant-inflatable-pig-used-in-recording-studios-Washington-war-with-broadcasters/1268263634**
Dionne Warwick tells Congress radio should pay - **www.google.com/hostednews/ap/article/ALeqM5iGP6YXA5YfP-wry4vjq5wBu6aB3IQD9E6MLS81**
Former broadcaster turned podcaster is seeing success - **www.washingtonpost.com/wp-dyn/content/article/2010/02/19/AR2010021905989.html**
BMW launches RadioTime powered cars - **www.rbr.com/radio/21915.html**
iPhone 4.0 to multitask, sources say - **www.ipodnn.com/articles/10/03/11/may.borrow.mac.interface.concepts/**

MT REVIEW

FLEX-3000 SDR Transceiver Review, Part 1

The future of radio in your shack today

By Larry Van Horn, N5FPW
Monitoring Times Review Editor

In the past two annual ham radio issues of *Monitoring Times* (the May editions), I have authored a couple of features about how the world of digital communications has been embraced within the amateur radio community.

Digital communications have rapidly grown to be among the most popular modes of operation in the HF bands. Thanks to increasingly powerful computers, we continue to expand the boundaries of digital communications used within the amateur radio service. Digital modes that were invented by hams and tested in the amateur radio bands have now found their way into other portions of the radio spectrum, and are even being used by government and military agencies on a regular basis.

But one area in which the digital revolution has not made significant inroads into our radio hobby community is in the equipment through which we communicate. The next logical step in our digital evolution is to incorporate digital electronic techniques in the radios we use for transmitting and receiving radio signals.

But, to some, especially "us" older radio hobbyists, that word "digital" and "equipment" can strike fear in our hearts. The thought of using some sort of fancy, all digital radio to receive and transmit radio communications seems like something written in a SciFi movie script for most of us. So, try as we may, sometimes it is still hard to get an old dog to try a new trick when the words "digital" and "equipment" are spoken in the same breath.

I am happy to report that recently I definitely learned a few new tricks when the opportunity to review the FlexRadio Systems FLEX-3000™ SDR transceiver came my way.

But first, before I dive deep into this two-part equipment review on the FLEX-3000, a bit of education on this SDR subject is definitely in order.

❖ SDR – what is that?

SDR is an acronym for software defined radio (SDR). The technical staff at FlexRadio provides the following excellent definition:

"A software defined radio is one where the radio frequency (RF) signal is converted to a digital bit stream and all of the modulation and demodulation of the signal is done with digital signal processors (DSPs). An SDR performs significant amounts of signal processing in a general purpose computer, or a reconfigurable piece of digital electronics. The goal of this design is to produce a radio that can receive and transmit a new form of radio protocol just by running new

software."

In a nutshell, a software-defined radio system is a radio communication system where components that have typically been implemented in hardware (e.g., mixers, filters, amplifiers, modulators/demodulators, detectors, etc.) are instead implemented using software. While the concept of SDR is not new, the rapidly evolving capabilities of digital electronics are making practical many processes that were once only theoretically possible.

A basic SDR system may consist of a personal computer (PC) equipped with a sound card, or other analog-to-digital converter, preceded by some form of RF front end hardware. Significant amounts of signal processing are handed over to a general-purpose processor, rather than being accomplished using special-purpose hardware. Such a design produces a radio that can receive and transmit widely different radio protocols (sometimes referred to as a waveforms) based solely on the software used.

So using the concept above, in theory, if you wanted to communicate using the JT65 mode, or any of the other dozens of digital modes, that digital protocol could be part of a transceiver's software package. So all you would have to do would be to select a button marked JT65 and tune in a signal to either decode or transmit it to another station via our digital radio described above.

Unfortunately we aren't quite there yet, since no one has incorporated that capability in an all-in-one software package to date. But we are there in a fundamental sense, in that I can run a third party piece of software to do the decoding job while running my SDR software for my radio, simultaneously on one computer.

The basic SDR concept which led to the development of the first SDR experimenter's kit for ham radio was first described by FlexRadio Systems CEO Gerald Youngblood, K5SDR, in *QEX* magazine during the summer of 2002.

Gerald's four-part article on the concepts and techniques was used to develop the world's first SDR for ham radio operators and it is still the quintessential primer on SDRs. You can check out all four of these highly informative, light reading primers online at the FlexRadio company website (Adobe Acrobat PDF format) via the following links:

- Part one introduces DSP and how it is applied to SDRs along with describing a transceiver architecture. **www.flex-radio.com/Data/Doc/qex1.pdf**
- Part two describes the initial software engineering needed to define an SDR. **www.flex-radio.com/Data/Doc/qex2.pdf**
- Part three illustrates the use of DSP along with using a PC sound card to define a functional SDR. **www.flex-radio.com/Data/Doc/qex3.pdf**
- Part four is a detailed description of the three board stack that was to become the ground breaking SDR-1000. **www.flex-radio.com/Data/Doc/qex4.pdf**

So, now that we have been introduced to the SDR concept, what is all this hype I have mentioned about the FlexRadio 3000a SDR? It is time to take a closer look.

❖ SDR versus Traditional Transceiver

What are the advantages of a FlexRadio SDR over a traditional transceiver?

There are many advantages, so let me count the ways of just a few of them to illustrate why FlexRadio SDRs are so cool to own and operate.

First, the DSP code is not "fixed" in firmware like its hardware-based transceiver cousins. That makes upgrading the DSP hardware easy. New radio or operating features are easily implemented with a software upgrade.

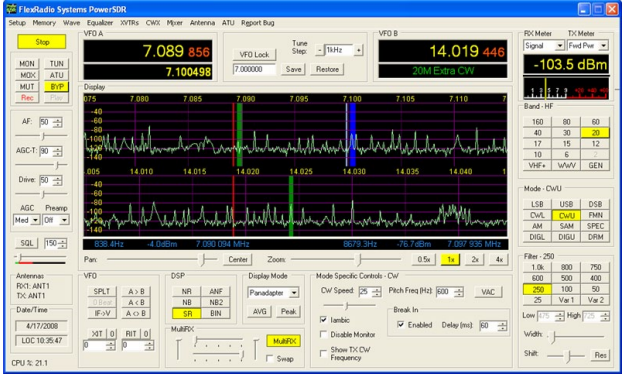
That means that the radio is constantly being improved. It never becomes obsolete. Try doing that with a conventional hardware transceiver – You can't!

Also, this DSP software code is open source. It is not proprietary so you can do a bit of experimenting on your own if you have the knowledge to do such things. More about this subject later.

There is only a single step or conversion from RF to baseband audio. Thus, you will have less equipment noise generated due to eliminated multiple IF conversions. Also, there will be low distortion. Distortion is introduced at every conversion stage in a radio, and since we only have one in the FlexRadios – low distortion.

Another plus of this single conversion is that roofing filters are not required to improve performance. A "roofing filter" is simply a filter in the radio's first intermediate frequency (IF) stage through which all signals must pass before they will be "seen" by later receiver stages. Remember, as I mentioned above we have done away with the need for a "roofing filter" because we have done away with the traditional IF stage found in conventional radios.

Finally, 99 percent of the signal path is entirely in the digital domain. In the Flex-Series of radios the receiver performance is directly related



to the dynamic range of the analog-to-digital converters (ADCs) utilized. Radio frequency signals are down converted to the audio frequency band, which is sampled by a high performance audio frequency ADC. By using these embedded high performance ADCs, we have a product that provides higher dynamic range and is more resistant to noise and RF interference.

Since most of our signal path is in the digital realm, the FlexRadio SDR software performs all of the demodulation, filtering (both radio frequency and audio frequency), signal enhancement (equalization and binaural presentation).

So, what are the major differences between an SDR and a traditional radio that you are going to notice?

There are no knobs and buttons on the transceiver to manipulate. All of the radio control is done via software, so functions such as changing frequency, selecting filters, changing bands are no longer initiated on the radio hardware itself. The hardware is less complex due to the elimination of circuits that would normally be in traditional radios. Basic radio functions are now handled by the SDR software. Also, since very high quality A/D and D/A converters are used, SDRs outperform all traditional radios on both transmit and receive.

Oh, and if that no knob thing is a sticking point for you old timers, you can get a knob as an accessory. I'll have more about that in part two of this review.

❖ Things You Need to Know

Before you jump out there and slap down that credit card to by one of these modern digital marvels, there are a few things you need to know and decide, in order to operate your FLEX-3000 or any of the other FlexRadio SDRs.

The first and most important decision you will need to make before you buy any of the SDRs is what computer are you going to use to run the SDR software. Since we rely on the computer to replace a significant portion of the hardware that is traditionally in a hardware-based transceiver, you won't be able to pick up just any old hamfest flea market special to do this part of the computing for you. You're going to need a computer with some real computing power if you are going to effectively run the main star of the FlexRadio show – their FlexRadio PowerSDR™ software package.

The FlexRadio PowerSDR software provides all DSP and hardware control functions for FlexRadio System's fully software defined radios and is released under the open source General Public License (GPL).

Written in a combination of ANSI C and C# computer languages, the FlexRadio PowerSDR software is easy to learn and modify. Yes, I said modify. The source code for this program is openly available to encourage amateur SDR research and experimentation. For those of us who are not computer programmers, (and for whom the mere thought of programming makes us break out in a cold sweat), the complete application is provided in compiled form so that you can simply download, install and run it. Wipe the sweat off your brow now.

FlexRadio PowerSDR software will run on a variety of personal computers. The transceiver's digital-to-analog converter (DAC)/ADC can operate at 48-, 96- or 192-kHz ,which is known as the sampling rate. This sampling rate is hardware dependent, so a particular hardware platform may not support all sampling rates.

Why is this sampling rate important? The higher the sampling rate, the larger the spectrum bandwidth you can sample and view. Also, higher sampling rates can reduce processing latency. Processing latency is the slight delay between receiving the RF signal and having it converted to an audio frequency (AF), which is what you hear from the headphones or speakers. The higher the sampling rate, the greater the computing resources needed to run at that speed.

There is one other parameter in addition to sampling rate which can affect a computer's performance, and that is the hardware/audio buffers. Smaller audio buffers produce less latency, but require more computing resources.

Fast computers (multiple core central processing units or CPUs) that can be purchased today, can run at the highest sampling rates with the lowest buffer settings. Older computers with less processing power will run very well, but may have to use lower sampling rates and/or larger buffers to achieve acceptable performance.

Since this is a multiple dependency system, it is difficult to state definitively a "recommended" computer configuration. But in a nutshell, just about any new computer you buy today with a dual-core CPU (AMD or Intel) with at least 1 MB of L2 cache RAM will be more than sufficient for running the PowerSDR software package.

Cache memory is different than the main RAM of your personal computer. Cache RAM, the processor's local temporary storage area, is located on the CPU. More cache RAM means less trips to the main RAM, speeding high speed operations like DSP functions.

A great website for checking out your computer's CPU performance is located at **www.cpubenchmark.net**. The higher PassMark rated CPUs will speed up your FlexRadio performance. PowerSDR will run on CPUs with a PassMark rating of 400, but if you are buying a new system, consider purchasing a unit that has a CPU measurement with at least a 1000 rating.

FlexRadio does offer on their website a "Knowledge Center" article that describes several factors that need to be taken into account when choosing a PC to use with their FlexRadio PowerSDR. These suggestions can also be used to evaluate your current computer system. You can access that article online at **http://kc.flex-radio.com/KnowledgebaseArticle50063.aspx**.

The FlexRadio Rule of Thumb is this: "Get the highest performance PC you can afford and get one that allows you to upgrade if necessary."

❖ Firewire Throughput is Critical

One of the more critical elements for determining if a computer will run the PowerSDR software package is the throughput achieved from the Firewire host controller. Most computers today come with an integrated Firewire interface. In some cases, these integrated peripherals haven't been optimized for high throughput data rates.

Using a bus-connected Firewire host controller card that is PCI or PCI-E based is recommended for an optimum data throughput. For laptops, you want to get an ExpressCard Firewire host controller rather than a PCMCIA if at all possible. You can get additional details on this subject on the FlexRadio website at **http://kc.flex-radio.com/KnowledgebaseArticle50179.aspx**.

One final note about Firewire, FlexRadio will be shipping you a 1394a 6-pin to 6-pin Firewire cable about 1 meter in length. You will need to know what sort of 1394 pin you will have on your card or computer and make plans accordingly. I had a 4-pin 1394 connector on my laptop, so I needed to get a 6-pin to 4-pin cable. Tech support at FlexRadio Systems told me that they recommend a cable over a pin converter for stability purposes.

The following cables, connectors and software were included with the FLEX-3000 I reviewed: PowerSDR Software CD with all necessary software and documentation to run your Flex Radio; 13.8 VDC power cable – one end terminated with the FLEX-3000 power connector and the other unterminated; BNC (male) to SO-239 connector for connecting coax with PL-239 connectors; and the aforementioned 1394 Firewire cable.

One final thing you will have to have ahead of time is a microphone. The FLEX-3000 and FLEX-1500 radios use an 8-pin modular connector or "jack" for interfacing a microphone to the transceiver. This connector is a modular "8P8C" (8 position/8 contacts) connector. A corresponding 8P8C plug is needed, commonly referred to as an RJ-45 plug or connector, for connecting a microphone to the radios. This plug is commonly used for twisted pair Ethernet cabling applications. The FLEX-3000/1500 uses the same connector pinout as the Yaesu FT897, FT857 and FT817. You can get more info on this subject online at **http://kc.flex-radio.com/KnowledgebaseArticle50063.aspx**.

If you need a different cable, microphone cables, microphone, or a tuning knob, FlexRadio has an online store where these items can be bought as you make your SDR purchase.

So, as the folks at FlexRadio say, "Tune in the excitement"™ with their radios. We are now to the point where we are ready to tune in the excitement. Join us for Part Two of this review in the June issue of *Monitoring Times,* as we as put the FLEX-3000 on the air during a big international amateur radio DX contest.

What's NEW

Tell them you saw it in Monitoring Times

Jetstream JTPS30M DC Power Supply

Reviewed by Bob Grove W8JHD

The subject of power supplies is an art in itself. Every day we are besieged by "wall warts," battery chargers, heavy duty power supplies, and AC adapters. Even batteries come in an array of sizes, shapes, voltages and current ratings.

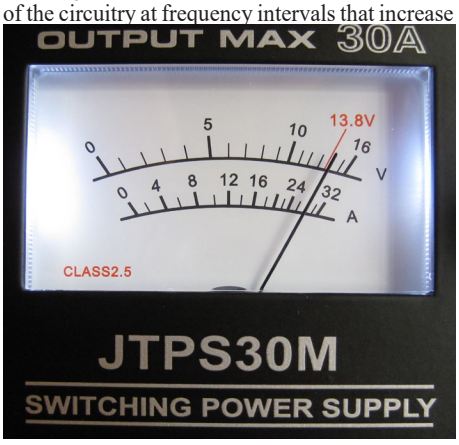
AC power supplies can be regulated or unregulated, fixed voltage or adjustable, conventional transformer or switching, and come in a wide range of voltages and current capacities.

This new release from Jetstream© is of the heavy-duty, adjustable voltage, regulated, switching variety. It is encased in a sturdy metal cabinet with a finned top to assist heat dissipation. Heat is always a side effect of high current in a small package. A warning label is affixed to the top heat sink to alert users to this probability under certain high-load conditions.

A little theory

Most of the power supplies we see, especially traditional linear types, consist of a transformer, rectifier diodes, and filter capacitors. They may have regulating devices that keep the voltage steady under varying current-loading conditions, and they may have components to allow voltage adjustment.

Switching power supplies are a newer technology, using lighter-weight transformers which still allow heavy current delivery. They do this by allowing the transformer to be switched in and out of the circuitry at frequency intervals that increase their efficiency.



The panel meter displays accurate voltage and current levels

Such designs cut costs while still delivering the goods. But there is one problem with switching power supplies: Unless well filtered and shielded, their switching circuitry can radiate considerable radio frequency interference (RFI) to surrounding receiving equipment.

I've often traced severe RFI in my own radio room to switching power supplies around the house. I've seen it in power-tool battery chargers, electric blanket regulators, electric shaver drop-in chargers, radio power supplies, and even electric washer and drier controls.

Let's try this one out

So, if switching power supplies can be such a dreadful nuisance, why are we even reviewing one in *MT*? I'll have to admit considerable skepticism at first. The price was very reasonable considering its many features. I just assumed it would be electrically noisy.

The first thing I did when I took it out of the box was to set it next to the short whip antenna on my spectrum analyzer, expecting to see quite a spectacle when I turned it on! But the spectrum analyzer didn't even flinch. I put the spectrum analyzer's antenna right on the power supply; still nothing. I wrapped the AC cord around the antenna and put a 10 amp load on the supply to make it work, assuming that would generate some RFI. Not a peep! This is one, quiet, switching power supply.

Features

The new Jetstream JTPS30M is handsome, compact, lightweight, and powerful. Two of these 30A power supplies would fit inside the cabinet of my 20A Astron linear power supply and still have room.

The Jetstream can be voltage adjusted from 9-15 VDC and produce a current up to 30 amps with very low ripple. Attractive blue-white lighting illuminates the panel meter when the supply is turned on; a rocker switch lets you choose whether to read the voltage or the current.

Power is available on the front panel cigarette lighter jack and push terminals

Since most DC-powered electronic equipment and accessories are designed to accept the nominal 13.8 VDC of an automotive electrical system, the Jetstream has both a red 13.8 V mark on the adjustable meter scale as well as a rear-panel rocker switch that automatically sets the supply to 13.8 VDC, disabling the variable control.

A cigarette-lighter style socket on the front panel invites the operation of mobile radio equipment commonly equipped with that type of cord; a maximum of 10A current is specified for this connector. A pair of push terminals allows the attachment of random wires for a load not to exceed 3A.

The rear panel sports the 30A terminals, cooling fan, and 13.8V switch

For full 30A current drain, a husky set of screw terminals on the back is provided. Under high load conditions, a cooling fan automatically kicks in for temperature regulation. Remember, 30 amps at 13.8 volts is over 400 watts – way more power capability than required by any ham transceiver I know of!

Just in case it does encounter an overload situation, the power supply is fused. The fuse is located inside a small panel under the AC input connector. A spare fuse is also inside that panel.

Some final thoughts

I certainly have no reservation about recommending this fine power supply for any imaginable 9-15 volt use. The only criticism I could offer would be to ask why, since this is a voltage-adjustable supply, wasn't it designed to allow complete adjustment from 0 to 15 Volts? This would allow it to be used for virtually any accessory or piece of equipment, rather than just those designed for 9-15 volt (typically mobile) applications.

That puzzlement aside, as I conclude this review, I have already attached this power supply to my ham transceiver; it's a great improvement over the much larger, much heavier, and much uglier box that used to power it!

The Jetstream JTPS30M is $109.95 from Grove Enterprises (800-438-8155 or **www.groveent.com**) and other *MT* advertisers.

SPECIFICATIONS

Input voltage: 115 VAC +/-10% @60 Hz
Output voltage: 9-15 VDC variable, 13.8 VDC fixed
Output voltage tolerance: <2%
Output current: 25A continuous, 30A maximum (short-term)
Output ripple/noise: <80mV P-P
Protection: Short-circuit and overload
Fuse: F8A 120V
Dimensions: 7-1/2"W x 2-3/4"H x 8-1/2"D
Weight: 5 lbs.

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, *larryvanhorn@monitoringtimes.com*.

When ordering or inquiring about the products mentioned in this column, be sure to tell them that you saw it in the pages of *Monitoring Times* magazine.

LETTERS

editor@monitoringtimes.com

This column is open to your considered comments. Opinions expressed here are not necessarily those of Monitoring Times. Your letters may be edited or shortened for clarity and length. Please mail to Letters to the Editor, 7540 Hwy 64 West, Brasstown, NC 28902 or email editor@monitoringtimes.com

Happy monitoring!

Rachel Baughn, Editor

Rachel Baughn
rachelbaughn@monitoringtimes.com

Farewell to Passport

We were sorry to hear the news that *Passport to World Band Radio* will not be revived in another form. When the decision not to publish the 2010 edition of this well-respected book was announced, the hobby anticipated a follow-up announcement of a change in delivery format. But it appears editor-in-chief Lawrence Magne plans to retire in earnest, and *PWBR* will not be revived.

On the website **www.passband.com/category/receivernews/** Magne recounts how the book began and thanks his many contributors and supporters. Read it quickly, because the website is being closed down soon. It is indeed the end of an era.

Gayle Van Horn, MT's Frequency Manager, said, on hearing the news, "The *New York Times* called *Passport to World Band Radio*, 'the TV Guide for world band radio' – and rightly so." *Passport* held a place in listening posts across the globe, including mine. I will miss the informative reviews, features, programming guides and the Blue Pages. Whether using a hand held portable or a table top receiver, *Passport* kept the shortwave community informed. My sincere good wishes to Larry Magne in any future endeavors.

We join in Gayle's well-wishes. Larry Magne, who wrote receiver reviews for *Monitoring Times* for ten years, fought hard for the hobby throughout his career, and he remains a good friend. We all will miss his useful "Blue Pages" listings and in-depth receiver reviews.

It is sad news, but, trying to be philosophical, past generations have already discovered that when one's life's work is born out of one's passion, it can only be passed on if someone is found with an equal passion to continue it. But, who knows? Maybe waiting in the wings is some youngster who will start a new listener service, streaming international broadcasters and sending a Twitter message to his subscription list as the next broadcast begins – or maybe he/she will do something new we haven't even dreamed of yet … just like Lawrence Magne did.

Cruising for DX

Long-time *MT* subscriber Maury Midlo (author of April's *First Person Radio* article) took a cruise last February and hoped to be able to visit the bridge and check out the radio room. He said, "Security is tight, even on ships these days, so I am not surprised by the inability to visit [the bridge]."

As to DXing shipboard, Maury said, "I took along a scanner and a shortwave radio. The shortwave listening was not exciting and the ship's few routine VHF & UHF communications were mostly not in English."

Long-time* Monitoring Times *subscriber Maury Midlo relaxes on his cruise-ship stateroom balcony with his scanner and SW radio. (Feb., 2010.)

March Corrections

The photograph on page 8 of March *MT* should have been credited to Kevin Burke. The photo on page 55 of the same issue should have been credited to Brian Topolski. *MT* regrets the error.

Also, thanks to Steve Silverwood for testing all the links in the SW Guide list of SWB URLs! A labor of love, indeed, and much appreciated by all who read *MT*.

Monitoring MURS

James Newman wrote: "I was reading your article on MURS (Feb *MT*). I drive a truck around the country; sometimes I'll scan FRS GMRS and MURS. I have found a lot of Walmarts, Lowes, and Home Depots using MURS, and at least one MacDonalds. I have been scanning those freqs. for about a year. I think I even heard some crane crews that are building windmills in the midwest."

Jim KG4TRI

"Thanks, Jim, for the interesting info on your MURS monitoring. I'm glad to hear that MURS is being used. It's got a lot going for it. I hope that eventually more manufacturers will start making more versatile MURS HTs available."

Ken Reitz KS4ZR

EDITOR'S SOAPBOX: HAM RADIO IS NOT DYING!

By Larry Van Horn, N5FPW

I have been a licensed amateur radio operator now for 36 years. During this time I have experienced three solar cycles, seen major changes to the rules and regulations that govern the amateur radio service, and participated in a technological revolution that is still rewriting amateur radio history books. It has been fun to be a part of such a dynamic and cutting edge hobby.

One of the things that has remained a constant during my many years as a ham is the number of times I have heard or seen it written that "the ham radio service is dying." In fact, that statement always seems be spoken in the same breath with "the whole radio hobby is dying."

I have seen this written on the net, in various print publications and recently on a shortwave radio station broadcast. For instance, in researching this soapbox article I ran across this headline on the internet, "Top 25 things vanishing from America: #16 – Ham radio."

In that article was this little gem: "As cell phones and the Internet siphon off much of what once attracted people to amateur radio, the nation's ham radio population is graying rapidly. Given the cash value of the radio bands allocated to amateur radio, there will be relentless pressure on the government to take back those bands so they can be sold. All these elements speak to a long, slow diminishment of a pastime that began with Marconi."

So, maybe it is time to sprinkle some sunspot dust on the radio community, and use actual facts and figures to get to the truth. I recently did a search using my favorite search engine Google™ and uncovered an online article on the ARRL website titled, "2009 Sees Surge of New Amateur Radio Licensees."

According to the ARRL, in 2009, the FCC issued more than 30,144 new amateur radio licenses.

"This past year was a banner year for new amateur radio licensees," according to ARRL VEC Manager Maria Somma, AB1FM.

According to the ARRL piece, the number of new licenses issued in 2009 was an increase of almost 7.5 percent from 2008. In 2005, 16,368 new hams joined amateur radio's ranks; just five years later, that number had increased by almost 14,000 – a whopping 84 percent increase in growth between 2005 and 2009!

"When looking at the statistics over the last 10 years, these are some the highest numbers we've seen," Somma explained. "Additionally, our total number of licensees across all three classes has grown each year."

Currently, there are 682,500 licensed amateur radio operators in the U.S. In 2008, there were 663,500 licensed amateurs; there were 655,800 in 2007. Broken down by license class, at the end of 2009 there were 17,084 Novices, 334,245 Technicians, 150,970 Generals, 60,795 Advanced and 119,403 Amateur Extra licensees.

Not a bad number for a radio service that is supposed to be dying. If you aren't currently licensed, now is a good time to jump on the amateur radio band wagon. Licensing requirements have never been easier.

So, I'm glad to report that 2009 was a very good year for amateur radio, and I am excited by the promise of 2010 for a service that is clearly "not dying."

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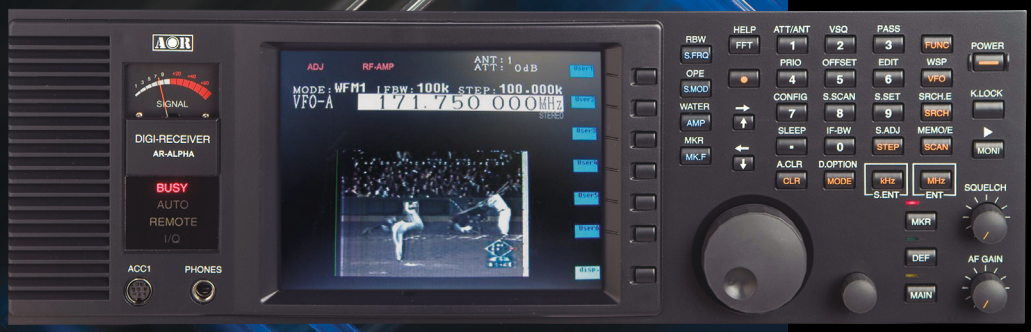

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Columnist Blogs and Web Sites

These blogs and web pages were created by some of our columnists to better serve their readers. While we highly recommend these resources, they are not official instruments of Monitoring Times.

AMERICAN BANDSCAN
http://americanbandscan.blogspot.com/ - by Doug Smith

FED FILES
http://mt-fedfiles.blogspot.com/ - by Chris Parris

MILCOM
http://mt-milcom.blogspot.com/ - by Larry Van Horn

LARRY'S MONITORING POST
http://monitor-post.blogspot.com/ - by Larry Van Horn

SCANNING REPORT
http://www.signalharbor.com/ - by Dan Veeneman

SHORTWAVE
http://mt-shortwave.blogspot.com/- by Gayle Van Horn

UTILITY WORLD
http://mt-utility.blogspot.com/- by Hugh Stegman
www.ominous-valve.com/uteworld.html

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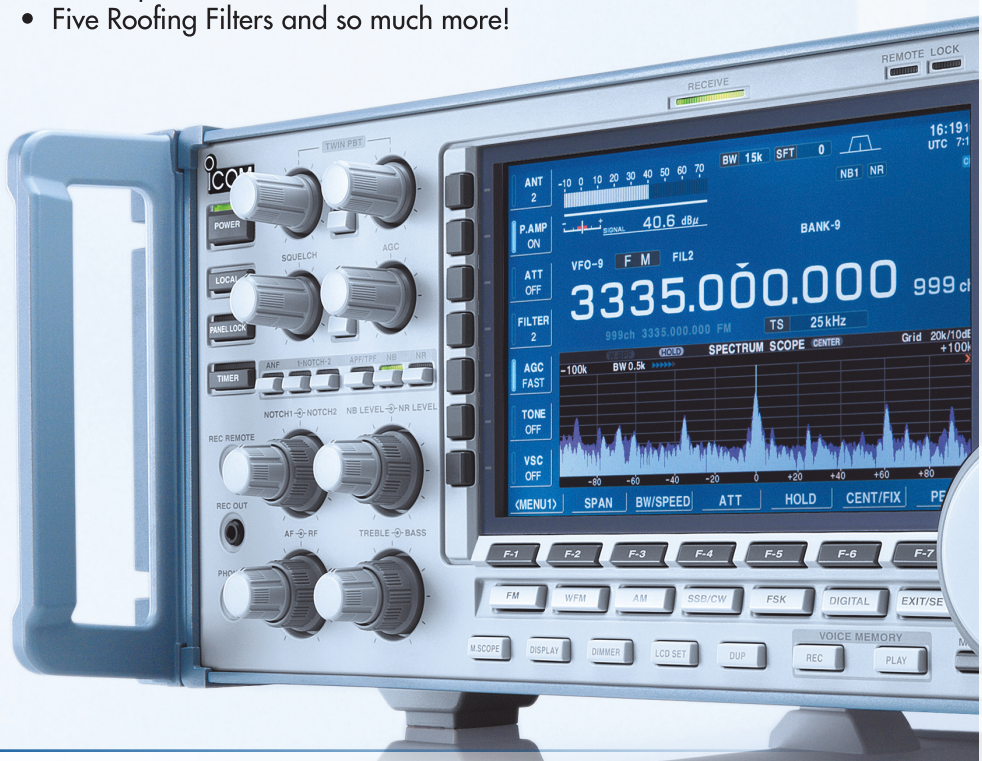

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