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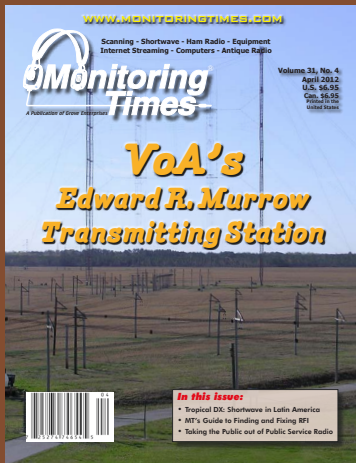- Tropical DX: Shortwave in Latin America
- MT's Guide to Finding and Fixing RFI
- Taking the Public out of Public Service Radio

VoA's Edward R. Murrow Transmitting Station
By Thomas Witherspoon K4SWL

As a lifelong shortwave listener, Thomas Witherspoon K4SWL had listened to the Voice of America and often wondered what the transmitting facilities looked like. This past winter he got his chance to see firsthand when he was invited on a private tour of the VoA's Edward R. Murrow Transmitting Station in Greenville, North Carolina. In this month's cover story, Thomas shares his trip with us.

The first thing he saw, as he drove the one mile long driveway that took him deep into a 2,700 acre sprawling antenna farm, were the 20 rhombic and 19 curtain antennas on 300 foot towers. Thomas tells us, "These structures are so incomprehensively immense that even the photos we took fail to convey the enormity."

It's an amazing radio engineering fantasyland and Thomas explains just what it takes to feed 500 kW into these antennas and what it takes to keep the massive transmitters going.

On Our Cover

One of 19 curtain antennas on the antenna farm at the VoA's Edward R. Murrow Transmitting Station. This one is 300 feet high. Telephone poles, seen at the bottom of the photo, carry feed lines to various antennas. (Cover photo courtesy: Voice of America)

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Tropical DX: Shortwave Still Thriving in Latin America
By Eric Bryan

Decades ago many hundreds of shortwave transmitters were in use across Central and South America providing one of the few ways news and entertainment could penetrate the vast jungles, deserts and enormous mountain ranges of the region. Today more than 150 shortwave stations remain and make excellent listening targets for listeners. This month Eric Bryan takes *MT* readers on a trip down south, really south, and details which stations are where and how you can tune in.

MT's Guide to Finding and Fixing RFI
By Kirk A. Kleinschmidt, NT0Z

It's an electrically noisy world and each year it seems to get a little worse. Now almost everything in our home, from dimmer switches to digital TV sets and all manner of electronic gadgets, is a potential source of interference to our radio hobby. In this timely article Kirk Kleinschmidt tracks down the culprits and offers remedies. You may not have to sell your house and move after all!

Scanner Squeeze: Taking the Public out of Public Radio
By Ken Reitz KS4ZR

Americans have enjoyed listening to police, fire and other public service radio transmissions for nearly 80 years. To do so dozens of manufacturers have sold tens of millions of radios capable of doing just that. Yet now, with the advent of smartphone apps that can stream such transmissions, police and legislatures are panicking. While attempting to squeeze out honest listeners, these agencies have embraced flawed and expensive radio systems that aren't as secure as they imagine.

REVIEWS

By Bob Grove W8JHD

Multi-band hand-held transceivers have a lot going for them. But, they also bring with them a few drawbacks: minimal antenna, miniscule displays and tiny buttons. How does the Alinco DJV57 stack up? Find out why Bob says the low price, wide frequency range, and multiple functions, "make this a bargain radio, both for the beginner who needs easy operation, and the experienced ham who is looking for advanced functions."

GROVE

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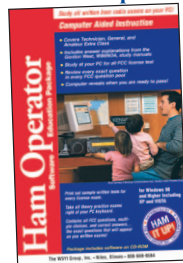
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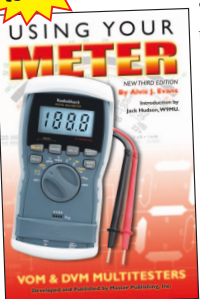
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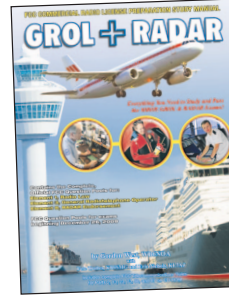
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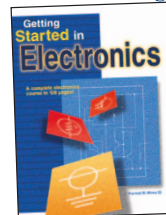
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COMMUNICATIONS

by Ken Reitz

AMATEUR RADIO/SHORTWAVE

FCC-2, K1MAN-1 in Confused Case

Off and on since the late 1980s Glen Baxter K1MAN has been a fixture on the 20 meter band with extended daily broadcasts to hams under various organizational banners including the International Amateur Radio Network (IARN) and the American Amateur Radio Association (AARA). These activities long attracted the ire of hams who complained to the FCC about what appeared to be violations of FCC amateur rules.

In October, 2010, following months of monitoring, the FCC concluded that Baxter had violated five rules and fined him $21,000. Baxter countersued the FCC for $50 million, a suit that was dismissed by the courts. The FCC settled on three charges: Failure to respond to an FCC inquiry, willful or malicious interference with other radio transmissions, and engaging in communications in which he had a pecuniary interest. The Commission reduced the original fine to $14,000.

This past January a Federal District Court in Maine, seat of Baxter's home address, issued a summary judgment for the U.S. on the first two charges but not on the third. Throughout the legal proceedings Baxter represented himself which led to a certain amount of confusion. The court, in the Order on Motion for Summary Judgment, noted at one point that, "Here, the Court's job is even more difficult because Mr. Baxter is clearly bristling with irritation with the Government."

The document goes on to relate a few of Baxter's jabs at the FCC in general and former FCC Special Counsel Riley Hollingsworth in particular. The Order also points out procedural missteps by the FCC in presenting its case including inconclusive or contradictory transcripts of tape recordings of K1MAN made by FCC field agents.

Regarding the issue of pecuniary interest the Order points out that, "There is no screenshot of the website, no printout of its contents, no affidavit from someone with knowledge of its contents, no statement by a member of either the IARN or the AARA that he or she was led to the website and made a purchase. In the absence of such evidence, there remains a genuine issue of material fact as to whether Mr. Baxter had a pecuniary interest in transmitting communications that directed listeners to **www.K1MAN.com**. Therefore, the Court denies the Government's motion for summary judgment as to Count III." The Order imposed a fine of $3,000 for failure to respond and $7,000 for willful or malicious interference."

Since the Order was released Baxter announced on his web site that K1MAN has gone back to 24/7 on-air operations on 14.275 USB.

BPL Withers on the Vine

Broadband over Power Line (BPL) provider IBEC, which serviced customers on several rural electric cooperatives in Pennsylvania, Virginia and Indiana, has thrown in the towel. In a message to customers, the service closed its customer service office January 16. The company claimed that tornado damages to its facilities in Alabama last spring, and subsequent lack of compensation by its insurance company, forced it to shut down. With too much capital outlay chasing too few willing customers, there remain very few BPL systems operating in the U.S.

David Sumner, ARRL CEO, which fought running battles with the FCC regarding BPL issues, noted in a statement that, "in the long run, rural areas that IBEC was trying to serve will be better served by broadband technologies that are superior to BPL and do not pollute the radio spectrum."

PUBLIC SERVICE

DOJ Report: $350 million Flop

Many news outlets reported late January about the Justice Department Inspector General's 75 page audit revealing that some $350 million in taxpayer funds, spent developing a wireless network over the last ten years, has "yet to achieve the results intended." Among the complaints: Justice Department gear is not yet synced with that used by the Department of Homeland Security; some departments within the DoJ are using obsolete gear, and use of outdated equipment means encrypted channels can't be used. The report quoted a DoJ Assistant Attorney General as blaming "changing circumstances," that "significantly changed the scope and deployment approaches for the IWN (Integrated Wireless Network) program."

But, that's not all. According to the report (a redacted copy of which may be read here: **www.justice.gov/oig/reports/2012/a1210.pdf**), "We also found that the Department is still not fully compliant with the NTIA's narrowband mandate." And, "the planned suspension of the IWN program due to FY 2012 funding cuts further jeopardizes the planned upgrades to the Department's aging LMR systems and the nationwide implementation of the IWN project."

The audit concludes that, "It remains critically important that the Department's law enforcement officers and agents have a reliable, safe, secure, and efficient way to communicate. Yet, the Department has not achieved communication interoperability with other federal, state, and local law enforcement agencies even though the IWN program has been underway for over 10 years. Joint development of IWN with the Treasury and DHS has not been successful and there is no longer a pursuit of an 'Integrated Wireless Network' outside the Department. Although the agencies did develop a new agreement in 2008 to resolve the issues we identified in our prior report, we found that the 2008 agreement has not accomplished the intended goal of an integrated system. As a result, the Department and DHS are pursuing their own solutions to their wireless communication needs."

There is no telling how much that new effort will cost.

SATELLITE

SBCA Fights Philly Dish Ban

Last fall, as reported in this column, the city council of Philadelphia enacted a bill to regulate the placement of satellite TV dishes on city buildings. But, there's a problem. FCC rules regarding over-the-air-devices, known as OTARD to the FCC, preempt such local laws. Now, as reported in the *Philadelphia Daily News*, the industry trade group Satellite Broadcasting and Communications Association (SBCA) has challenged the legality of the local ordinance with a petition before the FCC. According to the article, Philadelphia has more than 100,000 satellite subscribers between DirecTV and DISH Network.

Web Hackers Want Their Own Satellite

The *BBC*, among many other media outlets, reported in early January that Internet hackers, miffed at the "Stop Online Piracy Act" (SOPA), planned to launch their own Internet satellite. Dubbed Hackerspace Global Grid (HGG), the plan is to "design and build a modular terrestrial base-station for satellite communication based on open-source hard- and software as well as open standards," according to their web site.

Well, everybody needs a hobby. A profit-

able course for HGG would be to study the past 50 years of amateur radio satellite builders and operators. After millions of dollars in fund-raising and countless hours of volunteer labor, they are happy to have a handful of Low Earth Orbit satellites (launched with the blessings of the U.S. Air Force among other non-hacker organizations) capable of relaying FM voice, CW, PSK31 and Slow Scan TV even if only for ten minutes at a time. Still, you have to give the group credit for PR initiative: It got more than 33 media outlets to report its plan. Make that 34.

Survey: HD-Who?

A research report from *Mark Kassof & Company* shows the extent to which Ibiquity's HD-Radio brand has and has not penetrated American minds. The research, released January 20 notes, "Comparing our most recent Listener/Think HD study with our last one (September '08), we find no progress." The report said that awareness of HD-Radio has, in fact, declined. In 2008 65 percent or respondents had at least heard of HD-Radio. That number is now 54 percent. The report said that, "Only 8 percent understand that it delivers more channels and choices."

HD-Radio spokesman Steve Baldacci told *MT* in an email that, at press time the HD-Radio Alliance hadn't fully examined the survey. He noted that, "There are several studies – some with efficacy, some more anecdotal – that contradict the Kassof study, and a number that support the findings. We are reviewing everything." Baldacci noted too that the Kassof study contained valuable information for them, which is why they are examining it so closely. He added, "There may indeed be a silver lining" in the study.

First White-Fi Goes Live

An article in *TV Technology* notes that the first commercial "White-Fi" network was launched in Wilmington, North Carolina in late January. Using equipment manufactured by KTS Wireless, the service is the nation's first broadband service utilizing frequencies once occupied by Over-the-Air TV stations, now known as "White Spaces." Operated by Spectrum Bridge, a company based in Lake Mary, Florida, the new service is part of the FCC's Rural Broadband Initiative. FCC Chairman Julius Genachowski called it, "a new wave of wireless innovation." He added, "Unleashing white spaces spectrum has the potential to exceed even the many billions of dollars in economic benefit from Wi-Fi, the last significant release of unlicensed spectrum, and drive private investment and job creation."

White-Fi is another of the reasons that BPL is no longer a competitive rural broadband option.

KTS Wireless Agility White Space Radio and Agility Telemetry Radio uses former TV channels for rural broadband. (Courtesy: KTS Wireless)

Hospital Security gets it Wrong

FCC field agents found that the security department of a hospital in Pennsylvania, which holds two Private Land Mobile licenses, was not only operating out of its licensed band but using a repeater it had no license for.

Lounge Jamming Keyless Locks

People in the vicinity of a lounge in Farmington, Michigan noticed that their keyless lock systems weren't working properly. FCC field agents traced the jamming to a wireless transmitting device, operating on 314.93 MHz, associated with a lighting controller located inside a lounge. The device was also not FCC approved. Turning off the device caused the jamming to cease.

FCC Sweeps FL Swamp

FCC field agents were busy as usual in south Florida in the latest Enforcement Bureau reporting period. Two of their latest catches were very well organized and right out in the open. One station, calling itself Vision FM 927 had incorporated and bought an Internet domain name, the site for which had been taken down by the time the $10,000 Notice of Apparent Liability for Forfeiture (NAL) was issued.

And, there's the woman in Miami who, according to FCC documents, was renting a locked room in her residence to a guy known as "Oneway" who had installed an FM radio station complete with RDS transmission capability (which read, "98.7 FM Energy" on the field agents radio). It didn't take long to match the phone numbers, web address, Facebook page, corporate name and vanity license plate to Mr. Oneway. Willful and malicious: $10,000.

Then there was the guy in Palm Beach, Florida who set up on 107.3 MHz FM and was blasting away. Unfortunately for him, his signal was putting a spurious emission on 119.1 MHz right on top of the Palm Beach International Airport's control tower. The normal $10,000 fine was bumped to $20,000.

But, the Commission threw the book at a repeat offender who had been previously fined $10,000 and then had the fine reduced to $500 when he showed he lacked the funds to pay the fine. He paid the $500 fine. Then suddenly he's back on the air. Here come the agents with the direction finding gear. Sure enough; willful and malicious.

What was he thinking?! Probably that a $500 fine was way cheaper than getting a license. The Commission was disinclined to that view. For the second offense: $10,000 plus an upward revision by $15,000 for a grand total of $25,000. If will be interesting to see if he rates another fine discount.

VoA's Edward R. Murrow Transmitting Station

By Thomas Witherspoon, K4SWL
(All photos courtesy of the author)

During the final years of the Cold War, when I was a kid first tuning in to foreign broadcasters on my vintage Zenith Transoceanic, my imagination formed impressions of the voices I heard and the facilities required to send their messages. I saw Radio France International, for example, broadcasting from an Eiffel Tower-shaped structure just outside Paris, where glib, stylish reporters perched in front of their microphones. I envisioned Radio Moscow in black and white; likely because of what I'd only heard of life behind the Iron Curtain, my young mind defaulted to a nostalgic WWII like scene, with 1940s-era equipment, massive fields of antennas, desks heaped with papers awaiting translation, overly-full ash trays, and near-empty bottles of vodka.

Voice of America, meanwhile, I imagined as a gleaming NASA-like facility with immaculate offices inhabited by reporters and engineers in horn-rimmed glasses, all engaged in a hum of activity at microphones and brightly-lit control panels. VOA, in my patriotic young mind, must be the most advanced facility of all: I could only imagine my own country's contri-

bution to the soup of international broadcasting as the best and freshest.

So, some thirty years hence, presented with an opportunity to take a private tour of the VOA transmission site in Greenville, North Carolina, with a few friends from the NCDXCC (North Carolina DX and Contest Club), my local ham radio club – Phil Florrig W9IXX, Dave Anderson K4SV, and Phillip Jenkins N4HF – I naturally jumped at the opportunity.

As we drove out to the site, I could see why many of Greenville's locals seem unaware of its existence, despite the facility's vast size: it's truly remote. On the mile-long driveway, we stopped the car, awed by the 2,715 acre expanse of open land, populated only by monolithic shortwave broadcast antennas. These structures are so incomprehensibly immense that even the photos we took fail to convey their enormity; there are no trees, no buildings, no vehicles: indeed, the only thing I could find for scale were deer, herds of them, running and leaping beneath. Clearly, these massive antennas mean business, and the ham radio operator in each of us stood at attention, in silent admiration.

Finally resuming our drive, we arrived at the security gate, where I picked up a phone to request permission to enter. Placing the phone to my ear, I heard music, Radio Martí, I noted. However, as the front desk answered the call, I noticed that the music didn't stop: not music-on-hold at all, it was simply the telephone absorbing the extraordinary impact of 500 kW International Broadcasting Bureau transmitters engaged in their usual business.

As we entered the lobby of the gleaming 1960s-era government building with its prominent portrait of Edward R. Murrow, we were warmly greeted by Macon Dail, Chief Engineer; Rick Williford, Program Support Specialist; and Walt Patterson, Station Manager.

Williford provided an overview of the site's history: the Edward R. Murrow Transmitting Station, as it is now known, has always been a transmission site, delivering broadcasts through the Cold War, the fall of the Berlin Wall, and the 9/11 terror attacks. Under threat of closure in 2010, it found last-minute political support which has kept it in service. This was particularly fortunate in the aftermath of the Haiti earthquake, as it was this site that broadcast additional VOA Creole services to the stricken country, programming that proved vital to the survival of many.

Indeed, that political support galvanized in December of 2011, when Victor Ashe, a member of the Broadcasting Board of Governors, issued a call to keep open this broadcasting facility, as it is the only one on U.S. territory capable of transmitting shortwave radio programs to China – or to any country we please, for that matter. He noted that other facilities under the Broadcasting Board of Governors throughout the world operate in cooperation with other governments, many of which can limit broadcast targets. Thus, support for the facility's continuation continues to grow.

Following this insightful introduction, Williford and Dail led us upstairs to a tower on top of their building which offers a bird's-eye, 360-degree view of the vast campus, a prime vantage point, and the start of a fascinating tour.

First QSL

Macon Dail WB4PMQ, we were soon to realize, is key to the lasting health of the Edward R. Murrow Transmitting Station. Dail has been working for VOA (or what is now the International Broadcasting Bureau) since 1984, and even looks the part, down to the collection of pens and tools in his shirt pocket.

Dail led us to his office, where he proudly showed us one of the site's recent direct QSL reports, from a Japanese shortwave listener who had identified a Radio Martí transmission intended for Cuba. At the time, IBB had only begun the process of receiving QSLs directly, thus were encouraged by the prompt response, and from an area that was not technically within

Technician presetting the tuning controls of a GE 250 kW transmitter for the next operating frequency

the footprint of their broadcast (a fact representative of the magic of shortwave radio).

Control Room

Down the hallway from Dail's office lies the heart of the transmission site, the control room where our tour officially began. The control room is exceptionally large, with two-story ceilings and a raised platform in the center. It's from this raised platform that Dail showed us how content sources are controlled that originate from the IBB headquarters in Washington, D.C. Content is sent to one of nine transmitters, and antennas selected based on the target footprint of the broadcast.

The platform contains seating positions for several people; the mixture of 1960s technologies with current computer technology appears harmonious. On almost every control surface is taped a printed block chart transmission schedule for the broadcast season, with each space filled: obviously, knowing which program broadcasts, and when, is top priority here.

The control room contains the audio switching computer terminal, remote antenna switching computer terminal, and frequency synthesizers; it's also where incoming and outgoing modulation levels are monitored. Moreover, this area is where transmitter audio processing equipment is housed. An office for the shift supervisor is centered at the far end of the room.

From almost every point within the control room, technicians can view a large digital clock with UTC time synced to a GPS-based time standard. Along the outer perimeter of the control room are the actual transmitters and their various controls, while a glass wall stands between the control room and each transmitter section.

Broadcast operations are monitored by a computer system which provides a voice prompt; this prompt alerts staff of problems or upcoming events, freeing them to perform other duties such as equipment maintenance. The idea for the computer monitoring system is derived from the classic TV series, "Star Trek," which features a computer monitoring system on the flight deck of its Starship *Enterprise*. Dail sampled sounds from the show, thus adding a sci-fi note to their own monitoring system.

Transmitters

Dail then took us into the hallways on the perimeter of the control room where the transmitters are located. A quick walk through these halls and one quickly recognizes that to work at this site you need to be familiar with the characteristics of transmitters from not just one or two manufacturers, but from at least four: Continental, GE, ABB, and Telefunken were all represented. Dail explained that this transmission site initially received some transmitters that had been intended for another facility that was never built.

Dail then took us "behind the scenes" of a General Electric transmitter, quickly and expertly pulling panels off of protected portions of the mammoth transmitter, exposing the huge PA tuning coil, gears, and power distribution equipment. It became obvious that Dail knows this equipment as well as if it were in his home.

The site's transmitters varied from the classic 1950s Continental to the ABB with fiber-optic controls, installed in the 1980s. The ABB transmitter, unlike the others at the site, incorporates a 100% solid state, step modulator – no vacuum tubes – and by using a step modulator, broadcasts more efficiently than its predecessors.

Power Supply

As the reader might imagine, it takes vast

Feed line manifold feeding the dipole elements of a curtain antenna

amounts of power to run transmitters capable of emitting up to 500 kilowatts of electromagnetic radiation. Because of the extraordinary power consumption of the equipment, the IBB crew is ever-aware of their electronics engineering safety rules. Throughout the facility, one sees postings on the order of "Remember the Two Man Rule and use your ground sticks," "Stay alive: use a ground stick," and "Caution: 4160 Volts exposed through the top of this cubical, this transformer is live at all times."

Obviously, this was no playground, and we were careful walking amongst the humming transformers and high voltage equipment. But for the techs, the safety routine is a familiar friend as they grab ground sticks to insure no residual voltage is left in "powered-down" equipment and take buddies along to double-check safety precautions when working in high-voltage areas.

Dail says that the facility's power bills now run about $700,000 annually, and this is an improvement over the $2,000,000 spent previously. He then explained that he and his coworkers had "home-brewed" monitoring solutions that could better manage the distribution of power loads when parallel generator operation is required. By working with incremental power days, their 1.8 megawatt on-site generator kicks in, parallel with the power company's supply, to shift the heavy load when their overall grid demand is at its highest.

Indeed, creative adaptation is an oft-repeated refrain at the station. Throughout the facility one notices ingenious solutions that help the facility's crew manage an array of decades-old technologies in an efficient and current manner. Dail implemented several of these himself and adds that this is his favorite part of the job.

What, exactly, makes this work interesting? "Having to fix a problem, in a creative way, and in the process increasing overall efficiency," Dail reveals. Much of his handiwork has been inspired by the ham radio world, as first and foremost Dail, an electrical engineer, is also ham radio operator, and has been one since his teens.

Spare Parts

On the way out of the building, Dail guided us through a testing area, where members of the technical staff build, modify, and test various components. He also took us through their inventory warehouse. In this environ, where it's necessary to actively operate equipment which

Tuning controls of a Continental Electronics 500 kW transmitter

may have originated from manufacturers many years out of business, an ample stock of replacement parts is an absolute must. Dail and his crew meticulously maintain and catalogue thousands upon thousands of spare parts, many of which may be the only ones left on this planet.

The array of tubes and valves alone is staggering. Many take shapes I had never seen before, and others are so large as to require a special portable crane to lift them. At the Edward R. Murrow Transmitting Station, employees do not simply discard damaged parts; they try to repair or salvage them whenever possible.

Antenna Switching

Perhaps the most surprising facility on the site is the "switch bay," in essence, their antenna switch. While my antenna switch in my shack at home is the size of a thick paperback book, the station's antenna switch bay is a 55 x 185 foot building. It's massive, and probably can be seen from space (Google Earth certainly gives you a good look at it). All of the transmission lines are overhead in this massive corrugated building with a dirt floor. Dail had one of the guys in the control room switch an antenna. The pneumatically-controlled system snapped into place, the sound suggesting steam train classic films, in which you can hear the points switching on the tracks.

On the exterior of the switch bay, parallel feed lines run in radial directions to the IBB's antenna farm. These lines are all exceptionally large versions of the ladder line many hams use in our shacks. Instead of 16 or 18 AWG solid copper conductors, theirs are 5/8" outer diameter copper tubes, 300 ohm line, made to withstand more than 500 kW. Many of these lines are up to a mile long, but only suffer a 1 dB attenuation loss with this type of arrangement.

The Antenna Farm

The station's antenna farm consists of 20 rhombic, 19 curtain, 2 log periodics and 2 dipoles. Of the 43 original antennas, approximately 40% are still in active use.

Dail drove us around the vast antenna farm, and we stopped to learn about each type of antenna. Of course, any time we alighted from the truck, we were looking at antennas that were inactive. When dealing with output levels as high as these, there would be serious danger

One of 19 curtain antennas roughly 300 feet high

in walking around an active high-gain antenna; the numerous warning signs were a constant reminder of this sobering fact.

Each of the antennas is a fascinating work of engineering, but the curtains are especially intricate. The sheer amount of stand-offs, insulators, and the parallel arrangement of elements were something to behold. The average curtain antenna is about 300 feet in height, 240 feet wide and has a typical forward gain of 18 dB or more.

Perhaps the most fascinating antenna the site features, however, is near their campus entrance. It's a 160 degree bore sight, slewable curtain antenna that can literally adjust its angle to target any portion of Latin America, South America and Cuba. The slewable antenna has no moving parts other than the slew switches; rather, it uses phase-shifting to steer the beam.

I asked about lightning protection. Lightning? As far as Dail knows, the site has never experienced any major damage due to lightning. Literally everything is grounded. While back home, I live in fear of lightning harming my shack, it occurred to me that here, perhaps the lightning is afraid of the antennas.

Wrapping up Our Tour

As we moved back into the main building, and our remarkable five-and-a-half hour tour drew to a close, I still had not had enough time to take it all in. To add to my incredulity, Dail mentioned that, now decommissioned, IBB Site A is practically an identical twin of the Murrow site, once simply known as "VOA Site B." I thought he must be speaking figuratively.

"Really?" I asked, It's identical in size, in transmitter and antenna inventory...? No way." Although acknowledging some "small differences in transmitter types and antennas," regarding the physical plant, Dail calmly responded, "It's

Macon Dail (left) (WB4PMQ), Chief Engineer of the Edward R. Murrow Transmitting Station

identical, down to where the water fountains are placed in the main building."

And, as if that weren't enough, there was a Site C as well, a receiver and administrative site only, at about the same distance, which was decommissioned in 1999 and granted to East Carolina University.

The Largest Thing

So, how does the reality of the Edward R. Murrow Transmitting Station compare with my childhood imaginings? While it's not NASA, it is much more ... human. This, despite the fact that human becomes Lilliputian within the vast workings of the site. Touring this site was like touring the inside of a ham radio transceiver, one built on an absolutely astronomic scale.

Indeed, everything at the station is overwhelmingly colossal; the transmitters, power supplies, the antennas. On our fantastic voyage among the gargantuan curtain and rhombic antennas surrounding the building, I could readily visualize the listeners' side of the equation: remote corners of Africa and Latin America where it is a cinch to catch IBB's broad signal with a simple, hand-held shortwave radio.

I found myself suddenly reawakened to the brilliance of shortwave radio: unlike the Internet, which requires infrastructure on each side, all the technology and brutal power of the shortwave radio medium is provided almost entirely by the broadcaster, thus listening requires very little. The messages conveyed by these powerful antennas travel every day, every hour, across closed borders with no regard for those in power, into remote areas with no electricity or basic services, inviting those with radios to simply listen. Radio, I reflected, is free speech in its most available, equitable form.

This is precisely the motivation behind the gentlemen of the station. Throughout the facility, I could see the handiwork and ingenuity of Dail and his co-workers; additions, modifications, notices, even wear on their oldest transmitters tell their ongoing story. The spirit of ingenuity and cause are in the hands and eyes of those we met that day; a sense of power and precision in the equipment.

We left feeling that we had discovered *deus ex machina*, and come face-to-face with Oz. Because, at the heart of it all, dedicated engineers are devoted to something largest of all: a humanitarian cause, which is to say, sending Voice of America and its award-winning news, documentaries, music, and Special English broadcasts to those with no more than a shortwave transistor radio, and the willingness to listen.

Send your VOA QSL Reports to:

International Broadcasting Bureau
3919 VOA Site B Road
Grimesland, NC 27837
USA

Thomas Witherspoon (K4SWL) is founder/director of Ears To Our World (http://etow.org), a charity which donates self-powered shortwave radios to schools and communities in third world countries. Thomas is also an avid shortwave listener and blogger at the SWLing Post (http://SWLing.com/blog).

Tropical DX:
Shortwave Still Thriving In Latin America

By Eric Bryan

When living in the countryside, I built two longwire antennas and attached them to my DX-160 and an assortment of world band radios. These ranged from a Heathkit GR-81 and an early wooden JVC portable to an Astonaut-5. I trawled the tropical bands at local sunset. "Tropical bands" painted pictures in my mind of crystal beaches dotted with coco palms, tribal or island music, and obscure stations off the beaten path.

I remember such regulars as Radio Reloj, with its ticking clock; the lively Ecos del Torbes and Radio Rumbos; the peaceful Radio SRS, and Radio Clarín. There were others from Venezuela and Colombia, and internationals in Ecuador, Argentina, and Chile.

Though I never received the low-powered Peruvians, I enjoyed the atmospheres expressed by those stations I heard. I had a foam-backed world map on the wall and stuck pins into the broadcast sites.

History

Shortwave broadcasting in Argentina began in the 1920s, evolving into 11 transmitters. The government-run station was founded in 1949, utilizing two 50 kW transmitters. In 1958, this became Radiodifusión Argentina al Exterior (RAE). Though RAE has two 50 kW and one 100 kW transmitter, there are rumblings of upgrades.

A former Central American was Radio One Belize, born out of the British Honduras Broadcasting Company. Influenced in structure by the BBC, they were heard regularly in North America. I had a Radio One Belize station sticker, with a charming, homemade appearance.

Brazil is known as one of the countries with the most shortwave stations and the listings below confirm this. It is understandable when you consider Brazil is the world's fifth-largest country. Shortwave covered the square mileage so broadcasts could reach outlying regions. Rádio Nacional is still the most reliable signal in the 25 meter band in the local daytime in the Northwest USA.

Before the military coup in 1973, Chilean shortwave stations ranged from socialist to Christian-Democrat to private. After the coup La Voz de Chile went on-air via 100 kW Russian-made transmitters. With the economic collapse in 1980, the external service was cancelled. Now La Voz is heard regularly.

Colombian stations were among the easiest Latins to log in North America. Not only was this due to Colombia's proximity, but because some of the stations were higher-powered (25 or 50 kW) than average.

It was fun to hear Radio Reloj. Even though it was one of the regular loggings, I was happy to receive a low-wattage signal well. Other past stations from Costa Rica include RFPI (Radio for Peace International), Radio Casino, and Radio Impacto.

It seemed incongruous that Ecuador had one of the major international players, HCJB. They featured English programming, including the *DX Party Line*. Their schedule was printed on orange paper which unfolded like a map.

The most reported station from Guatemala was Radio Cultural. Shortwave broadcasting in Guatemala was restricted to religious programming, with stations run by Catholic, Seventh Day Adventist, or Evangelical groups.

Shortwave broadcasting began in Honduras in 1928 with La Voz del Trópico, the country's first radio station. During WWII, they increased power and carried BBC and NBC programming. Today the stations in Honduras carry religion programs.

Government-run shortwave stations started in Mexico in the 1930s. The main shortwave broadcaster in Mexico was XERMX. They began transmissions in 1969 over five frequencies, from 49 to 16 meters. Radio Educación started in 1924, and is known for its eclectic music programs.

Former shortwave broadcasters in Nicaragua include Radio Rica, Radio Nicaragua, and Radio Miskut.

Radio Nacional del Paraguay was established in the 1940s, eventually broadcasting with 35 kW. Radio Nacional moved its international service to Internet-only. Other former stations in Paraguay include Radio Encarnación, which streams its programming online now.

As with Brazil, Peru shortwave covers remote jungle regions. Shortwave became vital for personal communication and sending messages where telephone service didn't exist. There were perhaps as many as 100 simultaneously-active Peruvian stations.

A former Suriname voice was Radio SRS. They began test transmissions in 1963, going on-air in 1965. Radio SRS was on mediumwave and FM as well as shortwave. They now have four FM frequencies. Other stations from this country were Radio Suriname International and Radio Apintie. Radio Apintie started shortwave broadcasts in 1979 with a 50 watt transmitter. RSI boasted 250 kW. Though RSI is gone, Radio Apintie is on 24/7.

Mediumwave broadcasting began in Uruguay in 1924. Former shortwave voices were Radio El Espectador and Radio Libertad Sport, both operated by Radiodifusoras del Uruguay. There was government-run SODRE, Servicio Oficial De Radiodifusión Eléctrica (later, Radiotelvisión y Espectáculos), which had shortwave broadcasts.

Past shortwave broadcasters from Venezuela were Ecos del Torbes and Radio Rumbos, Radio Barquisimeto, Radio Tachira, Radio Valera, Radio Continental, and Radio Los Andes. There were also Radio Maracaibo, La Voz del Tigre, Radio Mara, and Radio Libertador. Programming from Radio Nacional de Venezuela was relayed by Radio Habana Cuba, with some English.

In this list, broadcasts are in Spanish (except for those of Brazilians which are in Portuguese), unless noted. Frequencies are in kilohertz, times in UTC. Please keep in mind the changeability of some Latin American stations, both in frequencies and broadcast times. Thanks to the invaluable resources of **www.eibispace.de/** and **www.mcdxt.it/LASWLOGS.html** which were so helpful during the construction of this list.

Argentina:

Argentina stretches over the southern half of South America, east of the Andes. Because of its north-south vastness, the country has subpolar to tropical climates. In the central portion are plains where most of Argentina's produce is grown. Agricultural export provides much of the country's wealth. Argentina has been developing its industries since the 1940s.

RAE, Radiodifusión Argentina al Exterior, 11710, English 0200-0300 Tues-Sat. 15345, English 1800-1900 Mon-Fri. Radio Nacional English page: www.radionacional.com.ar/english.html
Radio Nacional, 6060, 0000-0230 Sun, 0000-0300 Mon, 0300-1000.
Radio Rivadavia, various programs via feeders, 8098, 11133, 13363, 15820, 24 hours.

Bolivia:

Bolivia is landlocked in west-central South America. The west is amongst Andean mountains and barren plateaus two and a half miles above sea level. In the east are prairies which slope down to tropical rainforest. Most of the population is in the Andes.

Bolivia's elevations create a varying climate, with temperatures ranging from cool in the mountains to warm in the lowlands. Mining, gas, and agriculture form most of the industry. Exports are natural gas, sugar, precious metals, wood and soybeans.

Emisoras Pío XII, 5952, 0100-0235 Tues-Sat, 1000-1100, 1100-0100.
Radio Eco, 4410, 2200-0330.
Radio Emisoras Ballivián, 4788, 1120-0030.
Radio Emisoras Camargo, 3390, 2300-0300.
Radio Fides, 6155, 0930-0203. www.radiofides.com/
Radio Cultural Juan XXIII, 6055, 2100-0030.
Radio Kawsachun Coca, 6076, 0800-0230. http://radio-kawsachuncoca.blogspot.com/
Radio Lípez, 4796, 0830-0105.
Radio Logos, 4865, 2200-0200. 6165, 0900-1200, 2200-0200.
Radio Loyola, 5996, 0945-0040.
Radio Mosoj Chaski, 3310, 0830-1200, 2030-0210. Facebook page: www.facebook.com/pages/Radio-Mosoj-Chaski/204626520242?v=info
Radio Panamericana, 5970/6105, 1030-0400 Mon-Sat, 1030-2400 Sun. www.panamericana-bolivia.com/
Radio Patria Nueva/Radio Illimani, 6025, 0900-0407.
Radio Pío XII, 5952, 0100-0235 Tues-Sun, 1000-1100, 1100-0100. Webpage with some English: www.radiopio12.org/articulo.php?p=29&more=1&c=1
Radio San Gabriel, 6080, 0850-0130.
Radio San José, 5580, 1030-0200.
Radio San Miguel, 4700, 0900-1100 Mon-Sat, 1100-0350.
Radio Santa Ana, 4451, 1030-0100.
Radio Santa Cruz, 6135, 0900-1200 and 2100-0110. www.irfabolivia.org/
Radio Virgen de Remedios, 4111, 1000-0330.
Radio Yura, 4716, 1005-0210, Quechua.

Brazil:

Brazil makes up almost half of South America, occupying most of the east of the continent. The rainforests of the Amazon Basin are in the north, the Brazilian Highlands in the south. The climate is tropical, with higher elevations and areas further from the equator milder. There are sparse uplands, pinelands, savannah, and near-desert scrublands. Exports are timber, coffee, sugar, and minerals. Brazil is the most industrialized South American country, with the largest economy.

Difusora Pocos, 4945. Webpage with pictures of equipment: www.difusorapocos.com.br/radio_difusora_am_pocos_de_caldas/pages/transmissores_sw.html
Oldiesrádio Cidade, 7695, 0500-1100, 1800-2100.
Rádio 9 de Julho, 9820, 24 hours. www.radio9dejulho.com.br/
Rádio Alvorada, 4865.
Rádio Alvorada, Parintins, 4965, 0900-0200.
Rádio Anhanguera, 4905, 0900-0315.
Rádio Aparecida, 5035, 0800-0300. 6135,0800-0315. 9630, 0800-0320. 11855, 0800-0300. www.a12.com/radiooc/default.asp
Rádio Bandeirantes, 6090, 9645, 11925, 24 hours. www.bandeirantes.net/
Rádio Boa Vontade, 6160, 9550, 11895, 24 hours.
Rádio Brasil Central, 4985, 11815, 24 hours.
Rádio Cançao Nova, 4825, 6105, 9675, 24 hours.
Rádio Capital, 6070, 24 hours. www.radiocapitalrio.com.br/
Rádio Capixaba, 4935, 24 hours.
Rádio Clube do Pará, 4885, 24 hours. www.radioclubedopara.com.br/
Rádio Congonhas, 4775, 0830-2400.
Rádio Cultura O.T. 4845.
Rádio Cultura AM, Sao Paulo, 9580, 9585, 9590, 9615, 17815, 0800-0300.
Rádio Cultura, Araraquara, 3365, 2030-1115.
Rádio Cultura, Belém, 5045.
Rádio Cultura Ondas Tropicais, 4845, 1000-0300. 5045, 24 hours.
Rádio Daqui, 4915, 0900-0400, 6080, 0900-0400. 11830, 0900-2100.
Rádio Difusora, Londrina, 4815, 0800-0900 Sun, 0900-0300.
Rádio Difusora, Cáceres, 5055, 0830-0410.
Rádio Difusora 6 de Agosto, 3355.
Rádio Difusora do Amazonas, 4805, 0940-1300, 1500-1800, 2000-0300.
Rádio Difusora Roraima, 4877, 0405-0555 Sun, 0700-0800 Mon-Fri, 0800-0900 Mon-Sat, 0900-0405.
Rádio Educação Rural, Tefé, 4925, 1000-0300.
Rádio Educação Rural, Coari, 5035, 1000-0045.
Rádio Educadora, Acreana, 3355, 0930-0400.
Rádio Educadora, Braganca, 4825, 0830-0100.
Rádio Educadora de Limeira, 2380. www.educadoraam.com.br/site/
Rádio Filadelfia, 6105, 0930-0110.
Rádio Gaúcha, 6020, 1000-0400. 11915, 0800-0400.
Rádio Globo, 6120, 1000-2000.
Rádio Guaíba, 6000, 24 hours; 117585.
Rádio Guarujá, 5045.
Rádio Gazeta, 9685, 24 hours.
Rádio Ibitinga, 4845.
Rádio Imaculada Conceiçao, 4755, 24 hours.
Rádio Inconfidência, 6010, 15190, 24 hours. www.inconfidencia.com.br/
Rádio Itatiaia, 5970, 0900-0400. Webpage: www.itatiaia.com.br/site/institucional/radio_itatiaia/
Rádio Jornal A Crítica, 5055, 0000-2400.
www.apostolica.com.br/home/radio.asp?pagina=R%E1dio%20Online#
Rádio María, 4885, 0700-2400.
Rádio Marumby, 6080, 0800-0200; 9515, 0800-0200; 11725, 0800-2120.
Rádio Mundial, 3325, 4975, both 24 hours.
Rádio Mundial-Nossa Voz, 4975, 24 hours.
Rádio Municipal, 3375, 0900-1000 Mon-Sat, 1000-1300, 2100-0335.
Rádio Nacional da Amazônia. 6180, 24 hours alternate.11780, 0400-0750, Sundays; 0750-0400. Webpage with frequencies and streaming: www.ebc.com.br/canais-ebc/radios/radio-nacional-da-amaz%C3%B4nia-oc-11780-khz-e-6180khz
Rádio Novas de Paz, 6080, 9515, 11725.
Rádio Novo Tempo, 4895, 24 hours.
Rádio Pioneira, 5010/5015, 24 hours.
Rádio Record, 6150, 0800-0330. 9505, 0800-2350.
Rádio Rio Mar, 9696, 1100-2200. 29090.
Rádio Senado, 5990, 0855-2200.
Rádio Trans Mundial, 5965, 0800-0200. 9530, 0800-0200. 11735, 0800-2000.
Rádio Verdes Florestas, 4865, 0930-1000 Mon-Sat, 1000-1400, 2300-0050. www.diocesecruzeirodosul.org/index.php?s=radio-verdes-florestas
Rádio Voz Missionária, 5940, 9665, 11750, 24 hours.
Súper Rádio Deus é Amor, 6060, 6120, 9565, 11765, 11805, 24 hours. www.superradiodeuseamor.com.br/

Chile:

Averaging 110 miles in width, Chile is about 2650 miles long. Chilean archipelagos stretch along the southern coast to Cape Horn. The Andes cross the east from Tierra del Fuego to the Bolivian tablelands. Along the west are low coastal mountains. Between the ranges lies the Chilean Central Valley. Chile has three climatic regions: desert in the north, Mediterranean-like in the middle, and mild in the south. The Central Valley is the most populated area.

Chile is one of South America's leading industrial countries. Its exports are minerals, copper, fruit, vegetables, and wheat. The largest exporter of fruit in the southern hemisphere, it has a thriving wine industry.

CVC La Voz, 9635, 1100-1200, 1200-2200. 9780, 2200-0100. 11665, 2300-0100. 17680, 1100-1200, 1200-1300. CVC Digital, 17640, 1800-20000. www.cvclavoz.cl/
HCJB Global, 9835, 2300-2400, German and Portuguese. 11920, 2245-0045, mostly Portuguese.
Radio Esperanza, 6090, 24 hours.

Colombia:

Colombia occupies the northwest of South America. With Caribbean and Pacific coasts, it has tropical beaches, the Andes in the central and western regions, and plains and rainforests in the east. The mountains are interspersed with high tablelands and fruitful valleys. Most of Colombia's population resides in the valleys. Colombia's climate varies with elevation, from tropical to subtropical to temperate to cold.

Colombia exports minerals, coffee, and petroleum. They produce sugarcane, bananas, cotton, rice, tobacco, and potatoes. Colombia is the world's top resource for emeralds.

Alcaraván Radio, 5910, 2330-1200.
La Voz del Guaviare, 6035, 0930-0230.
La Voz de Tu Conciencia, 6010, 24 hours.
Radio Líder/Melodía, 6140, 24 hours. www.cadenamelodia.com/

Costa Rica:

Costa Rica has Caribbean and Pacific coasts. Cocos Island about 300 miles southeast is under Costa Rican control. Most of Costa Rica is craggy highlands and mountains. Tablelands between the mountain ranges are inhabited by most of the population. Coastal lowlands are on both sides. The climate is tropical on the coasts, mild in the uplands.

Industries are timber production, fishing, and mining. Exports include sugarcane, cacao, timber, pineapples, coffee, bananas, coffee and textiles.

Radio República, clandestine broadcasting to Cuba, 5955, 2100-1000.

Cuba:

Cuba is the biggest island of the West Indies. The territory includes smaller islands and archipelagos. Agriculturally fertile, they export tobacco, sugarcane, coffee and fruit. With stretches of lowlands, Cuba has mountain ranges in the west, east, and south central regions. Nickel and other minerals and metals are mined. They export shrimp, fish, and shellfish.

Radio Rebelde, 5025, 24 hours. English webpage: www.radiorebelde.cu/english/

Dominican Republic:

The Dominican Republic occupies the eastern part of Hispaniola. Most of the country is mountainous. Pico Duarte, 10,417 feet, is the highest point in the West Indies. Between the mountain ranges running from the southeast to the northwest lies the fertile Cibao Valley. The climate in the lowlands is subtropical, milder in the uplands. Exports are gold, silver, nickel, sugarcane, coffee, cocoa, and tobacco.

Radio Amanecer, 6025, 0330-0700, 1000-0330. www.ra.do/raudio.html

Ecuador:

Ecuador is on the west coast of South America. Territory includes the Galápagos Islands, about 600 miles west. Ecuador has a coastal plain, mountainous central highlands surrounding a tableland, and the eastern jungle. Ecuador's elevations have climates from tropical along the coast to milder in the highlands and hot and humid in the jungle.

Most of Ecuador's population lives in the highlands. They export balsa wood, petroleum, bananas, coffee, cocoa, and sugarcane. Salt, lead, zinc, silver and gold are mined.

Centro Radiofónica Imbabura, 3380, 2300-0110.
HCJB, 6050. Spanish and Quechua, occasional English.
La Voz del Napo/Radio María, 3280, 0940-1140 and 2200-0310.
Radio El Buen Pastor, 4815, 1000-1600, 2100-2300 in Quechua; 2300-0300 in Spanish. www.radiobp.com/
Radio Federación, 4960, 0900-0100.
Radio Oriental, 4781, 0800-2400.
Radio Quito, 4919, 2200-1300.
Radiodifusión Católica Cultural, 4870, 1045-0300.

Guatemala:

Guatemala has the highest population in Central America. Roughly 65% of the country is mountainous. Guatemala has western uplands, the Pacific coastal area south of the mountains, and the Petén territory north of the mountains. The landscape varies from the Sierra Madre range with a peak reaching almost 14,000 feet, to lush tropical lowlands, fertile valleys, and rainforest. Guatemala's climate ranges from hot coastal plains to cold mountain peaks.

Most of the population lives in the highlands, with about two million in Guatemala City. Half or more of the country's population is Maya, distinct from those with mixed Spanish and indigenous heritage. Guatemala exports bananas, coffee, sugar, cardamom, timber, and textiles.

Radio Verdad, 4055, English at 0300-0400 Mon, 0500-0610. Other hours in Spanish. www.radioverdad.org/

Guyana:

Guyana, between Venezuela and Suriname on the north coast of South America, was a Dutch colony and later part of the British Empire. It has cultural similarities to the islands of the West Indies which were not settled by the Portuguese or Spanish. The coastal region, most of it below sea level, is sheltered by dikes and dams. South of the coastal area, forest stretches into highlands peaking at 9,340 feet. Beyond the forests is savannah. Several rivers have some of the largest waterfalls in the world. The climate is tropical; the coastal area is milder.

Nearly 90% of Guyana's population lives in the coastal region. Over half the population is East Indian, with most of the rest of African descent. A small number of Chinese and Europeans reside there. Guyana exports rice, bauxite, coffee, rum, fruit, alumina, coconuts, sugar, cocoa, timber and corn.

Voice of Guyana, 3290, 0800-0400, English. www.voiceofguyana.com/

Honduras:

Dual-coast Honduras has mountains, valleys, plains, and extensive coastline. The western portion was at the southeastern edge of the Maya civilization. Honduras was part of New Spain. Roughly 90% of Honduras' population is of mixed Spanish and native ancestry. The rest are indigenous, and those of African and white European heritage. Most of the population is in the central and northern coastal zones. Honduras exports coffee, bananas, lead, timber, silver, shellfish, and zinc.

Radio Luz y Vida, 3250, 1000-2100 Mon-Sat, 2100-0400. Some English.
Radio Misiones Internacionales, 3340, 24 hours, some English. www.radiomi.com/

Mexico:

Mexico has tropical beaches, deserts, snow-topped mountains, high tablelands between the two Sierra Madre chains, and tropical rainforests. About a fifth of the country's population lives in Mexico City. Mexico's climate is semiarid, though the densely forested areas in the south are tropical.

Mexico exports silver, crude oil, sugar, coffee, tomatoes, cotton, and fruit. Mexico manufactures autos for multinational makers.
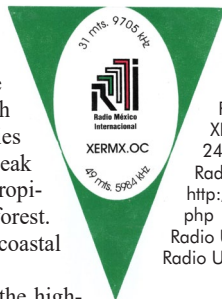
Radio Educación. 6185, 2200-1130, occasional English. English page: www.radioeducacion.edu.mx/about-radio-educacion/
Radio Insurgente, 6000, 2000-2100 Sat.
Radio Mil, 6010, 24 hours.
XEQM, 6105, 0000-1100 Spanish, and 1100-2400 Maya.
Radio Transcontinental, 4800, 2130-1600. http://radiomil.com.mx/v3/paginas/programacion.php
Radio UNAM, 9599, 24 hours.
Radio Universidad, 6045, 1200-0400.

Paraguay:

Paraguay is landlocked in south-central South America. Portions of the country are an alluvial plain which stretches into Brazil, Argentina, and Bolivia. The plain includes scrubby woodlands, swamplands and grasslands. In the east a plateau gives way to verdant foothills. Paraguay's climate is subtropical, it being hottest in the west and north.

Paraguay's population is mostly of mixed Spanish and indigenous races and lives primarily in the west. An agricultural country, Paraguay exports timber, cotton, oilseeds, sugarcane, corn, oranges, bananas, and soybeans.

Radiodifusión América, 7370. Info on frequencies: www.dxing.info/profiles/paraguay_america.dx

Peru:

Peru is on the west coast of central South America. Its coastal plain is part of the Atacama Desert. To the east are the Andes, with massive mountains, high tablelands, and deep valleys. In the northeast the forest slopes down to a tropical jungle reaching to Brazil. Peru's climate varies from tropical in the east to arctic in the mountains.

Nearly half of the country's population is native, some of Inca heritage. Most of the remainder is of mixed Spanish and native ancestry. There are some Africans, Chinese, and Japanese. Roughly half the population lives in the upland regions, with about 40% in the coastal territory. Many indigenous tribes live in the jungle.

Exports include fish meal, petroleum, coffee, silver, lead, sugar, iron ore and zinc.

La Voz de las Huarinjas, 5060, 1000-0205.
La Voz de la Selva, 4824, 0000-0400, 0930-2400.
Nueva Súper Sensación, 6536, 1200-0230.
Ondas del Huallaga, 3330, 0930-0400.
Ondas del Suroriente, 5120, 0955-0300.
Radio Altura, 5014, 0950-0340.
Radio Bethel, 5921, 24 hours.
Radio Cultural Amauta, 4955, 0930-0108.
Radio Cusco, 6192, 0800-1230, 2130-0200.
Radio Emisoras, Camargo, 3390, 2300-0300.
Radio Emisoras Bolívar, 5460, 1000-0310.
Radio Frecuencia Popular, 5486. 1000-0200.
Radio Génesis, 4850, 1000-1200, 2230-0130.
Radio Huanta 2000, 4747, 0955-0103.
Radio la Hora, 4957. 0950-0315, in Quechua.
Radio JPJ, 3360, 1000-0410. www.radiojpj.com/
Radio Libertad de Junín, 5040, 1000-0205. www.rlibertadjunin.com/
Radio Madre de Dios, 4950, 0900-0200.
Radio Manantial, 4986, 24 hours.
Radio Marañón, 4835, 0930-0200. www.radiomaranon.org.pe/
Radio Melodía, 5939, 0900-0500.
Radio Oriente, 6188, 0900-1200, 2230-0030.
Radio del Pacífico, 4975, 9675, 24 hours.
Radio Quillabamba, 5025, 0700-0300. http://quillabambanoticias.org/radioquillabamba/
Radio Reina de la Selva, 5485, 1000-0130. http://reinadelaselva.net/
Radio San Antonio, 4940, 1000-0200.
Radio Santa Rosa, 6047, 1800-1230.
Radio Sicuani, 4827, 0900-0300.
Radio Tacna, 9505, 1000-0005.
Radio Tarma, 4775, 1000-0200.
Radio Tawantinsuyo, 6173, 1000-0300.
Radio Tropical, 4935. www.radiotropicalperu.com/radio/
Radio Unión/La Rompe, 6115, 0200-1700.
Radio Victoria, 6019, 2145-1300. 9720, 2145-1200. www.radiovictoria.pe/
Radio Visión, 4790, 24 hours. www.visionradioperu.com/frecuencias.php

Suriname:

Culturally not part of Latin America, Suriname was a dependent of The Netherlands. It is on the north coast of South America between Guyana and French Guiana. The population is of Asian Indian, Creole, and Indonesian heritage. Few indigenous inhabitants remain. Most live in Paramaribo.

Suriname's topography includes marshy coastal plains; central tablelands with savannah, woodlands and dunes; and southern mountains covered in forests. The climate is tropical. Suriname's economy is based on the mining of bauxite. Exports are aluminum, alumina, and bauxite. They produce rice, fruit, cacao, bananas, coffee, and sugarcane.

Radio Apintie, 4990, 24 hours. Dutch, some English. www.apintie.sr/

Uruguay:

Uruguay is on the east coast of southern South America. The south is made of rolling prairielands. Along the coast, sandy stretches and lagoons reach inland for several miles. In the north are tablelands and low hills. The eastern part of the country is hilly. Its highest point is 1,644 feet above sea level. Uruguay's climate is mild.

The population is mostly of European heritage, with few of European-native ancestry. Virtually no indigenous peoples remain. Uruguay is highly urbanized. Most of the population lives near the coast. Uruguay's economy depends on the raising of livestock, with exports being wool, meat, textiles, rice, fish and hides.

Emisora Chaná, 5831/5886, 0900-1440, 2300-0200. 5925, 1300-1440, 2300-0110.
Radio Artigas/La Voz de Artigas, 6075 kHz. Listed as having an irregular 31 meter-band frequency. www.radioartigas.com/
Radio SODRE, 6125.
Radio Sarandi Sport, 6045.
Radio Universo Internacional, 6055.

Venezuela:

Venezuela is on the north coast of South America between Colombia and Guyana. The northern tip of the Andes is in the northwest. Venezuela includes islands off its coast. There are lowlands in the northwest encircled by mountains. Tropical savannah covers the north central area. The south is mountainous and remote.

The population is mostly of mixed Spanish and native heritage, the remainder primarily of European descent. Most live in the northwestern coastal region. Exports are petroleum, aluminum, chemicals, bauxite, and steel. They produce sugarcane, oranges, bananas, coffee, plantains, rice, and cassava.

RNV, Radio Nacional de Venezuela. Formerly relayed by Radio Havana, Cuba. English webpage: www.rnv.gob.ve/noticias/index.php?s=6ac1b65c6eb061d84ad4c3925f195ebd&act=SF&f=31

MT's Guide to Finding and Fixing RFI

By Kirk A. Kleinschmidt, NT0Z

6068.2Hz   -49.8dBm   1.381 668 MHz   -25636.4Hz   -53.9dBm   1.349 964 MHz

If you had a time machine that allowed you to take your trusty all-band receiver back into the depths of pre-history, what might you hear? Despite its clear-channel signal, KAAY in Little Rock is at least a million years in the future. And the same goes for XEROK and any other powerhouse broadcaster on any band.

Assuming that aliens weren't jamming the airwaves with frantic pre-invasion radio chatter, you'd mostly be listening for "natural" RF emissions caused by atmospheric, ionospheric, geomagnetic and planetary sources: Lightning strikes ("spherics"), auroral squawks VLF curiosities such as "whistlers" and "chorus," and other burps, gurgles, barks, chirps, hisses and groans emitted by Mother Nature herself. (You can hear them examples of them all at www.spaceweather-sounds.com.) Although natural radio sounds are essentially continuous, unless you're really trying to hear them (think VLF), summer static from lightning strikes would be pretty much the only signals practically available.

If you rapidly turned the dials on your trusty time machine, your menu of radio signals would be essentially unchanged until the dawn of the 20th century, when distributed electricity, industry and organized radio transmissions began in earnest. Even through the industrial revolution, unwanted signals were the exception, not the rule. Early television receivers were challenged by strong, nearby signals, but SWLs and hams enjoyed – and took for granted – pristine radio frequencies with exceptionally low noise levels. When an Old-Timer tells you how good the bands sounded back in the day, he's not kidding! Less background noise improves signal-to-noise ratios universally.

By the time you reached the beginning of the solid-state era, which led to ICs, microelectronics and microprocessors – the technologies that enabled and drive our civilization to this day (and undoubtedly enabled the construction of your time machine) – your monitor receiver would note a sharp increase in unwanted radio signals and a sharp decrease in "band quality."

And today, well, you don't need a time machine to know what it's like out there! As members of a progressive society that depends on computers and advanced electronics, we have flooded our homes with everything from washing machines to plasma TVs, compact fluorescent lights to 24/7 wireless data networks, microwave ovens to sewing machines that can produce 200 distinct stitches, many of which are unintentional RF radiators. The result is that AM listening has never been more difficult, short-wave listening is seriously impaired, amateur radio operation for many is compromised – and there's really no "magic bullet solution" in sight, technologically or politically.

This short article is an introduction to radio-frequency interference (RFI) and provides information on finding it and eliminating or reducing its impact on our radio hobby as SWLs and hams. In that sense, RFI consists of unwanted, mostly man-made signals that interfere with the reception of the radio signals we're trying to receive, from the AM broadcast band through VHF.

Some of the techniques we'll discuss may also help to eliminate interference from natural sources (static crashes, for example), but we're mostly focused on the man-made stuff. Interference to other electronic devices, whether ours or our neighbors', caused by ham radio transmissions is also an important topic, and is addressed somewhat in the December 2011 *On the Ham Bands.*

Location, Location, Location

Most RFI is a byproduct of civilization, so an ideal solution is to put your radio where civilization isn't. If unhindered reception is a driving force in your life, take your radio gear to a rural area or, if possible, move outside the city limits. Just as country living fills the night sky with stars, it also fills the nighttime bands with signals – the kind you want to hear, not those you don't. Country living isn't exempt from RFI, but you're usually trading a thousand individual interference sources for one misbehaving electric fence charger, which makes for much simpler troubleshooting.

The Usual Suspects

A wide variety of industrial and consumer devices emit potentially unwanted radio signals. Some signals are intentional (baby monitors) and some are accidental (malfunctioning doorbell buzzers). Some are infrastructure systems (power lines and cable plants) and some are up close and personal (your personal computer). Let's take a look at some of the usual suspects.

The Electrical Grid

Electric power systems permeate civilization. Even when properly functioning, these ac systems with miles of elevated wire "antennas" transmit generally low-level RF at 60- and 120-Hz (fundamental and second harmonic RF signals). This can make a mess at VLF, but

Although it can be a bit complicated to adjust and may be frustrating for band hoppers, MFJ's Deluxe Noise Canceling Signal Enhancer – using old-school analog RF trickery – can knock down or eliminate noise and interference that even the most sophisticated DSP can't touch. By using the '1026's adjustable phasing network, you can combine the patterns of two antennas to null strong interfering signals or peak weaker desired signals at a push of a button. The 1026 can attenuate electrical noise from power lines, fluorescent lamps, motors, light dimmers, TV birdies, static crashes – you name it – by as much as 60 dB. It's better than a noise blanker because the undesired noise is eliminated before it gets detected in your receiver. The Model 1026, which works with receivers and transceivers, retails for $199 and is available from your favorite amateur radio reseller or from www. mfjenterprises.com.

from the AM broadcast band and up it's usually not a big deal. When parts of the power system malfunction, however, the amount of broadband RF they can spew is nothing short of amazing.

With potentials ranging from 120 V to several kilovolts (with essentially infinite current capacity), there's plenty of oomph available to power misbehaving 60-Hz "signal generators."

Let's take a typical power line insulator as an example. Normally, power transmission lines are strung between poles or towers, with appropriately sized insulators (glass, ceramic or synthetic) to keep power from shorting to ground or other nearby objects.

A bright and shiny insulator doesn't allow current to flow anywhere but down the wire. But a dirty or cracked insulator (dirt or other conductive contaminants can accumulate in the surface crack) can allow unwanted current to flow. What starts as a trickle can end up as sparking and arcing, and if you remember your electronics history, a high-frequency spark-gap connected to an elevated wire makes a dandy radio transmitter that can span hundreds of miles!

The RF "crud" produced by a cracked, arcing power line insulator generally only affects receivers within a few blocks to a few miles, but the result is similar. Because there's no control operator working a Morse code key, the signal is usually a steady, raspy RF hash that covers a wide span of frequencies. But if a power pole is swaying in the breeze, of if other mechanical factors affect the arcing insulator or device, the unwanted RF can stop, start and drift in frequency. Some of these "ghost ship"-style RFI sources sound eerily modulated or man-made!

Dirty and cracked insulators are often the culprit when ac power systems misbehave, but just about any other part of the system exposed to the 60-Hz power signal can inadvertently function as an RF generator. These include connectors, switches, pole transformers, brushes and contactors in motors, etc. By hook or by crook, many interfering signals are caused by or powered by the ac mains.

In-Home Devices

Needless to say, there's plenty of ac wiring in a typical home, and the above-mentioned problems that often affect the overall ac distribution infrastructure can also affect the smaller-scale ac distribution system in your home. That means that the wiring, connectors, switches, transformers, motors and lights in your house (and/or nearby houses) can misbehave and cause RFI.

And in addition, your house's internal ac wiring powers a slew of potential RFI generators, including doorbell transformers, fan motors, microwaves, washing machines, air conditioners, GFCI safety outlets, thermostats, fluorescent lights, furnace ignition systems, etc.

To make matters worse, thanks to bunches of interconnecting wires and minimal RF shielding, the digital circuits in personal computers, monitors, and TVs often emit RF signals from 1 MHz to 5 GHz. And thanks to the computer revolution there's at least one computer or microcontroller in every dishwasher, refrigerator, washer/dryer, etc.

Ironically, as our computers are inadvertent

radios, our radios are themselves computers! Unless you build it yourself or use vintage equipment, it's almost impossible to find a modern radio that doesn't have at least one embedded microprocessor. And yes, our radios do interfere with themselves! Some receivers suffer from digital noise emitted by microprocessors or display controllers, or from digital noise produced by switching-mode (computer-style) power supplies.

We're completely surrounded by electronic goodies that can – and usually do – emit unwanted RF signals while performing their desired tasks. Remember, these devices are in every house, every neighborhood and every town. It's enough to make you move to the country and switch to steam power!

Intentional Radiators

Whether from local radio and TV transmitters, neighborhood CBers or even your own amateur radio transmissions, there's a lot of RF floating around out there. And although many of the same remedies apply, because of space limitations, solving these issues is best handled by a trip to the Resources sidebar! The same goes for vehicle-based RFI.

Who is Responsible?

In any complex, politically and economically charged situation, determining exactly who's responsible for "fixing" your interference problem is tricky at best. A detailed and in-depth treatment of this subject can be found in *The ARRL RFI Book*, now in its third edition. At several hundred pages it's One Stop Shopping for just about any RFI cure imaginable, and also includes up-to-date industry and regulatory information about RFI issues. It's one of the few "must have" books for SWLs and hams alike. The Resources sidebar has links to it and other government and industry information about RFI.

Power, cable and telephone companies must comply with FCC regulations on signal leakage and unwanted RF emissions, but dealing with them on a local basis can be hit or miss. Some local operators are very responsive to customer input about RF-noisy system components, but some are not. Smart operators know that in almost every case the unwanted RF (from arcing, sparking or cable leakage) indicates some level of malfunction that, if untreated, can lead to larger, costlier repairs or downtime. Because their systems can leak RF from 50 to 800 MHz, cable operators are especially eager to fix leaky systems that could be interfering with other legitimate services.

If you're fairly sure that a particular problem requires provider intervention, call the company's local engineering department after you've reviewed the appropriate federal, state and local regulations. In addition to FCC rules, many service providers must comply with local charters and laws administered through various state public utilities commissions.

Local hams and ham radio clubs may have experience in resolving interference issues with local providers, so ask around. Nationally, the ARRL offers extensive RFI-resolution assistance to its members and has volunteer experts

available to help in every part of the country. If you're having a severe RFI problem, the $39 annual membership fee could be money well spent.

So, start locally and escalate to state and federal resources as appropriate and necessary. Be reasonable, patient and well-behaved, but be persistent. Resolving issues through bureaucratic channels often takes time.

Tracking down Interference

Like education, charity and terrorism, finding interference starts at home. If you're hearing unwanted RF crud in your receiver, start by selectively turning things off in your own home. You may want to enlist the aid of a helper for this task.

Start with the obvious devices and, if necessary, move to the more obscure. Touch lamps, fluorescent lights, computers and plasma TVs are notoriously RF-noisy, so turn 'em off (pull the power plug out of the wall) and have a listen. If the offending noise stops, you know what to address.

Unfortunately, RFI investigations are rarely this easy, and many modern devices are still "on" even when the devices are switched "off." So after the low-hanging fruit has been picked, the next step is to turn off one circuit at a time at your house's breaker box. Whether obvious or hidden, any RF-emitting device powered by that particular circuit will be silenced. You will still have to track it down specifically, but you will at least know approximately where to find it. Make sure you turn off sensitive devices such as computers and TVs before dropping the power, because they may be damaged by simply pulling the plug.

If the "one breaker at a time" method doesn't work, pulling the main breaker sometimes does. This will drop power to every device in the house, so as before, make sure you turn off all sensitive devices before pulling the big breaker, and make sure everyone in the house knows what's happening ahead of time. Switching off the main breaker has helped hams find

The SCE RFI techs use a vehicle-mounted noise monitor receiver that covers 0.5 to 1000 MHz, and once spikes are detected they connect a directional antenna to pinpoint the noise sources on foot. The RFI sleuths (hams and SoCal techs) found at least one noisy power pole that day and marked it for repair (photos courtesy of Steve Hammer, K6SGH, www.k6sgh.com/radiogames.htm).

RF-noisy breakers in the same power panel, hidden/previously unknown devices that may have been connected to the ac mains in a "non-standard" fashion, or interference that is being "conducted" into the house via external power lines.

After the breaker tests, if the problem persists you know it's coming from solar or battery powered devices, nearby vehicles, or some other outside source that you have to track down. Some urban hams and SWLs have a Field Day during large power outages because most local RFI sources are offline!

Intermittent RFI is the worst. If the blower motor in your furnace is emitting RF when it's running, you can only accurately diagnose its condition when the furnace is operating. The same goes for some clothes dryers and dishwashers. They may be RF silent just sitting there, but spew raspy RF hash from dc to daylight when in operation. Be sure to consider these factors when tracking down RFI.

Tools and Territories

If the RFI source is outside your house (or inside under certain conditions), taking your main receiver with you as you search for clues may not be practical. A portable shortwave or AM broadcast receiver is practical, however, and is often all that's needed. If you've ever driven a car under an RF-noisy power line while listening to AM radio, you know what I mean! When you're right on top of the RF leak, the noise is deafening.

Detailed sleuthing techniques can be found in *The ARRL RFI Book* and elsewhere, but a transistor AM radio (or shortwave radio for frequency-dependent problems) can lead you to most nearby RFI sources. Just follow the intensity of the noise. Unlike normal operation, though, you may need to attenuate the input signal, disconnect the antenna or even shield the radio with your body to help the radio respond to only local signals. If your interference source is a faraway, over-the-horizon HF radar, for example, this won't work at all. Fortunately, most noise is "local."

It's a safe bet that, sooner or later, your AM radio will lead you to the vicinity of an RFI source in someone else's home, business or property. Be sure to be on your best behavior, because non-hams and other "normal people" can be easily freaked out by a knock on the front door from a couple of people with a shortwave radio complaining about an RFI noise source inside their home or business. More than a few have called the police when faced with just this scenario!

Neighbors or people you know might be more receptive to remedial action, but not necessarily so. And business owners may not care about your personal RF problems at all. Perhaps the best way to approach these situations is to find a friend or other neighbor who knows you and the other party to act as a helper or go-between. Your local ham club may have experienced RFI helpers, too.

Once you overcome the social hurdles, finding the RFI source is the same, although I recommend starting the search with the portable radio, as it may lead you right to the problem without requiring that breakers be switched off, etc. Non-hams of every stripe will appreciate this!

Subject to local personalities and procedures, power and cable companies will at least be familiar with handling reports about noisy system hardware. If your receiver has led you to power poles, transformers or other devices in a particular spot, make a detailed description of the address and orientation of the device for your initial report. Some power poles even have ID tags.

Don't trespass or break the law in the pursuit of RFI remediation! And don't climb power poles or protective fences or barriers, etc. Power poles, cable pedestals and telco vaults are not public property. Respect that, please, as bad behavior will only hamper current and future efforts.

Fixes

The best fix by far for typical RFI problems is to find them and eliminate them at the source. If a leaky power pole, for example, is fixed, it eliminates any and all follow-on fixes that may have involved repositioning antennas, noise blankers, filters, DSP, and other "after the fact" workarounds. That's not always possible, though, so one or more fixes (from dozens) may be required. *The ARRL RFI Book* has hundreds of pages of step-by-step instructions, including what to do if you can't find the source and turn it off. I may be able to follow up on these topics in more detail in the future.

In closing, let me mention a few tidbits that are more universal in nature. When it comes to

Now in its third (and significantly updated) edition, the popular ARRL RFI Book is a treasure trove of expert advice on handling every type of RFI situation, including vehicles, TVs, stereos, computers, AV gear, telephones and more. Included are step-by-step troubleshooting procedures, a thorough primer on EMC/RFI fundamentals and an exhaustive list of resources. This 320-page reference sells for $30 and is available from your favorite amateur radio bookseller or from www.arrl.org.

RF noise from 0 to 500 kHz produced by various electronic ballasts installed in a typical fluorescent desk lamp. The trace at the top, background noise, is followed by four different ballasts and a nearby incandescent light dimmer. Note the distinctly different pulse shapes for the various sources. Also note that although the spectrum scans stop at 500 kHz, the noise almost certainly doesn't! (Figure courtesy of TJ Nelson, "Silence of the Lamps: Reducing Radio Frequency Interference from Small Fluorescent Lamps, http://randombio.com/fluorescent-lamp-interference.html)

antennas and potential interference, a few key concepts are important. Within reason, the higher the better and the farther away from structures and power/telco lines the better. A low antenna adjacent to (or inside) a house has a much greater RFI potential than a similar antenna atop a 100-foot tower on a backyard, vacant lot.

SWLs and hams who live in apartments, condos or other RF unfriendly environments are really plagued by all of the garbage RF produced by modern households. In some cases, antenna types can make a difference. Loops, as opposed to dipoles, verticals and end-fed wires, are often less susceptible to electrical noise (atmospheric and man-made). Taken to an extreme, compact magnetic loops, such as MFJ's Model 1786, with their extremely narrow receive bandwidths and directional nulls, can sometimes operate well in environments that don't work at all with more conventional antennas.

An old-school, yet somewhat extreme, tool for wrangling local electrical noise issues is an antenna phasing unit such as MFJ's Model 1026, which has been well-received by users. These units can be frustrating for "band hoppers," as they have to be precisely tuned for each band, but they offer two unique solutions to combat noise that can't be silenced in the usual ways.

These units have two antenna inputs and an adjustable L/C phasing network that can electrically steer the antenna pattern produced by combining both antennas. If a noise source is in one particular direction, the phasing controls can be used to null the pattern in the noisy direction and improve reception of desired signals from other directions. If one antenna is vertically polar-ized and the other is horizontal, these units can produce a type of "diversity reception" that can dramatically reduce certain types of polarization-related fading. And if one antenna is full size and the other is tiny and located near the operating position, signals that are strong on both antenna ports must be locally generated noise, as the tiny antenna (sometimes called a "noise probe") can't receive faraway signals as well as the full-size antenna. By adjusting the phasing circuitry (plus some DSP smarts on some sophisticated units), the noise can be "subtracted" from the combined signal.

Most modern receivers have several built-in interference-fighting tools, including noise blankers, DSP circuits, notch filters and audio equalizers.

Noise blankers, whether analog in the IF or digital in the radio's DSP, quickly turn the receiver's audio output off ("blanking") when the circuit detects a strong, fast-rising noise pulse, and quickly turn it back on after the pulse. Noise blankers can do this many times each second, and when things work well you can hardly tell that they're working at all.

Noise blankers tend to work best on certain types of noise, especially vehicle ignition system noise. The unfortunate thing about noise blankers is that many aren't effective at all. Still, some radios have spectacular noise blankers, and once you've heard one of these in action you'll wonder how you got along without an effective noise blanker for so long. You'll have to pore over printed and online product reviews to get an idea of how well a particular model might work at your QTH. Then, if possible, test one owned by a fellow ham to be sure.

The same goes for DSP noise-reduction systems, built-in, or external, at IF or AF. Some radios have awesome DSP noise-reduction systems, some are average and some are not worth activating. Review, discuss and test. It's the only way to be sure.

Understanding and fighting RFI can sometimes be frustrating and complex, but the simple techniques discussed here, in conjunction with a wealth of useful information available in books and on the Internet, can go a long way toward handling just about any RFI situation.

MT

Scanner Squeeze:
Taking the Public out of Public Service Radio

By Ken Reitz KS4ZR

In November, 1930 Galvin Manufacturing Corporation, the makers of Motorola radios, began selling their radios to police departments. In those days even the police had to be content to just monitor, because department broadcasts were one-way. At that time, according to Motorola company history, two-way radios in police cars were still nine years away. Many multi-band radios sold in the 1930s, from floor models to automobile radios, covered what were then known as the police bands; just above the AM broadcast band and just below the shortwave bands. Millions of law-abiding Americans tuned in and have been listening ever since.

So, how did monitoring the police band become a criminal activity? It's not, and never has been, but continuing pressure from police agencies on local and state legislatures and movement by those same agencies to adopt encrypted radio schemes has gradually restricted the rights of Americans to observe, by ear, the very agencies they employ with their tax dollars to protect them. There has been a eighty year effort to take the public out of public service radio.

But, under federal law there is no prohibition to monitoring the police bands. As *MT Scanning Report* columnist Dan Veeneman points out, the legal grounds for radio monitoring are found in United States Code Title 18, Section 2511, paragraph (2)(a)(g).

Rampant Technology and Law

Public service band monitors throughout the decades have had to contend with two tracks of progress. First was the progress of technology as burgeoning public service agencies, no longer confined just to police and fire but including everything from school buses to trash trucks, migrated into VHF and UHF frequencies, trading old-fashioned AM transmissions for narrowband FM and eventually digital transmissions. Radio manufacturers have more than kept up, offering ever impressive scanners that scan ever increasing banks of frequencies at faster and faster speeds. And, tens of millions of such radios have been sold.

The second track has been a legal track as local and state lawmakers sought to limit listening despite federal insistence that such monitoring has always been legal. For example, various states have laws against listening to scanners in cars or the possession of a scanner while breaking the law.

On the issue of scanners in cars, the FCC has been quite clear with PR 91-36, a Memorandum Opinion and Order from 1993, which declares a "Federal preemption of state and local laws concerning amateur operator use of transceivers capable of reception beyond amateur service frequency allocations." In that narrow sense, hams get a pass and it becomes one more reason for you to get your license.

Scanning for Answers

Are police and other public service frequencies government secrets? Far from it, the FCC makes almost all such frequencies available to everyone. According to Dan Veeneman they're found here: **http://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp**.

And, as *MT*'s Bob Grove points out, "There is nothing in the FCC database that is 'top secret.' You can access and distribute the list as you wish. It's not copyright protected." He notes however, that, federal and military agency frequencies and their databases are controlled by the National Telecommunications Information Agency (NTIA) and are inaccessible without clearance. Even so, scanner technology today lets listeners find those frequencies on their own.

Since more and more police departments are moving to APCO Project 25 (known as P25) digital transmissions, are those digital signals now illegal to monitor? Not at all: despite what

Dial from 1936 RCA multi-band table radio with police band reception from just above AM band to just below shortwave bands. You had to switch bands to catch both ends of the police band.

Motorola 1939 P280 desktop two-way radio. (Courtesy: Motorola)

misinformed police agency public information offices may think, unencrypted digital transmissions are simply another mode. The statute Veeneman cites above remains the law: "It shall not be unlawful under this chapter or chapter 121 of this title for any person – (i) to intercept or access an electronic communication made through an electronic communication system that is configured so that such electronic communication is readily accessible to the general public."

Police agencies nationwide have put a lot of faith in expensive P25 systems, somehow believing they've rid themselves of public scrutiny once and for all. But, as just noted, going digital doesn't mean the public can't listen, though encrypting digital communications does. Still, P25 systems themselves are fraught with problems (see Kirk Kleinschmidt's "The Great APCO Project 25 Boondoggle: 22 years in search of interoperability" *MT* February 2011).

As the rest of us are only too aware, with the great Digital TV switch of 2009 and the efforts of HD-Radio, digital communications come with additional burdens. For many police departments it's hard enough to make their P25 gear work properly without adding a layer of encryption. Most opt not to encrypt.

When police agencies switch to encryption, the press claims their work is hampered by not having access to police and fire communications. Are they just being lazy? Dan Veeneman says, "They may be lazy, but scanners do give them an immediate indication that 'something is up.' On a practical level, what are their al-

Uniden HomePatrol scanner; keeping up with public service radio technology. (Courtesy: Uniden)

ternatives? Follow police cars around all day to see where they go? Wait for citizens to call in tips? Wait for a police buddy to clue them in? Wait for the police department spokesperson to issue a statement? Monitor Facebook and Twitter to see if bystanders have noticed something? Maybe when unmanned aerial drones are cheap enough, news departments will fly them around to gather stories. Until then, the scanner gives them the best view into the moment-by-moment action."

Is this a First Amendment issue? Veeneman replies, "The First Amendment issue would be interesting if it is ever tried in court. As I wrote in a previous column, court rulings on the legality of citizens recording police officers in public often cite the need to keep government activity 'out in the open.' The same logic, I think, would apply to scanners."

As reported in media outlets across the country, police departments nationwide recently slipped into total hysteria over the ability of smartphones to turn themselves into a sort of scanner by utilizing widely available and inexpensive apps that allow users to listen to specific city's police radio streams. These same overwrought agencies have somehow forgotten that – a) handheld scanners capable of monitoring all but encrypted public service transmissions have been around for many years and available at your nearest Radio Shack; b) smartphones are more expensive than P25 handheld scanners, particularly when monthly fees and apps are added; and, c) that hundreds of crooks have left their phones at the scene of the crime which led to their immediate arrest; or accidently triggered 911 calls, which caused them to be immediately located, or were implicated through text messages or phone photos on the phones of other crooks who were previously apprehended, which led in turn to they themselves being caught. Remember, it's the phones that are smart, not the crooks.

Interoperability Dreaming

Instead of worrying about whether or not law abiding citizens and working media are listening, police agencies should be working on the more serious problems with P25's supposed ace in the hole: encryption. As widely reported last year, a group of academic researchers authored an 18 page paper titled, "Insecurity in Public Safety Communications: APCO Project 25." You can read a full copy of the paper by simply Googling the title. In the report, researchers found that, "Although P25 supports the use of cryptographically sound ciphers such as AES and 3DES [Advanced

Encryption Standard and Triple Data Encryption Standard] the use of such ciphers alone is not sufficient to ensure secure operation."

The group found flaws in what it termed a "weak encryption system" including the authentication and access control mechanism; key hierarchy and message authenticity, and risk to denial of service threats against individual stations among others. The paper warns, "P25 radio systems are more secure than conventional analogue radio systems but not nearly as secure as the term 'encrypted' would imply. The most serious security flaw in P25 is the optional nature of the security protocol…"

Incidentally, this research was not the work of underground Ukrainian hackers; it was funded by the Australian government's Department of Broadband, Communications and Digital Economy and the Australian Research Council through the ICT Centre of Excellence program. It makes one wonder why our own researchers couldn't have discovered these insecurities. Or did they?

On top of that, P25 has other problems. As reported in the *Communications* column this month, a recently released 75 page audit of the Integrated Wireless Network (IWN) by the Department of Justice Inspector General's office's reveals a swamp of problems ranging from interoperability issues (yes, even after 23 years) to lack of funding (yes, even after spending $350 million nationally and billions of dollars on state and county P25 radio projects).

Dan Veeneman notes, "Lack of ability to interoperate; no progress due to shifting priorities; difficulties in getting adequate funding. Sounds like almost every engineering project I've ever worked on. Add in government bureaucracy and it's no surprise that they have little to show for all that time and money. I'm reminded of a favorite quote from a book called *Systemantics*: 'A complex system that works is invariably found to have evolved from a simple system that worked. A complex system designed from scratch never works and cannot be made to work. You have to start over, beginning with a system that works.' Perhaps the IWN program was too ambitious in their goals; they might have had more success if they started small with something simpler and worked their way up."

I wouldn't want to minimize the impact of police band listening on those living in municipalities that have switched to fulltime

Apple's iPhone 4S ($200 plus $40/month for a year totals $680) vs GRE's PSR-800 ($450), both can "receive"P25 digital communications but as a radio, the scanner is far cheaper in the long run. (Courtesy: Apple and GRE)

encrypted police communications. But, in this most sluggish of all economies, where municipalities depend on ever increasing tax revenue to fund expensive projects such as regional P25 communications systems and where federal government funding for such projects is rapid drying up, there's not likely to be a rush to do so everywhere.

What the nation is stuck with for the foreseeable future is a patchwork of radio communications that includes nearly antique but still functional analog systems, slick and mostly functional P25 digital systems, and every conceivable system in between. And, because each municipality is racked by its own economic woes, where local agencies fight for every scrap of taxpayer dollars, whichever radio system is in place where you live is likely to be the one in use for years to come.

For the time being, for most of the country, the public still has a toehold in public service radio. But, for those in localities that have switched to fulltime digital transmissions, there appears to be no recourse other than to support the local media in their efforts to turn off encryption, something most police agencies won't do without legislative fiat.

Thanks also to MT Assistant Editor Larry Van Horn and the many MT readers who contributed news stories and links related to this topic.

SCANNING REPORT
THE WORLD ABOVE 30MHZ

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Sun Setting on EDACS

As anyone who has visited a recycling center knows, the technology we use doesn't last forever. Hardware gets smaller. Computers run faster and can perform more complicated tasks. We learn better ways of doing things that make older methods obsolete. The same thing happens to radio systems. This month we take a look at the twilight of a common public safety trunking technology.

❖ Montgomery, Alabama

The City of Montgomery is the capital of Alabama and the county seat of Montgomery County. The County has about 230,000 residents with more than 200,000 of them living within the city limits.

The Montgomery Metro Communications Cooperative District (MMCCD) currently operates an Enhanced Digital Access Communications System (EDACS) for public safety communications. The system serves about 1,500 public safety personnel and an additional 900 municipal, university and support users.

❖ EDACS End of Life

EDACS technology has reached what providers call "end of life." The Public Safety and Professional Communications (PSPC) division of Harris Corporation, who sells and maintains EDACS, has announced that they will stop supporting the technology in 2017. Citing "advances in technology, regulatory changes and customer-driven initiatives," Harris decided to stop marketing and selling EDACS and focus their efforts elsewhere. Letters like the one quoted here went out to EDACS operators last year:

EDACS®

This letter is to restate what Harris has previously announced at the Florida User Group meeting late last year regarding Harris' plans to discontinue further manufacturing of EDACS site equipment with a last time to order date of December 30, 2011. As you are aware, the Land Mobile Radio (LMR) marketplace has been rapidly moving towards standards based protocols such as P25 and IP-based networks which require Harris to focus engineering resources to develop these new technologies. Support for EDACS will continue for 7 years or until December 2017.

This means those municipalities and organizations operating EDACS are no longer able to purchase new equipment from Harris, although parts and repair services are expected to be available for many years. With this kind of warning, EDACS users should be planning a migration strategy to new technology.

In January, MMCCD awarded Harris a $7.3 million contract to design and build an APCO Project 25 radio system that is expected to be operational this fall. This new system will provide a transition away from EDACS and into a standards-based network supported by several manufacturers.

❖ Project 25

The Association of Public-safety Communications Officials (APCO) helped create a set of standards for digital radio communications under the name Project 25. These standards specify, in exacting detail, the signals and formats by which radios should communicate. The intent was to provide manufacturers with a common set of specifications that would allow equipment from multiple vendors to all work together.

Prior to P25, purchasers of radio systems would typically have to choose a particular manufacturer and stick with them, since one manufacturer's equipment would not work with any other. This "vendor lock-in" made systems more expensive than they would otherwise be in a competitive marketplace and slowed the implementation of new features and capabilities.

APCO identified additional concerns that drove the standards, including increasingly congested airwaves, the need for greater voice and data capability, reliable and secure communication, and the ability to interoperate with other agencies and jurisdictions.

❖ New Montgomery System

The new MMCCD system is a Harris product marketed as "P25IP," described as Project 25 to the power of Internet Protocol. The use of Project 25 standards follows the Federal government recommendation for public safety radio and will allow county personnel to communicate directly with other P25 systems.

The new network will make use of the existing repeater sites and will include a new site on the campus of Troy University to provide better coverage in the south and east areas of the county. In total, the new system will have five repeater sites: three operating as simulcast (simultaneous broadcast) and two sites with multiple independent channels. The underlying network will be based on Internet Protocol, the same digital protocol used to carry information across the World Wide Web.

Public safety agencies in the county are scheduled to move to the new system in the fall, while other users may continue to use EDACS for at least two more years. MMCCD plans to move some of the current EDACS frequencies over to the new system while keeping enough to support those users who do not migrate. MMCCD is also expected to meet with adjoining jurisdictions to discuss having them join the new Project 25 system.

❖ Montgomery EDACS

The current Montgomery EDACS system carries voice in both analog and a proprietary digital format called *ProVoice*. Although Project 25 systems also carry voice in digital format using the same Improved Multi-Band Excitation (IMBE) vocoder (voice encoder) as ProVoice, the two formats are not compatible and there is no commercial scanner on the market that can monitor ProVoice transmissions.

Unfortunately for scanner listeners, ProVoice digital capability was added to the Montgomery EDACS system in 2003 and currently most of the police and fire transmissions are ProVoice digital. Even the County Sheriff dispatch can be either analog or digital, so much of the public safety activity is out of reach. Perhaps the transition to a Project 25 system will allow residents to once again hear what their public servants are doing.

The MMCCD EDACS has three subsystems. The first is made up of three repeater sites that all transmit the same information on the same frequency at the same moment in a method called *simulcast* (simultaneous broadcast). These three sites, all located within city limits, use the same 17 frequencies, and as with any EDACS system they must be programmed into a scanner in what is called Logical Channel Number (LCN) order:
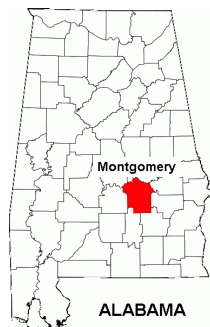
Simulcast Overlapping Coverage
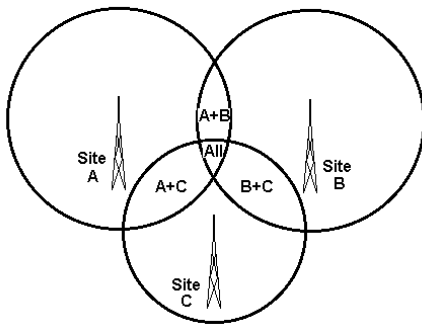
LCN Frequency
01 854.0125
02 855.4875
03 854.8375
04 856.7125
05 854.3375
06 855.8625
07 857.2875
08 857.0125
09 856.2375
10 856.7625
11 857.2375
12 854.5375
13 855.2125
14 855.7875
15 856.0125
16 856.3375
17 857.4375

The second subsystem is a five-channel repeater site located in the town of Red Level, south of Montgomery:

LCN Frequency
01 856.2625
02 857.2625
03 858.2625
04 859.2625
05 860.2625

The third subsystem is another five-channel site in Montgomery:

LCN Frequency
01 856.4625
02 856.9625
03 857.7375
04 858.9625
05 859.9875

Talkgroups on the systems are as follows. Remember that many of the police and fire talkgroups are in ProVoice digital format and cannot be monitored on a regular scanner. Talkgroup identifiers in EDACS can either be a single decimal number or a segment number pair called Agency-Fleet-Subfleet (AFS). The first number of the AFS pair identifies the agency or department. The second number is the fleet and sub-fleet identifier for the individual talkgroup.

Dec.	AFS	Description
289	02-041	Montgomery County Sheriff (Dispatch)
290	02-042	Montgomery County Sheriff (Dispatch)
292	02-044	Montgomery County Sheriff Supervisors
295	02-047	Mutual Aid 3
302	02-056	Montgomery County Sheriff
303	02-057	Montgomery County Sheriff
305	02-061	Montgomery County Sheriff Investigators 1
306	02-062	Montgomery County Sheriff Investigators 2
307	02-063	Montgomery County Sheriff Investigators 3
321	02-081	Montgomery County Sheriff Warrant Service
322	02-082	Montgomery County Sheriff Legal Services
323	02-083	Montgomery County Sheriff Legal Services
338	02-102	Montgomery County Sheriff Special Operations Bureau
339	02-103	Montgomery County Sheriff
353	02-121	Montgomery County Sheriff Courthouse Security 1
354	02-122	Montgomery County Sheriff Courthouse Security 2
355	02-123	Montgomery County Sheriff Courthouse Security 3
369	02-141	Montgomery County Sheriff Detention Facility 1
370	02-142	Montgomery County Sheriff Detention Facility 2
371	02-143	Montgomery County Sheriff Detention Facility 3
375	02-147	Montgomery County Sheriff
401	03-021	Pike Road Volunteer Fire Department
402	03-022	Snowdoun Volunteer Fire Department
403	03-023	Waugh-Mount Meigs Volunteer Fire Department

EDACS
Agency - Fleet - Subfleet
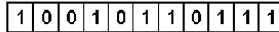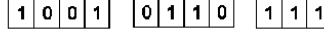
Dec.	AFS	Description
404	03-024	Catoma Volunteer Fire Department
405	03-025	Pintlala Volunteer Fire Department
406	03-026	Rolling Hills Lakes Volunteer Fire Department
407	03-027	North Montgomery Volunteer Fire Department
408	03-030	South Montgomery County Volunteer Fire Department
417	03-041	Montgomery County Fire (Dispatch South)
418	03-042	Montgomery County Fire (Dispatch North)
419	03-043	Montgomery County Fire (Dispatch West)
420	03-044	Montgomery County Fire (Dispatch East)
449	03-081	Montgomery County Sheriff Train 1 Training 1
450	03-082	Montgomery County Sheriff Train 2 Training 2
451	03-083	Montgomery County Sheriff Train 3 Training 3
467	03-103	Montgomery County Sheriff
497	03-141	Montgomery County Schools Security 1
498	03-142	Montgomery County Schools Security 2
501	03-145	Montgomery County Schools Security 3
502	03-146	Montgomery County Schools Security 4
503	03-147	Montgomery County Health Department
610	04-122	Mutual Aid 1
796	06-034	Disaster 1
797	06-035	Disaster 2
798	06-036	State Law Enforcement (patched to 155.010 MHz)
799	06-037	Mutual Aid 4
1009	07-141	Troy University
1010	07-142	Troy University Maintenance 1
1011	07-143	Troy University Maintenance 2
1012	07-144	Troy University Maintenance 3
1013	07-145	Montgomery Police Housing Authority Police
1041	08-021	Montgomery Traffic Engineering 1

1042	08-022	**Montgomery Traffic Engineering 2**
1073	08-061	**Montgomery Streets**
1089	08-081	**Montgomery Sanitation**
1090	08-082	**Montgomery Sanitation Administration**
1096	08-090	**Montgomery Building Inspectors**
1296	10-020	**Montgomery Police Channel 1 (Dispatch)**
1297	10-021	**Montgomery Police Channel 4 Unit-to-Unit**
1313	10-041	**Montgomery Police Channel 2 (Record Checks)**
1314	10-042	**Montgomery Police Channel 3 (Car-to-Car)**
1315	10-043	**Montgomery Police Channel 5 (Patrol Car-to-Car)**
1316	10-044	**Montgomery Police Channel 6 (Accident Investigators)**
1317	10-045	**Montgomery Police Channel 7 (Supervisors)**
1318	10-046	**Montgomery Police**
1320	10-050	**Montgomery Police**
1329	10-061	**Montgomery Police (Detective Division)**
1330	10-062	**Montgomery Police (Juvenile Division)**
1331	10-063	**Montgomery Police (Special Operations)**
1334	10-066	**Montgomery Police (Car-to-Car)**
1335	10-067	**Montgomery Police**
1336	10-070	**Montgomery Police**
1337	10-071	**Montgomery Police**
1338	10-072	**Montgomery Police**
1354	10-092	**Montgomery Police (Record Checks)**
1362	10-102	**Montgomery Police (Special Operations)**
1394	10-142	**Montgomery Police**
1395	10-143	**Montgomery Police**
1396	10-144	**Montgomery Police (Events)**
1553	12-021	**Montgomery Fire (Dispatch)**
1554	12-022	**Montgomery Fire (Fireground)**
1555	12-023	**Montgomery Fire**
1556	12-024	**Montgomery Fire**
1557	12-025	**Montgomery Fire**
1558	12-026	**Montgomery Fire**
1559	12-027	**Montgomery Emergency Medical Services**
1619	12-103	**Montgomery Fire Codes and Standards**
1777	13-141	**Mutual Aid 2**
1808	14-020	**Department of Public Safety All Call**
1810	14-022	**Department of Public Safety 1 (patched to 154.92 MHz)**
1811	14-023	**Department of Public Safety 2**
1812	14-024	**Department of Public Safety 3**
1872	14-100	**Alabama Highway Patrol All Call**
1873	14-101	**Alabama Highway Patrol 1**
1874	14-102	**Alabama Highway Patrol 2**
1875	14-103	**Alabama Highway Patrol 3**
1916	14-154	**Radio Technicians**
1965	15-055	**Capitol Police**

Conventional (non-trunked) analog frequencies are also active in Montgomery County:

Frequency	Description
154.430	**Montgomery Fire (Dispatch)**
154.920	**Department of Public Safety 2 (Base to Mobiles)**
155.010	**Alabama State Law Enforcement Mutual Aid**
155.040	**Alabama State Fire Mutual Aid**
154.280	**National Fire Network**
155.295	**Montgomery County Emergency Medical Services (Dispatch)**
155.340	**National Emergency Medical Services**
155.445	**Department of Public Safety 2 (Mobiles to Base)**
155.475	**National Law Enforcement Network**
155.505	**Department of Public Safety (Car-to-Car)**
155.520	**Montgomery Police Tactical (patched MA-1 on TRS)**
158.790	**Department of Public Safety 1 (Base to Mobiles)**
159.030	**Department of Public Safety 1 (Mobiles to Base)**
453.850	**Montgomery County Fire (Dispatch)**
460.550	**Montgomery Housing Authority**
460.600	**Montgomery County Fire (Dispatch South)**

❖ Iowa

One of the largest EDACS operators in the midwestern United States is a private company called RACOM, based out of Marshalltown, Iowa. Their private trunked radio system operates in the 800 MHz band and was one of the first companies to host public safety agencies on a privately-funded radio network. Since 1994, more than 300 municipal, state, and federal agencies use the system for day-to-day operations.

Last summer RACOM released a plan that provides a roadmap for transition away from EDACS onto an APCO Project 25 network with all users and equipment upgraded by 2020. The first part of the plan calls for the installation of P25 controllers and repeater sites and a gateway that will interconnect EDACS with the new P25 equipment. A Harris EDACS IP Gateway can support up to 24 simultaneous conversations, whether individual or group calls, between EDACS and the new P25 system. This will allow old and new radios to operate at the same time during the transition period.

Despite the cost of such an upgrade, RACOM identifies a number of benefits that will come from the new network, including compliance with federal recommendations to use Project 25 and a common technology platform to interoperate with the statewide P25 networks in Illinois, Minnesota and Nebraska. RACOM expects the new technology to last up to 20 years and be available from several competing providers, giving them options for better pricing and support.

RACOM customers will need to purchase P25-capable radios, although many recent EDACS radios are already capable of operating on both EDACS and P25 networks.

❖ Florida SLERS

One of the largest EDACS systems in use for public safety is Florida's Statewide Law Enforcement Radio Network (SLERS). In 2000, Florida's Department of Management Services (DMS) formed a partnership with Com-Net Ericsson, then the vendor for EDACS. The partnership specified that Com-Net would build, operate and maintain the statewide network while Florida provided funding, planning, and management oversight. After a series of corporate purchases, Harris Corporation became the vendor and partner in 2009.

SLERS began operation in 2004 and now serves more than 7,500 law enforcement officers from two dozen different agencies. The system has more than 17,000 radios and covers 98% of the state from more than 200 repeater sites.

SLERS management anticipates that radio equipment has a limited lifetime, meaning that it will wear out or become obsolete after a certain amount of time. Specifically, they expect six years for handheld radios and eight years for vehicle-mounted units. Planning for the replacement of all 15,000 state-owned radios, at an average cost of $5,000 per unit, means an expenditure of $75 million. The repeater site radios and associated EDACS equipment would be another $25 million. Florida expects that at the time the radios and equipment are replaced, the new hardware will come with the capability of operating on Project 25 networks, allowing a transition away from the end-of-life EDACS technology.

❖ Walton County, Florida

Speaking of SLERS, a county in northwest Florida recently voted to spend $3.7 million to help make the transition onto the system. Walton County, located on the panhandle in an area local residents often call the "Redneck Rivera," is home to about 40,000 residents.

At the urging of the Sheriff, the county began the planning process to join the Statewide Law Enforcement Radio System. As with most jurisdictions, finding the money quickly became an issue. Small departments would have a difficult time affording new $5,000 radios for each of their members, and because Harris is the only vendor for SLERS equipment, there was no price competition or negotiation.

Some agencies also voiced concerns about adequate coverage, especially inside large buildings where calls from police or firefighters might have a hard time reaching the outside.

So far, the total cost of joining SLERS has reached $5.4 million, which includes the construction of three new repeater sites, located near DeFuniak Springs, Freeport and Peach Creek and the infrastructure to connect them to a dispatch center. It also includes new radios for all Sheriff's deputies and 60 new radios for several local fire departments.

The county is hoping to be on SLERS by the end of the year. In the meantime, check these conventional analog frequencies:

Frequency	Description
154.085	Walton County Fire (Dispatch North)
154.250	Walton County Fire (Dispatch South)
154.220	Argyle Volunteer Fire Department
154.190	Liberty Fire District (Dispatch)
155.295	Liberty Fire District (Fireground)
460.0250	DeFuniak Springs Police (Dispatch)
460.0500	Walton County Sheriff (Dispatch North)
460.2000	Walton County Sheriff (Dispatch South)
460.6250	Freeport Fire District
463.0000	Healthmark Regional Medical Center
463.0125	Sacred Heart Hospital
463.0750	County Medical Coordination (MED-4)

That's all for this month. As always, I welcome your electronic mail about EDACS, trunked radio, and scanning in general at *danveeneman@ monitoringtimes.com*. More radio-related information is available on my website at **www. signalharbor.com**. Until next month, happy monitoring!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

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More on Railroad Radio

In our February column, we briefly answered a question about new technical requirements for railroad communications. Long time reader Dick Holbert, K2HZ, of Rochester, NY contributed the following additional information:

The Association of American Railroads (AAR) is recommending that all replacement radios meet NXDN very-narrow band, digital-capable specifications, but that the Federal Communications Commission (FCC) has not yet set a date for conformity.

NXDN currently supports two 6.25 kHz digital voice channels in each current 12.5 kHz-wide frequency allocation. Class 1 railroads are reportedly purchasing digital NXDN radios for specialized local operations. Traditional analog voice communications are expected to continue for the immediate future for interoperability among varied users.

Q. *Is there a formula to convert a lead-acid battery rated in cold cranking amps (CCA) to ampere hours (AH)?*

A. Unfortunately, no. Batteries used for starting automotive engines have more lead and are capable of providing heavy current loads for a short period of time as they turn the engine over, while electronics batteries have less lead and provide moderate current loads for a longer period before the voltage drops appreciably.

For example, a car battery may be rated for 500 CCA, meaning it can provide 500 amps at 0 degrees Fahrenheit for 30 seconds before the terminal voltage drops to 10.8 V, while a 7.5 AH computer backup battery can provide 7.5 amps for an hour before it discharges to 10.8 V (below which a lead-acid battery experiences damage).

Because the two applications require different battery construction, I have seen references that show anywhere from 3 to 10 as divisors to convert CCA to AH; thus, a VERY approximate gauge is to divide CCA by 6 to get AH. While you won't get an accurate number, it can let you know if you're in the right ball park!

A much better way is to connect a 12V headlight or brake light bulb on a fully charged battery and see how long it takes to drop to 10.8 V while monitoring the current. Keep in mind, however, that as the voltage drops, so will the current through the bulb. Ideally, you should keep changing the resistance to maintain a constant current drain while monitoring the voltage as it reduces to 10.8 V.

Q. *I am thinking about getting the PAR "End Fedz" antenna for* shortwave reception. Is this a directional antenna much like a SW Dipole? And will reception be generally as good as with cut-to-frequency dipoles? (Glenn Bowman KC8WUL)

A. Regardless of the location of the feedpoint, the same-size horizontal wire will respond to signals the same – at right angles to the sides of the axis of the wire.

Even though signals may be slightly weaker if the antenna is shorter on the longer wavelengths than a cut-to-frequency dipole, the reduction of signal strength is accompanied by the reduction of natural, atmospheric background noise, so the signal-to-noise ratio (SNR) will remain the same.

Q. *Why don't amateur radio manufacturers offer transceivers for the 902/1240 MHz (33 cm/23 cm) ham bands? Maybe a dual or triple band radio to include 420-450 MHz (70 cm)? (James Monagle, KC9QYC)*

A. Alinco recently released their 222/902 MHz DJ-G7 handy talkie, but the market must be there. A quick look at the list of repeaters in the U.S. shows thousands of them for 144/420 MHz (2 meters and 70 cm), but only a tiny fraction of that for the higher-frequency bands. The low-power, line-of-sight limitations of such radios would necessitate repeater operation in populated areas to be successful; otherwise they would be useful only for short range, and we already have plenty of low-cost FRS transceivers for that.

Q. *I have an excellent external speaker I'd like to add to my receiver, but it's rated at 4 ohms impedance. My radio specifications say to use an external speaker of 6-8 ohms. What problems might I encounter? (Will Stibgen, Quakertown, PA)*

A. While a solid-state audio amplifier is designed for a certain power maximum (watts), it's the current (amps) that heats them up, sometimes destructively high. Following a derivative of Ohm's law ($W=I^2R$), we see that for the same amount of power to be produced in a 4 ohm speaker as in an 8 ohm speaker, four times as much current must be delivered.

Additionally, it takes twice as much voltage to produce that extra current, and high voltage is another problem for solid-state devices.

You probably won't do a bit of harm using the 4 ohm speaker just so long as you don't keep it at high volume. A failsafe technique to prevent this from happening is to add in series a low-value resistor (2.7 ohms at 1/2 watt) to keep the total impedance at or above the specified 6 ohm minimum.

Feel the resistor after a few minutes of reasonably-loud listening to be sure it doesn't get uncomfortably hot. If it does, try a higher power (1 watt) resistor or, better yet, turn the volume down!

Q. *As a novice to SWL, I was given an old FRG-100 Yaesu receiver. I would like to use your Flex-Tenna HF for my antenna supported by a tree limb. The receiver has a 50 ohm coaxial, PL-259 connector for a low-impedance antenna, and a connection for a high-impedance wire connection. Which should I use? (Rick Magnuson)*

A. No subject brings in more questions than antennas. Use a standard shielded (coax) cable (any impedance) like RG-58/U (50 ohms) or TV style RG-6/U or RG/59 U. At shortwave frequencies in lengths under 100 feet or so you won't notice any difference.

Connect the shielded cable to your Yaesu's 50 ohm coax connector. You don't need a ground at the far end (at the antenna junction), but if you do have a good earth ground pipe there, it could help reduce electrical line noise interference if you find it objectionable.

Impedance matching for receiving shortwave frequencies is not critical. The primary background noise comes from atmospheric sources (global lightning static), and if one antenna brings in signals stronger than another, it usually means that the signal and the background noise are both louder. There's no real improvement in signal above the background noise.

UTILITY WORLD
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CFH Weather Broadcasts Return - For Now

Starting on January 20, 2012, listeners worldwide were surprised to hear a return of the weather information broadcasts from the Canadian Forces base in Halifax, Nova Scotia (CFH). These had vanished on September 2, 2010, after a terse announcement had been given a few times on-air. A source in the Canadian military confirmed that, "Canadian naval vessels are no longer using it because they receive weather information by other means."

At the time, most people assumed that they were gone forever, though a return could not be ruled out. The United States military had discontinued its weather broadcasts for the same reason, but sporadic radioteletype (RTTY) and radiofacsimile (FAX) transmissions took place for years afterward.

A notice in the 2011 Canadian Coast Guard Radio Aids to Marine Navigation (RAMN) bears out this original supposition. Quoting:

"The Canadian Forces Fleet MetOc *[Meteorological and Oceanographic]* Broadcast may be reinstated and ceased without warning as necessitated by military operational requirements. When notified, MCTS *[Marine Communications and Traffic Services]* will issue a Notice to Shipping concerning reinstatements or cessations of this service."

With any luck, there will still be activity when people see this column. If not, then it's worth noting the frequencies and modes being used just in case it begins yet again.

CFH typically broadcasts one or two FAX weather charts on the hour. The schedule is still widely available, though the current activity has not always stuck to it. Some people have noticed charts starting around 22 minutes after the hour, though most are still at the top.
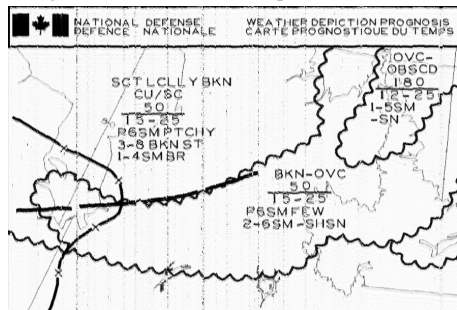
At some point after the FAX concludes, the transmitters switch to RTTY for various coded weather observations. These are for Canadian airports, plus a few in the US. Accordingly, the predominant formats are METAR (Routine Aviation Weather) and TAF (Terminal Aerodrome Forecast).

Frequencies have changed somewhat. A new one, 2574 kilohertz (kHz), has been heard by several people: The others remain 4271, 10536, and 13510 kHz. There also used to be a HF (high frequency) channel at 6496.4 kHz, and a longwave channel at 122.5 kHz. No one has reported either of these as of February first.

These are assigned channels, and radio dial/window offsets for RTTY will vary. FAX is typically tuned 1.9 kHz lower.

All frequencies used to be active in parallel at all times, but this time around it seems more selective. 13510 seems to be busiest. For FAX, use the standard parameters of 120 lines per minute (LPM or RPM) and 576 for the Index Of Cooperation (IOC). RTTY is in standard Baudot, sent at 75 baud with a shift of 850 Hz.

❖ Canadian Maritime Publications

The aforementioned RAMN publications from the Canadian Coast Guard are great information sources regarding Canada's huge area of responsibility. Most vessels operating in these waters are required to carry them. Anyone else can download them, for free, in Portable Document Format (PDF) form. The link is **www.ccg-gcc.gc.ca/eng/CCG/MCTS_Radio_Aids**

There are two volumes. One is for the East: Atlantic Coast, Gulf and St. Lawrence River to Montreal, Eastern Arctic (including Hudson Bay and Strait), the Great Lakes (including St. Lawrence River to Montreal), and Lake Winnipeg. The other is for the West: Pacific Coast, Western Arctic and the Athabasca-Mackenzie Watershed area.

These are updated yearly in April. The new ones should be out shortly after readers see this column.

❖ Changes at 4XZ

4XZ used to be considered a "numbers" station, but now it is known that the station is most likely operated by the Israeli Defense Force, and in particular the Navy. A transmitter site near Haifa has been suggested, and there may be others.

Most of what people hear is in on-off keyed Morse code, also known as CW from its old name of "Continuous Wave." Over the years, listeners have heard various types of encrypted messages, plus what may be plain text traffic in Hebrew. Another code has been shown to be actually weather in a compressed international format.

The rest of the time, 4XZ runs a traditional CW channel marker using the "VVV" test group. It goes VVV DE (from) 4XZ 4XZ BT BT. BT is a procedural signal meaning "break," sent as one long character, dahdidididah.

It had been assumed for some time that the old CW was cutting back in favor of faster data modems. Traffic volume had dropped off, and the frequencies had been reduced to only three. Now, perhaps due to increased Middle East tensions, the operation has greatly expanded again.

4XZ's new CW frequencies, as of January 2012, are 2680, 2860, 4331, 4595, 6379, and 6607 kHz. Note how they are paired by band. Sometimes, though, they all run in parallel.

This station will certainly bear watching.

❖ WRC-12 in Progress

It'll be old news by the time this column gets out, but it's still worth noting that the International Telecommunications Union (ITU) began its 2012 World Radiocommunication Conference (WRC-12) on January 23. WRC-12, in Geneva, Switzerland, was scheduled to last about a month, with over 3000 participating.

These WRCs are a big deal. They can have a major effect on world radio regulations on all frequencies. The agendas are announced years in advance, and participating countries go to work naming committees, issuing position papers, conducting endless meetings, and in general getting all the T's crossed and the I's dotted before ever landing in Geneva.

WRC-12 affects mostly frequencies well above HF, but a couple of agenda items do have a bearing on what everyone in our hobby will be hearing, and in some cases doing, on the radio.

❖ Sea Surface Radar

Item 1.15 is, "To consider possible allocations in the range 3-50 MHz to the radiolocation service for oceanographic radar applications." This is basically an attempt to bring order out of chaos in the licensing and use of coastal sea surface radars operating in this spectrum.

Everyone's heard these. They are the radar stations that sweep a pulsed carrier across a very wide frequency range once or twice per second. They're the scourge of the 4.5-megahertz band. The sound is best described as a "pweeng, pweeng, pweeng" noise. It can definitely get irritating when one is trying to pull out a weak signal.

Frequencies, power output, and bandwith (100 kHz in some cases) vary with the specific

application. One of these is CODAR, which stands for Coastal Ocean Dynamics Applications Radar. It is used mostly for research. Another system is used for surveillance, and it is being deployed all up and down the coasts of the US and some other countries.

For the first time, these units would have specific frequency allocations, though on a non-interference basis to the fixed and mobile radio services. HF band segments (in kHz) mentioned in preliminary papers include 3155-3200, 4438-4650, 5250-5450, 13410-13570, 14350-14990, 25330-25550, and 26200-26420.

The very busy segment just above 20 meter amateur (14350-14990) is kind of an eyebrow raiser. There's also been some objection from amateur radio groups to the one at 5 megahertz, which might interfere with the limited ham use being allowed by many countries on this band.

The one thing for sure is that the exact allocations will change during the give and take of the WRC.

❖ 600-Meter Amateur

Item 1.23 is, "To consider an allocation of about 15 kHz in parts of the band 415-526.5 kHz to the Amateur Service on a secondary basis, taking into account the need to protect existing services."

This is pretty self-explanatory. Right now, a number of countries allow "experimental" amateur operations on specific frequencies in this historic band, which is still being used for navigation beacons, the Navigational Telex (NAVTEX) service, and some remaining (and important) CW maritime mobile services. Many radio people consider this old-school band, with its matching coils the size of beer kegs, and its various ground wave propagation modes, as a sub-hobby waiting to happen.

Various competing proposals are currently being explored at WRC-12, and it is likely that some sort of small amateur band will result. We'll see what transpires, and tell all next month.

ABBREVIATIONS USED IN THIS COLUMN

ALE	Automatic Link Establishment
AM.................	Amplitude Modulation
ASCII	American Standard Code for Information Interchange
AWACS	Airborne Warning and Control System
CAMSLANT	Communications Area Master Station, Atlantic
CAMSPAC	Communications Area Master Station, Pacific
CAP	US Civil Air Patrol
COMPTUEX....	Composite Training Unit Exercise
COTHEN........	US Customs Over-The-Horizon Enforcement Network
CW	On-off keyed "Continuous Wave" Morse telegraphy
DSC..............	Digital Selective Calling
E11...............	"Strich" family numbers, says "Oblique" for "/"
EOC	Emergency Operations Center
FAX	Radiofacsimile
FEMA	US Federal Emergency Management Agency
FSK...............	Frequency-Shift Keying
G11...............	German version of E11, says "Strich" for "/"
HFDL	High Frequency Data Link
HFGCS	High Frequency Global Communications System
ID	Station identification
LDOC	Long-Distance Operational Control
LSB	Lower Sideband
M18...............	Russian CW "clock," sends local time of day strings
MARS	US Military Auxiliary Radio System
MCW	Modulated CW, direct or AM tone
Meteo	Meteorological (weather office), also "Metro"
MFA	Ministry of Foreign Affairs
MFSK	Multiple Frequency Shift Keying
MSK..............	Minimum Shift Keying
NASA............	US National Aeronautics and Space Administration
NAT	North Atlantic air route control, families A-F
NATO............	North Atlantic Treaty Organization
Navtex	Navigational Telex
NDB..............	Non-Directional Beacon
PACTOR	Packet Teleprinting Over Radio, modes I-IV
RTTY	Radio Teletype
S06s	Russian Lady variant, 00000 ending is slower
Selcal............	Selective Calling

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 ().

129.1   DCF49-European Ripple Control, Mainflingen, Germany, ASCII power grid control codes at 1628 (MPJ-UK).

135.6   HGA22-European Ripple Control, Lakihagy, Hungary, ASCII power grid control codes at 1658 (MPJ-UK).

263.0   QY-NDB, Sydney, NS, Canada, MCW tone and ID at 0404 (PPA-Netherlands).

286.5   001-Differential GPS beacon, Baltiysk/Kaliningrad, Russia, MSK correction data at 2114 (PPA-Netherlands).

315.0   A8UD3-Liberian-flag Dutch offshore production vessel Noble Globetrotter, MCW helipad beacon at 2117 (PPA-Netherlands).

320.0   DO-NDB, Djupivogur, Iceland, MCW ID at 2125 (PPA-Netherlands).

368.0   WTD-NDB, Waterford, Ireland, MCW ID at 0422 (PPA-Netherlands).

372.0   OZN-NDB, Prins Christian Sund, Greenland, MCW ID at 2015 (PPA-Netherlands).

380.0   FIL-NDB, Horta/ Faial Island, Azores, MCW tone and ID, at 0441 (PPA-Netherlands).

490.0   "I"-La Maddalena Radio, Sardinia, Italy, SITOR-B Navtex at 1252 (PPA-Netherlands).

518.0   "V"-LGV, Vardo/ Bodo Radio, Norway, SITOR-B Navtex at 1930 (PPA-Netherlands).

520.0   F9-NDB, Miramichi-Chatham, NB, Canada, at 0040 (Mario Filippi NJ).

1650.0   CROSS-French Coast Guard, Gris-Nez, storm warning in French, at 0733 (PPA-Netherlands).

1743.0   Stornoway-UK Coast Guard, weather for Scotland coast at 0714 (PPA-Netherlands).

1770.0   4XWO-CW fishing beacon, periodic ID at 0255 (Filippi NJ). Shetland Islands-UK Coast Guard, gale warning at 0414 (PPA-Netherlands).

1855.0   IQP-San Benedetto del Tronto Radio, Italy, navigational warnings in Italian, at 0451 (PPA-Netherlands).

2054.0   VAE-Canadian Coast Guard, Tofino, BC, weather at 0052 (Jack Metcalfe-KY).

2187.5   UAVA-Russian flag cargo vessel Kelarvi, DSC with Lyngby Radio, Denmark, at 0752 (Michel Lacroix-France).

2311.0   Arklow-Shipping company base station, Ireland, position reports from vessels Arklow Forest, Arklow Rebel, Arklow Rover, and Arklow Rogue, at 2025 (PPA-Netherlands).

2574.0   CFH-Canadian Forces, Halifax, NS, FAX upper-level and surface charts at 0302 (Pete Giugliano-VA). [Yes, CFH is back, at least temporarily. This is confirmed as a new frequency. -Hugh]

2598.0   VCP-Canadian Coast Guard, Placentia, weather for Labrador at 0737 (PPA-Netherlands).

2677.0   CROSS-French Coast Guard, La Garde, weather in French at 2005 (PPA-Netherlands).

2749.0   VCO-Canadian Coast Guard, Sydney, weather at 0743 (PPA-Netherlands).

2761.0   OSU-Oostende Radio, Belgium, weather at 0240 (Metcalfe-KY).

2817.5   B5Z159-US Army, calling helicopter R02000, ALE at 2303 (Metcalfe-KY).

2828.0   RB1-USMC, calling MEC, also on 6942.5 and 7332.5, ALE at 2054 (Metcalfe-KY).

3286.0   AAA5MI-US Army MARS, working AAT5IR in 64-tone Olivia MFSK, at 0035 (Metcalfe-KY).

3322.0   Unid-Russian Air Defense, CW null-message tracking string stamped with local time 0055, also on 4865.5 and 4951.5, at 2054 (MPJ-UK).

3803.0   Unid-Russian CW pseudo-time station (M18), continuous 4-figure strings with local time, at 2306 (Ary Boender-Netherlands).

3810.0   HD2IOA-Ecuador Navy standard time station, Guayaquil, LSB pips and announcements in Spanish, at 0730 (PPA-Netherlands).

4045.0   Ambarchik-Russian aero net, Aktyubinsk Airport, Kazakhstan, radio check in Russian with Turkmenbashi, Krasnovodsk Airport, Turkmenistan, at 1745. Unid female, attempting radio checks in Russian with Sardina (Baku) and Elektrichka (Donetsk, no joy), at 1845 (Patrice Privat-France).

4271.0   CFH-Canadian Forces, Halifax, NS, weather in RTTY at 0159, then FAX charts at 0202 (Giugliano-VA).

4583.0   DDK2-Hamburg/Pinneberg Metro, Germany, RTTY (50/450) weather in German, also on 7646 (DDH7) and 10100.8 (DDK9), at 0308 (Filippi NJ).

4593.5   AFA5NF-USAF MARS Net Control, with AFA1NN as alternate, checking in many stations at 0004 (MDMonitor-MD).

4604.0   Red Fox 48-CAP net control, IL, checking in stations at 0030 (MDMonitor-MD).

4610.0   HIJ-US Government "Three-Letter Net," usual middle-of-month ALE sounding; also on 4979, 5837, 7870, 9314, 10424, and 11448.0; at 1911 (Metcalfe-KY).

4627.0   Mockingbird 4-CAP, MS, net control at 1304 (Metcalfe-KY).

4630.0   Georgia CAP 41-CAP, checking in with Southeast CAP 4, at 0101 (MDMonitor-MD).

4675.0   N832MH-Delta Air Lines B767, answered selcal QS-KR from Shanwick (NAT-D), at 0857 (Lacroix-France).

4780.0   Angola-Indiana National Guard armory, LSB net check-in with Kokomo and Muncie, at 140 (Metcalfe-KY).

5066.5   USADA1010-US Department of the Army EOC, DC, working USAIS1012 (US Army Intelligence and Security Command, VA), ALE at 0647 and 1015 (Bob Wilczynski-MA).

5135.0   VA78CT-VA Emergency Management, calling unknown station in ALE, at 2210 (MDMonitor-MD).

5170.0   Unid-Chinese air defense, CW test string AU34567DNT (cut 1234567890), time stamped UTC+8, at 1843 (PPA-Netherlands).

5354.5　Unid-Bechar Province, Algeria, calling KERZAZ, ELWATA, and others; PACTOR-I at 0401 (ALF-Germany).

5436.0　Warszawa3-Polish police, Warsaw, calling MOBILE2, ALE at 1920 (PPA-Netherlands).

5510.0　KM3-Possible Colombian Navy, calling ACP, PPF, and V0F; also on 5500, 5708, 5720.5, 5815.5, 7455, 7750, 8250, 9089.9, 9090, 12416.9, 12417; all ALE at 0535 (Wilczynski-MA).

5526.0　Cayenne-South American air control, French Guiana, selcal MR-AE to KLM 706, a B777 reg PH-BQI, at 0454 (PPA-Netherlands).

5541.0　SDJ-Stockholm LDOC, Sweden, patch to company operations for Channex 159, a Jet2 B737 reg G-CELB, at 0700 (PPA-Netherlands).

5680.0　Kinloss Rescue-UK Royal Air Force, working Sea King helo Rescue125, at 0908 (Lacroix-France).

5687.0　DHM-German Air Force, selcal GJ-EP to C-160D number 50+40 for weather, at 0941 (Lacroix-France).

5723.0　Defiant Gray-USS Vicksburg (CG-69), working Climax, USS Enterprise (CVN-65), at 0210 (Wilczynski-MA).

5732.0　718-USCG HC-130H #1718, COTHEN ALE and voice with Coast Guard Air Station Clearwater, FL, at 0037 (MDMonitor-MD).

5757.5　SPARE32MEBCM-USMC 2nd Marine Expeditionary Brigade, calling 8THCOMM2MEBCMD, ALE at 2000 (Wilczynski-MA).

6305.0　The Russian Lady-Russian intelligence 5-figure groups, slow ending variant (S06s), callup 481 297 5; similar on 6420, 7030, 7150, 8215, 10920, 11780, 12155, 12365, 12570, and 14280; at 1210 (Boender-Netherlands).

6312.0　353414000-Panama flag bulk cargo vessel Eagle Arrow (3FJA2), DSC position for Paita, Peru, at 0827 (Lacroix-France).

6640.0　San Francisco LDOC, selcal check JQ-MP with Abex 977, an ABX Air B767 freighter reg N219CY, at 1047 (Allan Stern-FL).

6765.0　WNHN755 Portable 1-Michigan Bell National Security/ Emergency Preparedness (NS/EP) station, checking into SHARES Northern Net, at 1651 (Metcalfe-KY).

6772.0　CL1-USMC, ALE with CL2, MEC, and ME4; also on 7435.5, at 1932 (Metcalfe-KY).

6910.0　NNN0LAC-US Navy/ Marine Corps MARS, checking into regional SHARES Net, at 1618 (Metcalfe-KY).

6911.0　KBDLNG-CT Army National Guard, Bradley Airport, working UH-60L helicopter R23590, also on 9081.5, ALE at 0038 (Wilczynski-MA).

6945.0　Trenoga-Russian aero net, Kharkov, calling Zadorny (Voronej), in Russian, at 0528 (Privat-France).

7348.0　DC3FEM-FEMA, DC, ALE with FR3FEM, FEMA Region 3, MD, then voice as WGY983 working WGY903, at 1810 (Metcalfe-KY).

7361.5　DECOPS-US Army ground station, working UHA727, also on 8181.5, ALE at 2335 (Wilczynski-MA).

7435.5　PAE-USMC, ALE and data with CL2, HB6, ME2, ME4, MEC, VAL, and TYN; at 2107 (Metcalfe-KY).

7580.0　New Star Radio Station (V13), Program #4, flute music and female voice with numbers messages, at 0500, 0508, 0600, 0620, and 1224 (Boender-Hong Kong remote).

7665.0　0125SCCAP-CAP, SC, ALE sounding, also on 9082, 12124, and 14445, at 1432 (MDMonitor-MD).

7688.0　New Star Radio Station (V13), Program #3, music and numbers, at 0700, 0712, 0805, and 0819 (Boender-Hong Kong remote).

7971.6　KOP629-US Government, ALE with KLE439, KLE444, KLE445, and KLE446; also on 2552.4, 4947.9, 5241.7, 7971.9, 9352.2, 10874.3, and 12188.6; at 1840 (Metcalfe-KY).

8046.0　870-Unknown Chinese military, similar on 9201, 9267, 9320, 17435, and 19096; ALE at 1750 (Eddy Waters-Australia).

8047.0　F040LN-FL National Guard, calling N040CN, NC, ALE at 1343 (MD-Monitor-MD).

8048.5　READYTOALE-Unknown military, working WHITE1ALE, ALE at 2300 (Wilczynski-MA).

8091.0　Unid-"Oblique" numbers station (E11), null-message callup "469 Oblique 00;" similar on 9446, 10690, 10800, and 15632; at 1045 (Boender-Netherlands).

8912.0　LNT-USCG CAMSLANT Chesapeake, VA, calling J16, USCG MH-60J Jayhawk #6016, COTHEN ALE at 1645 (MDMonitor-MD).

8918.0　Reach 40-USAF Air Mobility Command HC-130N #69-5824, selcal and position on Caribbean air control net, at 1710 (Tony Agnelli-FL).

8974.0　Echo Whiskey-US Navy carrier USS Enterprise, battle group COMPTUEX traffic including "birds away" and "splash report," at 1434 (Agnelli-FL).

8983.0　CAMSLANT-USCG, position from HU-25D Coast Guard 2113, at 2236 (Stern-FL).

9025.0　170037-USAF Air Mobility Command C-5B #87-0037, ALE sounding at 1743 (MDMonitor-MD).

9106.0　KTQ313A-US Environmental Protection Agency, AL, calling KGC253, US General Services Administration, DC, at 1430 (MDMonitor-MD).

9295.0　"S-9-J"-Unknown military unit, working JOC (Joint Operations Center), ALE at 1459 (Wilczynski-MA). R24587-US Army National Guard helo, ALE and voice ops-normal report with MAAASF1, MA Army Aviation Support Facility, at 1944 (Metcalfe-KY).

10075.0　VQ-BEG-Aeroflot A321, flight SU0248, HFDL position for Al-Muharraq, Bahrain, at 2258 (MPJ-UK).

10087.0　"14"-HFDL ground station, Krasnoyarsk, Russia, working Aeroflot SU0748, an A319 reg VP-BWJ, at 0938 (PPA-Netherlands).

10242.0　LNT-CAMSLANT, calling J42, USCG MH-60T Jayhawk, COTHEN ALE at 2301 (MDMonitor-MD).

10315.0　Magic 52-NATO E-3 AWACS back end, voice and data with DHN 66, Geilenkirchen, at 0915 (Lacroix-France).

10588.0　FC8FEM-FEMA Region 8, CO, raised ND8FEM (ND state EOC) in ALE, then voice as WGY908 working WGY948, at 1602 (Metcalfe-KY).

10839.0　ERS-USMC, calling TYC, also on 10977.5, ALE at 1744 (Metcalfe-KY).

11175.0　Offutt-USAF HFGCS, patching Furlough, a possible E-6B, to Offutt order wire controller, at 2040 (Stern-FL).

11184.0　CCA937-Air China International, HFDL position for Reykjavik, at 1436 (Lacroix-France).

11232.0　Otis 69-USMC KC-130J tanker, patches via Trenton Military to command post, also Otis 68 with similar, at 2152 (Wilczynski-MA).

11256.0　ETK4-Ethiopian Airlines, selcal JS-EF to Ethiopian 501, a B777 reg ET-ANN, at 1755 (PPA-Netherlands).

11418.5　OEY61-United Nations Disengagement Observer Force (UNDOF), Golan Heights, Syria, ALE link check with OEY80, Austrian military in Villach, Austria, also using 14609.5 and 16252.5, at 0916 (PPA-Netherlands).

11451.0　CHPNSC140M-Phone company NS/EP, Chapin, SC, calling LNPNAK75, Lena Point/ Juneau, AK, at 1630 (MDMonitor-MD).

11494.0　711-USCG HC-130H #1711, calling LNT, CAMSLANT, COTHEN ALE at 1835 (MDMonitor-MD).

12087.0　V020IN-US Army National Guard, Virgin Islands, ALE sounding, also on 14776, at 1150 (Waters-Australia).

12362.0　VMW-Australian weather service, Wiluna, ending weather bulletin with frequency info, at 1357 (PPA-Netherlands).

12577.0　C6VR4-Bahamas flag cargo ship Chiquita Bremen, DSC safety checks with Miami and Norfolk, at 1705 (MPJ-UK).

12579.0　NRV-USCG, Guam, SITOR-B navigation warnings at 0902 (Lacroix-France).

12992.6　KSM-Maritime Radio Historical Society (MRHS), Pt. Reyes, CA, CW shipping industry news at 1829 (Metcalfe-KY).

13105.0　BZL26-Unknown Chinese station, RTTY at 0830 (Waters-Australia).

13185.0　XVG-Hai Phong Radio, Viet Nam, phone call in Vietnamese, at 1410 (PPA-Netherlands).

13510.0　CFH-Canadian Forces, Halifax, NS, ending FAX transmission and switching to RTTY for aviation weather, at 1726 (MPJ-UK).

13927.0　AFA5QW-USAF MARS, IN, working U-2 Pinon 72, who then went to 7633.5 for AFA9PF (USAF MARS, CA), at 1743 (Stern-FL).

14384.5　CIW64-Canadian Forces Affiliate Radio System, working CIW320 in PACTOR-III, at 1643 (Metcalfe-KY).

14396.5　AAV4AR-US Army MARS, GA, SHARES Admin Net control with NNN0VUV, US Navy/ Marine Corps MARS; checking in WAR (US Army, DC), KCR 873 (Boise Interagency Fire Center, ID), many others, at 1655 (MDMonitor-MD). KHA959-NASA Goddard Space Flight Center, VA, asking for regional frequencies; given 5236 and 7632; also at 1655 (Metcalfe-KY).

14455.0　KHA959-NASA, net with KHA925, Johnson Space Center, TX, at 1644 (Metcalfe-KY).

14526.5　AFB1MA-USAF MARS, PACTOR-III messages at 1730 (Metcalfe-KY).

14606.0　AFA5QW-USAF MARS, IN, radio check from a B-52H self-identified as "Fear 42;" ground op asked about call sign and aircraft answered that Fear and Chill are Minot AFB, and Skull and Doom are Barksdale; at 1805 (Stern-FL).

14745.0　420709-Indonesian Army, ALE sounding at 1145 (Waters-Australia).

15867.0　N10-USCG HC-144A Ocean Sentry, COTHEN ALE with Z12, USCG Sector Miami, FL, then voice as November 10, at 2120 (MDMonitor-MD).

16130.0　HBD20-Swiss MFA, ALE sounding, also on 20708, at 0920 (Waters-Australia).

16886.0　TAH-Istanbul Radio, Turkey, CW marker at 0400 (Waters-Australia).

17460.0　HKI2-Finnish MFA, Helsinki, calling RIA, ALE at 0948 (PPA-Netherlands).

17967.0　"15"-HFDL ground station, Al-Muharraq, Bahrain, uplink to VT-IGY, an IndiGo A320, at 1302 (PPA-Netherlands).

18594.0　LNT-USCG CAMSLANT, VA, calling F12, an HU-25 #2112, COTHEN ALE at 2112 (MPJ-UK).

18665.0　MADADGAR-Pakistan Navy utility tanker Madadgar, ALE text exchange with ZULFIQAR1, frigate Zulfiqar, at 1030 (Wilczynski-MA).

18722.7　8WD2-India MFA, Delhi, RTTY messages, also on 18725, at 1005 (Waters-Australia).

19814.0　0060PCRCAP-CAP Pacific Coast Region, ALE sounding at 2031 (MDMonitor-MD).

19969.0　FC8FEM-FEMA Region 8 Comms, CO, ALE text regarding weather (cold) to FC8FEM2, at 1625 (MPJ-UK).

20818.5　Unid-North Korean MFA, Pyongyang, ARQ messages, also on 22323.5, at 0118 (Waters-Australia).

21949.1　"08"-HFDL ground station, Johannesburg, South Africa, uplink to A7-ADX, a Qatar Airways A321 flight QR0436, at 1242 (PPA-Netherlands).

22372.0　3201-Maltese Maritime Service headquarters, Malta, working 3204, Patrol Boat P-22, ALE at 1535 (MPJ-UK).

22445.0　KSM-MRHS, CA, CW ID and MEBA Free Press from the Marine Engineers' Beneficial Association, at 1914. KSM, marker and listening for traffic, OBS (formatted weather observations), or AMVERs (positions for the Automated Mutual Assistance Vessel Rescue System), at 2114 (Filippi NJ).

22527.0　NMC-USCG CAMSPAC Pt. Reyes, CA, FAX chart at 1851 (Filippi NJ).

24526.0　FC4FEM-FEMA Region 4 comms, calling SC4FEM, SC state comm manager, ALE at 1437 (MPJ-UK).

27500.0　Unid-Irish LSB freebander, working another unid in TX, at 1554 (Filippi NJ).

29752.0　Unknown-Weak FSK telemetry signal [110-Hz shift –Hugh], probably from a Datawell Waverider sea measurement buoy, at 1607 (Filippi NJ).

DIGITAL DIGEST

DIGITAL MODES ON HF

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KM3 ALE Net and Angolan Military MISSANG

This month we focus on an update to a previously-covered "mystery" ALE network and detail HF operations of the Angolan Forces.

❖ The KM3 Mystery Net Revealed

Last month I detailed a new MIL-STD-188-141 ALE-based network that appeared to be in the process of building out. This has continued to be the case since the last column was published, with new frequencies being found every few days and new identifiers joining the network. After intensively monitoring the two busiest channels, 9090 kHz and 10876 kHz USB, over a number of weeks, the origin of the network finally came to light after seeing this AMD (ALE's text message service) chat between the stations 5KM and POH:

```
[TO] 5KM [AMD] AMDCHAT [LQA][THIS IS] POH
[TO] 5KM [AMD]
BUENAS NOCHES PSE QSP CON CESYP ESTOY
    OPX ES [THIS IS] POH
[TO] POH [THIS IS] 5KM
[TO] 5KM [THIS IS] POH
```

The key in the one line of chatter is the acronym "CESYP" which has been used previously by the Colombian Navy as an ALE identifier and stands for the "Comando Especifico de San Andres y Providence," the main Colombian naval base that protects the islands of San Andres and Providencia, located off the Nicaraguan coast, in addition to being the HQ of Colombia's Caribbean naval zone.

The MIL-188-110A serial tone modem traffic has yet to yield any further details other than that the equipment is most likely from US supplier Datron. Much of the AMD chatter between stations has been about issues with the encryption being used, which somewhat surprisingly appears to be the well-known open source software "PGP" (Pretty Good Privacy). Evidently, the network is still very much in "set up" mode.

Matching the identifiers being used with locations remains a mystery, but with KM0, 1, 2, 3 and 5 being used extensively throughout the network, these probably correspond to the four other naval bases at Cartagena, Buenaventura, Tumaco and Barranquilla. Here is the latest list of IDs in use:

```
111NO, 3KM, 5KM, ACP, BET, BLP, BOP, BOZ,
BOZAS, CPL, DATAFAX, DPA, EIB, EPA,
GAM, GPM, KM0, KM1, KM2, KM3, KM5,
KN2, MPM, PDC, PFA, PMF, POD, POH,
QAQ, RADIOROOM
```

The frequency list has also now grown to:

```
4475, 5510, 5815.5, 6530 (LSB), 7750 (LSB),
7873, 8010, 8060, 8250, 9090, 9345,
10876, 11150, 11450, 12417, 13540,
14922 & 16554 kHz USB
```

Many of these channels are +/- 10kHz of previously known Colombian Navy channels not active with ALE since 1999 but more recently observed with Clover-2000, making it likely that the Datron gear is an upgrade for this network.

❖ Angolan Mission to Guinea-Bissau

Sometimes you find the most interesting things on HF. In 2010, at the summit of the CPLP (Community of Portuguese-Speaking Countries), the Angolan President committed to providing military and technical support to the tiny Western African country of Guinea-Bissau which had seen much turmoil from repeated coups, abductions of prominent politician, and a rampant illegal drug trade largely run by the Bissaun army. A force of more than 200 soldiers was sent by the FAA (Angolan Forces) to Bissau under a program named MISSANG/GB, to help train army and police forces, improve security, repair infrastructure and advise on other urgently needed tasks.

You can hear the lengthy and detailed daily status reports from Bissau to the FAA headquarters in Luanda on 20521.6 kHz (center of data) or 20520 kHz USB. The Angolans use the lesser-known FEC (Forward Error Correction) broadcast mode of the PacTOR-II modem. The reports detail the local political situation, news, weather, personnel and food supply levels and even weapons and ammunition status. It's fascinating stuff. Here is a typical example:

```
FOR}AS ARMADAS ANGOLANAS
COMANDO DA MISSAO DE COOPERA}AO
    TECNICO-MILITAR E DE SEGURAN}A AN-
    GOLANA NA GUINE-BISSAU
GABINETE DO RESPONSAVEL DA ED.PATRIOTICA
VISTO
O CHEFE DA MISSANG
INFORME
SINTESE DE PRINCIPAIS ACTIVIDADES DESEN-
    VOLVIDAS DURANTE O PERIODO DE 16
    A 23 DE DEZEMBRO DE 2011
a)-SITUA}AO DE SEGURAN}A PUBLICA

A situa}ao publica na republica da Guine-Bissau
    e tida como calma e dentro do periodo em
    referencia nao foram registados quaisquer
    ocorrencias Que. alterassem significativa-
    mente a ordem institucional, havendo con-
    tudo, registos de roubos, agressoes,posse e
    consumo de estupefacientes.
```

While not as regularly heard as the MIS-SANG/GB contingent, there are other Angolan Forces on the same channel. Codan radios are in use with the distinctive +1200Hz PTT release "pip" and their 100bd CCIR493-compatible selcal is used to summon stations in the net. The NCS (Net Control Station) appears to use "8000", with outstations "8021", "8023" and "8027" having been heard. The selcals are sent with a +1785Hz offset from the USB point.

Standard PacTOR selcals are also used and CASTELO, CASTRO, CRAVO, and RUBE have all been heard. CRAVO is the name of one of the many oil and gas fields being explored off the coast of Angola, making it likely that these are naval stations providing security for the rigs.

❖ More Congolese Police Channels

Last month I detailed the activities of the Congolese National Police who can be heard using ALE and Codan radios on a number of HF channels. Some further comparisons with the identifiers used and monitoring to confirm ALE scanning between frequencies has yielded a number of other potential channels. Here they are:

```
13449, 14670, 14692, 19548 kHz USB
```
Listen out for this interesting net.

❖ Changes at CFH Again

After a period of returning to 75bd/850 Baudot RTTY for its NAWS (Notice to Allied WarShips) messages, the Canadian Forces station CFH in Halifax, NS seems to have now settled on STANAG4285 using 75bps and long interleaving. The excellent and free decoder Sigmira (see Resources) will allow you to decode the text. It was well covered by Hugh's *Utility World* column in the August 2011 issue of *MT*. You can find CFH on 5095.2, 10943.2 and 15918.2 kHz USB on a 24 hour basis.

Oddly enough, on 20th January, CFH returned to both RTTY and Fax on 13510 kHz (center of data) and provided good copy of both modes throughout the day and early evening here.

That's all for this month; do keep your letters and emails coming with ideas for topics that you would like covered in future editions of *Digital Digest*. I'll do my best to entertain all requests!

RESOURCES

Sigmira Decoder **www.saharlow.com/technology/sigmira/**

Amateur Radio Podcasting
Broadcasting Come Full Circle

In the early days of broadcasting it took a lot of time, money and expertise to get your message out to the masses. Sure, plenty of "one-man-band" stations became local or regional media powerhouses, but to take that success nationwide required network affiliation. And unlike today, there were only a handful of networks, each with the power to make or break your ability to distribute your message on a wide scale.

Networks functioned as gatekeepers in several ways: financial, political and technological. In the early days of television, for example, only the Big Players had video cameras (about the size and weight of a refrigerator), and the ability to store and transmit video. (The first commercially successful video recorder, the Ampex VRX-1000, cost $50,000 in 1956 – equivalent to about $400,000 today.)

As technology evolved, the "nuts and bolts" of radio and TV broadcasting became smaller, more affordable and better performing. As cable and satellite TV became ubiquitous, the cost of national distribution diminished and the opportunity for such distribution increased almost exponentially. Despite these positive factors, large-scale distribution of audio and video information and entertainment products was still almost exclusively limited to medium- or large-size companies.

❖ The Evolution of Podcasting

Today's smart phones can record video of much higher quality than early commercial video systems that cost fortunes. But getting audio and video programming produced by the "average Joe" distributed to every corner of the globe required the synergistic confluence of the internet and the personal computer. For the past 10 years or so, individuals have been easily able to produce, record and distribute audio and video content on the internet, essentially for free (e.g., **www.youtube.com, www.vimeo.com, www.itunes.com, podcast.com**, etc).

The phrase used to describe this phenomenon is "podcasting," a term created by Apple evangelists back when the Apple iPod accelerated the "MP3 music craze." MP3 is a digital audio format that is usually highly compressed, allowing reasonable-fidelity speech and music data files to be small and easily distributable. It's the de facto data format for personal audio players and most "internet audio." Similar formats for digital video (mp4 and flv) make it possible to distribute high-quality video productions in much the same way ("video podcasts" or "netcasts").

In practical terms, podcasts aren't much different than broadcasts, as they are audio or video "programs," usually episodic, that are available via web sites (at least) or are distributed automatically to listeners or viewers through various internet syndication/distribution channels (the most popular being Apple's iTunes service and RSS, which stands for Really Simple Syndication).

You can watch or listen to podcasts with a PC, a tablet, a "smart TV," a cell phone or a portable digital media player. If you want to get fancy, you can "subscribe" to a podcast and each new episode will be automatically downloaded to your PC or digital music player so you can listen to your favorite audio shows on the way to work or school.

Many podcasts are produced by people like you and me – non-professionals for their own enjoyment – but more and more commercial, small business and organizational podcasts are showing up. "Podcasters" may work alone, producing and distributing their digital content, or they may work through an online community or a company that makes it easy to get started. These "content aggregators" provide support to many podcasters and make their recurring content available online (just like a network does in broadcasting terms).

❖ Coming Full Circle

And speaking of networks, podcasting, in a way, has now come full circle with the advent of "netcasting" – video podcasting with an old-school twist: a group of podcasters banding together to produce a slate of shows that are supported, produced and distributed by an internet-based commercial organization.

This newfangled "broadcast network" model uses the internet to distribute its content and needs no connection to conventional radio and TV broadcasting networks. These "netcast networks" are supported by ad revenue, but their internet origins (and freer internet thinking) makes them much more accessible to content producers.

Two of the most notable netcast networks are Revision 3 (**http://revision3.com**) and TWiT (short for This Week in Tech, **http://twit.tv**). Both trace their roots to the late-'90s cable channels ZDTV and TechTV, which ushered cable network-style coverage of computers and technology into the mainstream. There are other major and emerging netcast networks, but these two provide nearly continuous coverage of topics likely to be of interest to hams: computers, technology, internet, green energy, broadcasting and amateur radio.

A variety of no cost/low cost amateur radio podast/netcast content is available at all levels of production, from individuals with mics and webcams, to mid-level organizational material, to high-end broadcast-quality netcast productions from **twit.tv**. Although it's far from comprehensive, this month we'll take a look at some of the amateur radio content available on the internet.

The "shows" can be downloaded periodically and enjoyed via computer instead of television or radio. Most podcasts are updated weekly, some daily, and some only occasionally. To get started, point your web browser to the site that hosts the podcast you want to check out, click on the link required to listen to or download the audio or video file, and enjoy! Once you've mastered that, you can investigate having the shows automatically delivered to your PC (or your iPod) every week, or watching the shows on your internet-connected TV or game console.

❖ Ham Podcasts/Netcasts

Amateur Radio Newsline™

For more than 30 years (!!), the folks at *Amateur Radio Newsline* (*ARN*)have been producing weekly audio podcasts filled with news and information of interest to hams everywhere.

ARN is a free and independent service entirely supported by voluntary donations from hams and ham clubs. The writers and air talent are broadcast news professionals who volunteer their time: all funds go directly to defraying operating costs.

The weekly audio bulletins conform to all relevant FCC Part 97 rules regarding "bulletins of interest to all amateurs," and the production values are uniformly high. An *ARN* podcast sounds just like a mainstream radio network newscast. The only difference is, instead of being about doom, gloom and who did what to whom, all the stories are about amateur radio!

Newsline content is delivered primarily by MP3 internet audio, and new podcasts are typically available every Friday. The audio bulletins are engineered for distribution on the web and via independent VHF/UHF amateur repeaters and FM bulletin stations, but the service is also relayed with good results on HF SSB (note: *ARN* provides the audio bulletins but does not directly

transmit on any radio frequency).

ARN podcasts are top-notch, and with the apparent continued absence of *This Week in Amateur Radio (TWIAR)*, *Amateur Radio Newsline* remains a primary source for ham radio audio news. **www.arnewsline.org**

Ham Nation

Part news show, part TV variety show, part call-in show, *Ham Nation* is the first ham radio video podcast to be produced and distributed by a major netcast network, TWiT.

The weekly video/audio netcast (relatively new, with 34 episodes as I write) is hosted by Bob Heil, K9EID, with help from twit.tv founder Leo Laporte, W6TWT (a new ham with vanity call sign!), and veteran ham author and educator Gordon West, WB6NOA, plus a variety of guests.

Not only is Bob Heil, K9EID, a ham, he hosts his own amateur radio variety show, Ham Nation, on the TWiT Network (see text). (TWiT, www.twit.tv)

The show, shot and mixed in real-time, covers the excitement and importance of ham radio, from tossing an antenna wire in a tree, to the importance of ham radio operators in time of disaster, to just about everything in-between.

Bob Heil, K9EID, is owner of Heil Sound, maker of microphones, and friend of rock stars everywhere. The show's first guest was Heil's friend, rock star, and fellow ham operator Joe Walsh, WB6ACU, of "The Eagles" fame, who also wrote the theme music for the show.

Laporte, long familiar with ham radio, is a broadcast radio and TV veteran who still hosts a national radio technology talk show Saturday and Sunday afternoons on more than 170 stations on the Premiere Radio Networks, including XM Channel 166. His TWiT Netcast Network produces some of the most popular (and award-winning) podcasts in the world, including *This Week in Tech*, *Tech News Today*, *Security Now!*, *Windows Weekly*, *MacBreak Weekly*, and *This*

Leo Laporte, W6TWT, co-host of Ham Nation and founder of the TWiT Netcast Network, is a veteran broadcast journalist and a relative newcomer to ham radio – one of 300+ people the show has so far inspired to get or renew their amateur radio tickets. (TWiT, www.twit.tv)

Week in Google.

In 2008, Laporte launched a live streaming video version of TWiT called *TWiT Live* with 30 hours of original programming each week. *Ham Nation* is a *TWiT Live* show.

According to viewer feedback, Heil, Laporte and West have inspired more than 300 hams to obtain or renew their ham licenses. I have watched Laporte on various TV shows since the late '90s, and it's sort of funny to see Leo – who is an acknowledged computer and technology expert – display the same "ham newbie" awkwardness we all did when we were beginners. Of course, Leo always has veteran ops Gordo and Bob to set him straight!

Ham Nation airs live each Tuesday at 9 PM EST on **http://live.twit.tv**. The show's home (and all previous episodes) can be found at **http://twit.tv/hn**.

Soldersmoke

Soldersmoke, an amateur radio and electronics podcast from Bill Meara, M0HBR (CU2JL, N2CQR), is personal, rambling and very charming. About once a month or so, Bill discusses home-brew projects and various ham radio electronics conundrums with other home-brewing hams in the USA and Europe via the Echolink VoiP system. The shows run an hour or two and are quite interesting for build-it-your-selfers.

Meara, a diplomat by day and a ham and author by night, is well-read and well-spoken, and his podcasts make listeners

Diplomat, world traveler, author and avid ham radio home-brewer Bill Meara, M0HBR (CU2JL, N2CQR), hosts his Soldersmoke podcast at www.soldersmoke. com. (Bill's Youtube channel www.youtube.com/user/ M0HBR)

feel as though they – and they alone – are sitting in Bill's Rome apartment, sipping espresso and having a one-on-one conversation about ham radio home-brewing. *Soldersmoke*, which has a definite cult following, also spawned a book, "*Soldersmoke - Global Adventures in Wireless Electronics*," available from on-demand publisher **lulu.com**.

Currently at episode 141, all *Soldersmoke* podcasts and links to various related sites and blogs can be found at **www.soldersmoke.com.**

ARRL Audio News

Hosted by ARRL News Editor S. Khrystyne Keane, K1SFA, news and info of interest to hams everywhere (the same material finds its way into ARRL on-air bulletin broadcasts, the *ARRL Letter*, etc) can be found at **www.arrl. org/arrl-audio-news** and via iTunes.

The RAIN Report

Produced by Hap Holly, KC9RP, from his home studio/shack in suburban Chicago, the *RAIN Report* is a mostly-weekly audio show with interviews about ham radio and people in the hobby. The *Report*, all volunteer and non-

profit, is carried on various bulletin services (HF and VHF) and is available on the web at **www. rainreport.com**.

UK Radio News

News and views from the Radio Society of Great Britain (ARRL's sister society in the IARU) are available from the GB2RS podcast at **www.rsgb.org/news/gb2rsaudio.php.**

Amateur Logic.TV

With six+ years and 36 episodes in the can, the *Amateur Logic.TV* video podcast is now available in HD (and other resolutions if your net connection can't handle an 860 MB download) from **www.amateurlogic.com**.

❖ Other Podcasts/Video Blogs

With production values across the boards, there are lots of interesting audio and video tidbits of interest to hams out there in cyberspace! Check these out: *The Practical Amateur Radio Podcast* by Jerry, KD0BIK, at **www.myamateurradio.com**; the *ICQ Ham Radio Podcast* at **www.icqpodcast.com**; *HamBrief.TV* by Chris Matthieu, N7ICE, at **http://73s.com/hambriefs**; and news and information from Minnesota's Courage Center/Handiham System at **www. handiham.org/node/15**.

A Google search for "amateur radio podcasts" will keep you busy for quite a while, and if you get bored, try searching for "amateur radio" or "ham radio" at **www.youtube.com**. There's a lot of interesting audio and video out there that isn't formally packaged as podcasts. Just watching it all is an education unto itself!

❖ Notably Absent...

As with "regular" radio and TV programming, shows come and go, and some we miss more than others! My short list of "cancelled" shows includes:

This Week in Amateur Radio (TWIAR), a fun, slick, "broadcast quality" weekly audio magazine of current amateur radio happenings, tidbits, stories, propagation, DXing, product reviews, celebrities – you name it! If *Amateur Radio Newsline* is the *NBC Nightly News* of ham podcasts, TWIAR was "*Entertainment Tonight*." The show's web site, **www.twiar.org**, still exists, so maybe there's hope of an eventual return.

The online ham radio licensing classes created by John Martin, KF8KK, and Mike Dell, N7LMJ, are officially defunct. As noted on **www.hamradioclass.org**, the two founders are looking for others to carry forth and update the existing material to reflect the content of the latest question pools, etc.

The *W0KIE Satellite Radio Network*, which hosted a wide and wacky variety of ham, SWL, satellite and general variety audio shows (from tame to strange), has been off the air for several years now. The service was pioneering and one of a kind, but changes in C-band satellite transponder provisioning and precipitous declines in big-dish listeners spelled the end of an era. See **http://en.wikipedia.org/wiki/W0KIE** for the details.

A Reader's HD-Radio Experience and More

Long-time *MT* reader Donald Strumpf read my feature article "Who's Killing AM Radio (and, why isn't it dead yet)?" in the January 2012 issue about AM HD reception which mentioned the Jensen HD-5313 AM/FM/HD after-market radio. Here's his story:

"I live in a Philadelphia, Pennsylvania suburb where we have only one classical music station for the whole metropolitan area, and that is only on for a half day, this was very disappointing to me. Notice the past tense.

I drive an older Toyota Camry equipped with a factory radio which is so old that it does not have a CD player but instead has a tape player. Well, my tape player died a few months ago so I checked the price of having a local radio dealer install a replacement radio. Too pricey! Next, I searched the Internet and found Crutchfield, a long time supplier of replacement car radios (**www.crutchfield.com**).

I went to their website and was presented with several screens that showed exactly what car, model and equipment I had. They recommended a couple dozen radios that they said were an easy replacement, and ranged from under a hundred to several hundred dollars each. One was the Jensen HD 5313 ($86) which included some marvelous wire connecting devices (no crimping needed, just a twist and the wires are connected). I ordered one and it turned out to be the radio pictured in your January 2012 article.

Jensen HD 5313 AM/FM/HD car radio also features CD, Aux input for MP3 player and USB port. (Courtesy: Crutchfield.com)

When it arrived it had a lot of wires coming out of the back of the radio. Scary! So, I called Crutchfield tech support and the rep said not to worry, there's a conversion harness in with the radio. I connected the Jensen radio wires to the harness wires with the magic connectors. Color to color wire joining. Easy! Then came the next scary part: taking off a piece of the dashboard to get to the factory radio. I was scared I would crack the dashboard piece, so I called Crutchfield again and they recommended nylon pry tools from Harbor Freight. They were inexpensive ($8 plus shipping), so I bought them. I followed the excellent instructions that came with the radio and put the pry bars exactly where I was supposed to. Viola! The dashboard piece popped out smoothly.

Now that the radio was exposed, all I needed was a Phillips screwdriver and a socket wrench; the radio came out easily. I had never seen the back of a car radio before. It had a hole where the antenna wire went in and a plug with a lot of wires going under the dashboard. I pulled out the antenna wire and the plug; put the antenna wire into the Jensen and the conversion harness socket into the factory plug (with all the wires). Next, I turned on the car electrical system and turned the Jensen on. I was surprised, it worked the first time!

I screwed the radio into the dashboard and popped the dashboard piece back with no trouble at all. Now I was ready to explore the Jensen. It has a removable front to prevent theft which tilts down to get to the CD player. There is an auxiliary input which works perfectly with my little MP3 player; it also has a USB socket which works with my flash drive (it's supposed to work very well with an iPod, but I don't have one), it also accepts micro-SD memory cards. But there was more.

My classical music station, WRTI-FM 90.1 MHz, plays classical music during daylight hours and jazz at night. Now I have two HD stations, one all classical and one all jazz. They keep their formats going 24/7. Our local NPR station (WHYY-FM 90.9 MHz) also had two HD stations, their regular programming and a mix of BBC World Service programming. They occasionally play classical music as well. Then a big surprise; I found WPEN-FM 97.5 MHz, a noted sports talk station. But, much to my surprise, one of their HD channels plays classical music 24/7. By the way, the HD music comes in at near CD quality. All this for $86, my Jensen is a joy!

The only problem I had replacing the car radio was my fear of doing so. The paper instructions from Crutchfield that came with the Jensen were excellent, and the Crutchfield people are wonderful. They are located in western Virginia, stay open late, speak clear English, and, when given my order number, they knew immediately who I was, what I had ordered, and how to instruct me on whatever was bothering me at that moment. I called them many times and they were always pleasant and helpful.

The reason for my fear of doing this job was that I do not work with my hands, I'm inexperienced in this area, and I'm not a youngster (let's leave it that I get Social Security to augment my professional fees). If I can do it anyone can!"

Thanks for your very interesting story, Donald. HD-FM is finally starting to make inroads, particularly with non-commercial stations, and I think those stations are realizing that, instead of competing with themselves, they can actually attract more listeners (and more donations when it comes to fund-raising time!) by broadening their scope with HD-2 and HD-3 channels. For many of us it's an affordable alternative to expensive satellite radio fees. I'm sure that other *MT* readers will be encouraged by your experience.

❖ Monitoring the International Space Station

I try to make it a habit to check out the upcoming International Space Station school contact schedule (**http://ariss.rac.ca/upcoming.htm**) which lets me know when the contacts will be, with which school and whether or not I'll be able to listen in. Also on that page is a list of the questions the students have prepared to ask. This helps move things along quickly once the spacecraft comes into range; they typically have only 10 minutes in a pass. To monitor the 145.800 MHz FM frequency I use a 2 meter mobile rig attached to a one-quarter wave scanner antenna.

Last fall I was able to listen as the ISS contacted a French-speaking high school in Quebec. The students were practicing their English and learning about space travel. Of course, I could only hear the ISS reply to the questions. Here's some of what I heard:

How do you take showers? "We just dream of taking showers up here because the problem is that the water doesn't know how to find the drain. Basically, we just take a sponge bath; put some soapy water on a sponge cloth or a towel and bathing that way."

The astronaut also explained that one of the hardest things to get used to when returning to Earth is using muscles, particularly leg and back muscles, that on Earth have to support our full weight and function as we lift things, which in space are simply not needed for support. Leg and back aches are big problems on return, according to the astronaut.

What about the food? "The meals are really good, although, it gets a little tiring; there's not that much of a selection. Most of the food is in pouches so you just heat it up and eat it, it's not that bad."

Adapting to space? "It takes really a month or more to get comfortable in space."

What does the ISS smell like? "I remember distinctly the first time I opened the hatch to

come on board the space station five and a half years ago from the Space Shuttle. It smells like a combination of a locker room and exotic foods."

What about water? "Water weighs a lot and you can't dehydrate water. We reuse all of our waste water including our sweat. It's all dumped into a cleaner and it's recycled. For the last year or so we've also been recycling a large amount of the water from urine waste. It takes a little trust and confidence in the technology, but it works very well. And, that's important because if we want to go to Mars someday we're going to need to be able to recycle almost all of our water because it is so heavy and we need a lot to stay healthy."

Zero gravity? "It makes you less physically tired, but I think more mentally tired."

Give ISS monitoring a try and, if you can, listen with a youngster, they'll be amazed.

❖ Pirate Radio Yesterday and Today

This past December saw a lot of shortwave pirate radio activity on 6925 kHz. One that I caught was Pirate Radio Boston which had an excellent signal into central Virginia. During that time I also heard WPON (motto: "Don't get mad, get a weapon!") which aired some very humorous anti-banking music including Ry Cooder's "No Banker Left Behind." WHYP was also heard here during that period.

Several years ago there was a movie that attempted to portray the 1960s British pirate radio scene called "The Boat that Rocked" (and re-titled for U.S. audiences as "Pirate Radio"). A better portrayal of the period was actually produced at the time that off-shore British pirate radio was current; an episode in the *Secret Agent* TV series (known in the U.K. as *Danger Man*). The show starred Patrick McGoohan as John Drake, a secret agent ala James Bond.

In the episode titled, "The Not- So-Jolly Roger," Drake was assigned as a replacement DJ on the fictitious pirate radio station, called Radio

Radio Jolly Roger (actually Radio 390) from the 1966 Secret Agent/Danger Man TV series. (Courtesy: Author)

Jolly Roger, with studios and transmitter atop a disused World War II anti-aircraft installation somewhere off the coast of southern England. In the story, it seems the British government was less interested in unlicensed AM broadcasters than catching spies working at the station who were secretly contacting enemy subs lurking nearby (via CW numbers groups no less!).

Well, the story may have been fiction but what was real in this black and white production, which was broadcast in the U.S. April 1966, was the location: an actual pirate radio station known as Radio 390, according to the credits at the end of the episode. Several exterior shots show the 297 foot tower on the center structure with guy wire sets going to other nearby structures.

Other fun and authentic bits in the episode include a left-handed CW operator sending on a semi-automatic bug from a booklet showing 5 number/letters groups. With the Blue Danube Waltz playing in the background along with ambient noise, and sound from a kit oscilloscope that Drake made from parts concealed in his shaving kit, it's tough copy. But, clearly heard is "G HQ G HQ" followed by random numbers and letters. Another interesting bit is that the woman playing the female DJ had a UK hit with the song announced by Drake at the end of the
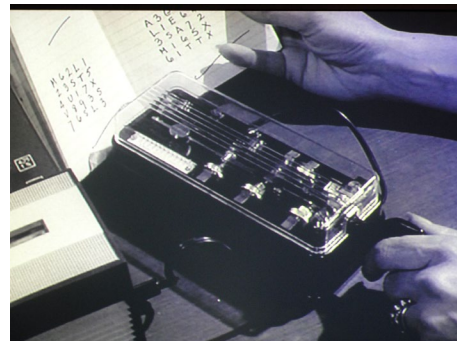
Left-handed CW op sends 5 letter/number groups via a secret transmitter aboard Radio Jolly Roger, from the 1966 Secret Agent episode, "The Not-So-Jolly Roger." (Courtesy: Author)

show giving her real name.

While Radio Jolly Roger was portrayed as mostly a folk/rocker, Radio 390's format was, of all things, easy listening. That probably explains the well-used Ferrante and Teicher album propped up by the turntables in one scene. Radio 390 only lasted from 1965 to 1967 so this episode was probably filmed at the time the station had just started up.

Radio 390 was shut down in 1967 by British authorities who noted that, while the installation was outside the three-mile limit of English coastline, it was near a series of sand bars which were exposed during low tide, thus making the station actually inside claimed English territory. Episodes of Secret Agent/Danger Man are widely available on Amazon.com; this episode is from Volume 13, Set 6 of the series.

Pirate Radio Boston QSL card from last year's Christmas weekend pirate radio extravaganza, signed by Charlie Loudenboomen and claims a 7 watt output in AM. (Courtesy: Author)

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

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

Quick Trip around Eastern Europe

In January of 2012, Radio Bulgaria joined the list of international broadcasters who have abandoned shortwave in favor of the Internet. This month, we will shine the *Programming Spotlight* on the countries of Eastern Europe, and then look at a long-standing radio program which has recently celebrated a milestone.

With Bulgaria now gone from shortwave, the list of international broadcasters on the shortwave bands from the region is considerably smaller. But they are still there if you look. These days one is more likely to hear programming from Eastern Europe via the Internet. This is not necessarily a bad thing, just different.

❖ Albania

Albania was once a powerhouse belying its tiny size and influence. After falling out with both Moscow and later China (which supplied it with powerful shortwave transmitters), it took an independent path, proclaiming itself the one true Marxist and atheist state. During the Cold War the programming and political hyperbole were quite amusing at times.

After the downfall of the regime around 1991, **Radio Tirana** became a shadow of its former self and lost a lot of the propaganda. The former "atheist state" devoted some of those transmitters to Christian broadcasting (!) leasing time to religious broadcasters. It can still be heard; try 7420 kHz around 0230 UTC, one hour earlier after DST kicks in).

❖ Bulgaria

Radio Bulgaria left the shortwaves on Jan 31 of this year. However, one can continue

to listen to RB programs via the Internet. I've always been fond of **Radio Bulgaria** or **Radio Sofia, Bulgaria** as it was known during the Cold War. There was nothing particularly special about the programming in the "bad old days," but it was the first shortwave radio station I ever heard, back in 1978. Todor Zhivkov was the Party Boss back then, and Bulgarian radio treated us to endless reports about his accomplishments, and production figures and so forth. Still, there was some great music and other features.

Nowadays, one must listen online. As of this writing, all of the usual features one could hear on shortwave are still available online. Whereas Bulgaria was perhaps the closest ally of the Soviet Union in the 1970s and 1980s, today it is a member of NATO. The Reagan Administration considered Bulgaria a pariah, yet a recent report on **Radio Bulgaria** covered Hillary Clinton's visit to Sofia, where she described Bulgaria as a "model state"!

Particularly enjoyable are the music segments and the history programs. Listen to the same full one hour programs one could hear on shortwave (archived for over a week), or pick and choose stories from the various programming segments, such as music, history, culture and sport, news and life. These programs include some real gems if one pokes around, providing information about Bulgaria and events in the Balkans that routinely go unreported here. Go to **http://bnr.bg/sites/en/Pages/default.aspx** and explore!

❖ Czechoslovakia

Radio Prague was another powerhouse, Cold War broadcaster. In the 1970s and 1980s, Radio Prague would broadcast several one-hour programs each day. Like their neighbors, the programming was often dull and occasionally heavy handed. But this was balanced by some amazingly good cultural programming. The Czech and Slovak music was often beautiful. A regular feature was a program which encouraged listeners to tape record that days featured song, including a countdown to the start of the song so one could press record at just the right moment!

Communism fell in 1989 and dissident Vaclav Havel became President. Shortly thereafter, the country split into its two constituent nations, one for the Czechs and one for the Slovaks.

In recent times both **Radio Prague** and **Radio Slovakia International** have

ceased broadcasting via shortwave from within the countries and continue online. Both countries broadcast via **WRMI** online and on shortwave 9955 kHz. All the programs and features that were popular in the past continue online. The **Radio Prague** website **www.radio.cz/en** is, in my opinion, one of the better ones around. It is well organized and offers easy to find links to all the programs of **Czech Radio**, and links to other languages as well. A particularly interesting program is *Screen Czech*, which seems to be relatively new. As the name implies, the program looks at the film industry in the Czech Republic, the people who make the films, the good, the bad and the ugly of Czech Cinema. It is a great program for film fans and well worth bookmarking.

Slovak Radio also continues online at **www.rozhlas.sk/radio-international-en** Here you can follow the links to the various news and feature programs.

❖ Hungary

In many ways, Hungary started the exodus from shortwave a few years ago. Back in the 1970s, **Radio Budapest** sponsored the Radio Budapest Shortwave Club, something I joined in 1978 or 1979. It used to offer a pen pal service. I put my name in and made pen pals from all over the world, from Europe, Asia and South America. In one of those historical ironies, just about the time I would have become a Life Member of the club (20 years in good standing), it folded! Oh well. The last English broadcast from **Radio Budapest** took place in 2007. Today, one can listen to the various domestic networks of Hungarian Radio in Hungarian by going to **www.radio.hu/**

❖ Poland

In either the Cold War era or the present, **Radio Polonia** (as it was) or **Polish Radio External Service** (as it is now) has been a tricky catch on shortwave. It has always been plagued by weak transmitters and heavy interference. However, it was not impossible to hear. **Radio Polonia** was always well worth trying for.

In the 1970s, it was a typical Soviet satellite echoing the party line from Moscow. After the fall of Communism in 1989, it became quite an enjoyable station. I would log it occasionally on shortwave or listen to it via the **CBC Overnight** block of programming, during my night owl days. Later, I became a regular listener via the **World Radio Network (WRN)**. While there

is a shortwave broadcast at 1800 UTC on 3955 kHz, reception of that in North America is pretty improbable.

One can listen to all the news and features from **PRES** by going to their website **www.thenews.pl/1/6,Radio.** Some programs, like *The Chart Show* are very old, having originally aired between 2007 and 2009. By the same token, lots of the material is brand new. Poland is a happening country and this year is the co-host of the European Football Championships. *Day in the Life* is also an interesting program highlighting a different Polish personality each week. Recent shows have featured athletes, architects and theologians. **PRES**, like many of the stations in this survey, does a lot with a small budget.

❖ Romania

Radio Romania International is one nation (touch wood) which continues on shortwave, as well as online. Listen to **RRI** daily at 0100 UTC on 7355 kHz or via **www.rri.ro.** The programming of **RRI** is vastly different from the **Radio Bucharest** programming of the Ceausescu era. Ponderous political discussions dominated in those days, although at the same time Romania was seen as something of a maverick nation, not necessarily toeing the Moscow party line.

Then, of course, the events of November 1989 transpired as Ceausescu and his wife were toppled in the bloodiest and last revolt against Communism in Eastern Europe.

The programming of today's **RRI** could not be more different than that of the pre-1989 era. Formerly taboo topics like the pre-Communist regime, Romania's wartime alliance with Germany and the crimes of the Communist era are openly discussed. Like Bulgaria, Romania is allied with the West on many issues. Rather than a diatribe against the evils of capitalism, one will more likely hear programming espousing the investment potential of the country.

❖ Overview

Eastern Europe has changed dramatically over the past quarter century. Once a dreary broadcasting landscape dotted with occasional bouquets of endearing cultural programs, it is now a vibrant watercolor of ideas, music, and culture.

❖ What's New

Germany's New Online Presence – As **Radio Bulgaria** was leaving the shortwaves, on February 6, **Deutsche Welle** revamped its online presence. At first glance it is an improvement over the sometimes confusing old **DW** website. A new logo for all **DW** programming TV, Radio

© DW

and Internet was also unveiled. Check it out at **www.dw.de**

Polski Fusion – This is a new food related program from **Polish Radio External Service**. It seems to have begun just at the end of 2011 and topics have included the traditional Polish Christmas Dinner, Polish food and the Polish presidency of the EU and Polish fruit and produce. Listen to the current, and archived shows at **www.thenews.pl/1/3/Tematy/100275** Listening to this show will tell you everything you wanted to know about food in Poland and the Polish diet; be sure to bring a healthy appetite to the table!

❖ What's Not So New

Desert Island Discs – On January 29, the BBC 4 program *Desert Island Discs* celebrated its 70th anniversary! The program debuted on that date in 1942. In honor of this occasion, **Radio 4**'s program *Archive on 4* devoted an hour to the history of this long standing, popular program. **Radio 4** also aired a program celebrating the very first "castaway" on the program, Vienna-born entertainer Vic Oliver.

The concept is a simple one. Guests describe the eight pieces of music, a book and one luxury item that they would take with them on a trip to an imaginary desert island. It is a surprisingly interesting exercise, and the choices of the guests often reveal a lot about them, and lead to fascinating insights. *Desert Island Discs* is heard on **BBC Radio 4** on Fridays. There is an archive page on which you can search through every episode of the program since its inception. Go to **www.bbc.co.uk/programmes/b006qnmr** and start charting the hippest deserted island in the world!

❖ *Programming Spotlight Time Machine*

Did you ever wish that you could travel back in time and experience events in other eras? We all dream about this at one time or another. In this Internet age, we *can* go back in time through the many archive sites that have sprung up on the World Wide Web. This month we set the dial on the time machine to 1954, and our destination is the old **Canadian Broadcasting Corporation** building on Jarvis Street in Toronto.

Inside one of the studios is a man who would become a legend in Canadian broadcasting. His name was **Allan McFee**. I only heard **McFee** at the end of his long career in the late eighties. He had started at the **CBC** in 1937 and except for 3 years in the military during World War II, he would work at the **CBC** until he retired in 1991. McFee was the consummate broadcaster with a deep, sonorous voice. He was also mischievous, funny and at times a little crazy. His battles with **CBC** management were legendary.

"A particular joy for **McFee** was introducing an afternoon soap opera called *Terry and the Pirates* that was fed in from New York. The program would open with a street scene evoked by the sounds of rickshaws and gongs and a multitude of Chinese voices. **McFee**'s job was to announce *Terry and the Pirates*, and then the recorded sounds would play for half a minute or

so. Amid the cacophony, however, **McFee** would open his mike, adopt a sing-song accent, and castigate his bosses, saying 'Old crazy knucklehead Ernie Bushnell, he one stupid man. Velly dumb, velly useless. He not earn his money. Oh Charlie Jennings, he sit on big fat bum all day. Big dumb Charlie Jennings,' and on he would rant, adding in the names of all his bosses and rivals. His comments were mixed in with the street noises and could be understood only by particularly sharp-eared listeners. On one occasion as **McFee** was spouting his Chinese-accented invective, the broadcast line from New York failed. **McFee** did not find out until later that only his voice was going out over the air." (Knowlton Nash in *Cue the Elephant, Backstage Tales at the CBC,* McLelland and Stewart 1996)

From 1972-1985, **McFee** hosted a late night program Monday to Friday called *Eclectic Circus* ("with your delightful host, Me, **Allan McFee**"), which became a weekly program after that, until he retired. "In the show, **McFee** would converse with an imaginary mouse, a 'small grey presence' which lived in his pocket, and play an eclectic array of obscure musical selections. Referring to himself as 'the old musicologist,' he would address his audience as 'all those out there in vacuumland'" (Wikipedia).

I looked for an edition of *Eclectic Circus* but came up short. However the **CBC** online archive does have a recording of **McFee** hosting *Program for Shut-ins*, which ran from 1949-1957. In 1954, there were 17,000 tuberculosis patients being treated in "sanitariums" across the country. **McFee** would play music requested by and for people in such hospitals. (The "San" here in St. Catharines continues to operate as the Hotel Dieu/Shaver Hospital, specializing in rehab.)

Courtesy of the **CBC** Archive site, there is a 1954 edition of **Allan McFee's** *Program for Shut-ins*. Give it a listen and see if you don't agree that he was one heck of a broadcaster. I think his life would make a fascinating book! **http://archives.cbc.ca/programs/820/**

❖ A Titanic Event

Can it possibly be one hundred years since the (until then) most dramatic use of radio in history? In April of 1912, the brave wireless operators of RMS *Titanic*, Jack Phillips and Harold Bride flashed the news of the collision with an iceberg and their subsequently perilous position to all ships at sea in the Atlantic. Philips remained at his post until the water was entering the radio room. He and Bride made it off the ship; however, Phillips succumbed to hypothermia before they were rescued by the *Carpathia*. Bride lived, dying in 1956. But their sense of duty and selflessness no doubt helped to save the 700 or so souls who survived the tragedy.

Around the 14th of this month, look for programming to commemorate the centenary of this awful tragedy. For instance, **BBC 4 Extra** will probably air its 10-part series based on Walter Lord's book "*A Night to Remember*" **www.bbc.co.uk/radio4extra** Also, give the **BBC Northern Ireland** feed a listen. *Titanic* was built in Belfast and began her fateful voyage there. **www.bbc.co.uk/northernireland/**

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com
http://mt-shortwave.blogspot.com
Twitter @QSLRptMT

Staying up to date a major key to QSLing

Every QSL collector has their own method of achieving the ultimate goal – nabbing a station verification. Generally, I recommend addressing postal or email station correspondence to a veri-signer, that being the individual that has been reported in the hobby press as confirming their station by signing the QSL card or replying to an electronic email with a E-QSL.

A veri-signer, or a QSL Manager, is the individual that checks your reception report and verifies it based on your program details. Despite our best intentions, staff personnel can change frequently as well as a station's QSL policy. Addressing a letter or reception report to a now absent person may be discarded, and that could mean a follow-up report is in your future. Unfortunately, that will require an extra postal expense or additional email correspondence. Consider your decision on using a veri-signer, based on your station research.

Staying up to date on station contacts and personnel is one of the most important aspects of QSLing. Like veri-signers, email and postal addresses can change frequently.

This month, *QSL Report* brings you the latest verification signers, postal and email addresses from stations actively QSLing, current as of editorial deadline.

One classy touch in the QSL game is thanking the station after the QSL has been received. To keep costs down, consider a tourist postcard or email. Either may lead to future correspondence, or an invitation to visit the station.

VERIFICATION

We are pleased to verify your reception of World Harvest Radio:

Date January 16 1994
Time 0001 – 0025 UTC
Freq 17.555 KHZ

Thank you for your report.

Loren Holycross
KWHR Engineering

STUDIO
P.O. Box 12
South Bend, IN
46624 U.S.A.

TRANSMITTER:
Naalehu, Hawaii
U.S.A.

Albania
Radio Tirana. Mrs Drita Cico, Head of Monitoring Center *dcico@abcomal.com*

Argentina
LRA1 Radio. Nacional P.O. Box 555, 1000 Buenos Aires, Argentina

Australia
Radio Symban. John Wright, ARDXC *dxer1234@gmail.com*

Belarus
Belarus Radio. Larisa Suarez Maria del Aguila, Secretary of the Spanish Service, 2220807 Minsk, 4 Krasnaya St., Minsk, Belarus *radiostation-belarus@tvr.by*

Benin
Radiodiffusion du Burkina. Mr. Pascal Goba, Chef des Programmes, *nadow02002@yahoo.fr*

Brazil
Radio Clube do Para. Camilo Centeno, Diretor Geral. Avenida Almirante Barroso 2190, CEPO 66095-000 Barrio Marco, Belem, Para, Brasil
Radio 9 de Julho. Pe Renato Ferriera, Diretor de Programacão. Radio Senado, *radio@senado.gov.br* (or) *ondacurtas@senado.gov.br*
Standard Time/Frequency Station-Observatorio Nacional. Rio Janeiro. Ricardo Carvalho, Gerente *carvalho@on.br*
Super Rede Boa Vontade. Alziro de Paiva, Marketing FJPN, Fundacao de Jose Paiva Netto, Rua Doraci 90, Bom Retiro CEP 01134-050 Sao Paulo, SP, Brasil
Radio Trans Mundial. Rudolph Grimm, P.O. Box 18.113, 04626-970 São Paulo, SP Brazil *rtm@transmundial.com.br*

Canada
VCK Canadian Coast Guard. Riveiere-au-Renard Quebec. Alain Poirier, Officer in Charge
XMJ329 Canadian Coast Guard. Frank Dwyer, Officer in Charge

Clandestine
Cotton Tree News Radio via Ascension Island. Fourah Bay College, Mont Aureol, P.O. Box 766, Freetown, Sierra Leone
Radio Dardasha 7 via Wertachtal, Germany. P.O. Box 991, Larnaca, Cyprus
Radio Y'Abaganda via TDF. Alex K. Kigonagu, Administration Team

Colombia
Marfil Estereo. Rafael Rodriguez, QSL Manager *rafaeldx@yahoo.com*
Radio Alcarav. R. Rodriquez

Croatia
HRT via Deanovec. J. Romer, Assistant Program Director
Voice of Croatia. *milton.arandia.antezana@hrt.hr*

Cuba
Radio Rebelde. Osana Osorio, Writer Secretary. Apartado 6277, La Habana 10600 (or) Edif Del ICRT, Av23 No 258, Vedado, La Habana 10400 Cuba *radiorebelde.icrt.cu*

France
AWR Europe via Issoudun, France relay. Adrian M. Peterson, DX Editor, P.O. Box 29235, Indianapolis, IN 46229 USA.
IBRA Radio via Issoudun, France relay. *info@ibra.se* IBRA Media, SE-141 99 Stockholm, Sweden (or) Regulator-vagen 11, SE-141 49 Huddinge, Sween
Radio Netherlands via Issoudun, France relay. Jaime Baguena *cartas@rnw.nl*

Gabon
Africa Number One via Moyabi, Gabon. Guy Kalenda Mutelwa, Coordinateur d' *antenneguykalenda@africa1.com*. Boite Postal 1, Libreville, Gabon. QSLs also received from: Africa Media S.A., 33 rue Faubourg St-Antoine, 75011 Paris, France

Germany
HCJB via Wertachtal, Germany. Renate Schwarz
Radio Free Europe/Radio Liberty via Wertachtal, Germany *kazbundovak@rferl.org*
Traumland Radio. Postfach 15, B-4730 Raeren, Belgium

Guatemala
Radio Verdad. Edgar Amilcar Madrid, Apartado 5, Chiquimula, Guatemala *radioverdad5@yahoo.com*

Honduras
Radio Luz y Vida. Adonay Jose Sanchez *joseado76@yahoo.es*

India
All India Radio via Bengaluru. T. Jaisakthivel, Assistant Professor, Department of Communications, MS University, Tirunelveil, 627012, India
All India Radio via Bhopal *bhopal@air.org.in*
All India Radio via Khampur. Prem Singh, Assistant Station Engineer. Delhi.*khampur@air.org*

Italy
Standard Time/Frequency Station-IBF Torino. *qsl@radiomaria.org*

Mexico
Radio Educacion. Ramses Marquez G., Subdirector de Desarrolo Tecnico   *rmarquez@radioeducacion.edu.mx*

Moldova
Voice of Russia via Kishinev-Grigoriopol *world@ruvr.ru*

Peru
Radio JPJ Lima. Manzana D, Lote Numero 9, Asociacion Vivienda Monte Los Olivos, Distrito de San Martin de Lima, Los Porres de Lima, Peru

Russia
TWR India via Samara, Russia. Daniel Devadoss *ddevadoss@in.twrsa.org*
Voice of Russia via Krasnodar *world@ruvr.ru*
Voice of Russia via Saint Petersburg Regional Center. Mikhail Timofeyev.
Voice of Tatarstan. Ildus Ibatullin, Tatarstan Wave, Ulitza Gorkoga 15, kazan, Tartarstan, Russia 420015

Sao Tome
Voice of America relay via Pinheira, Sao Tome. Helena Menezes, Secretary to Station Manager. *hmenezes@sto.ibb.gov*

Singapore
Radio Australia via Singapore relay. Roger Broadbent *broadbent.roger@abc.net*

Solomon Islands
SLBC, P.O. Box 654, Honiara, Solomon Islands

Somaliland
Radio Hargheisa. Mr. Baldur Drobnica. Zedernweg 6, DE-50127 Bergheim, Germany.   Include Konsularische Vertretung of the Republic of Somaliland in the address.

South Africa
IBRA Radio via Meyerton relay *info@ibra.se*. IBRA Meyerton, SE-141 99 Stockholm, Sweden

Sri Lanka
Radio Netherlands via Trincomalee, Sri Lanka relay. P.O. Box 222, NL-1200 JG Hilversum, Netherlands

Swaziland
TWR Africa via Manzini, Swaziland. Mrs Lorraine Stavropoulos, DX Secretary for Africa *lstavrop@twr.org*

Switzerland
HEB Bern Radio. Michael Zesigner *michael.zesiger@swisscom.com* (or) *info.broadcasting@swisscim.com*

Taiwan
WYFR/Family Radio Worldwide via Bao-Zhong (Yun-lin), Taiwan *inti@familyradio.com*

United Arab Emirates
Deutsche Welle via Dhabbaya. Horst Scholz, Transmission Management, Deutsche Welle, DE-53110, Bonn, Germany
Radio Netherlands Worldwide via Dhabbaya. PB 222, NL-1200 JG Hilversum, Netherlands

United Kingdom
Eglise du Christ via Skelton, UK. Jean Grenier *egliseduchrist@video.ca*
Polskie Radio via Skelton, UK. Michael Puetz, Medienservice, Seestrasse 17, DE-19089 Goehren, Germany

United States
BBG/Radio Free Afghanistan via Kuwait. *kazbundovak@rferl.org*
Radio Marti. Margarita Ray de Arenas, Secretary
WTWW. George McClintock, 1784 West Northfield, Murfreesboro, TN 37129 *DMcclin802@aol.com*

Uzbekistan
Radio Prague via Yangi Yul, Uzbekistan. *cr@radio.cz*
Voice of Asia via Tashkent, Uzbekistan. Timotheus Bahl *gracewithin.tim@gmail*

Venezuela
RNV Canal Internacional Venezuela, Freddy R.Santos, Asistente de Produccion Canal International. *canalinternacionalrnv@gmail.com*

Zambia
CVC One Africa via Lusaka, Zambia. *1@forun.cvc.tv* P.O. Box 3933, Tygervalley 7536, South Africa

HOW TO USE THE SHORTWAVE GUIDE

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0000-0100 twhfa    USA, Voice of America    5995am  6130ca  7405am  9455af
   ①      ② ⑤       ③        ④                    ⑥ ⑦
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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 broadcast⑤ 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 PROMISING FREQUENCIES

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.

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

SHORTWAVE GUIDE

0000 UTC - 7PM EST / 6PM CST / 4PM PST

0000	0030	Egypt, R Cairo 6270na		
0000	0030	USA, BBG/Voice of America 7560as		
0000	0045	India, All India R/External Svc	6055as	
		7305as	11645as	13605as
0000	0045	USA, WYFR/Family R Worldwide	11720ca	
0000	0057	China, China R International	6005as	
		6020na	6180as	7350eu 7425as
		9425as	9570as	11650as 11790as
		11885as		
0000	0059	Canada, R Canada International	9880as	
0000	0100	Anguilla/Caribbean Beacon/Univ Network		
		6090na		
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, R Australia	9660pa	12080pa
		13690va	15240va	17715va 17750va
		17795va		
0000	0100	Bahrain, R Bahrain	6010me	
0000	0100	Canada, CFRX Toronto ON 6070na		
0000	0100	Canada, CFVP Calgary AB 6030na		
0000	0100	Canada, CKZN St Johns NF 6160na		
0000	0100	Canada, CKZU Vancouver BC	6160na	
0000	0100	Cuba, R Havana Cuba	5040ca	
0000	0100	Malaysia, RTM Kajang/Traxx FM	7295do	
0000	0100	Micronesia, V6MP/Cross R/Pohnpei	4755 as	
0000	0100	New Zealand, R New Zealand Intl	15720pa	
0000	0100 DRM	New Zealand, R New Zealand Intl	17675pa	
0000	0100	Russia, Voice of Russia	7250va	
0000	0100	Spain, R Exterior de Espana 6055va		
0000	0100	Thailand, R Thailand World Svc	13745na	
0000	0100	UK, BBC World Service	6195as	9410as
		9740as	12095as	13725as 15755as
0000	0100	USA, Amer Forces Network/AFRTS	4319usb	
		5446usb	5765usb	7812usb 12133usb
		12759usb	13362usb	
0000	0100	USA, EWTN/WEWN Irondale AL	11520me	
0000	0100	USA, FBN/WTJC Newport NC	9370na	
0000	0100 sm	USA, WBCQ Monticello ME 5110am		
0000	0100	USA, WBCQ Monticello ME 9330am		
0000	0100 mtwhfa	USA, WBCQ Monticello ME 7490am		
0000	0100 sm	USA, WHRI Cypress Creek SC	7385ca	
0000	0100	USA, WINB Red Lion PA	9265ca	
0000	0100	USA, WTWW Lebanon TN	5080am	5755am
		12105na		
0000	0100	USA, WWCR Nashville TN	3195eu	5070af
		9980af	13845eu	
0000	0100	USA, WWRB Manchester TN 3185na		3215na
		5050na	5745va	
0000	0100	USA, WYFR/Family R Worldwide	6115va	
		6155ca	7360sa	7395sa
0000	0100	Zambia, CVC/R Christian Voice	4965af	
0030	0100	Australia, R Australia	15415va	
0030	0100 fsa	Canada, Bible Voice Broadcasting	7395as	
0030	0100 Sun	Palau, T8WH/WHRI	15700na	
0030	0100	UK, BBC World Service	9510as	
0030	0100	USA, BBG/Voice of America 6170va		9325va
		9490va	9715va	11695va 11730va
		15185va	15205va	15290va
0030	0100	USA, BBG/Voice of America/Special English		
		6170va	9325va	9490va 9715va
		11695va	11730va	12005va 15185va
		15205va	15290va	
0035	0045	India, All India R/Aizawl	5050do	
0035	0045	India, All India R/Chennai 4920do		
0035	0045	India, All India R/Guwahati 4940do		
0035	0045	India, All India R/Hyderbad 4800do		
0035	0045	India, All India R/Imphal	4775do	
0035	0045	India, All India R/Port Blair	4760do	
0035	0045	India, All India R/Shillong	4970do	
0035	0045	India, All India R/Shimla	4965do	
0035	0045	India, All India R/Thiruvananthapuram 5010do		

0100 UTC - 8PM EST/ 7PM CST / 5PM PST

0100	0115 Sat	Canada, Bible Voice Broadcasting	7395as	
0100	0130	Vietnam, VO Vietnam/Overseas Svc	6175na	
0100	0156	Romania, R Romania Intl	6145na	7355na

0100	0157	China, China R International	6005na	
		6020na	6075as	6175as 7350eu
		9410eu	9420as	9570na 9580na
		11650as	11885as	
0100	0200	Anguilla/Caribbean Beacon/Univ Network		
		6090na		
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, R Australia	9660pa	12080va
		13690va	15240va	15415va 17715va
		17750va	17795va	
0100	0200	Bahrain, R Bahrain	6010me	
0100	0200	Canada, CFRX Toronto ON 6070na		
0100	0200	Canada, CFVP Calgary AB 6030na		
0100	0200	Canada, CKZN St Johns NF 6160na		
0100	0200	Canada, CKZU Vancouver BC	6160na	
0100	0200	Cuba, R Havana Cuba	6000na	6050na
0100	0200	Malaysia, RTM Kajang/Traxx FM	7295do	
0100	0200	Micronesia, V6MP/Cross R/Pohnpei	4755 as	
0100	0200	New Zealand, R New Zealand Intl	15720pa	
0100	0200 DRM	New Zealand, R New Zealand Intl	17675pa	
0100	0200	North Korea, Voice of Korea	4405as	
		7220as	9345as	9730as 11735as
		13760as	15180as	
0100	0200	Russia, Voice of Russia	7250va	
0100	0200	Taiwan, R Taiwan Intl	11875as	
0100	0200	UK, BBC World Service	5940as	5970as
		9740as	11750as	12095as 15310as
		15335as	15755as	17685as
0100	0200	USA, Amer Forces Network/AFRTS	4319usb	
		5446usb	5765usb	7812usb 12133usb
		12759usb	13362usb	
0100	0200	USA, BBG/Voice of America 9435as		11705pa
0100	0200	USA, EWTN/WEWN Irondale AL	11520me	
0100	0200	USA, FBN/WTJC Newport NC	9370na	
0100	0200 mtwhfa	USA, WBCQ Monticello ME 7490am		
0100	0200	USA, WBCQ Monticello ME 9330am		
0100	0200 twhfa	USA, WHRI Cypress Creek SC	5920na	
0100	0200	USA, WINB Red Lion PA	9265ca	
0100	0200	USA, WTWW Lebanon TN	5080am	5755am
		12105na		
0100	0200	USA, WWCR Nashville TN	3195eu	4840na
		5935af	9980af	
0100	0200	USA, WWRB Manchester TN 3185na		3215na
		5050na	5745va	
0100	0200	USA, WYFR/Family R Worldwide	6115ca	
0100	0200	Zambia, CVC/R Christian Voice	4965af	
0120	0200 mtwhfa	Sri Lanka, SLBC 6005as	9770as	15745as
0130	0200	Iran, IRIB/VOIRI 7230eu	7365eu	
0130	0200 Sun	Palau, T8WH/WHRI	15700as	
0130	0200 twhfa	Serbia, International R Serbia	6190va	
0130	0200 twhfa	USA, BBG/Voice of America/Special English		
		5960va	7465va	
0130	0200 twhfa	USA, WRMI/R Slovakia Intl relay	9955am	
0140	0200	Vatican City State, Vatican R 5890as		7410as

0200 UTC - 9PM EST / 8PM CST / 6PM PST

0200	0227	Iran, IRIB/VOIRI 7230eu	7365eu	
0200	0230	Thailand, R Thailand World Svc	15275na	
0200	0257	China, China R International	11785as	
		13640as		
0200	0300	Anguilla/Caribbean Beacon/Univ Network		
		6090na		
0200	0300 twhfa	Argentina, RAE 11710am		
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, R Australia	9660pa	12080va
		13690va	15240va	15415va 15515pa
		17750va	21725as	
0200	0300	Bahrain, R Bahrain	6010me	
0200	0300	Canada, CFRX Toronto ON 6070na		
0200	0300	Canada, CFVP Calgary AB 6030na		
0200	0300	Canada, CKZN St Johns NF 6160na		
0200	0300	Canada, CKZU Vancouver BC	6160na	
0200	0300	Cuba, R Havana Cuba	6000na	6050na
0200	0300	Egypt, R Cairo 9315na		
0200	0300	Malaysia, RTM Kajang/Traxx FM	7295do	
0200	0300	Micronesia, V6MP/Cross R/Pohnpei	4755 as	
0200	0300	New Zealand, R New Zealand Intl	15720pa	
0200	0300 DRM	New Zealand, R New Zealand Intl	17675pa	

0200	0300	North Korea, Voice of Korea	3560as	
		13650as	15100as	
0200	0300 Sun	Palau, T8WH/WHRI	17800as	
0200	0300	Philippines, R Pilipinas Overseas	11880me	
		15285me	17700me	
0200	0300	Russia, Voice of Russia	7250sa	
0200	0300	South Korea, KBS World R	9580sa	
0200	0300 mtwhfa	Sri Lanka, SLBC 6005as	9770as	15745as
0200	0300	Taiwan, R Taiwan Intl	5950as	9680na
0200	0300	UK, BBC World Service	5875me	5940as
		7385af	12095as	15310as
0200	0300	USA, Amer Forces Network/AFRTS	4319usb	
		5446usb	5765usb 7812usb	12133usb
		12759usb	13362usb	
0200	0300	USA, EWTN/WEWN Irondale AL	11520me	
0200	0300	USA, FBN/WTJC Newport NC	9370na	
0200	0300 mtwhfa	USA, WBCQ Monticello ME 7490am		
0200	0300	USA, WBCQ Monticello ME 9330am		
0200	0300 twhfa	USA, WHRI Cypress Creek SC	5920na	
		7385na		
0200	0300	USA, WINB Red Lion PA 9265ca		
0200	0300	USA, WTWW Lebanon TN 5080am	5755am	
		12105na		
0200	0300	USA, WWCR Nashville TN 3215eu	4840na	
		5890af	5935af	
0200	0300	USA, WWRB Manchester TN3195na	5050na	
		5745va		
0200	0300	USA, WYFR/Family R Worldwide	5985ca	
		6115ca	7360ca	
0200	0300	Zambia, CVC/R Christian Voice	4965af	
0215	0225	Nepal, R Nepal 5005as		
0230	0257	China, China R International	15435as	
0230	0300 twhfas	Albania, R Tirana 7420na		
0230	0300	Myanmar, Myanma R/Yangon	9590do	
0230	0300	Vietnam, VO Vietnam/Overseas Svc	6175na	
0245	0300	Australia, HCJB Global Australia	15400as	
0245	0300	India, All India R/Bhopal 7430do		
0245	0300	India, All India R/Delhi 4860do	6030do	
		7235do	11830do 15135do	
0245	0300	India, All India R/Gorakhpur	3945do	
		6030do	7235do 11830do	15135do
0245	0300	India, All India R/Guwahati 4940do		
0245	0300	India, All India R/Hyderbad 7420do		
0245	0300	India, All India R/Imphal 7335do		
0245	0300	India, All India R/Itanagar 4990do		
0245	0300	India, All India R/Jaipur 4910do		
0245	0300	India, All India R/Kolkata 7210do		
0245	0300	India, All India R/Kurseong 4895do		
0245	0300	India, All India R/Lucknow 4880do		
0245	0300	India, All India R/R Kashmir 4760do		
0245	0300	India, All India R/Shillong 4970do		
0245	0300	India, All India R/Shimla 6020do		
0245	0300	India, All India R/Thiruvananthapuram7290do		
0250	0300	Vatican City State, Vatican R 6040am	7305am	
0255	0300 Sun	South Africa, TWR Africa	3200af	

0300 UTC - 10PM EST / 9PM CST / 7PM PST

0300	0315	Croatia, Voice of Croatia	3985am	7375am
0300	0315	India, All India R/Imphal 7335do		
0300	0315	India, All India R/Itanagar 4990do		
0300	0315	India, All India R/Shillong 4970do		
0300	0325 Sun	South Africa, TWR Africa 3200af		
0300	0330	Egypt, R Cairo 9315na		
0300	0330	Myanmar, Myanma R/Yangon	9590do	
0300	0330	Philippines, R Pilipinas Overseas	11880me	
		15285me	17700me	
0300	0330	Vatican City State, Vatican R 9660af	11625af	
0300	0357	China, China R International	6190na	
		9460as	9690na 9790na	13620as
		15120as		
0300	0359	South Africa, Channel Africa	3345af	
0300	0400	Anguilla/Caribbean Beacon/Univ Network		
		6090na		
0300	0400	Australia, ABC NT Alice Springs	4835do	
0300	0400	Australia, ABC NT Katherine5025do		
0300	0400	Australia, ABC NT Tennant Creek	4910do	
0300	0400	Australia, R Australia	9660pa	12080va
		13690va	15240va 15415va	15515pa
		17750va	21725va	
0300	0400	Bahrain, R Bahrain	6010me	
0300	0400 twhfas	Canada, CBC Northern Quebec Svc	9625na	
0300	0400	Canada, CFRX Toronto ON 6070na		

0300	0400	Canada, CFVP Calgary AB 6030na		
0300	0400	Canada, CKZN St Johns NF 6160na		
0300	0400	Canada, CKZU Vancouver BC	6160na	
0300	0400	Cuba, R Havana Cuba	6000na	6050na
0300	0400	Malaysia, RTM Kajang/Traxx FM	7295do	
0300	0400	Micronesia, V6MP/Cross R/Pohnpei	4755 as	
0300	0400	New Zealand, R New Zealand Intl	15720pa	
0300	0400 DRM	New Zealand, R New Zealand Intl	17675pa	
0300	0400	North Korea, Voice of Korea	4405as	
		7220as	9345as 9730as	
0300	0400	Oman, R Sultanate of Oman	15355af	
0300	0400 Sun	Palau, T8WH/WHRI	17800as	
0300	0400 mtwhf	Palau, T8WH/WHRI	17800as	
0300	0400	Russia, Voice of Russia	7250sa	12040us
0300	0400	South Africa, Channel Africa	6155af	
0300	0400 Sat	Sri Lanka, SLBC 6005as	9770as	15745as
0300	0400	Taiwan, R Taiwan Intl	6875na	15320as
0300	0400	UK, BBC World Service	3255af	5940me
		6140af	6190af 7255af	9410as
		9460af	11860af 12095as	15310as
		17790as		
0300	0400	USA, Amer Forces Network/AFRTS	4319usb	
		5446usb	5765usb 7812usb	12133usb
		12759usb	13362usb	
0300	0400	USA, BBG/Voice of America 4930af	6080af	
		9885af	15580af	
0300	0400	USA, EWTN/WEWN Irondale AL	11520me	
0300	0400	USA, FBN/WTJC Newport NC	9370na	
0300	0400 mtwhfa	USA, WBCQ Monticello ME 7490am		
0300	0400	USA, WBCQ Monticello ME 9330am		
0300	0400 Sat	USA, WHRI Cypress Creek SC	7520va	
0300	0400	USA, WINB Red Lion PA 9265ca		
0300	0400	USA, WTWW Lebanon TN 5080am	5755am	
		12105na		
0300	0400	USA, WWCR Nashville TN 3215eu	4840na	
		5890af	5935af	
0300	0400	USA, WWRB Manchester TN3195na	5050na	
		5745va		
0300	0400	USA, WYFR/Family R Worldwide	6115ca	
		9930ca	11740ca	
0300	0400	Zambia, CVC/R Christian Voice	4965af	
0330	0400	Iran, IRIB/VOIRI 7200eu	7365eu	
0330	0400	Vietnam, VO Vietnam/Overseas Svc	6175na	
0335	0345	India, All India R/Aizawl	5050do	
0335	0345	India, All India R/Delhi	7235do	11830do
		15135do		
0335	0345	India, All India R/Kolkata	7210do	

0400 UTC - 11PM EST / 10PM CST / 8PM PST

0400	0427	Iran, IRIB/VOIRI 7200eu	7365eu	
0400	0430	USA, BBG/Voice of America 4930af	4960af	
		6080af	9885af 15580af	
0400	0456	Romania, R Romania Intl	6130na	7305na
		11895as	15220as	
0400	0457	China, China R International	6190na	
		9460as	13620as 15120as	17725as
		17855as		
0400	0457	Germany, Deutsche Welle	6180af	7350af
		9855af		
0400	0458	New Zealand, R New Zealand Intl	15720pa	
0400	0458 DRM	New Zealand, R New Zealand Intl	17675pa	
0400	0500	Anguilla/Caribbean Beacon/Univ Network		
		6090na		
0400	0500	Australia, ABC NT Alice Springs	4835do	
0400	0500	Australia, ABC NT Katherine5025do		
0400	0500	Australia, ABC NT Tennant Creek	4910do	
0400	0500	Australia, R Australia	9660pa	12080va
		13690va	15240va 15515pa	17750va
		21725as		
0400	0500	Bahrain, R Bahrain	6010me	
0400	0500 twhfas	Canada, CBC Northern Quebec Svc	9625na	
0400	0500	Canada, CFRX Toronto ON 6070na		
0400	0500	Canada, CKZN St Johns NF 6160na		
0400	0500	Canada, CKZU Vancouver BC	6160na	
0400	0500	Cuba, R Havana Cuba	6000na	6050na
0400	0500	Malaysia, RTM Kajang/Traxx FM	7295do	
0400	0500	Micronesia, V6MP/Cross R/Pohnpei	4755 as	
0400	0500	Russia, Voice of Russia	12040as	
0400	0500	South Africa, Channel Africa	7230af	
0400	0500 Sat	Sri Lanka, SLBC 6005as	9770as	15745as
0400	0500	Turkey, Voice of Turkey	7240as	9655va

Start	Stop	Days	Station	Freq1	Freq2	Freq3	Freq4
0400	0500		UK, BBC World Service	3255af	6005af		
				6190af	7255af	9410me	11860af
				12035af	12095af	15310as	15360as
				17790as			
0400	0500		USA, Amer Forces Network/AFRTS	4319usb			
				5446usb	5765usb	7812usb	12133usb
				12759usb	13362usb		
0400	0500		USA, EWTN/WEWN Irondale AL	11520me			
0400	0500		USA, FBN/WTJC Newport NC	9370na			
0400	0500	mtwhfa	USA, WBCQ Monticello ME 7490am				
0400	0500		USA, WBCQ Monticello ME 9330am				
0400	0500	m	USA, WBCQ Monticello ME 5110am				
0400	0500	hf	USA, WHRI Cypress Creek SC	7385na			
0400	0500	Sun	USA, WHRI Cypress Creek SC	7465eu			
0400	0500	Sat	USA, WHRI Cypress Creek SC	9640me			
0400	0500		USA, WTWW Lebanon TN	5080am	5755am		
				12105na			
0400	0500		USA, WWCR Nashville TN	3215eu	4840na		
				5890af	5935af		
0400	0500		USA, WWRB Manchester TN	3195na	5050na		
				5745va			
0400	0500		Zambia, CVC/R Christian Voice	4965af			
0430	0500		Australia, R Australia	15415va			
0430	0500	Sun	Palau, T8WH/WHRI	17800as			
0430	0500		South Africa, TWR Africa	3200af			
0430	0500		USA, BBG/Voice of America	4930af	4960af		
				9885af	15580af		
0435	0445		India, All India R/Delhi	4860do			
0459	0500		New Zealand, R New Zealand Intl	11725pa			
0459	0500	DRM	New Zealand, R New Zealand Intl	13730pa			

0500 UTC - 12AM EST / 11PM CST / 9PM PST

Start	Stop	Days	Station	Freq1	Freq2	Freq3	Freq4
0500	0507	twhfas	Canada, CBC Northern Quebec Svc	9625na			
0500	0530		Germany, Deutsche Welle	6155af	9800af		
				12045af			
0500	0530		Japan, R Japan NHK World	5975va	6110na		
				9770va			
0500	0557		China, China R International	5960na			
				6190na	7220af	7295af	9440af
				11880as	15350as	17505va	17540as
				17725as	17855as		
0500	0600		Anguilla/Caribbean Beacon/Univ Network	6090na			
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, R Australia	9660pa	12080va		
				13630va	13690va	15160va	15240va
				17750va	21725va		
0500	0600		Bahrain, R Bahrain	6010me			
0500	0600		Bhutan, Bhutan Broadcasting Svc	6035do			
0500	0600		Canada, CFRX Toronto ON 6070na				
0500	0600		Canada, CKZN St Johns NF 6160na				
0500	0600		Canada, CKZU Vancouver BC	6160na			
0500	0600		Cuba, R Havana Cuba	6010na	6050na		
				6060ca	6125ca		
0500	0600	mtwhf	Eqt Guinea, R Africa 2	15190af			
0500	0600		Germany, Deutsche Welle	11800af			
0500	0600		Malaysia, RTM Kajang/Traxx FM	7295do			
0500	0600		Micronesia, V6MP/Cross R/Pohnpei	4755 as			
0500	0600		New Zealand, R New Zealand Intl	11725pa			
0500	0600	DRM	New Zealand, R New Zealand Intl	13730pa			
0500	0600		Nigeria, Voice of Nigeria	15120af			
0500	0600		South Africa, Channel Africa	7230af			
0500	0600		South Africa, TWR Africa	3200af	4775af		
				6120af			
0500	0600		Taiwan, R Taiwan Intl	6875na			
0500	0600	DRM	UK, BBC World Service	3955eu			
0500	0600		UK, BBC World Service	3255af	3955eu		
				6005af	6190af	7255af	9410me
				12095af	15310as	15360as	15400af
				15420af	17640af	17790as	
0500	0600	Sat/Sun	UK, BBC World Service	15420af			
0500	0600		USA, Amer Forces Network/AFRTS	4319usb			
				5446usb	5765usb	7812usb	12133usb
				12759usb	13362usb		
0500	0600		USA, BBG/Voice of America	4930af	6080af		
				9885af	15580af		
0500	0600		USA, EWTN/WEWN Irondale AL	11520me			
0500	0600		USA, FBN/WTJC Newport NC	9370na			
0500	0600		USA, WBCQ Monticello ME 9330am				
0500	0600	Sun	USA, WHRI Cypress Creek SC	11565pa			

Start	Stop	Days	Station	Freq1	Freq2	Freq3	Freq4
0500	0600		USA, WTWW Lebanon TN	5080am	5755am		
				12105na			
0500	0600		USA, WWCR Nashville TN	3215eu	4840na		
				5890na	5935af		
0500	0600		USA, WWRB Manchester TN	3195na	5050na		
				5745va			
0500	0600		Zambia, CVC/R Christian Voice	6065af			
0530	0600		Australia, R Australia	15415va			
0530	0600	Sun	Palau, T8WH/WHRI	17800as			
0530	0600		Thailand, R Thailand World Svc	12015eu			

0600 UTC - 1AM EST / 12AM CST / 10PM PST

Start	Stop	Days	Station	Freq1	Freq2	Freq3	Freq4
0600	0630		Australia, R Australia	15290as			
0600	0630		Germany, Deutsche Welle	12045af	15440af		
				17800af			
0600	0630		Vatican City State, Vatican R	3975eu	6075eu		
				7250eu			
0600	0650	DRM	New Zealand, R New Zealand Intl	13730pa			
0600	0655		South Africa, Channel Africa	15255af			
0600	0657		China, China R International	6115na			
				11750af	11770as	11880as	13645as
				15145as	15350as	15465as	17505va
				17540as	17710as		
0600	0659		South Africa, Channel Africa	7230af			
0600	0700		Anguilla/Caribbean Beacon/Univ Network	6090na			
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, R Australia	9660pa	12080va		
				13630va	13690va	15160va	15240va
				15415va	17750va	21725va	
0600	0700		Bahrain, R Bahrain	6010me			
0600	0700		Canada, CFRX Toronto ON 6070na				
0600	0700		Canada, CFVP Calgary AB 6030na				
0600	0700		Canada, CKZN St Johns NF 6160na				
0600	0700		Canada, CKZU Vancouver BC	6160na			
0600	0700		Cuba, R Havana Cuba	6010na	6050na		
				6060ca	6125ca		
0600	0700	mtwhf	Eqt Guinea, R Africa 2	15190af			
0600	0700		Malaysia, RTM Kajang/Traxx FM	7295do			
0600	0700		Micronesia, V6MP/Cross R/Pohnpei	4755 as			
0600	0700		New Zealand, R New Zealand Intl	11725pa			
0600	0700		Nigeria, Voice of Nigeria	15120af			
0600	0700	Sun	Palau, T8WH/WHRI	17800as			
0600	0700		Papua New Guinea, R Fly	5960do			
0600	0700		Russia, Voice of Russia	17805pa	21805pa		
0600	0700	DRM	Russia, Voice of Russia	11635eu			
0600	0700		South Africa, CVC 1 Africa R	13590af			
				17695af			
0600	0700		South Africa, TWR Africa	3200af	4775af		
				6120af			
0600	0700		UK, BBC World Service	3955eu	6005af		
				6190af	9410af	11760me	12015af
				12095af	15310as	15400af	15420af
				17640af	17790as		
0600	0700	DRM	UK, BBC World Service	3955eu			
0600	0700		USA, Amer Forces Network/AFRTS	4319usb			
				5446usb	5765usb	7812usb	12133usb
				12759usb	13362usb		
0600	0700		USA, BBG/Voice of America	6080af	9885af		
				15580af			
0600	0700		USA, EWTN/WEWN Irondale AL	11520af			
0600	0700		USA, FBN/WTJC Newport NC	9370na			
0600	0700		USA, WBCQ Monticello ME 9330am				
0600	0700	Sat	USA, WHRI Cypress Creek SC	9615me			
0600	0700		USA, WTWW Lebanon TN	5080am	5755am		
				12105na			
0600	0700		USA, WWCR Nashville TN	3215eu	4840na		
				5890af	5935af		
0600	0700		USA, WWRB Manchester TN	3185na	5050na		
				5745va			
0600	0700		Zambia, CVC/R Christian Voice	6065af			
				17695af			
0630	0645		India, All India R/Guwahati 7280do				
0630	0645		India, All India R/Hyderbad 7420do				
0630	0645		India, All India R/Kurseong 7230do				
0630	0645		India, All India R/Mumbai 7240do				
0630	0645		India, All India R/Thiruvananthapuram	7290do			
0630	0656	DRM	Romania, R Romania Intl	9600eu			
0630	0656		Romania, R Romania Intl	7310eu	17780eu		
				21600eu			

Start	Stop		Station	Freq	Freq
0630	0700		Vatican City State, Vatican R	7360af	9660af
			11625af		
0651	0700	DRM	New Zealand, R New Zealand Intl	13730pa	

0700 UTC - 2AM EST / 1AM CST / 11PM PST

Start	Stop		Station	Freq	Freq
0700	0757		China, China R International	11785eu	
			11880as	13645as	15125va 15350as
			15465as	17540as	17490eu 17710as
0700	0758		New Zealand, R New Zealand Intl	11725pa	
0700	0758	DRM	New Zealand, R New Zealand Intl	13730pa	
0700	0800		Anguilla/Caribbean Beacon/Univ Network 6090na		
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, R Australia	9475as	9660pa
			9710as	11945as	12080as 13630va
			15160va	15240va	21725va
0700	0800		Bahrain, R Bahrain	6010me	
0700	0800	m/DRM	Belgium, TDP Radio	6015eu	
0700	0800		Canada, CFRX Toronto ON	6070na	
0700	0800		Canada, CFVP Calgary AB	6030na	
0700	0800		Canada, CKZN St Johns NF	6160na	
0700	0800		Canada, CKZU Vancouver BC	6160na	
0700	0800	mtwhf	Eqt Guinea, R Africa 2	15190af	
0700	0800		Malaysia, RTM Kajang/Traxx FM	7295do	
0700	0800		Micronesia, V6MP/Cross R/Pohnpei	4755 as	
0700	0800		Papua New Guinea, R Fly	5960do	
0700	0800		Russia, Voice of Russia	17805va	21805va
0700	0800	DRM	Russia, Voice of Russia	11635eu	
0700	0800		South Africa, CVC 1 Africa R	13590af	
			17695af		
0700	0800		South Africa, TWR Africa	3200af	4775af
			6120af		
0700	0800		UK, BBC World Service	3955eu	5875eu
			6190af	11760me	11770af 12095af
			13820af	15310as	15400af 15575me
			17640af	17790as	17830af
0700	0800	DRM	UK, BBC World Service	5875eu	
0700	0800		USA, Amer Forces Network/AFRTS	4319usb	
			5446usb	5765usb	7812usb 12133usb
			12759usb	13362usb	
0700	0800		USA, EWTN/WEWN Irondale AL	11520af	
0700	0800		USA, FBN/WTJC Newport NC	9370na	
0700	0800		USA, WBCQ Monticello ME	9330am	
0700	0800	Sun	USA, WHRI Cypress Creek SC	11565pa	
0700	0800		USA, WTWW Lebanon TN	5080am	5755am
			12105na		
0700	0800		USA, WWCR Nashville TN	3215eu	4840na
			5890af	5935af	
0700	0800		USA, WWRB Manchester TN	3185na	
0700	0800		Zambia, CVC/R Christian Voice	6065af	
			17695af		
0730	0745		India, All India R/Aizawl	5050do	
0730	0745		India, All India R/Delhi	6190do	11710do
			15185do	15260do	
0730	0745		India, All India R/Guwahati	7280do	
0730	0745		India, All India R/Imphal	7335do	
0730	0745		India, All India R/Jaipur	7325do	
0730	0745		India, All India R/Kolkata	7210do	
0730	0745		India, All India R/Kurseong	7230do	
0730	0745		India, All India R/Shimla	6020do	
0730	0800		Australia, HCJB Global Australia	11750pa	
0730	0800		India, All India R/Chennai	4920do	
0759	0800		New Zealand, R New Zealand Intl	9765pa	
0759	0800	DRM	New Zealand, R New Zealand Intl	9870pa	

0800 UTC - 3AM EST / 2AM CST / 12AM PST

Start	Stop		Station	Freq	Freq
0800	0815		Nepal, R Nepal 5005as		
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		Australia, HCJB Global Australia	11750pa	
0800	0830	Sun	Canada, Bible Voice Broadcasting	7250eu	
0800	0845	Sat	Canada, Bible Voice Broadcasting	7220eu	
0800	0850		Austria, TWR Europe	7310eu	
0800	0850		Germany, TWR Europe	6105eu	
0800	0857		China, China R International	9415as	
			11785eu	11880eu	13350as 15465as
			15625va	17490eu	17540as

Start	Stop		Station	Freq	Freq
0800	0900		Anguilla/Caribbean Beacon/Univ Network 6090na		
0800	0900		Australia, R Australia	5995va	9475as
			9580pa	9590pa	9710as 11945as
			12080va	13630va	
0800	0900		Bahrain, R Bahrain	6010me	
0800	0900	t/DRM	Belgium, TDP Radio	6015eu	
0800	0900		Bhutan, Bhutan Broadcasting Svc	6035do	
0800	0900		Canada, CFRX Toronto ON 6070na		
0800	0900		Canada, CFVP Calgary AB 6030na		
0800	0900		Canada, CKZN St Johns NF 6160na		
0800	0900		Canada, CKZU Vancouver BC	6160na	
0800	0900	mtwhfa	Ecuador, HCJB/LV de los Andes	3995eu	
0800	0900	mtwhf	Eqt Guinea, R Africa 2	15190af	
0800	0900		Malaysia, RTM Kajang/Traxx FM	7295do	
0800	0900		Micronesia, V6MP/Cross R/Pohnpei	4755 as	
0800	0900		New Zealand, R New Zealand Intl	9765pa	
0800	0900	DRM	New Zealand, R New Zealand Intl	9870pa	
0800	0900		Palau, T8WH/WHRI	9930as	
0800	0900	Sun	Palau, T8WH/WHRI	9930as	
0800	0900		Papua New Guinea, R Fly	5960do	
0800	0900		Russia, Voice of Russia	17805va	21805va
0800	0900	DRM	Russia, Voice of Russia	7325eu	11635eu
0800	0900	Sun	South Africa, Amateur R Mirror Intl	7205af	
			17760af		
0800	0900		South Africa, Channel Africa	9625af	
0800	0900		South Africa, CVC 1 Africa R	13590af	
			17695af		
0800	0900		South Korea, KBS World R 9570as		
0800	0900		UK, BBC World Service	5760as	5875eu
			6190af	11760me	12095af 15310as
			15400af	15575me	17640af 17790as
			17830af	21470af	
0800	0900	DRM	UK, BBC World Service	5790eu	5875eu
0800	0900		USA, Amer Forces Network/AFRTS	4319usb	
			5446usb	5765usb	7812usb 12133usb
			12759usb	13362usb	
0800	0900		USA, EWTN/WEWN Irondale AL	11520af	
0800	0900		USA, FBN/WTJC Newport NC	9370na	
0800	0900		USA, WBCQ Monticello ME 9330am		
0800	0900	smtwhf	USA, WHRI Cypress Creek SC	11565pa	
0800	0900		USA, WTWW Lebanon TN	5080am	5755am
			12105na		
0800	0900		USA, WWCR Nashville TN	3215eu	4840na
			5890af	5935af	
0800	0900		USA, WWRB Manchester TN	3185na	
0800	0900		Zambia, CVC/R Christian Voice	6065af	
			17695af		
0820	0900	smtwhf	Guam, TWR Asia/KTWR	15170as	
0830	0845		India, All India R/Aizawl	5050do	
0830	0845		India, All India R/Chennai	4920do	
0830	0845		India, All India R/Delhi	6190do	11710do
			15185do	15260do	
0830	0845		India, All India R/Hyderbad	7420do	
0830	0845		India, All India R/Imphal	7335do	
0830	0845		India, All India R/Itanagar	4990do	
0830	0845		India, All India R/Kolkata	7210do	
0830	0845		India, All India R/Shillong	7315do	
0830	0845		India, All India R/Thiruvananthapuram	7290do	
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, TWR Asia/KTWR	11840pa	

0900 UTC - 4AM EST / 3AM CST / 1AM PST

Start	Stop		Station	Freq	Freq
0900	0910	mtwhfa	Guam, TWR Asia/KTWR	11840as	
0900	0930	mtwhf	Palau, T8WH/WHRI	9930as	
0900	0930	Sun	Palau, T8WH/WHRI	9930as	
0900	0957		China, China R International	9415as	
			15210pa	15270eu	15350as 17490eu
			17570eu	17690pa	17750as
0900	1000		Anguilla/Caribbean Beacon/Univ Network 6090na		
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, R Australia	9475as	9580pa
			9590pa	11945as	12080va
0900	1000		Bahrain, R Bahrain	6010me	
0900	1000	w/DRM	Belgium, TDP Radio	6015eu	
0900	1000		Canada, CFRX Toronto ON 6070na		
0900	1000		Canada, CFVP Calgary AB 6030na		

Start	Stop	Notes	Station	Frequencies
0900	1000		Canada, CKZN St Johns NF	6160na
0900	1000		Canada, CKZU Vancouver BC	6160na
0900	1000	3rd Sun	Germany, XVRB Radio	6045va
0900	1000	Sat	Italy, IRRS-Shortwave	9510va
0900	1000		Malaysia, RTM Kajang/Traxx FM	7295do
0900	1000		Micronesia, V6MP/Cross R/Pohnpei	4755 as
0900	1000	DRM	New Zealand, R New Zealand Intl	9870pa
0900	1000		New Zealand, R New Zealand Intl	9765pa
0900	1000		Nigeria, Voice of Nigeria	9690af
0900	1000	Sat	Palau, T8WH/WHRI	9930as 15700as
0900	1000		Papua New Guinea, R Fly	5960do
0900	1000		Russia, Voice of Russia	7205as 17805va 21805va
0900	1000	DRM	Russia, Voice of Russia	7325eu 11635eu
0900	1000		South Africa, Channel Africa	9625af
0900	1000		South Africa, CVC 1 Africa R	13590af 17695af
0900	1000		UK, BBC World Service	6190af 6195as 9740as 11760me 11895as 12095af 15285as 15310as 15400af 15575me 17760as 17790as 17830af 21470af
0900	1000		USA, Amer Forces Network/AFRTS	4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0900	1000		USA, EWTN/WEWN Irondale AL	9390as
0900	1000		USA, FBN/WTJC Newport NC	9370na
0900	1000		USA, WBCQ Monticello ME	9330am
0900	1000	Sun	USA, WHRI Cypress Creek SC	11565pa
0900	1000		USA, WTWW Lebanon TN	5080am 5755am 12105na
0900	1000		USA, WWCR Nashville TN	3215eu 4890na 5890af 5935af
0900	1000		USA, WWRB Manchester TN	3185na
0900	1000		USA, WYFR/Family R Worldwide	9465as
0900	1000		Zambia, CVC/R Christian Voice	6065af 17695af
0905	0910		Pakistan, PBC/R Pakistan	15725eu 17700eu
0915	0930	mtwhf	Palau, T8WH/WHRI	9930as
0930	1000	w	Palau, T8WH/WHRI	9930as
0945	1000	m	Palau, T8WH/WHRI	9930as
0945	1000	hf	Palau, T8WH/WHRI	9930as
0945	1000	mtwhf	Palau, T8WH/WHRI	15700as

1000 UTC - 5AM EST / 4AM CST / 2AM PST

Start	Stop	Notes	Station	Frequencies
1000	1030		Japan, R Japan NHK World	9605as 9625pa 9840pa
1000	1030		Vietnam, VO Vietnam/Overseas Svc	9840as 12020as
1000	1057		China, China R International	5955as 7215as 11640as 13590as 13720as 15190as 15210pa 15350as 17490eu 17690as
1000	1057		Netherlands, R Netherlands Worldwide	12065as
1000	1058		New Zealand, R New Zealand Intl	9765pa
1000	1100		Anguilla/Caribbean Beacon/Univ Network	11775na
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, R Australia	9580pa 9590pa 11945as 12080va
1000	1100		Bahrain, R Bahrain	6010me
1000	1100	h/DRM	Belgium, TDP Radio	6015eu
1000	1100		Canada, CFRX Toronto ON	6070na
1000	1100		Canada, CFVP Calgary AB	6030na
1000	1100		Canada, CKZN St Johns NF	6160na
1000	1100		Canada, CKZU Vancouver BC	6160na
1000	1100		India, All India R/External Svc	7270as 13710va 15020as 15235as 17510pa 17800as 17895pa
1000	1100		Indonesia, Voice of Indonesia	9525va
1000	1100		Malaysia, RTM Kajang/Traxx FM	7295do
1000	1100		Micronesia, V6MP/Cross R/Pohnpei	4755as
1000	1100	DRM	New Zealand, R New Zealand Intl	9870pa
1000	1100		Nigeria, Voice of Nigeria	9690af
1000	1100		North Korea, Voice of Korea	6185as 6285sa 9335sa 9850as
1000	1100	fa	Palau, T8WH/WHRI	9930as
1000	1100		Russia, Voice of Russia	7205as
1000	1100		South Africa, Channel Africa	9625af
1000	1100		South Africa, CVC 1 Africa R	13590af 17695af
1000	1100		UK, BBC World Service	6190af 6195as 9740as 11760me 11895as 12095af 15285as 15310as 15575me 17640af 17760as 17790as 21470af
1000	1100	Sat/Sun	UK, BBC World Service	15400af 17830af
1000	1100		USA, Amer Forces Network/AFRTS	4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
1000	1100		USA, EWTN/WEWN Irondale AL	9390as
1000	1100		USA, FBN/WTJC Newport NC	9370na
1000	1100		USA, KNLS Anchor Point AK	9615as
1000	1100		USA, WBCQ Monticello ME	9330am
1000	1100	Sun	USA, WHRI Cypress Creek SC	11565pa
1000	1100		USA, WTWW Lebanon TN	5080am 5755am 12105na
1000	1100		USA, WWCR Nashville TN	4840na 5890af 5935af 7465eu
1000	1100		USA, WWRB Manchester TN	3185na
1000	1100		USA, WYFR/Family R Worldwide	9465as
1000	1100		Zambia, CVC/R Christian Voice	6065af 17695af
1015	1100	Sun	Palau, T8WH/WHRI	9930as
1030	1030	mtwhfa	USA, WRMI/R Prague relay	9955am
1030	1100		Iran, IRIB/VOIRI	21575va 21695va
1030	1100	Sun	Italy, IRRS-Shortwave	9510va
1030	1100	Sun	Italy, IRRS-Shortwave/Euro Gospel R	9510eu
1030	1100		Mongolia, Voice of Mongolia	12085as
1030	1100	mtwhf	Palau, T8WH/WHRI	9930as
1059	1100		New Zealand, R New Zealand Intl	15720pa

1100 UTC - 6AM EST / 5AM CST / 3AM PST

Start	Stop	Notes	Station	Frequencies
1100	1105		Pakistan, PBC/R Pakistan	15725eu 17700eu
1100	1127		Iran, IRIB/VOIRI	21575va 21695va
1100	1130	f/ DRM	Japan, R Japan NHK World	9760eu
1100	1130	Sat/DRM	South Korea, KBS World R	9760eu
1100	1130		UK, BBC World Service	15400af
1100	1130		Vietnam, VO Vietnam/Overseas Svc	7285as
1100	1157		China, China R International	5955as 5960na 9570as 11650as 11795as 13645as 13665eu 13590as 13720as 15110as 17490eu
1100	1158	DRM	New Zealand, R New Zealand Intl	9870pa
1100	1200		Anguilla/Caribbean Beacon/Univ Network	11775na
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, R Australia	5995va 6020va 6140as 9475as 9560as 9580pa 9590pa 11945as
1100	1200	DRM	Australia, R Australia	12080pa
1100	1200		Bahrain, R Bahrain	6010me
1100	1200	f/DRM	Belgium, TDP Radio	6015eu
1100	1200	Sat/Sun	Canada, CBC Northern Quebec Svc	9625na
1100	1200		Canada, CFRX Toronto ON	6070na
1100	1200		Canada, CFVP Calgary AB	6030na
1100	1200		Canada, CKZN St Johns NF	6160na
1100	1200		Canada, CKZU Vancouver BC	6160na
1100	1200	Sun	Italy, IRRS-Shortwave	9510va
1100	1200	Sun	Italy, IRRS-Shortwave/Euro Gospel R	9510eu
1100	1200		Malaysia, RTM Kajang/Traxx FM	7295do
1100	1200		New Zealand, R New Zealand Intl	15720pa
1100	1200		Nigeria, Voice of Nigeria	9690af
1100	1200	DRM	Russia, Voice of Russia	12000as
1100	1200		Russia, Voice of Russia	7205as 7260as 7350as 9560as 9670as
1100	1200		Saudi Arabia, BSKSA/External Svc	15250af
1100	1200		South Africa, Channel Africa	9625af
1100	1200		South Africa, CVC 1 Africa R	13590af 17695af
1100	1200		Taiwan, R Taiwan Intl	7445as 11715as
1100	1200		UK, BBC World Service	6190af 6195as 9740as 11760me 11895as 12095af 15285as 15575me 17640af 17790as 17830as 21470af
1100	1200		USA, Amer Forces Network/AFRTS	4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
1100	1200		USA, EWTN/WEWN Irondale AL	9390as
1100	1200		USA, FBN/WTJC Newport NC	9370na

1100	1200		USA, WBCQ Monticello ME 9330am	
1100	1200	Sat/Sun	USA, WHRI Cypress Creek SC	7315ca
1100	1200		USA, WTWW Lebanon TN 5755am 9990am 12105na	
1100	1200		USA, WWCR Nashville TN 4840na 5890af 5935af 7465eu	
1100	1200		USA, WWRB Manchester TN 3185na	
1100	1200		USA, WYFR/Family R Worldwide 13795as	9310as
1100	1200		Zambia, CVC/R Christian Voice 17695af	6065af
1130	1200	f	Vatican City State, Vatican R 15595as	17590as
1130	1200		Vietnam, VO Vietnam/Overseas Svc 12020as	9840as
1135	1145		India, All India R/Aizawl	5050do
1135	1145		India, All India R/Delhi 9595do 11710do 15185do	
1135	1145		India, All India R/Shillong	4970do

1200 UTC - 7AM EST / 6AM CST / 4AM PST

1200	1215		Nepal, R Nepal 5005as	
1200	1230		Germany, AWR Europe	17510as
1200	1230		Japan, R Japan NHK World 6120na	9695as
1200	1230		Saudi Arabia, BSKSA/External Svc	15250af
1200	1256		Romania, R Romania Intl 15430eu 15460eu 17530af 17765af	
1200	1257		China, China R International 5955as 7250as 9460as 9660as 9645as 9730as 9760 oa 11650as 11690as 11760pa 12015as 13665eu 13790eu 13980as 17490eu	
1200	1258		New Zealand, R New Zealand Intl	15720pa
1200	1300		Anguilla/Caribbean Beacon/Univ Network 11775na	
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, R Australia 6020va 6140as 9475as 9560as 9580pa 9590pa	
1200	1300	DRM	Australia, R Australia 5995va	
1200	1300		Bahrain, R Bahrain 6010me	
1200	1300	Sat/ DRM	Belgium, TDP Radio 6015eu	
1200	1300	Sat/Sun	Canada, CBC Northern Quebec Svc 9625na	
1200	1300		Canada, CFRX Toronto ON 6070na	
1200	1300		Canada, CFVP Calgary AB 6030na	
1200	1300		Canada, CKZN St Johns NF 6160na	
1200	1300		Canada, CKZU Vancouver BC	6160na
1200	1300		Ethiopia, R Ethiopia/Natl Pgm	9705do
1200	1300	Sun	Italy, IRRS-Shortwave/Euro Gospel R	9510eu
1200	1300		Malaysia, RTM Kajang/Traxx FM	7295do
1200	1300		Nigeria, Voice of Nigeria	9690af
1200	1300	Sat/Sun	Palau, T8WH/WHRI	9930as
1200	1300	DRM	Russia, Voice of Russia 7325eu 7340as 12000as	
1200	1300		Russia, Voice of Russia 7350as 9560as 11660as	
1200	1300		South Africa, CVC 1 Africa R 17695af	13590af
1200	1300		South Korea, KBS World R 9650na	
1200	1300		UK, BBC World Service 5875as 6190af 6195as 9740as 11760me 11895as 15310as 15575me 17640af 17830as 21470af	
1200	1300		USA, Amer Forces Network/AFRTS 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb	
1200	1300		USA, BBG/Voice of America 7575as 9640as 11700pa 11750pa 12150va	
1200	1300		USA, EWTN/WEWN Irondale AL	14610eu
1200	1300		USA, FBN/WTJC Newport NC	9370na
1200	1300		USA, KNLS Anchor Point AK 9615as	
1200	1300		USA, WBCQ Monticello ME 9330am	
1200	1300	smtwhf	USA, WHRI Cypress Creek SC	7385na
1200	1300		USA, WTWW Lebanon TN 5755am 9990am 12105na	
1200	1300		USA, WWCR Nashville TN 4890na 5935af 9980af 15825eu	
1200	1300		USA, WWRB Manchester TN 9385na	
1200	1300		USA, WYFR/Family R Worldwide 17520as 17880as	9310as

1200	1300		Zambia, CVC/R Christian Voice 17695af	6065af
1215	1300		Egypt, R Cairo 17870as	
1230	1245		India, All India R/Aizawl	5050do
1230	1245		India, All India R/Chennai 4920do	
1230	1245		India, All India R/Delhi 4860do	6085do
1230	1245		India, All India R/Hyderbad 4800do	
1230	1245		India, All India R/Jeypore 5040do	
1230	1245		India, All India R/Kurseong 4895do	
1230	1245		India, All India R/Port Blair 4760do	
1230	1245		India, All India R/R Kashmir 4950do	
1230	1245		India, All India R/Shillong 4970do	
1230	1245		India, All India R/Thiruvananthapuram 5010do	
1230	1300		Thailand, R Thailand World Svc	9720va
1230	1300		Vietnam, VO Vietnam/Overseas Svc 12020as	9840as

1300 UTC - 8AM EST / 7AM CST / 5AM PST

1300	1330		Egypt, R Cairo 17870as	
1300	1330		Japan, R Japan NHK World 11730as	
1300	1357		China, China R International 5995as 7300as 9570na 9655as 9730as 9765as 9870as 11760pa 11885na 11900pa 11980as 13670eu 13790eu 15230na	
1300	1400		Anguilla/Caribbean Beacon/Univ Network 11775na	
1300	1400		Australia, ABC NT Alice Springs	2310do
1300	1400		Australia, ABC NT Katherine 2485do	
1300	1400	DRM	Australia, R Australia 5995va	
1300	1400		Bahrain, R Bahrain 6010me	
1300	1400	Sun/DRM	Belgium, TDP Radio 6015na	
1300	1400	Sat/Sun	Canada, CBC Northern Quebec Svc 9625na	
1300	1400		Canada, CFRX Toronto ON 6070na	
1300	1400		Canada, CFVP Calgary AB 6030na	
1300	1400		Canada, CKZN St Johns NF 6160na	
1300	1400		Canada, CKZU Vancouver BC	6160na
1300	1400		Indonesia, Voice of Indonesia	9525va
1300	1400		Italy, IRRS-Shortwave	15190va
1300	1400		Malaysia, RTM Kajang/Traxx FM	7295do
1300	1400		New Zealand, R New Zealand Intl	5950pa
1300	1400		Nigeria, Voice of Nigeria 9690af	
1300	1400		North Korea, Voice of Korea 3560as 7570eu 9335na 11710na 12015eu	
1300	1400	Sat/Sun	Palau, T8WH/WHRI 9930as	
1300	1400	DRM	Russia, Voice of Russia 7325eu 7340as 9675eu	
1300	1400		Russia, Voice of Russia 7205as 7260as 9560as	
1300	1400		South Africa, CVC 1 Africa R 17695af	13590af
1300	1400		South Korea, KBS World R 9570as	
1300	1400		Tajikistan, Voice of Tajik 7245va	
1300	1400		UK, BBC World Service 5875as 6190af 6195as 9410as 9740as 11760me 11890as 12095af 15310as 15420af 15575me 17640af 17830as 21470af	
1300	1400		USA, Amer Forces Network/AFRTS 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb	
1300	1400	Sat/Sun	USA, BBG/Voice of America 7575as 9640as 11700va 12150va	
1300	1400		USA, EWTN/WEWN Irondale AL	15610eu
1300	1400		USA, FBN/WTJC Newport NC	9370na
1300	1400		USA, WBCQ Monticello ME 9330am	
1300	1400	Sun	USA, WHRI Cypress Creek SC	9840na
1300	1400		USA, WTWW Lebanon TN 9480na 9990am 12105na	
1300	1400		USA, WWCR Nashville TN 7490af 9980af 13845eu 15825eu	
1300	1400		USA, WWRB Manchester TN 9385na	
1300	1400		USA, WYFR/Family R Worldwide 5835as 9310as 9390as 11520as 11560as	
1300	1400		Zambia, CVC/R Christian Voice 17695af	6065af
1330	1345		India, All India R/Delhi 6085do	
1330	1400		India, All India R/External Svc 11620as 13710as	9690as
1330	1400		Turkey, Voice of Turkey 12035va	
1330	1400		Vietnam, VO Vietnam/Overseas Svc 12020as	9840as

1400 UTC - 9AM EST / 8AM CST / 6AM PST

1400	1415	Sun	Germany, Pan American Broadcasting 15205as	
1400	1430		Japan, R Japan NHK World 5955as	11695as
			21560af	
1400	1430		Serbia, International R Serbia	9635eu
1400	1430		Thailand, R Thailand World Svc	9725va
1400	1430		Turkey, Voice of Turkey	12035va
1400	1457		China, China R International	5955as
			7300as 9460as 9700eu 9765eu	
			9870as 11665as 13675na 13740na	
			15230na 17630af	
1400	1457		Netherlands, R Netherlands Worldwide	
			12080as	
1400	1500		Anguilla/Caribbean Beacon/Univ Network	
			11775na	
1400	1500		Australia, ABC NT Alice Springs	2310do
1400	1500		Australia, ABC NT Katherine2485do	
1400	1500		Australia, ABC NT Tennant Creek	2325do
1400	1500		Australia, R Australia 5995va	6080as
			7240pa 9590pa 11660as	
1400	1500		Bahrain, R Bahrain 6010me	
1400	1500	Sun	Canada, Bible Voice Broadcasting	15470as
1400	1500	Sat/Sun	Canada, CBC Northern Quebec Svc 9625na	
1400	1500		Canada, CFRX Toronto ON 6070na	
1400	1500		Canada, CFVP Calgary AB 6030na	
1400	1500		Canada, CKZN St Johns NF 6160na	
1400	1500		Canada, CKZU Vancouver BC	6160na
1400	1500		India, All India R/External Svc	9690as
			11620as 13710as	
1400	1500		Malaysia, RTM Kajang/Traxx FM	7295do
1400	1500		New Zealand, R New Zealand Intl	5950pa
1400	1500		Nigeria, Voice of Nigeria 9690af	
1400	1500		Oman, R Sultanate of Oman	15140va
1400	1500	Sat	Palau, T8WH/WHRI 9930as	
1400	1500	DRM	Russia, Voice of Russia 7340as	9675eu
1400	1500		Russia, Voice of Russia 4975va	7260as
			7310as 11660as	
1400	1500		South Africa, CVC 1 Africa R	13590af
			17695af	
1400	1500		UK, BBC World Service 5875as	5975as
			6190af 6195as 9410as 9740as	
			11760me 11890as 12095af 15420af	
			17640af 17830as	
1400	1500		USA, Amer Forces Network/AFRTS	4319usb
			5446usb 5765usb 7812usb 12133usb	
			12759usb 13362usb	
1400	1500		USA, BBG/Voice of America 6080af	15580af
			17650af 17715af	
1400	1500	mtwhf	USA, BBG/Voice of America 7575as	9760as
			12150va	
1400	1500		USA, EWTN/WEWN Irondale AL	15610eu
1400	1500		USA, FBN/WTJC Newport NC	9370na
1400	1500		USA, WBCQ Monticello ME 9330am	
1400	1500	Sun	USA, WHRI Cypress Creek SC	21600af
1400	1500	Sat	USA, WHRI Cypress Creek SC	9680na
1400	1500		USA, WJHR Intl Milton FL 15550na	
1400	1500		USA, WTWW Lebanon TN 9480na	9990am
			12105na	
1400	1500		USA, WWCR Nashville TN 7490af	9980af
			13845eu 15825eu	
1400	1500		USA, WWRB Manchester TN9385na	
1400	1500		USA, WYFR/Family R Worldwide	5835va
			9365as 11540as 11560as	
1400	1500		Zambia, CVC/R Christian Voice	6065af
			17695af	
1405	1435	Sun	Canada, Bible Voice Broadcasting	9390as
1415	1430	mtwhfa	Germany, Pan American Broadcasting 15205as	
1415	1430		Nepal, R Nepal 5005as	
1420	1440		India, All India R/Itanagar 4990do	
1425	1455		South Africa, TWR Africa 6025af	
1430	1445	Sun	Germany, Pan American Broadcasting 15205as	
1430	1445		India, All India R/Aizawl 5050do	
1430	1445		India, All India R/Delhi 6085do	9575do
			9835do	
1430	1445		India, All India R/Jeypore 5040do	
1430	1445		India, All India R/Mumbai 4840do	
1430	1500		Australia, R Australia 9475as	
1430	1500	Sat	Canada, Bible Voice Broadcasting	15470af
1430	1500	Sat	India, All India R/Gangtok 4835do	
1445	1500		Australia, HCJB Global Australia	15340as
1450	1500		India, All India R/Itanagar 4990do	
1450	1500		India, All India R/Kurseong 4895do	

1500 UTC - 10AM EST / 9AM CST / 7AM PST

1500	1515	Sun	Canada, Bible Voice Broadcasting	13740as
1500	1525	Sun	China, Haixa zhi Sheng/VO Strait	4940do
			9505do	
1500	1525	mh	Guam, TWR Asia/KTWR 15200as	
1500	1530		Australia, HCJB Global Australia	15340as
1500	1530		India, All India R/Jeypore 5040do	
1500	1530	Sun	USA, The Overcomer Ministry	15190va
1500	1530		USA, WRMI/R Prague relay 9955am	
1500	1530		Vietnam, VO Vietnam/Overseas Svc	7285as
			9840as 12020as	
1500	1535	twas	Guam, TWR Asia/KTWR 15200as	
1500	1550		New Zealand, R New Zealand Intl	5950pa
1500	1557		China, China R International	5955as
			6095as 7325as 7405as 9435eu	
			9525eu 9720va 9785as 9870as	
			13740na 17630af	
1500	1559		Canada, R Canada International	9635as
			11975as	
1500	1559		South Africa, Channel Africa	9625af
1500	1600		Anguilla/Caribbean Beacon/Univ Network	
			11775na	
1500	1600		Australia, ABC NT Alice Springs	2310do
1500	1600		Australia, ABC NT Katherine2485do	
1500	1600		Australia, R Australia 5995va	6080as
			7240pa 9475as 9590pa 11660as	
1500	1600		Bahrain, R Bahrain 6010me	
1500	1600		Bhutan, Bhutan Broadcasting Svc	6035do
1500	1600	Sat/Sun	Canada, CBC Northern Quebec Svc 9625na	
1500	1600		Canada, CFRX Toronto ON 6070na	
1500	1600		Canada, CFVP Calgary AB 6030na	
1500	1600		Canada, CKZN St Johns NF 6160na	
1500	1600		Canada, CKZU Vancouver BC	6160na
1500	1600	Sat	Clandestine, Sudan R Service	17745af
1500	1600		Malaysia, RTM Kajang/Traxx FM	7295do
1500	1600		Nigeria, Voice of Nigeria 15120af	
1500	1600		North Korea, Voice of Korea	3560as
			7570eu 9335na 11710na 12015eu	
1500	1600	DRM	Russia, Voice of Russia 7340as	
1500	1600		Russia, Voice of Russia 4975va	9470va
			9660as 9880as	
1500	1600		South Africa, CVC 1 Africa R	13590af
			17695af	
1500	1600		Uganda, Dunamis Shortwave	4750do
1500	1600		UK, BBC World Service 5875as	6190af
			6195as 9410as 9490as 9505as	
			11830me 12095af 15400af 15420af	
			17640af 17830as	
1500	1600	DRM	UK, BBC World Service 5845as	
1500	1600		USA, Amer Forces Network/AFRTS	4319usb
			5446usb 5765usb 7812usb 12133usb	
			12759usb 13362usb	
1500	1600		USA, BBG/Voice of America 4930af	6080af
			7575as 9930pa 11840va 12150va	
			13570va 15580af 17715af 17895af	
1500	1600		USA, BBG/Voice of America/Special English	
			6140va 7465va 7520va 9760va	
			9945va	
1500	1600		USA, EWTN/WEWN Irondale AL	15610eu
1500	1600		USA, FBN/WTJC Newport NC	9370na
1500	1600		USA, KNLS Anchor Point AK 9655as	
1500	1600	Sat	USA, The Overcomer Ministry	15190va
1500	1600		USA, WBCQ Monticello ME 9330am	
1500	1600	Sat	USA, WBCQ Monticello ME 15420am	
1500	1600	Sun	USA, WHRI Cypress Creek SC	17570va
1500	1600	Sat	USA, WHRI Cypress Creek SC	21630af
1500	1600		USA, WINB Red Lion PA 13570ca	
1500	1600		USA, WJHR Intl Milton FL 15550na	
1500	1600		USA, WTWW Lebanon TN 9480na	9990am
			12105na	
1500	1600		USA, WWCR Nashville TN 7490af	9980af
			13845eu 15825eu	
1500	1600		USA, WWRB Manchester TN9385na	
1500	1600		USA, WYFR/Family R Worldwide	6280as
			11610as 11995as 21840af	
1500	1600		Zambia, CVC/R Christian Voice	6065af
			17695af	
1515	1530	Sat	Canada, Bible Voice Broadcasting	13670as
1525	1555		South Africa, TWR Africa 6025af	
1530	1545		India, All India R/Aizawl 5050do	
1530	1545		India, All India R/Bengaluru 9425do	
1530	1545		India, All India R/Bhopal 4810do	

Start	End	Days/Mode	Station	Frequencies
1530	1545		India, All India R/Chennai	4920do
1530	1545		India, All India R/Delhi	5015do
1530	1545		India, All India R/Guwahati	4940do
1530	1545		India, All India R/Hyderbad	4800do
1530	1545		India, All India R/Itanagar	4990do
1530	1545		India, All India R/Jaipur	4910do
1530	1545		India, All India R/Kolkata	4820do
1530	1545		India, All India R/Kurseong	4895do
1530	1545		India, All India R/Lucknow	4880do
1530	1545		India, All India R/Panaji (Goa)	9820do
1530	1545		India, All India R/Port Blair	4760do
1530	1545		India, All India R/R Kashmir	4950do
1530	1545		India, All India R/Shillong	4970do
1530	1545		India, All India R/Shimla	4965do
1530	1545		India, All India R/Thiruvananthapuram	5010do
1530	1550	mtwhfa/DRM	Vatican City State, Vatican R	15190as
1530	1550	Sat/DRM	Vatican City State, Vatican R	15190as
1530	1600		Afghanistan, R Afghanistan	7200as
1530	1600	DRM	Belgium, TDP Radio/Disco Palace	12115as
1530	1600	h	Canada, Bible Voice Broadcasting	13670as
1530	1600	Sun	Clandestine, Sudan R Service	17745af
1530	1600	smtwa	Germany, AWR Europe	15255as
1530	1600		Iran, IRIB/VOIRI	13785as 15525as
1530	1600		Mongolia, Voice of Mongolia	12015as
1530	1600	Sat	Vatican City State, Vatican R	7585as 11850as 13765as
1551	1600		New Zealand, R New Zealand Intl	7440pa
1551	1600	DRM	New Zealand, R New Zealand Intl	5950pa

1600 UTC - 11AM EST / 10AM CST / 8AM PST

Start	End	Days/Mode	Station	Frequencies
1600	1627		Iran, IRIB/VOIRI	13785as 15525as
1600	1630		Australia, R Australia	9580as
1600	1630	DRM	Belgium, TDP Radio/Disco Palace	12115as
1600	1630		Guam, AWR/KSDA	11690as 11935as 15215as
1600	1630		Vietnam, VO Vietnam/Overseas Svc	7220me 7280eu 9550me 9730eu
1600	1650	DRM	New Zealand, R New Zealand Intl	5950pa
1600	1650		New Zealand, R New Zealand Intl	7440pa
1600	1657		China, China R International	6060as 7235as 7255eu 7420af 7435af 9435eu 9570af 9875eu
1600	1700		Anguilla/Caribbean Beacon/Univ Network	11775na
1600	1700		Australia, ABC NT Alice Springs	2310do
1600	1700		Australia, ABC NT Katherine	2485do
1600	1700		Australia, R Australia	5995va 6080as 7240pa 9475as 9710as 11660as
1600	1700		Bahrain, R Bahrain	6010me
1600	1700	Sat	Canada, CBC Northern Quebec Svc	9625na
1600	1700		Canada, CFRX Toronto ON	6070na
1600	1700		Canada, CFVP Calgary AB	6030na
1600	1700		Canada, CKZN St Johns NF	6160na
1600	1700		Canada, CKZU Vancouver BC	6160na
1600	1700		Egypt, R Cairo	15345af
1600	1700		Ethiopia, R Ethiopia	7235va 9560va
1600	1700		Malaysia, RTM Kajang/Traxx FM	7295do
1600	1700		North Korea, Voice of Korea	9990me 11545af
1600	1700	DRM	Russia, Voice of Russia	6180as
1600	1700		Russia, Voice of Russia	4975va 7270me 9470me
1600	1700		South Africa, CVC 1 Africa R	13590af 17695af
1600	1700		South Korea, KBS World R	9515eu 9640as
1600	1700		Taiwan, R Taiwan Intl	9440as 12055as
1600	1700		Uganda, Dunamis Shortwave	4750do
1600	1700		UK, BBC World Service	3255af 5875as 5975as 6190af 9410as 9505as 11830me 12095af 13790af 15400af 15420af 17640af 17830as
1600	1700	DRM	UK, BBC World Service	5845as
1600	1700		USA, Amer Forces Network/AFRTS	4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
1600	1700		USA, BBG/Voice of America	4930af 6080af 15580af 17895af
1600	1700		USA, BBG/Voice of America/Special English	13600va 15470va
1600	1700		USA, EWTN/WEWN Irondale AL	15610eu
1600	1700		USA, FBN/WTJC Newport NC	9370na
1600	1700	Sat	USA, The Overcomer Ministry	15190va
1600	1700		USA, WBCQ Monticello ME	9330am
1600	1700	Sat	USA, WBCQ Monticello ME	15420am
1600	1700	Sun	USA, WHRI Cypress Creek SC	9840na
1600	1700		USA, WHRI Cypress Creek SC	11630af
1600	1700		USA, WINB Red Lion PA	13570ca
1600	1700		USA, WJHR Intl Milton FL	15550na
1600	1700		USA, WTWW Lebanon TN	9480na 9990am 12105na
1600	1700		USA, WWCR Nashville TN	9980af 12160af 13845eu 15825eu
1600	1700		USA, WWRB Manchester TN	9385na
1600	1700		USA, WYFR/Family R Worldwide	11740as 17545af
1600	1700		Zambia, CVC/R Christian Voice	6065af 17695af
1630	1700	Sun	Canada, Bible Voice Broadcasting	11700me
1630	1700		Clandestine, Sudan R Service	17745af
1630	1700	mtwhf	USA, BBG/Voice of America	9790af 11905af
1645	1700	mtwhfa	Canada, Bible Voice Broadcasting	11700me
1651	1700	DRM	New Zealand, R New Zealand Intl	9890pa
1651	1700	smtwhf	New Zealand, R New Zealand Intl	9765pa
1658	1700	Sat	New Zealand, R New Zealand Intl	9765pa

1700 UTC - 12PM EST / 11AM CST / 9AM PST

Start	End	Days/Mode	Station	Frequencies
1700	1710		Pakistan, PBC/R Pakistan	7530eu 9470eu
1700	1715	f	Canada, Bible Voice Broadcasting	11700me
1700	1720	th	Canada, Bible Voice Broadcasting	11700me
1700	1750	DRM	New Zealand, R New Zealand Intl	9890pa
1700	1750	smtwhf	New Zealand, R New Zealand Intl	9765pa
1700	1755		South Africa, Channel Africa	15235af
1700	1757		China, China R International	6090as 6100eu 6140as 7205as 7255eu 7410as 7420as 7425as 9570af 9600as 13685af
1700	1800		Anguilla/Caribbean Beacon/Univ Network	11775na
1700	1800		Australia, ABC NT Alice Springs	2310do
1700	1800		Australia, ABC NT Katherine	2485do
1700	1800		Australia, R Australia	5995va 6080as 9475as 9580pa 9710as 11880pa
1700	1800		Bahrain, R Bahrain	6010me
1700	1800	Sat/Sun	Canada, Bible Voice Broadcasting	11700me
1700	1800	Sat	Canada, CBC Northern Quebec Svc	9625na
1700	1800		Canada, CFRX Toronto ON	6070na
1700	1800		Canada, CFVP Calgary AB	6030na
1700	1800		Canada, CKZN St Johns NF	6160na
1700	1800		Canada, CKZU Vancouver BC	6160na
1700	1800		Egypt, R Cairo	15345af
1700	1800		Malaysia, RTM Kajang/Traxx FM	7295do
1700	1800	DRM	Russia, Voice of Russia	7300eu
1700	1800		Russia, Voice of Russia	4975va 7240as 7270va 7330eu 9880as
1700	1800		South Africa, CVC 1 Africa R	4965af 13590af 17695af
1700	1800		South Africa, TWR Africa	3200af
1700	1800		Taiwan, R Taiwan Intl	15690af
1700	1800		UK, BBC World Service	5875as 5975as 6190af 7600as 9505as 12095af 13790af 15400af 15420af 17640af 17830af
1700	1800	DRM	UK, BBC World Service	5845as
1700	1800		USA, Amer Forces Network/AFRTS	4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
1700	1800		USA, BBG/Voice of America	15580af 17895af
1700	1800		USA, EWTN/WEWN Irondale AL	15610eu
1700	1800		USA, FBN/WTJC Newport NC	9370na
1700	1800		USA, WBCQ Monticello ME	9330am
1700	1800	Sat	USA, WBCQ Monticello ME	15420am
1700	1800		USA, WHRI Cypress Creek SC	21630af
1700	1800	Sun	USA, WHRI Cypress Creek SC	9840na
1700	1800		USA, WINB Red Lion PA	13570ca
1700	1800		USA, WJHR Intl Milton FL	15550na
1700	1800		USA, WTWW Lebanon TN	9480na 9990am 12105na
1700	1800		USA, WWCR Nashville TN	9980af 12160af 13845eu 15825eu
1700	1800		USA, WWRB Manchester TN	9385na
1700	1800		USA, WYFR/Family R Worldwide	7385af 7395af 17540af 17545af
1700	1800		Zambia, CVC/R Christian Voice	4965af 17695af

1730	1745	h	Canada, Bible Voice Broadcasting	9460me	
1730	1745		India, All India R/Bhopal	4810do	
1730	1745		India, All India R/Delhi	5015do	7370do
			9575do	9835do	
1730	1745		India, All India R/Guwahati	4940do	
1730	1745		India, All India R/Hyderbad	4800do	
1730	1745		India, All India R/Jaipur	4910do	
1730	1745		India, All India R/Kolkata	4820do	
1730	1745		India, All India R/Kurseong	4895do	
1730	1745		India, All India R/Lucknow	4880do	
1730	1745		India, All India R/R Kashmir	4950do	
1730	1745		India, All India R/Shimla	4965do	
1730	1745		India, All India R/Thiruvananthapuram	5010do	
1730	1800	m	South Africa, Amateur R Mirror Intl	4895af	
1730	1800		Turkey, Voice of Turkey	11735as	
1730	1800		Vatican City State, Vatican R	9755af	11625af
			13765af		
1740	1745		India, All India R/Chennai	4920do	
1745	1800	Sat	Canada, Bible Voice Broadcasting	15335af	
1745	1800	DRM	India, All India R/External Svc	9950eu	
1745	1800		India, All India R/External Svc		
			7410af	7550eu	9415af	9445af
			11670eu	11935af	
1751	1800	DRM	New Zealand, R New Zealand Intl	11675pa	
1751	1800		New Zealand, R New Zealand Intl	11725pa	
1758	1800	DRM	New Zealand, R New Zealand Intl	11675pa	
1758	1800	Sat	New Zealand, R New Zealand Intl	11725pa	

1800 UTC - 1PM EST / 12PM CST / 10AM PST

1800	1815	Sat	Canada, Bible Voice Broadcasting	7365as	
1800	1830	w	Austria, AWR Europe	11690af	
1800	1830	t	Canada, Bible Voice Broadcasting	9465me	
1800	1830	DRM	Romania, R Romania Intl	5875eu	
1800	1830	m	South Africa, Amateur R Mirror Intl	3230af	
1800	1830		South Africa, AWR Africa	3215af	3345af
1800	1830		Turkey, Voice of Turkey	11735as	
1800	1830		UK, BBC World Service	5975as	7600as
			9505as		
1800	1830		USA, BBG/Voice of America	4930af	6080af
			13635af	15580af	
1800	1830		Vietnam, VO Vietnam/Overseas Svc	5955eu	
1800	1850	DRM	New Zealand, R New Zealand Intl	11675pa	
1800	1856	DRM	Romania, R Romania Intl	9745eu	
1800	1856		Romania, R Romania Intl	11955eu	
1800	1857		China, China R International	6100eu	
			6165as	7405eu	13685af
1800	1859		Canada, R Canada International	9740va	
			9770af	11845af	15365af	17790af
1800	1900		Anguilla/Caribbean Beacon/Univ Network		
			11775na		
1800	1900	mtwhf	Argentina, RAE	15345eu	
1800	1900		Australia, ABC NT Alice Springs	2310do	
1800	1900		Australia, ABC NT Katherine	2485do	
1800	1900		Australia, R Australia	6080as	7240pa
			9475as	9580pa	9710as	11880pa
1800	1900		Bahrain, R Bahrain	6010me	
1800	1900	Sun	Canada, Bible Voice Broadcasting	9465me	
1800	1900	Sat	Canada, Bible Voice Broadcasting	6110me	
1800	1900		Canada, CFRX Toronto ON	6070na	
1800	1900		Canada, CFVP Calgary AB	6030na	
1800	1900		Canada, CKZN St Johns NF	6160na	
1800	1900		Canada, CKZU Vancouver BC	6160na	
1800	1900	DRM	India, All India R/External Svc	9950eu	
1800	1900		India, All India R/External Svc	7400af	
			7410af	7550eu	9415af	9445af
			11670eu	11935af	
1800	1900		Kuwait, R Kuwait	15540eu	
1800	1900		Malaysia, RTM Kajang/Traxx FM	7295do	
1800	1900		Netherlands, R Netherlands Worldwide		
			11655af		
1800	1900		New Zealand, R New Zealand Intl	11725pa	
1800	1900		Nigeria, Voice of Nigeria	15120af	
1800	1900		North Korea, Voice of Korea	3560as	
			7570eu	12015eu	
1800	1900		Poland, Polskie R Warsaw	3955eu	
1800	1900	DRM	Russia, Voice of Russia	6145eu	7300eu
1800	1900		Russia, Voice of Russia	7270va	7330eu
			11985va	12060eu	
1800	1900		South Africa, CVC 1 Africa R	4965af	
			13590af	17695af	

1800	1900		South Africa, TWR Africa	3200af	
1800	1900		South Korea, KBS World R	7275eu	
1800	1900		Taiwan, R Taiwan Intl	3965eu	
1800	1900		UK, BBC World Service	3255af	5945as
			6190af	9430af	11810af	15400af
1800	1900		USA, Amer Forces Network/AFRTS	4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb	
1800	1900		USA, EWTN/WEWN Irondale AL	15610af	
1800	1900		USA, FBN/WTJC Newport NC	9370na	
1800	1900		USA, WBCQ Monticello ME	9330am	
1800	1900	fas	USA, WHRI Cypress Creek SC	21630af	
1800	1900	Sat/Sun	USA, WHRI Cypress Creek SC	9840na	
1800	1900		USA, WINB Red Lion PA	13570ca	
1800	1900		USA, WJHR Intl Milton FL	15550na	
1800	1900		USA, WTWW Lebanon TN	9480na	9990am
			12105na		
1800	1900		USA, WWCR Nashville TN	9980af	12160af
			13845eu	15825eu	
1800	1900		USA, WWRB Manchester TN	9385na	
1800	1900		USA, WYFR/Family R Worldwide	5890af	
			7385af	7395af	9895af	11665af
			12140af	13750af	
1800	1900		Zambia, CVC/R Christian Voice	4965af	
			17695af		
1830	1845		India, All India R/Delhi	5015do	
1830	1900	Sun	Italy, IRRS-Shortwave/Euro Gospel R	7290eu	
1830	1900		South Africa, AWR Africa	11830af	
1830	1900	m	South Africa, TWR Africa	9500af	
1830	1900		UK, BBC World Service	9410af	
1830	1900		USA, BBG/Voice of America	4930af	6080af
			13635af	15580af	
1851	1900	DRM	New Zealand, R New Zealand Intl	15720pa	
1858	1900	Sat/DRM	New Zealand, R New Zealand Intl	15720pa	

1900 UTC - 2PM EST / 1PM CST / 11AM PST

1900	1915	Sun	Canada, Bible Voice Broadcasting	9465me	
1900	1928		Germany, Deutsche Welle	12045af	
1900	1930		Germany, Deutsche Welle	9735af	12070af
1900	1930		USA, WRMI/R Prague relay	9955am	
1900	1930		Vietnam, VO Vietnam/Overseas Svc	7280eu	
			9730eu		
1900	1945	DRM	India, All India R/External Svc	9950eu	
1900	1945		India, All India R/External Svc	7400af	
			7410af	7550eu	9415af	9445af
			11670eu	11935af	
1900	1950	DRM	New Zealand, R New Zealand Intl	15720pa	
1900	1957		China, China R International	7295as	
			7435 `af	9440as	
1900	1957		Netherlands, R Netherlands Worldwide		
			11655af		
1900	1959		Netherlands, R Netherlands Worldwide		
			11615af		
1900	2000		Anguilla/Caribbean Beacon/Univ Network		
			11775na		
1900	2000		Australia, ABC NT Alice Springs	2310do	
1900	2000		Australia, ABC NT Katherine	2485do	
1900	2000		Australia, R Australia	6080as	7240pa
			9500as	9580pa	9710as	11880pa
1900	2000		Bahrain, R Bahrain	6010me	
1900	2000	Sat	Canada, Bible Voice Broadcasting	9470me	
1900	2000	Sun	Canada, Bible Voice Broadcasting	6030eu	
1900	2000		Canada, CFRX Toronto ON	6070na	
1900	2000		Canada, CFVP Calgary AB	6030na	
1900	2000		Canada, CKZN St Johns NF	6160na	
1900	2000		Canada, CKZU Vancouver BC	6160na	
1900	2000	mtwhfa	Ecuador, HCJB/LV de los Andes	3995eu	
1900	2000		Egypt, R Cairo	15290af	
1900	2000		Indonesia, Voice of Indonesia	9525va	
1900	2000		Italy, IRRS-Shortwave	7290va	
1900	2000		Kuwait, R Kuwait	15540eu	
1900	2000		Malaysia, RTM Kajang/Traxx FM	7295do	
1900	2000		Micronesia, V6MP/Cross R/Pohnpei	4755as	
1900	2000		Netherlands, R Netherlands Worldwide		
			7425af		
1900	2000		New Zealand, R New Zealand Intl	11725pa	
1900	2000		North Korea, Voice of Korea	7210af	
			9975me	11535af	11910af	
1900	2000	DRM	Russia, Voice of Russia	6040eu	

1900	2000		Russia, Voice of Russia	7330eu	
1900	2000		South Africa, CVC 1 Africa R	4965af	
			13590af	17695af	
1900	2000		South Africa, TWR Africa	3200af	
1900	2000	mtwhf	Spain, R Exterior de Espana	9605af	9665eu
1900	2000		Thailand, R Thailand World Svc	9680eu	
1900	2000		UK, BBC World Service	3255af	5945as
			6005af	9410af	9430af	11810af
			15400af		
1900	2000		USA, Amer Forces Network/AFRTS	4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb	
1900	2000		USA, BBG/Voice of America	4930af	4940af
			6080af	7480va	9590va	15580af
1900	2000		USA, BBG/Voice of America/Special English	
			7480va	9590va	
1900	2000		USA, EWTN/WEWN Irondale AL	15610af	
1900	2000		USA, FBN/WTJC Newport NC	9370na	
1900	2000		USA, The Overcomer Ministry	9835af	
1900	2000		USA, WBCQ Monticello ME	9330am	
1900	2000		USA, WHRI Cypress Creek SC	9840na	
1900	2000		USA, WINB Red Lion PA	13570ca	
1900	2000		USA, WJHR Intl Milton FL	15550na	
1900	2000		USA, WTWW Lebanon TN	9480na	9990am
			12105na		
1900	2000		USA, WWCR Nashville TN	9980af	12160af
			13845eu	15825eu	
1900	2000		USA, WWRB Manchester TN	9385na	
1900	2000		USA, WYFR/Family R Worldwide	3230af	
			5850af	6020af	7395af	9610af
			9705af	9885af	9925af	
			18980eu		
1900	2000		Zambia, CVC/R Christian Voice	4965af	
			13590af		
1905	1920	Sat	Mali, ORTM/R Mali	9635do	
1915	1945	Sat	Canada, Bible Voice Broadcasting	6030eu	
1915	1945	Sun	Canada, Bible Voice Broadcasting	9470me	
1930	2000	Sat/Sun	Germany, Pan American Broadcasting	6040af	
1930	2000		Iran, IRIB/VOIRI	6010eu	6115eu	7320eu
			13670af	15450af	
1930	2000		Serbia, International R Serbia	6100eu	
1930	2000		South Africa, RTE R Worldwide	5820af	
1930	2000		Turkey, Voice of Turkey	6050va	
1951	2000	DRM	New Zealand, R New Zealand Intl	17675pa	
1958	2000	Sat/DRM	New Zealand, R New Zealand Intl	17675pa	

2000 UTC - 3PM EST / 2PM CST / 12PM PST

2000	2027		Iran, IRIB/VOIRI	6010eu	6115eu	7320eu
			13670af	15450af	
2000	2030		Egypt, R Cairo	15290af	
2000	2030	Sat	Germany, Pan American Broadcasting	6040af	
2000	2030	Sat	South Africa, TWR Africa	3200af	
2000	2030		Turkey, Voice of Turkey	6050va	
2000	2030		Vatican City State, Vatican R	7365af	9755af
			11625af		
2000	2050	DRM	New Zealand, R New Zealand Intl	17675pa	
2000	2057		China, China R International	5960eu	
			5985af	7285eu	7295as	7415eu
			9440as	9600eu	11640af	13630af
2000	2057		Netherlands, R Netherlands Worldwide	
			7425af	11615af	
2000	2100		Anguilla/Caribbean Beacon/Univ Network	
			11775na		
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, R Australia	9500as	11650as
			11660pa	11880pa	
2000	2100	mtwhf	Australia, R Australia	7240pa	
2000	2100	Sat/Sun	Australia, R Australia	6080as	7240pa
			12080va		
2000	2100		Bahrain, R Bahrain	6010me	
2000	2100	mtwhf	Belarus, R Belarus	6155eu	11730eu
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 Johns NF	6160na	
2000	2100		Canada, CKZU Vancouver BC	6160na	
2000	2100	f	Clandestine, JSR/Shiokaze/Sea Breeze	5965as
			5910al	6110al	

2000	2100		Cuba, R Havana Cuba	11760ca	
2000	2100		Germany, Deutsche Welle	9655af	9735af
			12070af		
2000	2100		Kuwait, R Kuwait	15540eu	
2000	2100		Malaysia, RTM Kajang/Traxx FM	7295do	
2000	2100		Micronesia, V6MP/Cross R/Pohnpei	4755as	
2000	2100		New Zealand, R New Zealand Intl	11725pa	
2000	2100	DRM	Russia, Voice of Russia	6040eu	
2000	2100		Russia, Voice of Russia	7330eu	
2000	2100		South Africa, CVC 1 Africa R	4965af	
			13590af		
2000	2100		UK, BBC World Service	3255af	6005af
			6190af	9410af	9430af	11810af
			15400af		
2000	2100		USA, Amer Forces Network/AFRTS	4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb	
2000	2100	mtwhf	USA, BBG/Voice of America	7470va	9480va
			9490va		
2000	2100		USA, EWTN/WEWN Irondale AL	15610af	
2000	2100		USA, FBN/WTJC Newport NC	9370na	
2000	2100		USA, WBCQ Monticello ME	9330am	15420am
2000	2100	smtwhf	USA, WBCQ Monticello ME	7490am	
2000	2100	Sun	USA, WHRI Cypress Creek SC	9895va	
2000	2100	Sat	USA, WHRI Cypress Creek SC	17520af	
2000	2100		USA, WINB Red Lion PA	13570ca	
2000	2100		USA, WJHR Intl Milton FL	15550na	
2000	2100		USA, WTWW Lebanon TN	9480na	9990am
			12105na		
2000	2100		USA, WWCR Nashville TN	9980af	12160af
			13845eu	15825eu	
2000	2100		USA, WWRB Manchester TN	9385na	
2000	2100		USA, WYFR/Family R Worldwide	6020af	
			9925af	15195af	15520af
2000	2100		Zambia, CVC/R Christian Voice	4965af	
			13590af		
2020	2100	Sat/Sun	Belarus, R Belarus	6155eu	11730eu
2030	2045		Thailand, R Thailand World Svc	9535eu	
2030	2100		USA, BBG/Voice of America	4930af	6080af
			7560as	15580af	
2030	2100	Sat/Sun	USA, BBG/Voice of America	4940af	
2030	2100		Vietnam, VO Vietnam/Overseas Svc	7270me	
			7280eu	9550me	9730eu
2045	2100		India, All India R/External Svc	7550eu	
			9445eu	11670eu	11715pa
2045	2100	DRM	India, All India R/External Svc	9950eu	
2045	2100	DRM	Vatican City State, Vatican R	9800am	
2050	2100		Vatican City State, Vatican R	3975eu	6075eu
			7250eu		
2051	2100	DRM	New Zealand, R New Zealand Intl	15720pa	

2100 UTC - 4PM EST / 3PM CST / 1PM PST

2100	2127		China, China R International	11640af	
			13630af		
2100	2130	mtwhfa	Albania, R Tirana	7530na	
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	9830af	
2100	2130	Sat	Canada, CBC Northern Quebec Svc	9625na	
2100	2150		New Zealand, R New Zealand Intl	11725pa	
2100	2150	DRM	New Zealand, R New Zealand Intl	15720pa	
2100	2157		China, China R International	5960eu	
			5690eu	7205af	7285eu	7405af
			7415eu	9600eu	
2100	2200		Angola, Angolan National R	7217af	
2100	2200		Anguilla/Caribbean Beacon/Univ Network	
			11775na		
2100	2200		Australia, R Australia	9500as	9660pa
			11650as	11660pa	11695va	12080va
			13630va	15515va	
2100	2200		Bahrain, R Bahrain	6010me	
2100	2200		Belarus, R Belarus	6155eu	11730eu
2100	2200		Canada, CFRX Toronto ON	6070na	
2100	2200		Canada, CFVP Calgary AB	6030na	
2100	2200		Canada, CKZN St Johns NF	6160na	
2100	2200		Canada, CKZU Vancouver BC	6160na	
2100	2200		Germany, Deutsche Welle	12070af	
2100	2200		India, All India R/External Svc	7550eu	
			9445eu	11670pa	11715eu
2100	2200	DRM	India, All India R/External Svc	9950eu	

Start	Stop	Days	Station	Frequencies
2100	2200		Malaysia, RTM Kajang/Traxx FM	7295do
2100	2200		Micronesia, V6MP/Cross R/Pohnpei	4755 as
2100	2200		North Korea, Voice of Korea	3560as 7570eu 12015na
2100	2200		Russia, Voice of Russia	7300eu
2100	2200		South Africa, CVC 1 Africa R	4965af 13590af
2100	2200		Syria, R Damascus	9330va
2100	2200		UK, BBC World Service	3255af 5875as 5905af 5955af 5965as 6190af 6195as 9410af 9915af 12095af
2100	2200		USA, Amer Forces Network/AFRTS	4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
2100	2200		USA, BBG/Voice of America	6080af 15580af
2100	2200		USA, EWTN/WEWN Irondale AL	15610af
2100	2200		USA, FBN/WTJC Newport NC	9370na
2100	2200		USA, WBCQ Monticello ME	9330am 15420am
2100	2200	smtwhf	USA, WBCQ Monticello ME	7490am
2100	2200	Sun	USA, WHRI Cypress Creek SC	9490va
2100	2200		USA, WINB Red Lion PA	13570ca
2100	2200		USA, WJHR Intl Milton FL	15550na
2100	2200		USA, WTWW Lebanon TN	9480na 9990am 12105na
2100	2200		USA, WWCR Nashville TN	7465eu 9350af 9980af 13845eu
2100	2200		USA, WWRB Manchester TN	3215na 9385na
2100	2200		USA, WYFR/Family R Worldwide	7425af 9925af 15195af
2100	2200		Zambia, CVC/R Christian Voice	4965af 13590af
2115	2200		Egypt, R Cairo	6270eu
2130	2156		Romania, R Romania Intl	6030na 7310na 7380na 9435na
2130	2200		Australia, ABC NT Alice Springs	4835do
2130	2200		Australia, ABC NT Katherine	5025do
2130	2200	mtwhfa	Canada, CBC Northern Quebec Svc	9625na
2130	2200		Turkey, Voice of Turkey	9610va
2151	2200		New Zealand, R New Zealand Intl	15720pa
2151	2200	DRM	New Zealand, R New Zealand Intl	17675pa
2158	2200	Sat	New Zealand, R New Zealand Intl	15720pa
2158	2200	Sat/DRM	New Zealand, R New Zealand Intl	17675pa

2200 UTC - 5PM EST / 4PM CST / 2PM PST

Start	Stop	Days	Station	Frequencies
2200	2215	t	USA, WBCQ Monticello ME	7490am
2200	2230		India, All India R/External Svc	7550eu 9445eu 11670pa 11715pa
2200	2230		Serbia, International R Serbia	6100eu
2200	2230		South Korea, KBS World R	3955eu
2200	2230		Turkey, Voice of Turkey	9610va
2200	2245		Egypt, R Cairo	6270eu
2200	2257		China, China R International	5915as
2200	2300		Anguilla/Caribbean Beacon/Univ Network	6090na
2200	2300		Australia, ABC NT Alice Springs	4835do
2200	2300		Australia, ABC NT Katherine	5025do
2200	2300		Australia, R Australia	9855as 11550as 12080va 13630va 15230va 15240va 15515va
2200	2300	fa	Australia, R Australia	9660pa
2200	2300		Bahrain, R Bahrain	6010me
2200	2300	smtwhf	Canada, CBC Northern Quebec Svc	9625na
2200	2300		Canada, CFRX Toronto ON	6070na
2200	2300		Canada, CFVP Calgary AB	6030na
2200	2300		Canada, CKZN St Johns NF	6160na
2200	2300		Canada, CKZU Vancouver BC	6160na
2200	2300	DRM	India, All India R/External Svc	11645as
2200	2300		Malaysia, RTM Kajang/Traxx FM	7295do
2200	2300		Micronesia, V6MP/Cross R/Pohnpei	4755 as
2200	2300		New Zealand, R New Zealand Intl	15720pa
2200	2300	DRM	New Zealand, R New Zealand Intl	17675pa
2200	2300		Russia, Voice of Russia	7250va 11830na
2200	2300	Sat/Sun	Spain, R Exterior de Espana	6125eu
2200	2300		UK, BBC World Service	3915as 5875as 5890as 5965as 6135as 6190af 6195as 7490as 9915af 12095af
2200	2300		USA, Amer Forces Network/AFRTS	4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
2200	2300	smtwh	USA, BBG/Voice of America	5840as 7365as 7425pa 7570va 11860va
2200	2300		USA, EWTN/WEWN Irondale AL	15610af
2200	2300		USA, FBN/WTJC Newport NC	9370na
2200	2300	smwhf	USA, WBCQ Monticello ME	7490am
2200	2300		USA, WBCQ Monticello ME	9330am
2200	2300	Sat	USA, WHRI Cypress Creek SC	9490va
2200	2300	f	USA, WHRI Cypress Creek SC	15180na
2200	2300	Sat	USA, WHRI Cypress Creek SC	9505va
2200	2300		USA, WINB Red Lion PA	9265ca
2200	2300		USA, WTWW Lebanon TN	9480na 9990am 12105na
2200	2300		USA, WWCR Nashville TN	7465eu 9350af 9980af 13845eu
2200	2300		USA, WWRB Manchester TN	3215na 5050va 5745va 9385na
2230	2300		Guam, AWR/KSDA	15320as
2230	2300	fa	Palau, T8WH/WHRI	9930as
2230	2300		USA, BBG/Voice of America	7545as 9570pa
2230	2300		USA, BBG/Voice of America/Special English	5810va 7545va 9570va
2245	2300		India, All India R/External Svc	6055as 7305as 13605as

2300 UTC - 6PM EST / 5PM CST / 3PM PST

Start	Stop	Days	Station	Frequencies
2300	0000		Anguilla/Caribbean Beacon/Univ Network	6090na
2300	0000		Australia, ABC NT Alice Springs	4835do
2300	0000		Australia, ABC NT Katherine	5025do
2300	0000		Australia, R Australia	9855as 9660pa 12080va 13690va 15230va 15515pa 17795pa
2300	0000		Bahrain, R Bahrain	6010me
2300	0000	smtwhf	Canada, CBC Northern Quebec Svc	9625na
2300	0000		Canada, CFRX Toronto ON	6070na
2300	0000		Canada, CFVP Calgary AB	6030na
2300	0000		Canada, CKZN St Johns NF	6160na
2300	0000		Canada, CKZU Vancouver BC	6160na
2300	0000		Egypt, R Cairo	6270eu
2300	0000		India, All India R/External Svc	6055as 7305as 13605as
2300	0000		Malaysia, RTM Kajang/Traxx FM	7295do
2300	0000		Micronesia, V6MP/Cross R/Pohnpei	4755 as
2300	0000		New Zealand, R New Zealand Intl	15720pa
2300	0000	DRM	New Zealand, R New Zealand Intl	17675pa
2300	0000		Russia, Voice of Russia	7250va 7290va
2300	0000		Turkey, Voice of Turkey	5960va
2300	0000		UK, BBC World Service	3915as 5875as 5980as 6195as 7490as 9740as 11955as
2300	0000		USA, Amer Forces Network/AFRTS	4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
2300	0000		USA, BBG/Voice of America	5840as 5895as 7365as 7460as 7480pa 7570pa 9490va 11840va 11860va
2300	0000		USA, EWTN/WEWN Irondale AL	15610af
2300	0000		USA, FBN/WTJC Newport NC	9370na
2300	0000	smtwhf	USA, WBCQ Monticello ME	7490am
2300	0000		USA, WBCQ Monticello ME	9330am
2300	0000	Sat	USA, WHRI Cypress Creek SC	9505va
2300	0000	smtwhf	USA, WHRI Cypress Creek SC	7385ca
2300	0000		USA, WINB Red Lion PA	9265ca
2300	0000		USA, WTWW Lebanon TN	9480na 9990am 12105na
2300	0000		USA, WWCR Nashville TN	3195eu 5070af 9980af 13845eu
2300	0000		USA, WWRB Manchester TN	3185na 5050na 5745va 9395na
2300	0000		USA, WYFR/Family R Worldwide	9430af 15400af
2300	2330		Australia, R Australia	15240as
2300	2330	DRM	Vatican City State, Vatican R	7370am
2300	2356		Romania, R Romania Intl	6015eu 7220eu 7300eu 9530eu
2300	2357		China, China R International	5915as 5990me 6040na 6145as 7350eu 7415as 9535as 11790as 11970va
2315	0000		USA, WYFR/Family R Worldwide	6115na
2315	2330		Croatia, Voice of Croatia	3985ca 7375eu
2330	0000		Australia, R Australia	15415va 17750va
2330	0000		Vietnam, VO Vietnam/Overseas Svc	9840as 12020as
2330	2345		India, All India R/Aligarh	9470do

MTXTRA
Shortwave Broadcast Guide

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.

1600 UTC - 11AM EST / 10AM CST / 8AM PST

1600	1630		France, Radio France Internationale	17690as
1600	1700		Bolivia, Radio Cultural Juan XXIII	6055do
1600	1700		Bolivia, Radio Eco	4409do
1600	1700		Bolivia, Radio Fides	6155do 9625do
1600	1700		Bolivia, Radio Illimani/Radio Patria Nueva 6025do	
1600	1700		Bolivia, Radio Lipez	4796do
1600	1700		Bolivia, Radio Logos	4865do 6165do
1600	1700		Bolivia, Radio Loyola	5996do
1600	1700		Bolivia, Radio Nacional	5965do
1600	1700		Bolivia, Radio San Jose	5580do
1600	1700		Bolivia, Radio San Miguel	4700do
1600	1700		Bolivia, Radio Santa Ana	4451do
1600	1700		Bolivia, Radio Santa Cruz	6135do
1600	1700		Bolivia, Radio Tacana	4782do
1600	1700		Chile, CVC Voz Crista	9635sa 17680sa
1600	1700		Colombia, La Voz de tu Conciencia	6010do
1600	1700		Colombia, La Voz del Guaviare	6035do
1600	1700		Colombia, Marfil Estereo	5910do
1600	1700	Sun	Cuba, Radio Havana Cuba	11690ca 13680ca
			13750sas 15370sa 17750sa	
1600	1700		Cuba, Radio Rebelde	5025na
1600	1700		Dominican Republic, Radio Amanecer Intl 6025do	
1600	1700		Ecuador, Radio Quito	4919do
1600	1700		Equatorial Guinea, Radio Nacional/Bata 5005do	
1600	1700		Equatorial Guinea, Radio Nacional/Malabo 6250do	
1600	1700		Honduras, HRMI/ Radio Misiones Intl	3340do
1600	1700		Mexico, Radio Mil Onda Corta	6010do
1600	1700		Mexico, Radio Transcontinental de America 4800do	
1600	1700		Mexico, Radio Universidad	6045do
1600	1700		Peru, La Voz de las Huarinjas	5059do
1600	1700		Peru, Ondas del Huallaga	3329do
1600	1700		Peru, Radio Altura	5014do
1600	1700		Peru, Radio Bethel	5921do
1600	1700		Peru, Radio Cusco	6195do
1600	1700		Peru, Radio del Pacifico	9675do 4974al
1600	1700		Peru, Radio La Hora	4857do
1600	1700		Peru, Radio Manantial	4986do
1600	1700		Peru, Radio Maranon	4835do
1600	1700		Peru, Radio Ondas del Suroiente	5120do
1600	1700		Peru, Radio Quillabamba	5025do
1600	1700		Peru, Radio Santa Rosa	6047do
1600	1700		Peru, Radio Sicuani	4826do
1600	1700		Peru, Radio Tawantinsuyo	6174do
1600	1700		Peru, Radio Victoria	6019do 9720do
1600	1700		Peru, Radio Vision	4790do
1600	1700	ma	Spain, Radio Exterior de Espana	15385af
1600	1700	mtwhf	Spain, Radio Exterior de Espana	17595sa
1600	1700	Sat	Spain, Radio Exterior de Espana	9765ca
			15125sa 17850na	
1600	1700	Sat/Sun	Spain, Radio Exterior de Espana	17575sa
1600	1700	Sun	Spain, Radio Exterior de Espana	9765ca
			17755af 17850na	
1600	1700		Spain, Radio Exterior de Espana	15585eu
			21610eu	
1600	1700		USA, BBG/Radio Marti	11845ca 11930ca
			13820ca	
1600	1700		USA, EWTN/WEWN Irondale, AL	11550ca
			12050sa	
1600	1700		USA, KVOH Rancho Simi CA	17775ca
1600	1700		USA, WYFR/Family Radio Worldwide	15130na
			21670eu	
1600	1700		Venezuela, Radio Amazonas	4940do

1700 UTC - 12PM EST / 11AM CST / 9AM PST

1700	1800		Bolivia, Radio Cultural Juan XXIII	6055do
1700	1800		Bolivia, Radio Fides	6155do 9625do
1700	1800		Bolivia, Radio Illimani/Radio Patria Nueva 6025do	
1700	1800		Bolivia, Radio Lipez	4796do
1700	1800		Bolivia, Radio Logos	4865do 6165do
1700	1800		Bolivia, Radio Loyola	5996do
1700	1800		Bolivia, Radio San Miguel	4700do
1700	1800		Bolivia, Radio Santa Ana	4451do
1700	1800		Bolivia, Radio Santa Cruz	6135do
1700	1800		Bolivia, Radio Tacana	4782do
1700	1800		Chile, CVC Voz Crista	9635sa 17680sa
1700	1800		Colombia, La Voz de tu Conciencia	6010do
1700	1800		Colombia, La Voz del Guaviare	6035do
1700	1800		Colombia, Marfil Estereo	5910do
1700	1800	Sun	Cuba, Radio Havana Cuba	11690ca 13680ca
			13750sa 15370sa 17750sa	
1700	1800		Cuba, Radio Rebelde	5025na
1700	1800		Dominican Republic, Radio Amanecer Intl 6025do	
1700	1800		Ecuador, Radio Quito	4919do
1700	1800		Equatorial Guinea, Radio Nacional/Bata 5005do	
1700	1800		Equatorial Guinea, Radio Nacional/Malabo 6250do	
1700	1800		Honduras, HRMI/ Radio Misiones Intl	3340do
1700	1800		Indonesia, Voice of Indonesia	9526va
1700	1800		Mexico, Radio Mil Onda Corta	6010do
1700	1800		Mexico, Radio Transcontinental de America 4800do	
1700	1800		Mexico, Radio Universidad	6045do
1700	1800		Peru, La Voz de las Huarinjas	5059do
1700	1800		Peru, Ondas del Huallaga	3329do
1700	1800		Peru, Radio Altura	5014do
1700	1800		Peru, Radio Bethel	5921do
1700	1800		Peru, Radio Cusco	6195do
1700	1800		Peru, Radio del Pacifico	9675do 4974al
1700	1800		Peru, Radio La Hora	4857do
1700	1800		Peru, Radio Manantial	4986do
1700	1800		Peru, Radio Maranon	4835do
1700	1800		Peru, Radio Ondas del Suroiente	5120do
1700	1800		Peru, Radio Quillabamba	5025do
1700	1800		Peru, Radio Santa Rosa	6047do
1700	1800		Peru, Radio Sicuani	4826do
1700	1800		Peru, Radio Tawantinsuyo	6174do
1700	1800		Peru, Radio Victoria	6019do 9720do
1700	1800		Peru, Radio Vision	4790do
1700	1800	Sat	Spain, Radio Exterior de Espana	9765ca
			15125sa 17850na	
1700	1800	Sat/Sun	Spain, Radio Exterior de Espana	9665eu
1700	1800	Sun	Spain, Radio Exterior de Espana	9765ca
1700	1800		Spain, Radio Exterior de Espana	17715sa
			17755af	
1700	1800		USA, BBG/Radio Marti	9565ca 11930ca
			13820ca	
1700	1800		USA, EWTN/WEWN Irondale, AL	11550ca
			13830ca	
1700	1800		USA, KVOH Rancho Simi CA	17775ca
1700	1800		USA, WYFR/Family Radio Worldwide	6085ca
			13615na 15130na	
1700	1800		Venezuela, Radio Amazonas	4940do
1730	1800		Bulgaria, Radio Bulgaria	5900eu 9400eu
1730	1800		Turkey, Voice of Turkey	9495va

1800 UTC - 1PM EST / 12PM CST / 10AM PST

1800	1830		Turkey, Voice of Turkey	9495va

Start	End	Days	Station	Freq
1800	1830		Vietnam, Voice of Vietnam/Overseas Svc	7280eu 9730eu
1800	1845		USA, WYFR/Family Radio Worldwide	21670eu
1800	1900	Sun	Argentina, RAE	6060am 15345am
1800	1900		Bolivia, Radio Cultural Juan XXIII	6055do
1800	1900		Bolivia, Radio Illimani/Radio Patria Nueva	6025do
1800	1900		Bolivia, Radio Lipez	4796do
1800	1900		Bolivia, Radio Logos	4865do 6165do
1800	1900		Bolivia, Radio Loyola	5996do
1800	1900		Bolivia, Radio San Miguel	4700do
1800	1900		Bolivia, Radio Santa Ana	4451do
1800	1900		Bolivia, Radio Santa Cruz	6135do
1800	1900		Bolivia, Radio Tacana	4782do
1800	1900		Chile, CVC Voz Crista	9635sa 17680sa 17860al
1800	1900		Colombia, La Voz de tu Conciencia	6010do
1800	1900		Colombia, La Voz del Guaviare	6035do
1800	1900		Colombia, Marfil Estereo	5910do
1800	1900		Cuba, Radio Rebelde	5025na
1800	1900		Dominican Republic, Radio Amanecer Intl	6025do
1800	1900		Ecuador, Radio Quito	4919do
1800	1900		Equatorial Guinea, Radio Nacional/Bata	5005do
1800	1900		Equatorial Guinea, Radio Nacional/Malabo	6250do
1800	1900		Honduras, HRMI/ Radio Misiones Intl	3340do
1800	1900		Mexico, Radio Mil Onda Corta	6010do
1800	1900		Mexico, Radio Transcontinental de America	4800do
1800	1900		Mexico, Radio Universidad	6045do
1800	1900		Peru, La Voz de las Huarinjas	5059do
1800	1900		Peru, Ondas del Huallaga	3329do
1800	1900		Peru, Radio Altura	5014do
1800	1900		Peru, Radio Bethel	5921do
1800	1900		Peru, Radio Cusco	6195do
1800	1900		Peru, Radio del Pacifico	9675do 4974al
1800	1900		Peru, Radio La Hora	4857do
1800	1900		Peru, Radio Manantial	4986do
1800	1900		Peru, Radio Maranon	4835do
1800	1900		Peru, Radio Ondas del Suroiente	5120do
1800	1900		Peru, Radio Quillabamba	5025do
1800	1900		Peru, Radio Santa Rosa	6047do
1800	1900		Peru, Radio Sicuani	4826do
1800	1900		Peru, Radio Tawantinsuyo	6174do
1800	1900		Peru, Radio Victoria	6019do 9720do
1800	1900		Peru, Radio Vision	4790do
1800	1900	mtwhf	Spain, Radio Exterior de Espana	17850na
1800	1900	Sat	Spain, Radio Exterior de Espana	17850na
1800	1900	Sat/Sun	Spain, Radio Exterior de Espana	9665eu
1800	1900	Sun	Spain, Radio Exterior de Espana	9765ca 17850na
1800	1900		Spain, Radio Exterior de Espana	9765ca 15125sa 17715sa 17755af
1800	1900		USA, BBG/Radio Marti	9565ca 11930ca 15330ca
1800	1900		USA, EWTN/WEWN Irondale, AL	12050ca 13830sa
1800	1900		USA, KVOH Rancho Simi CA	17775ca
1800	1900		USA, WYFR/Family Radio Worldwide	6085ca 9635eu 15130na
1800	1900		Venezuela, Radio Amazonas	4940do

1900 UTC - 2PM EST / 1PM CST / 11AM PST

Start	End	Days	Station	Freq
1900	1940	Sat	Vatican City State, Vatican Radio	9755af 11625af
1900	1957		North Korea, Voice of Korea	13760eu 15245eu
1900	2000	Sun	Argentina, RAE	6060am 15345am
1900	2000		Bolivia, Radio Cultural Juan XXIII	6055do
1900	2000		Bolivia, Radio Illimani/Radio Patria Nueva	6025do
1900	2000		Bolivia, Radio Lipez	4796do
1900	2000		Bolivia, Radio Logos	4865do 6165do
1900	2000		Bolivia, Radio Loyola	5996do
1900	2000		Bolivia, Radio San Miguel	4700do
1900	2000		Bolivia, Radio Santa Ana	4451do
1900	2000		Bolivia, Radio Santa Cruz	6135do
1900	2000		Bolivia, Radio Tacana	4782do
1900	2000		Chile, CVC Voz Crista	9635sa 17680sa 17860al
1900	2000		Colombia, La Voz de tu Conciencia	6010do
1900	2000		Colombia, La Voz del Guaviare	6035do
1900	2000		Colombia, Marfil Estereo	5910do
1900	2000		Cuba, Radio Rebelde	5025na
1900	2000		Dominican Republic, Radio Amanecer Intl	6025do
1900	2000		Ecuador, HCJB Global Voice/Quito	6050sa
1900	2000		Ecuador, Radio Quito	4919do
1900	2000		Equatorial Guinea, Radio Nacional/Bata	5005do
1900	2000		Equatorial Guinea, Radio Nacional/Malabo	6250do
1900	2000		Honduras, HRMI/ Radio Misiones Intl	3340do
1900	2000		Mexico, Radio Mil Onda Corta	6010do
1900	2000		Mexico, Radio Transcontinental de America	4800do
1900	2000		Mexico, Radio Universidad	6045do
1900	2000		Peru, La Voz de las Huarinjas	5059do
1900	2000		Peru, Ondas del Huallaga	3329do
1900	2000		Peru, Radio Altura	5014do
1900	2000		Peru, Radio Bethel	5921do
1900	2000		Peru, Radio Cusco	6195do
1900	2000		Peru, Radio del Pacifico	9675do 4974al
1900	2000		Peru, Radio La Hora	4857do
1900	2000		Peru, Radio Manantial	4986do
1900	2000		Peru, Radio Maranon	4835do
1900	2000		Peru, Radio Ondas del Suroiente	5120do
1900	2000		Peru, Radio Quillabamba	5025do
1900	2000		Peru, Radio Santa Rosa	6047do
1900	2000		Peru, Radio Sicuani	4826do
1900	2000		Peru, Radio Tawantinsuyo	6174do
1900	2000		Peru, Radio Victoria	6019do 9720do
1900	2000		Peru, Radio Vision	4790do
1900	2000	mtwhf	Spain, Radio Exterior de Espana	17850na
1900	2000	Sat/Sun	Spain, Radio Exterior de Espana	9665eu 11940sa 17755af
1900	2000		Spain, Radio Exterior de Espana	15110na 15125sa
1900	2000		Spain, Radio Exterior de Espana	9765ca
1900	2000		Spain, Radio Exterior de Espana	17850na
1900	2000		USA, BBG/Radio Marti	9565ca 11930ca 13820ca
1900	2000		USA, EWTN/WEWN Irondale, AL	12050ca 13830sa
1900	2000		USA, KJES Vado NM	15385ca
1900	2000		USA, KVOH Rancho Simi CA	17775ca
1900	2000		USA, WYFR/Family Radio Worldwide	15130na
1900	2000		Venezuela, Radio Amazonas	4940do
1900	2000		Venezuela, Radio Nacional de Venezuela	15290am

2000 UTC - 3PM EST / 2PM CST / 12PM PST

Start	End	Days	Station	Freq
2000	2020	Sun	Belarus, Radio Station Belarus	6155eu 7360eu 7390eu
2000	2030		Serbia, International Radio Serbia	6100eu
2000	2056		Romania, Radio Romania International	7430eu 9620eu
2000	2100	Sat/Sun	Argentina, RAE	6060am 15345am
2000	2100		Bolivia, Radio Cultural Juan XXIII	6055do
2000	2100		Bolivia, Radio Illimani/Radio Patria Nueva	6025do
2000	2100		Bolivia, Radio Lipez	4796do
2000	2100		Bolivia, Radio Logos	4865do 6165do
2000	2100		Bolivia, Radio Loyola	5996do
2000	2100		Bolivia, Radio Nacional	5965do
2000	2100		Bolivia, Radio San Miguel	4700do
2000	2100		Bolivia, Radio Santa Ana	4451do
2000	2100		Bolivia, Radio Santa Cruz	6135do
2000	2100		Bolivia, Radio Tacana	4782do
2000	2100		Bolivia, Radio Virgen de Remedios	4835do
2000	2100		Chile, CVC Voz Crista	9635sa 17680sa
2000	2100		Colombia, La Voz de tu Conciencia	6010do
2000	2100		Colombia, La Voz del Guaviare	6035do
2000	2100		Colombia, Marfil Estereo	5910do
2000	2100		Cuba, Radio Rebelde	5025na
2000	2100		Dominican Republic, Radio Amanecer Intl	6025do
2000	2100		Ecuador, HCJB Global Voice/Quito	6050sa
2000	2100		Ecuador, Radio Quito	4919do
2000	2100		Equatorial Guinea, Radio Nacional/Bata	5005do
2000	2100		Equatorial Guinea, Radio Nacional/Malabo	6250do
2000	2100		Honduras, HRMI/ Radio Misiones Intl	3340do
2000	2100		Mexico, Radio Mil Onda Corta	6010do
2000	2100		Mexico, Radio Transcontinental de America	4800do

2000	2100		Mexico, Radio Universidad	6045do
2000	2100		Peru, La Voz de las Huarinjas	5059do
2000	2100		Peru, Ondas del Huallaga	3329do
2000	2100		Peru, Radio Altura	5014do
2000	2100		Peru, Radio Bethel	5921do
2000	2100		Peru, Radio Cusco	6195do
2000	2100		Peru, Radio del Pacifico 9675do	4974al
2000	2100		Peru, Radio La Hora	4857do
2000	2100		Peru, Radio Manantial	4986do
2000	2100		Peru, Radio Maranon	4835do
2000	2100		Peru, Radio Ondas del Suroiente	5120do
2000	2100		Peru, Radio Quillabamba	5025do
2000	2100		Peru, Radio Santa Rosa	6047do
2000	2100		Peru, Radio Sicuani	4826do
2000	2100		Peru, Radio Tawantinsuyo	6174do
2000	2100		Peru, Radio Victoria 6019do	9720do
2000	2100		Peru, Radio Vision	4790do
2000	2100		Russia, Voice of Russia	5920eu
2000	2100	Sat	Spain, Radio Exterior de Espana	9765ca
			15125sa 17850na	
2000	2100	Sat/Sun	Spain, Radio Exterior de Espana	9665eu
			11940sa	
2000	2100	Sun	Spain, Radio Exterior de Espana	9765ca
			17850na	
2000	2100		Spain, Radio Exterior de Espana	15110na
2000	2100		Taiwan, Radio Taiwan International	3965eu
2000	2100		USA, BBG/Radio Marti 9565ca	11930ca
			13820ca	
2000	2100		USA, EWTN/WEWN Irondale, AL	12050ca
			13830sa	
2000	2100		USA, KVOH Rancho Simi CA	17775ca
2000	2100		USA, WYFR/Family Radio Worldwide	5985ca
			11855ca 13690na 15130na 15600eu	
2000	2100		Venezuela, Radio Amazonas 4940do	
2000	2100		Venezuela, Radio Nacional de Venezuela	
			17705am	
2030	2100		Iran, IRIB/ VOIRI 5930sa 9630sa	

2100 UTC - 4PM EST / 3PM CST / 1PM PST

2100	2127		Iran, IRIB/ VOIRI 5930sa 9630sa	
2100	2130		Ecuador, HCJB Global Voice/Quito	6050sa

2100	2130		France, Radio France Internationale	17630as
2100	2157		China, China Radio International	6020eu
			9640eu	
2100	2200	Sat/Sun	Argentina, RAE 6060am 15345am	
2100	2200		Bolivia, Radio Cultural Juan XXIII	6055do
2100	2200		Bolivia, Radio Fides 6155do	9625do
2100	2200		Bolivia, Radio Illimani/Radio Patria Nueva	
			6025do	
2100	2200		Bolivia, Radio Logos 4865do	6165do
2100	2200	Sun	Bolivia, Radio Loyola 5996do	
2100	2200		Bolivia, Radio Loyola 5996do	
2100	2200		Bolivia, Radio Mosoj Chaski 3310do	
2100	2200		Bolivia, Radio Nacional 5965do	
2100	2200		Bolivia, Radio Pio XII 5952do	
2100	2200		Bolivia, Radio San Gabriel 6080do	
2100	2200		Bolivia, Radio San Jose 5580do	
2100	2200		Bolivia, Radio San Miguel 4700do	
2100	2200		Bolivia, Radio Santa Ana 4451do	
2100	2200		Bolivia, Radio Santa Cruz 6135do	
2100	2200		Bolivia, Radio Tacana 4782do	
2100	2200		Bolivia, Radio Virgen de Remedios	4835do
2100	2200		Bulgaria, Radio Bulgaria 6000eu	9400eu
2100	2200		Chile, CVC Voz Crista 9635sa	17680sa
2100	2200		Colombia, La Voz de tu Conciencia	6010do
2100	2200		Colombia, La Voz del Guaviare	6035do
2100	2200		Colombia, Marfil Estereo 5910do	
2100	2200		Cuba, Radio Havana Cuba 5040va	
2100	2200		Cuba, Radio Rebelde 5025na	
2100	2200		Dominican Republic, Radio Amanecer Intl	
			6025do	
2100	2200		Dominican Republic, Radio Cristal Intl 5009do	
2100	2200		Ecuador, Radio Quito 4919do	
2100	2200		Equatorial Guinea, Radio Nacional/Bata	
			5005do	
2100	2200		Equatorial Guinea, Radio Nacional/Malabo	
			6250do	
2100	2200		Honduras, HRMI/ Radio Misiones Intl 3340do	
2100	2200		Honduras, Radio Luz y Vida 3250do	
2100	2200		Mexico, Radio Mil Onda Corta 6010do	
2100	2200		Mexico, Radio Transcontinental de America	
			4800do	
2100	2200		Mexico, Radio Universidad 6045do	
2100	2200		Peru, La Voz de las Huarinjas	5059do

Start	Stop	Days	Country, Station	Frequencies
2100	2200		Peru, Ondas del Huallaga	3329do
2100	2200		Peru, Radio Altura	5014do
2100	2200		Peru, Radio Bethel	5921do
2100	2200		Peru, Radio Cusco	6195do
2100	2200		Peru, Radio del Pacifico	9675do 4974al
2100	2200		Peru, Radio La Hora	4857do
2100	2200		Peru, Radio Madre de Dios	4950do
2100	2200		Peru, Radio Manantial	4986do
2100	2200		Peru, Radio Maranon	4835do
2100	2200		Peru, Radio Ondas del Suroiente	5120do
2100	2200		Peru, Radio Quillabamba	5025do
2100	2200		Peru, Radio Santa Rosa	6047do
2100	2200		Peru, Radio Sicuani	4826do
2100	2200		Peru, Radio Tawantinsuyo	6174do
2100	2200		Peru, Radio Victoria	6019do 9720do
2100	2200	Sat	Spain, Radio Exterior de Espana	9765ca 15125sa 17850na
2100	2200	Sat/Sun	Spain, Radio Exterior de Espana	9665eu 11940sa 17755af
2100	2200	Sun	Spain, Radio Exterior de Espana	17850na
2100	2200		Spain, Radio Exterior de Espana	15110na
2100	2200		USA, BBG/Radio Marti	9565ca 11930ca 13820ca
2100	2200		USA, EWTN/WEWN Irondale, AL	12050ca 13830sa
2100	2200		USA, KVOH Rancho Simi CA	17775ca
2100	2200		USA, WYFR/Family Radio Worldwide	5985ca 6915sa 11855ca 15130na
2100	2200		Venezuela, Radio Amazonas	4940do
2120	2200		Vatican City State, Vatican Radio	3975eu 6075eu 7250eu

2200 UTC - 5PM EST / 4PM CST / 2PM PST

Start	Stop	Days	Country, Station	Frequencies
2200	2256		Romania, Radio Romania International	13860sa 15160sa
2200	2257		China, China Radio International	6020eu 7210na 7250eu 9490eu 9640sa 13700sa
2200	2257		North Korea, Voice of Korea	13760eu 15245eu
2200	2300	mtwhf	Argentina, RAE	6060am 15345am
2200	2300	Sat/Sun	Argentina, RAE	6060am 15345am
2200	2300		Bolivia, Radio Cultural Juan XXIII	6055do
2200	2300		Bolivia, Radio Fides	6155do 9625do
2200	2300		Bolivia, Radio Illimani/Radio Patria Nueva	6025do
2200	2300		Bolivia, Radio Lipez	4796do
2200	2300		Bolivia, Radio Logos	4865do 6165do
2200	2300		Bolivia, Radio Loyola	5996do
2200	2300		Bolivia, Radio Mosoj Chaski	3310do
2200	2300		Bolivia, Radio Nacional	5965do
2200	2300		Bolivia, Radio Pio XII	5952do
2200	2300		Bolivia, Radio San Gabriel	6080do
2200	2300		Bolivia, Radio San Jose	5580do
2200	2300		Bolivia, Radio San Miguel	4700do
2200	2300		Bolivia, Radio Santa Ana	4451do
2200	2300		Bolivia, Radio Santa Cruz	6135do
2200	2300		Bolivia, Radio Tacana	4782do
2200	2300		Bolivia, Radio Virgen de Remedios	4835do
2200	2300		Bolivia, Yatun Ayllu Yura/Radio Yura	4717do
2200	2300		Chile, CVC Voz Crista	9635sa 17680sa
2200	2300		Colombia, La Voz de tu Conciencia	6010do
2200	2300		Colombia, La Voz del Guaviare	6035do
2200	2300		Colombia, Marfil Estereo	5910do
2200	2300		Cuba, Radio Havana Cuba	5040va 9540na 9710ca 11840sa 13640eu 13690sa 15230sa
2200	2300		Cuba, Radio Rebelde	5025na
2200	2300		Dominican Republic, Radio Amanecer Intl	6025do
2200	2300		Dominican Republic, Radio Cristal Intl	5009do
2200	2300		Ecuador, HCJB Global Voice/Quito	6050sa
2200	2300		Ecuador, La Voz del Napo	3280do
2200	2300		Ecuador, Radio Quito	4919do
2200	2300		Equatorial Guinea, Radio Nacional/Bata	5005do
2200	2300		Honduras, HRMI/ Radio Misiones Intl	3340do
2200	2300		Honduras, Radio Luz y Vida	3250do
2200	2300		Mexico, Radio Mil Onda Corta	6010do
2200	2300		Mexico, Radio Transcontinental de America	4800do
2200	2300		Mexico, Radio Universidad	6045do
2200	2300		Peru, La Voz de las Huarinjas	5059do
2200	2300		Peru, Ondas del Huallaga	3329do
2200	2300		Peru, Radio Altura	5014do
2200	2300		Peru, Radio Bethel	5921do
2200	2300		Peru, Radio Cusco	6195do
2200	2300		Peru, Radio del Pacifico	9675do 4974al
2200	2300		Peru, Radio La Hora	4857do
2200	2300		Peru, Radio Madre de Dios	4950do
2200	2300		Peru, Radio Manantial	4986do
2200	2300		Peru, Radio Maranon	4835do
2200	2300		Peru, Radio Ondas del Suroiente	5120do
2200	2300		Peru, Radio Quillabamba	5025do
2200	2300		Peru, Radio San Antonio	4940do
2200	2300		Peru, Radio Santa Rosa	6047do
2200	2300		Peru, Radio Sicuani	4826do
2200	2300		Peru, Radio Tawantinsuyo	6174do
2200	2300		Peru, Radio Victoria	6019do 9720do
2200	2300		Peru, Radio Vision	4790do
2200	2300	Sat	Spain, Radio Exterior de Espana	9765ca 15125sa 17850na
2200	2300	Sat/Sun	Spain, Radio Exterior de Espana	11625af 11940sa
2200	2300	Sun	Spain, Radio Exterior de Espana	9765ca
2200	2300		Spain, Radio Exterior de Espana	7275eu 15110na
2200	2300		Syria, Radio Damascus	9330eu
2200	2300		USA, BBG/Radio Marti	6030ca 9565ca 11930ca
2200	2300		USA, EWTN/WEWN Irondale, AL	12050ca 13830sa
2200	2300		USA, KVOH Rancho Simi CA	17775ca
2200	2300		USA, WYFR/Family Radio Worldwide	5985ca 6915sa 7520sa 9935sa 11855ca 15130na 15255do
2200	2300		Venezuela, Radio Amazonas	4940do
2200	2300		Venezuela, Radio Nacional de Venezuela	11670am
2200	2330		France, Radio France Internationale	17630as
2230	2300	mtwhf	Cuba, Radio Havana Cuba	6000na 9660na
2230	2300		Peru, Radio Genesis	4850do

2300 UTC - 6PM EST / 5PM CST / 3PM PST

Start	Stop	Days	Country, Station	Frequencies
2300	0000	Sat/Sun	Argentina, RAE	6060am 15345am
2300	0000		Bolivia, Radio Cultural Juan XXIII	6055do
2300	0000		Bolivia, Radio Fides	6155do 9625do
2300	0000		Bolivia, Radio Illimani/Radio Patria Nueva	6025do
2300	0000		Bolivia, Radio Lipez	4796do
2300	0000		Bolivia, Radio Logos	4865do 6165do
2300	0000		Bolivia, Radio Loyola	5996do
2300	0000		Bolivia, Radio Mosoj Chaski	3310do
2300	0000		Bolivia, Radio Nacional	5965do
2300	0000		Bolivia, Radio Pio XII	5952do
2300	0000		Bolivia, Radio San Gabriel	6080do
2300	0000		Bolivia, Radio San Jose	5580do
2300	0000		Bolivia, Radio San Miguel	4700do
2300	0000		Bolivia, Radio Santa Ana	4451do
2300	0000		Bolivia, Radio Santa Cruz	6135do
2300	0000		Bolivia, Radio Tacana	4782do
2300	0000		Bolivia, Radio Virgen de Remedios	4835do
2300	0000		Bolivia, Yatun Ayllu Yura/Radio Yura	4717do
2300	0000		Chile, CVC Voz Crista	9635sa 17680sa
2300	0000		Colombia, La Voz de tu Conciencia	6010do
2300	0000		Colombia, La Voz del Guaviare	6035do
2300	0000		Colombia, Marfil Estereo	5910do
2300	0000	mtwhf	Cuba, Radio Havana Cuba	6000na 9660ca
2300	0000		Cuba, Radio Havana Cuba	5040va 9540na 9710ca 11840ca 13640eu 11690sa 15230sa
2300	0000		Cuba, Radio Rebelde	5025na
2300	0000		Dominican Republic, Radio Cristal Intl	5009do
2300	0000		Ecuador, La Voz del Napo	3280do
2300	0000		Ecuador, Radio Quito	4919do
2300	0000		Honduras, HRMI/ Radio Misiones Intl	3340do
2300	0000		Honduras, Radio Luz y Vida	3250do
2300	0000		Mexico, Radio Mil Onda Corta	6010do
2300	0000		Mexico, Radio Transcontinental de America	4800do
2300	0000		Mexico, Radio Universidad	6045do
2300	0000		Peru, La Voz de la Selva	4824do
2300	0000		Peru, La Voz de las Huarinjas	5059do
2300	0000		Peru, Ondas del Huallaga	3329do
2300	0000		Peru, Radio Altura	5014do
2300	0000		Peru, Radio Bethel	5921do
2300	0000		Peru, Radio Cusco	6195do
2300	0000		Peru, Radio del Pacifico	9675do 4974al

2300	0000		Peru, Radio La Hora	4857do	
2300	0000		Peru, Radio Madre de Dios	4950do	
2300	0000		Peru, Radio Manantial	4986do	
2300	0000		Peru, Radio Maranon	4835do	
2300	0000		Peru, Radio Ondas del Suroiente	5120do	
2300	0000		Peru, Radio Quillabamba	5025do	
2300	0000		Peru, Radio San Antonio	4940do	
2300	0000		Peru, Radio Santa Rosa	6047do	
2300	0000		Peru, Radio Tawantinsuyo	6174do	
2300	0000		Peru, Radio Victoria	6019do	9720do
2300	0000		Peru, Radio Vision	4790do	
2300	0000		Spain, Radio Exterior de Espana	6125sa	
			9535am 9620sa 11680sa		
2300	0000		USA, EWTN/WEWN Irondale, AL	12050ca	
			13830sa		
2300	0000		USA, KVOH Rancho Simi CA	17775ca	

2300	0000		USA, WYFR/Family Radio Worldwide	5985ca	
			6915sa 9935sa 11530sa 11855ca		
2300	0000		Venezuela, Radio Amazonas	4940do	
2300	0000		Venezuela, Radio Nacional de Venezuela		
			13680am 15250am		
2300	2329		Canada, Radio Canada International	9785sa	
			11990sa		
2300	2330		Clandestine, Radio Nacional De La R.A.S.D.		
			6297af		
2300	2330		Ecuador, HCJB Global Voice/Quito	6050sa	
2300	2345		USA, WYFR/Family Radio Worldwide	15130na	
2300	2357		China, China Radio International	6175eu	
			7210eu 7250eu 9590eu 9800eu		
2325	0022		Ecuador, Radio Oriental	4781do	mtx1111
2330	0000	Sat/Sun	Ecuador, HCJB Global Voice/Quito	6050sa	
2330	0000		Peru, Radio Bolivar	5460do	

MT SHORTWAVE STATION RESOURCE GUIDE

Afghanistan, R Afghanistan .... **www.rta.org.af**
Albania, R Tirana....................................... **http://rtsh.sil.at/**
Angola, Angolan National R .... **www.rna.ao/**
Anguilla/Caribbean Beacon/Univ Network.. **www.worldwideuniversitynetwork.com/**
Argentina, RAE .... **www.radionacional.gov.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 Australia .... **www.hcjb.org.au**
Australia, R Australia................................. **www.abc.net.au/ra/**
Austria, AWR Europe **www.awr2.org/**
Austria, TWR Europe .... **www.twr.org**
Bahrain, R Bahrain.................................... **www.radiobahrain.fm/**
Belarus, R 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 Svc............... **www.bbs.com.bt**
Canada, Bible Voice Broadcasting .... **www.biblevoice.org/**
Canada, CBC Northern Quebec Svc........... **www.cbc.ca/north/**
Canada, CFRX Toronto ON .... **www.cfrb.com**
Canada, CFVP Calgary AB........................ **www.classiccountryam1060.com**
Canada, CKZN St Johns NF .... **www.cbc.ca/listen/index.html**
Canada, CKZU Vancouver BC.................... **www.cbc.ca/bc**
Canada, R Canada International .... **www.rcinet.ca/**
China, China R International .... **www.cri.cn**
China, Haixa zhi Sheng/VO Strait.............. **www.vos.com.cn**
Clandestine, JSR/Shiokaze/Sea Breeze .... **www.chosa-kai.jp**
Clandestine, Sudan R Service..................... **www.sudanradio.org**
Croatia, Voice of Croatia........................... **www.hrt.hr/**
Cuba, R Havana Cuba............................... **www.radiohc.cu/**
Ecuador, HCJB/LV de los Andes .... **www.radiohcjb.org**
Egypt, R Cairo .... **www.ertu.org**
Eqt Guinea, R Africa 2............................. **www.radiopanam.com/**
Ethiopia, R Ethiopia.................................. **www.erta.gov.com**
Ethiopia, R Ethiopia/Natl Pgm .... **www.erta.gov.com**
Germany, AWR Europe.............................. **www.awr2.org/**
Germany, Deutsche Welle .... **www.dw.de**
Germany, Pan American Broadcasting .... **www.radiopanam.com/**
Germany, TWR Europe............................... **www.twr.org**
Guam, AWR/KSDA **www.awr2.org/**
Guam, TWR Asia/KTWR .... **http://nea.ktwr.net/**
India, All India R/Aizawl .... **www.allindiaradio.org/**
India, All India R/Aligarh .... **www.allindiaradio.org/**
India, All India R/Bengaluru...................... **www.allindiaradio.org/**
India, All India R/Bhopal .... **www.allindiaradio.org/**
India, All India R/Chennai .... **www.allindiaradio.org/**
India, All India R/Delhi............................. **www.allindiaradio.org/**
India, All India R/External Svc .... **www.allindiaradio.org/**
India, All India R/Gangtok........................ **www.allindiaradio.org/**
India, All India R/Gorakhpur .... **www.allindiaradio.org/**
India, All India R/Guwahati .... **www.allindiaradio.org/**
India, All India R/Hyderbad .... **www.allindiaradio.org/**
India, All India R/Imphal .... **www.allindiaradio.org/**
India, All India R/Itanagar .... **www.allindiaradio.org/**
India, All India R/Jaipur............................ **www.allindiaradio.org/**
India, All India R/Jeypore.......................... **www.allindiaradio.org/**
India, All India R/Kolkata.......................... **www.allindiaradio.org/**
India, All India R/Kurseong....................... **www.allindiaradio.org/**
India, All India R/Lucknow .... **www.allindiaradio.org/**
India, All India R/Mumbai .... **www.allindiaradio.org/**

India, All India R/Panaji (Goa) .... **www.allindiaradio.org/**
India, All India R/Port Blair .... **www.allindiaradio.org/**
India, All India R/R Kashmir .... **www.allindiaradio.org/**
India, All India R/Shillong.......................... **www.allindiaradio.org/**
India, All India R/Shimla........................... **www.allindiaradio.org/**
India, All India R/Thiruvananthapuram........ **www.allindiaradio.org/**
Indonesia, Voice of Indonesia .... **www.voi.co.id**
Iran, IRIB/VOIRI .... **www.irib.ir/English/**
Italy, IRRS-Shortwave .... **www.nexus.org**
Italy, IRRS-Shortwave/Euro Gospel R .... **www.nexus.org**
Japan, R Japan NHK World .... **www.nhk.or.jp/english/**
Kuwait, R Kuwait .... **www.media.gov.kw/**
Mali, ORTM/R Mali .... **www.ortm.ml**
Micronesia, V6MP/Cross R/Pohnpei .... **www.pmapacific.org/**
Nepal, R Nepal .... **www.radionepal.org/**
Netherlands, R Netherlands Worldwide .... **www.radionetherlands.nl/**
New Zealand, R New Zealand Intl .... **www.rnzi.com**
Nigeria, Voice of Nigeria.......................... **www.voiceofnigeria.org**
North Korea, Voice of Korea..................... **www.vok.rep.kp**
Oman, R Sultanate of Oman .... **www.oman-tv.gov.om**
Pakistan, PBC/R Pakistan .... **www.radio.gov.pk**
Palau, T8WH/WHRI .... **www.whr.org/**
Philippines, R Pilipinas Overseas................ **www.pbs.gov.ph/**
Poland, Polskie R Warsaw .... **www.polskieradio.pl**
Romania, R Romania Intl .... **www.rri.ro/**
Russia, Voice of Russia .... **http://english.ruvr.ru/**
Saudi Arabia, BSKSA/External Svc.............. **www.saudiradio.net/**
Serbia, International R Serbia .... **www.glassrbije.org**
South Africa, Amateur R Mirror Intl............. **www.sarl.org.za**
South Africa, AWR Africa **www.awr2.org/**
South Africa, Channel Africa...................... **www.channelafrica.org**
South Africa, CVC 1 Africa R **www.1africa.tv**
South Africa, RTE R Worldwide **www.rte.ie/radio1/**
South Africa, TWR Africa .... **www.twrafrica.org/**
South Korea, KBS World R .... **www.worldkbs.co.kr**
Spain, R Exterior de Espana .... **www.ree.rne.es/**
Sri Lanka, SLBC .... **www.slbc.lk**
Syria, R Damascus .... **www.rtv.gov.sy/**
Taiwan, R Taiwan Intl............................... **http://english.rti.org.tw/**
Thailand, R Thailand World Svc **www.hsk9.org/**
Turkey, Voice of Turkey............................. **www.trt-world.com**
Uganda, Dunamis Shortwave .... **www.biblevoice.org/stations/east-africa**
UK, BBC World Service.............................. **www.bbc.co.uk/worldservice/**
USA, Amer Forces Network/AFRTS............. **http://myafn.dodmedia.osd.mil/**
USA, BBG/Voice of America .... **www.voanews.com**
USA, BBG/Voice of America/Special English **www.voanews.com**
USA, EWTN/WEWN Irondale AL .... **www.ewtn.com/**
USA, FBN/WTJC Newport NC .... **www.fbnradio.com/**
USA, KNLS Anchor Point AK...................... **/www.knls.org/**
USA, The Overcomer Ministry.................... **www.overcomerministry.org**
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/R Prague relay........................ **www.wrmi.net/**
USA, WRMI/R Slovakia Intl relay .... **www.wrmi.net/**
USA, WTWW Lebanon TN .... **www.wtww.us/**
USA, WWCR Nashville TN .... **www.wwcr.com**
USA, WWRB Manchester TN .... **www.wwrb.org/**
USA, WYFR/Family R Worldwide .... **www.familyradio.com/**
Vatican City State, Vatican R .... **www.vaticanradio.org/**
Vietnam, VO Vietnam/Overseas Svc .... **www.vov.org.vn**
Zambia, CVC/R Christian Voice................ **www.voiceafrica.net**

SHORTWAVE GUIDE

Changes in the Weather

Over the last few years, I have documented the wholesale changes to the Department of Defense bandplan in the 225-400 MHz milair band. One of the casualties of the bandplan changes has been the 344.600 MHz nationwide Metro (weather) frequency. This frequency is going away. As one example, a recent NOTAM change documented that the Cape Canaveral AFS Metro has moved from 344.600 to 225.050 MHz.

So, what is left on 344.600 MHz? Here are the last few Metro stations on this frequency that *will* be moving in the near future to another Metro assignment:

McClellan Airfield CA (MCC)
MacDill AFB FL (MCF)
MCAS Kaneohe Bay HI (PHNG)
Grissom ARB IN (GUS)
Joint Base Andrews Naval Air Facility MD (ADW)
Whiteman AFB MO (SZL)
MCALF Bogue Field NC (NJM)
Pope AFB NC (POB), and
Wright Patterson AFB OH (FFO)

If you hear one of these stations on a new frequency or have any information about impending frequency changes, please drop me some email at the address in the masthead.

USAF Red Flag Frequencies

David, a friend of this column, recently had a chance to monitor a US Air Force Red Flag exercise out in Las Vegas/Nellis AFB and he has passed along the following frequencies/call signs that he monitored. Thanks for sharing with the rest of our *MT* readers David. The ICAO airport ID for Nellis AFB is KLSV. Frequencies below are in MHz and the mode is AM.

118.125	Nellis Approach/Departure Control
119.350	NTTR Range Control West (LEE) Sector
120.900	Nellis AFB Clearance Delivery
121.800	Nellis AFB Ground Control
124.950	Nellis Approach/Departure Control
126.650	NTTR NATCF-East Check-in Tertiary (Sally Sector)
132.550	Nellis AFB Tower
135.100	Nellis Approach/Departure Control
138.250	57FW/414CTS MIG Air-to-Air Training
141.075	Thunderbirds Air-to-Air
228.200	Nellis AFB/Nevada Test Training Range (NTTR) Red Flag <Beige 24>
231.100	Unknown user/usage
234.900	Nellis AFB/NTTR Red Flag Operations <Channel 1>
251.250	Unknown user/usage
254.400	NTTR Range Control West (LEE) Sector/Beatty <Channel 8>
257.100	Nellis AFB/NTTR Orange 39/Red Flag
259.950	Nellis AFB/NTTR Red Flag ACM <Red 5>
270.100	Nellis AFB ATIS <Channel 11>
273.550	Nellis Approach/Departure Control North <Channel 6>
275.800	Nellis AFB Ground Control <Channel 3>
276.850	Nellis AFB/NTTR Red Flag Interplane <Red 7>
281.025	NTTR Air Defense Ground Control Intercept
289.400	Nellis AFB Clearance Delivery <Channel 2>
305.600	Nellis AFB 57FW Supervisor of Flying (SOF) <Channel 9>
308.600	Nellis AFB/NTTR Red Flag <White 8> JTAC-Tropical call sign
309.500	Nellis AFB/NTTR Red Flag <Blue 7>
317.525	NTTR Range Control <Channel 7>
322.775	Unknown user/usage
326.200	Nellis AFB Single Frequency Approach ATC Training
327.000	Nellis AFB Tower <Channel 4>
352.050	Los Angeles ARTCC (ZLA) Mount Potosi RCAG Sector 34 High Altitude paired with 132.625 MHz <Channel 18>
353.700	Las Vegas Departure Control, replaced 307.250 MHz
369.000	Nellis AFB/NTTR AWACS Have Quick Time of Day (TOD) signal
377.100	Los Angeles ARTCC (ZLA) Mount Potosi RCAG Sector 16 High Altitude paired with 124.625 MHz <Channel 17>
377.800	NTTR Range Control Blackjack <Channel 15>
379.600	Nellis AFB Unknown user/Squadron Wing Operations
385.400	Nellis Approach/Departure Control South <Channel 5>

Red Flag Call Signs

Baja	KC-135 tankers
Bandsaw	E-3 AWACS back-end battle staff
Beam	B-1B aircraft
Chocko	South Korean F-15 aircraft
Cylon	F-15 aircraft
Disco	E-3 AWACS
Eagle	F-15 aircraft
Energy 85	Department of Energy aircraft
Evil	Unknown user
Flanker	F-15 aircraft
Flite Check	FAA Learjet
Greedy	A-10 aircraft
Gulf	KC-135 tanker
Harley	F-16 aircraft
Hog	57 Wing/414CTS A-10 aircraft
Hoss	Unknown user
Iron	F-15 aircraft
Ivan	57 Wing/414CTS F-16 aircraft
Killer	F-22 aircraft
Mig	57 Wing/414CTS F-16 aggressors
NASA 926	NASA WB-57 aircraft
Pecos	F-16 aircraft
Pulsar	F-15 aircraft
Raptor	F-22 aircraft
Raven	F-22 aircraft
Rock	Unknown user
Rocket	F-15 aircraft
Soar /Sword	Saudi F-15 /Foreign Players
Texaco	Tanker aircraft
Thunderbird #	USAF Fight Demonstration Team
Tropical	JTAC
Vegas	57 Wing/FWS F-16 Division and 53TEG/422T&ES F-15/F-16 aircraft

The Last Deployment Workup

Our regular *Milcom* column reporter down in Central Florida, Mike C, monitored the last COMPUTEX from the *USS Enterprise* Carrier Strike Group (CSG) as they prepare for their 22nd and final deployment later this year. Here are the confirmed active frequencies that he monitored that may be used in the future by other east coast CSGs as they prepare to deploy overseas. Thanks, Mike, for sharing.

HF Comms (kHz/USB)

5723.0	CWC Air Defense Net - ECHO WHISKEY
6688.0	CWC Force Track Coordinator - ECHO FOXTROT
8974.0	CWC Air Defense Net Alternate - ECHO CHARLIE

VHF/UHF (MHz/AM mode)

120.950	FACSFAX Jax North - SEALORD
133.950	FACSFAX Jax South - SEALORD
134.650	Pinecastle Range Operations
136.875	Opposition Forces (OPFOR) Air/Air
225.350	Pinecastle Target - ADVANCE ##
227.175	CWC Air Defense Net Primary/Alternate - ECHO WHISKEY / ECHO CHARLIE
229.775	SAREX
229.975	OPFOR Orange Air Control - SILENT WARRIOR
232.300	E-2C/D Air/Air
233.325	E-2C - SCREWTOP <Yellow>
234.775	OPFOR Orange Air
235.325	E-8C JStars - VULTURE <Gold 4>
236.075	VMFA-211 - TBOLT
238.900	Avon Park Crystal AR
239.125	VFA-211 - NICKEL
239.975	E-2C/D SCREWTOP-STEELJAW
242.225	Unknown Air/Air
246.800	VFA-11 - RIPPER
261.250	Pinecastle Range Lake George
264.625	Avon Park North Tac Range - IRON CROSS
266.625	VFA-136 - HAWK
267.500	FACSFAX Jax South - SEALORD
276.600	Avon Park Range
277.800	Fleet Common
281.150	CWC Surface Warfare Net - ECHO SIERRA / Secure
283.500	CWC C2 Warfare Net - ECHO QUEBEC / Secure
284.300	CWC Force Track Coordinator - ECHO FOXTROT
284.500	FACSFAX Jax North - SEALORD
289.200	Pinecastle Range Operations
292.200	Avon Park Range Operations
292.225	Enterprise STRIKE A
293.225	Miami Center – Vero Beach RCAG
298.475	CWC Air Defense/Surface Warfare Net - ECHO ZULU / ECHO SIERRA / FREDDIE
299.500	VFC-12 - AMBUSH
300.825	Seymour-Johnson AFB 4FW WACO
300.925	Have Quick Mickey/Net 9
303.450	VFA-11 - RIPPER
307.650	Tanker King
307.750	Secure
311.500	FACSFAC Jax Bristol
312.150	VX-1 STEELJAW Base
318.325	Enterprise Departure
318.600	FACSFAX Jax Discrete / AR Boom
320.500	FACSFAC Jax Bristol IVAN CONTROL (OPFOR)
324.650	E-8C Jstars - VULTURE <Gold ?>
328.025	E-8C Jstars - VULTURE <Gold 2?>
328.425	Enterprise Marshal
338.750	BRICKYARD 41 / STRYKER 73
341.750	E-8C Jstars - VULTURE <Gold 3>
342.075	CWC Strike Warfare/Air Defense Net - ECHO PAPA / ECHO WHISKEY
343.325	VFA-211 - NICKEL
351.800	Jacksonville Approach/Departure

357.025   Strike Package EA-6B - TRON
363.650   CVW-1 REP
371.050   RED CROWN
371.125   VMFA-211 - TBOLT
372.150   E-8C VULTURE with MUSTANG (OPFOR)
374.000   Tanker King (moved to 307.650)
376.900   W-157 AR Boom
377.425   Enterprise Tower - CLIMAX Tower
379.825   Unknown user/Secure
384.100   OPFOR Air/Air

ARTCC Update

This month we resume our tour of Air Route Traffic Control Centers, listing the Remote Center Air/Ground (RCAG) VHF and UHF frequencies for Memphis and Houston. Please be patient and we will get around to your area as soon as possible. All frequencies listed in tables one and two are in MHz and the mode is AM.

And that is it for this month, so until next time, 73 and good hunting.

TABLE ONE: MEMPHIS ARTCC RCAG FREQUENCY LIST

RCAG Freq V/U Pair MHz	RCAG Location (ICAO Identifier)	Sector Number/Name: Notes
118.625/269.900	Memphis TN (ZME)	Sector 28 Memphis Hi
118.875/257.750	Joelton TN (BNA)	Sector 62 Smyrna Hi: Replaced 306.300
120.025/379.125	Tupelo MS (TUP)	Sector 32 Tupelo Ultra Hi
120.075/289.400	Walnut Ridge AR (ARG)	Sector 04 Jonesboro Lo
120.800/307.000	Huntsville AL (HSV)	Sector 13 Hamilton Lo
121.500/243.000	Memphis TN (ZME)	Civil/Military Calling and Emergency
122.275/354.150	South Fulton TN (QGT)	Sector 25 TNGS-Hi
124.125/269.425	Joelton TN (BNA)	Sector 61 Clarksville Super Hi: Replaced 363.000/327.800
124.275/288.350	Graham TN (GMH)	Sector 63 Campbell Hi
124.350/239.300	Jackson TN (MKL)	Sector 14 Holly Springs Lo
124.925/282.250	Greenville MS (GLH)	Sector 44 Pine Bluff Hi
125.475/316.050	North Little Rock (ORK)	Sector 20 Little Rock Ultra Hi
125.850/379.250	Graham TN (GHM)	Sector 42 Graham Lo
125.975/351.700	Meridian MS (MEI)	Sector 65 Kewanee Lo: Replaced 323.000/124.400
126.100/269.000	Fayetteville AR (FYV) Page OK (PGO)	Fort Smith AR (FSM) Sector 02 Fayetteville Lo
126.450/354.000	Jackson TN (MKL)	Sector 26 Jacks Creek Hi
126.525/281.475	Tupelo MS (TUP)	Sector 12 Will probably replace 128.500/279.550
126.750/353.500	Shelbyville TN (SYI)	Sector 60 Shelbyville Lo: Replaced 353.900/377.175
126.850/281.550	Brinkley AR (QBK)/ Harrison AR (HRO)	Sector 03 Harrison Lo
----------/281.550	Flippen AR (FLP)	Sector 03 Harrison Lo: UHF only, no VHF pair
127.375/285.550	Tupelo MS (TUP)	Sector 31 Muscle Shoals Hi
127.425/298.950	Greenwood MS (GWO)	Sector 43 Greenwood Ultra Hi
127.975/342.250	South Fulton TN (QGT)	Sector 33 Elvis Super Hi
128.275/285.400	Meridian MS (MEI)	Sector 46 Meridian Hi
128.475/377.150	Hot Springs AR (HOT)/ Russellville AR (RUE)	Sector 01 Hot Springs Lo
128.500/279.550	Tupelo MS (TUP)	Sector 12 Columbus Lo: Replaced 381.400
132.100/263.100	Joelton TN (BNA)	Sector 40 Nashville Lo: Replaced 132.900
132.375/257.600	Walnut Ridge AR (ARG)	Sector 27 Jonesboro Hi
132.425/323.250	North Little Rock (ORK)	Sector 21 Conway Hi
132.500/259.100	Greenwood MS (GWO)/ Jackson MS (JAN)	Sector 66 Jackson Lo
132.550/353.800	Fayetteville AR (FYV)	Sector 22 Razorback Hi
132.750/263.000	Louisville MS (LMS)	Sector 65 Navy Meridian UPT Sector
133.025/284.750	Harrison AR (HRO)	Sector 19 Drake Ultra Hi
133.075/322.350	Greenville AR (GLH)	Sector 45 Vicksburg Hi
133.125/317.650	Memphis TN (MEM)	Sector 34 Sikeston Super Hi
133.650/292.150	Paducah KY (PAH)/ South Fulton TN (QGT)	Sector 05 Paducah Lo: Replaced 397.900
133.850/285.500	Joelton TN (BNA)	Sector 41 Bowling Green Lo
134.400/295.000	Tupelo MS (TUP)	Sector 12 Columbus Lo
134.650/316.150	Jackson TN (MKL)	Sector 07 McKellar Lo
134.775/292.200	Columbus MS (UBS)	Sector 30 Columbus Hi: Replaced 387.100/294.700/295.000
135.225/322.300	Walnut Ridge AR (ARG)	Sector 35 Walnut Ridge Ultra Hi
135.300/335.800	Brinkley AR (QBK)	Sector 15 Helena Lo
135.875/269.350	Pine Bluff AR (PBF)/ Greenville MS (GLH)	Sector 67 Greenville Lo
135.900/273.550	Tupelo MS (TUP)	Sector 14 Holly Springs Lo
136.175/343.625	Jackson TN (MKL)	Sector 14 Holly Springs Lo
----------/254.400	Russellville AR (RUE)	Sector 03 (Joint use w/Navy) Harrison Lo Shirley MOA
----------/282.100	Louisville MS (LMS)	Sector 65 Kewanee Lo
----------/285.200	Jackson MS (JAN)	Sector 65 Kewanee Lo
----------/289.900	Meridian MS (MEI)	Sector 65 Kewanee Lo
----------/296.700	Brinkley AR (QBK)/ Graham TN (GHM)	

TABLE TWO: HOUSTON ARTCC RCAG FREQUENCY LIST

RCAG Freq V/U Pair MHz	RCAG Location (ICAO Identifier)	Sector Number/Name: Notes
	Jackson MS (JAN)	Military TSU MOA
----------/320.400	Columbus MS (CBM)	Unknown usage
----------/362.600	Louisville MS (LMS)	Sector 65 Kewanee Lo
----------/377.200	Meridian MS (MEI)	Sector 65 Kewanee Lo
----------/323.125	Columbus MS (CBM)	Unknown usage
119.725/285.600	Hattiesburg MS (HBG)	Sector 65 McComb Hi
120.350/----------	Multiple Sites	Sector 53 Offshore
120.975/299.600	Esler LA (ESF)/Natchez MS (HEZ)	Sector 40 Polk Low
121.025/317.775	LaCombe LA (NEW)	Military TSU Warning Area W-59A
123.725/319.150	College Station TX (CLL)	Sector 82 Bilee Hi
123.825/279.625	Beaumont TX (BPT)	Sector 68 Scholes Hi
124.700/317.400	Lake Charles LA (LCH)/ Houston TX (ZHU)	Sector 36 Beaumont Lo
124.725/291.750	Victoria TX (VCT)	Sector 95 Palacios Hi
125.150/288.725	College Station TX (CLL)	Sector 84 College Station Lo
125.175/285.575	Lufkin TX (LFK)	Sector 49 Cleep Lo
125.250/318.800	San Antonio TX (SAT)	Sector 76 San Antonio Hi
125.650/273.550	Austin TX (AUS)	Sector 96 Austin Lo
125.750/346.400	Fort Stockton TX (FST)/ Rocksprings TX (RSG)	Sector 98 Rocksprings Lo
125.775/322.400	Semmes AL (MOB)	Sector 63 Mobile Hi
126.100/319.100	Laredo TX (LRD)	Sector 93 Laredo Lo
126.350/338.250	LaCombe LA (NEW)/ Lafayette LA (LFT)	Sector 34 Baton Rouge Lo
126.425/371.850	Austin TX (AUS)/Sealy TX (QYN)	Sector 78 Austin Hi
126.800/327.800	Hattiesburg MS (HBG)/ McComb MS (MCB)	Sector 27 Picayune Lo
126.875/327.050	LaCombe LA (NEW)	Sector 37 Hattiesburg Ultra High
126.950/363.050	Beaumont TX (BPT)/Lufkin TX (LFK)	Sector 38 Daisetta Lo
127.650/288.150	Mobile AL (MOB)	Sector 25 Brookley Lo
128.075/351.950	College Station TX (CLL)	Sector 83 Cugar Lo
128.150/350.300	Rockport TX (RKP)/Sarita TX (QXB)	Sector 58 Victoria Lo
128.175/353.850	Newton TX (QNT)	Sector 26 Houston Hi
128.600/360.800	Palacios TX (PSX)/Sealy TX (QYN)	Sector 87 Eagle Lake Lo
128.650/363.250	Fredericksburg TX (FKB)	Sector 74 Llano Hi: Replaced 132.725
132.150/279.600	Austin TX (AUS)/Sealy TX (QYN)	Sector 80 Industry Lo
132.175/353.550	Grand Isle LA (GNI)	Sector 24 Grand Isle Hi
132.350/317.500	Lometa TX (MTA)	Sector 50 Lampasas Lo
132.375/244.275	Palacios TX (PSX)	Sector 53 Aggit Lo/Hi
132.400/299.200	Rocksprings TX (RSG)	Sector 97 Junction Hi
132.600/316.050	Mobile AL (MOB)	Sector 25 Brookley Lo Replaced 387.050
132.650/269.550	Multiple Sites	Sector 79 Ocean West Lo/Hi
132.700/348.750	Esler LA (ESF)	Sector 42 Alexandria Hi
132.775/335.650	Lufkin TX (LFK)	Sector 46 Houston Hi
132.800/343.700	San Antonio TX (SAT)	Sector 92 Universal City Lo
132.950/360.050	Lake Charles LA (LCH)	Sector 23 Orange Hi
133.400/306.300	Multiple Sites	Sector 28 Offshore Lo
133.650/263.100	Lafayette LA (LFT)	Sector 70 Tibby Hi
133.750/354.000	Laredo TX (LRD)/Sarita TX (QXB)	Sector 59 Corpus Hi
----------/354.000	San Antonio TX (SAT)	Sector 59 Corpus Hi
133.800/351.800	Beaumont TX (BPT)/ Galveston TX (GLS)	Sector 43 Sabine Lo
134.200/307.300	Llano TX (LLO)	Sector 50 Lampasas Lo
134.425/335.525	Esler LA (ESF)	Sector 81 Esler Ultra Hi
134.600/322.500	Three Rivers TX (THX)	Sector 56 Three Rivers Lo
134.800/269.600	College Station TX (CLL)/ Lufkin TX (LFK)	Sector 86 Houston Lo
134.900/290.450	Multiple Sites	Sector 30 Hammond Lo
134.950/269.400	Kerrville TX (ERV)/Uvalde TX (UVA)	Sector 85 Kelly Lo
135.050/353.600	Victoria TX (VCT)	Sector 58 Victoria Lo
133.775/251.050	Multiple Sites	Sector 72 Ocean East Lo/Hi
----------/239.275	San Antonio TX (SAT)	Military TSU 2A MOA Randolph 2A MOA
----------/243.000	Various Locations	Military Calling & Emergency
----------/251.075	San Antonio TX (SAT)	Military TSU 1A MOA Randolph 1A MOA
----------/254.375	San Antonio TX (SAT)	Military TSU 2A MOA Randolph 2A MOA
----------/267.900	Rocksprings TX (RSG)	Military TSU Ranch MOA
----------/269.300	Sarita TX (QXB)	Military TSU Kingsville MOA
----------/277.400	Semmes AL (MOB)	Sector 24 Leeville Lo/Hi
----------/288.100	Esler LA (ESF)	Military TSU Jena 1 MOA
----------/301.400	San Antonio TX (SAT)	Military TSU MOA Advisory
----------/306.900	San Antonio TX (SAT)	Military TSU 1A MOA Randolph 1A MOA
----------/321.300	Esler LA (ESF)/LaCombe LA (NEW) Houston TX (ZHU)/Sarita TX (QXB)	Military TSU
----------/322.700	Rocksprings TX (RSG)	Military TSU Texon MOA/Laughlin 1 MOA
----------/324.300	Rocksprings TX (RSG)	Military TSU Pecos MOA
----------/370.900	Grand Island LA (GNI)	Military TSU Warning Area W-59
----------/372.000	Lometa TX (MTA)	Military TSU Brady MOA
----------/375.825	Laredo TX (LRD)	Military TSU Crystal MOA

We Pause for Station Identification

I suppose most readers are aware that broadcast stations in the U.S. are required to identify themselves periodically. The requirement can be found in FCC regulation 73.1201, which requires an announcement "At the beginning and ending of each time of operation, and hourly, as close to the hour as feasible, at a natural break in program offerings..."

Obviously, these identification announcements make it *much* easier for DXers to figure out who they're listening to! This month we'll dig deeper into the station identification rules.

❖ What?

What's required to be in the identification announcement? "Official station identification shall consist of the station's call letters immediately followed by the community or communities specified in its license as the station's location;..." It goes on to list several optional allowable insertions:

- The name of the licensee;
- The station's frequency;
- The station's channel number as stated on the license;
- The station's network affiliation.

The regulation explicitly states that "No other insertion between the station's call letters and the community or communities specified in its license is permissible." (But keep reading...)

So, a bare minimum identification for station WXSS, Wauwatosa, Wisconsin would be "WXSS, Wauwatosa." Also permissible would be:

- "WXSS, Entercom Milwaukee License, LLC, Wauwatosa"
- "WXSS 103.7, Wauwatosa"
- "WXSS, Channel 279, Wauwatosa"

As you might guess from the name of the licensee, WXSS reaches a much larger audience in bordering Milwaukee than it does in the city specified on its license. You might think the station would find the requirement to announce its location as Wauwatosa to be somewhat limiting. But the FCC really doesn't much care what the station says outside of the ID. Most of the time, WXSS identifies as "103.7 Kiss FM". That's perfectly legal, as long as it says "WXSS, Wauwatosa" once an hour.

Once upon a time, the Commission used to frown on stations adding communities other than those specified on the license – today, it's fine, as long as the community/ies on the license are announced first. "WXSS, Wauwatosa, Milwaukee's 103.7 Kiss FM" would be permissible.

❖ When?

When must the identfication be given? The rule, again, says "Hourly, as close to the hour as feasible, at a natural break in program offerings." The exception was intended to relieve stations of the need to interrupt a symphony – or the 5th inning of the World Series game – for the hourly ID. The ID could wait for the end of the current movement, or a break in the sports action.

However, this requirement has come to be *very* broadly interpreted. These days, some stations will run a "fake ID" like "Chicago's X108" on the hour, among a collection of commercials – and bury the *real* ID as "WFMX, Schaumburg" at 43 minutes after the hour. That doesn't strike me as "...as close to the hour as feasible..." but I've never heard of anyone getting cited for it.

Oh, and what about that "At the beginning and ending of each time of operation," part? Besides the hourly identification, stations are also required to identify immediately after signing on the air, and immediately before signing off. Since a large majority of stations never sign off, this part is largely meaningless – although it does still apply to daytime-only AM stations

WSBC-1240, Chicago, once shared time with two other stations. (Photo courtesy "Wesha")

(and the rapidly vanishing group of stations that do still sign off).

While browsing David Eduardo's excellent radio history site, I stumbled scross Regulation #6 in the 1946 Canadian broadcasting rules. This rule, like the U.S. rule, required that Canadian stations announce their call letters at least once an hour. However, the 1946 Canadian rules had a twist: it was forbidden to announce your call letters *more* than four times an hour!

❖ How?

How must a station identify? It would seem pretty straightforward: they must verbally announce the call letters and community. In most cases, it *is* that simple. But, in some, it isn't.

I suppose the obvious exception would be television. TV stations can of course verbally announce their call letters and city. They also obviously have the ability to put up their call letters and city on the screen. The FCC doesn't care which method is used. TV stations may identify aurally, visually, or both.

This logo would not serve as a station ID, as it doesn't mention "Nashville." (Photo courtesy the author)

A less obvious exception, which sometimes trips up DXers, are translators. These low-power stations don't originate any programming – they simply relay the programs of some other station. There are two ways in which these stations can be identified:

- They can arrange for the station being relayed to announce the translator's call letters and location. These announcements need not be made every hour. Announcements are required in the morning, in the afternoon and, for FM translators, around 1pm.
- They can install an automatic identifier which sends the station's call letters in Morse Code at least once an hour. If the identification

is done in Morse, the location of the translator need not be transmitted. The means used for this Morse ID are such that it won't be audible on ordinary consumer receivers.

What about the language? Nothing in the regulations specify which language must be used for the identification announcement. Most stations seem to assume it must be made in English, but I have heard Spanish-language stations identify in Spanish. (I've also heard them make bilingual announcements, and of course quite a few identify in English.)

❖ Which?

Which letters appear in a callsign? All U.S. broadcasting callsigns begin with either K (for stations located west of the Mississippi) or W (for stations located in the East). For most stations, the K or W is followed by three more letters. A small number of stations first authorized before 1931 landed shorter callsigns, with only two letters after the K or W.

Many (but by no means all) FM stations have an FM suffix attached to their callsign. If the FM suffix appears on the station's license, it's part of their call sign, and must be announced during the identification announcement. Similarly, many TV stations have a TV suffix. *All* Low-Power FM and Low-Power analog TV stations have an LP suffix; digital Low-Power TV stations have LD; analog and digital Class A TV stations have CA and CD suffixes. All of these must be announced.

Translator stations receive a letter-number callsign. It begins with K or W (same geographic criteria), followed by the station's channel number, followed by two more letters. W31BF would be a TV translator on channel 31; K286AT would be an FM translator on 105.1 MHz. (Yes, FM stations have channel numbers!)

❖ FCC Changes Stance on Moving

From time to time, stations wish to move from their current community to another location. For the move to be approved, the station must convince the FCC that the new location would better serve the public interest. Generally, first priority has been to provide the first local station in a community – the applicant will try to find a community which doesn't currently have any stations (while also being located near a larger city, which the station will *actually* serve).

This has led to some rather absurd situations. A station would propose to move from a small town with two radio stations, to a suburb of a much larger city. The small town would lose half its local service, while the large city would go from 31 local stations to 32. But since the *suburb* went from no stations to one, the FCC would grant it.

Last fall, the Commission made a change in the rules. Now, a station proposing to move to a community in a metropolitan area will be presumed to be planning to serve that metropolitan area (not the suburb or small town they were able to dig up on the map). KTIA-FM's

request to move from Boone, Iowa to Johnson has been stalled; Johnson is 13 miles from Des Moines and is part of the Des Moines metropolitan area. Of course, Des Moines already has plenty of radio stations!

❖ Time Splitting

In the early days of radio, there weren't enough frequencies for everyone who wished to broadcast. The government asked stations to share; two or more stations would be licensed on the same frequency. Each would be allowed to use part of the broadcast day. Time-sharing was common through the 1930s, and there are still a few time-sharing arrangements around.

In all of these time-sharing cases, each station's operating period would be fairly lengthy. In one modern case in Iowa, Luther College station KWLC operates from 11pm through 1:30am weekdays, and from 8am-1am all weekend. Their time-sharing partner on 1240 kHz, KDEC, operates 7am-11pm weekdays only.

These days, a slot on cable and satellite is a necessity for a commercial TV station. A significant majority of viewers watch this way. Any station available via antenna only is going to have a tough time. FCC regulations dating back to the times of analog TV require cable and satellite to carry any full-license TV station in their market. With digital TV, it's now possible for one TV station to carry more than one program simultaneously. The "must-carry" regulations, however, only require cable/satellite to carry one program per transmitter.

ION Media has tried a novel new method to get more than one digital TV program carried on cable. A new firm, Urban Television LLC, applied for new stations on each of ION's channels. ION would agree to the applications, and the FCC would allow the existing ION station on each channel, and the new Urban station, to share time. Each station would designate one "primary" program which would be required carriage on cable and satellite in its market.

At first glance, this plan wouldn't seem to offer any advantage. Since the two stations would be sharing time, when the Urban Television station was using the channel, it would be carried on cable – but the ION Media station would be off the air. When the ION Media station was on cable, the Urban Television station would be off.

But take a closer look at the digital TV standard. In analog TV, the audio and video were transmitted continuously, on different frequencies. In digital TV, the audio and video are chopped into data "packets." Packets are transmitted sequentially; first, a packet of video; then, a packet of audio, and so on. A station can transmit more than one program by interspersing video and audio packets from one program with video and audio packets from another one.

And now, maybe you're seeing what ION and Urban had in mind. There's one transmitter; it spends about 11 microseconds transmitting one of ION's video or audio packets, then the transmitter is handed off to Urban, which spends about 11 microseconds transmitting one of their video or audio packets, etc.

As far as the viewer is concerned, there is

no difference from current practice. You have two TV stations, both of which appear to be operating continuously. As far as the equipment installation at the station, again, nothing changes. All that changes is that, legally, there are two stations – each of which is entitled to select a primary program which cable and satellite must carry.

The FCC didn't buy it. Your local ION TV station's channel will continue to host only one station.

Have you ever heard two time-sharing stations hand off the frequency to each other? Please write, at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to *dougsmith@monitoringtimes.com*. Good DX!

APRIL BANDSCAN STATION REPORT

NEW STATIONS:

New stations on the air:

White Hall, Arkansas	1190	KJJI	25,000/350 DA-2

Permits granted for new stations:

Hilo, Hawaii	1450	KMCA	5,000/5,000 DA-1
Paukaa, Hawaii	1400	(new)	2,500/2,500 ND
Star, Idaho	1020	(new)	1,0000/460 DA-2
Village of Superior, Wis.	1560	WIVS	5,000/4,000 DA-2

Applications for new stations:

Southchase, Florida	1540		7,000/300 DA-2

CHANGES:

Frequency & location changes on the air:

Sylva, North Carolina	540	WRGC	from 680; 5,000/140 ND
Memphis, Tennessee	830	KOTC	from Kennett, Mo.; 3,500 D

Frequency & location changes granted:

Cathedral City, Calif.	1200	KPSF	from 1220 Desert Hot Springs

DELETIONS:

Stations deleted:

Edmonton, Alberta	680	CHFA	(to go to 90.1 FM)
Field, B.C.	860	CBRD	(to go to 97.1 FM)
Winkler, Manitoba	1570	CKMW	(to go to 103.7 FM)
Aberdeen, N. Carolina	1350	WQNX	
Wilson, N. Carolina	590	WGTM	
Newberry, S. Carolina	1520	WKMG	
Burnet, Texas	1340	KRHC	

Permit for new station canceled:

Columbia Falls, Mont.	1400	KQDE	

Applications for new stations dismissed:

Montevallo, Alabama	880	
Longwood, Florida	890	
Melba, Idaho	1100	
San Angelo, Texas	1500	

ND: non-directional
ND-D: non-directional, only operates daytime
DA-N: directional at night only
DA-D: directional during daytime only
DA-2: directional all hours, two different patterns
DA-3: directional day, night and critical hours, three different patterns

URLs in this Month's Column:

http://americanbandscan.blogspot.com - My AM DX blog

http://edocket.access.gpo.gov/cfr_2009/octqtr/47cfr73.1201.htm - FCC Regulation 73.1201, which requires identification announcements

http://licensing.fcc.gov/cgi-bin/prod/cdbs/forms/prod/getimportletter_exh.cgi?import_letter_id=30775 - FCC letter denying ION Television's interesting timesharing proposal

www.fcc.gov/document/deficiency-letter-ktia-fm-boone-iowa
FCC letter on KTIA-FM's proposed move in Iowa

www.luther.edu/kwlc/

www.kdecradio.com/am_display.asp - KWLC & KDEC share time on 1240 in Decorah, Iowa

You Never Know about Radio...

I am constantly amazed where the hobby of radio will lead! Over the past few months, I have had some excellent monitoring, met several interesting people, gained useful information, been asked to speak to several organizations, and even received a gift of some vintage radio equipment! I have also been asked to help with some amateur radio classes, and teach the basic marine radio course. I enjoy being a volunteer examiner.

❖ Request for Information

My friend Dave, VE3HFX, presented me with an excellent vintage radio receiver. It is a National NC-46. The radio is working and is in good shape physically. It is a 10 tube single conversion general coverage receiver which covers up to 30 MHz and has a band spread. However, I have not been able to find much information concerning this unit.

According to several web sites, it was built between 1945 and 1948 only. Since Dave got this from a friend in Halifax, Nova Scotia many years ago, I think it may have been used for a marine purpose. I just do not remember seeing any of these units in any pictures of amateur radio shacks, over the years. I would appreciate any information about this receiver as we may have something which would be of value to a museum.

❖ Caribbean Marine Radio

From Dec. 1 to Dec. 10, my wife and I were cruising on the *Explorer of the Seas*. We sailed from Bayonne New Jersey to the eastern Caribbean and back. My VHF radio and short wave portable were put to good use. Traffic in New York Harbor used channels 11, 12 and 14 for traffic control. I also heard traffic in Bayonne New Jersey on channel 71. NOAA weather radio was very useful in providing marine forecasts, tide information, etc. Always try channels 10, 11, 12, 13 and 14 in major ports

The port of Bayonne, WQBF543, uses frequencies in the commercial band for many activities. 462.3875 is a repeater, while 451.4375, 451.7375, 452.7625, 462.2875 and 462.4125 MHz are listed as simplex frequencies.

While on board cruise ships, check out the 450 to 470 MHz commercial band. You will find several frequencies being used for ship's business. There is always something going on. Unlike in some recent tragedies, I had nothing but praise for the crew of the ship.

I enjoyed some sea days and put my Sangean portable to good use. I used the whip antenna on the 12th deck and also strung the roll up wire antenna on my balcony. I copied amateur radio transmissions on all bands. The Maritime Mobile Service Net on 14.300 MHz was easy to copy. KD4CMV, W8GOC, AJ4JM and, of course, KM4MA were among those stations heard. The Pacific Maritime Mobile Net on 21.412 MHz was copied regularly. Several people asked me what I was hearing and they enjoyed listening to the shortwave broadcast signals from Australia and aircraft signals from New York on 8.920 MHz.

A good guide to propagation conditions on marine HF are the time signal stations. WWV on 2.5, 5, 10, 15 and 20 MHz and CHU on 3.330, 7.850 and 14.670 MHz give you an idea of signal strength. I never hear the 14 MHz CHU signal here and found it to be stronger than I expected.

I heard the high seas weather broadcast from Chesapeake, VA, regularly. I had good signals on 6.501 and 8.764 MHz. 13.089 was the strongest in the morning.

Although I did not have a great deal of time to spend listening, I did hear some signals from Crowley Marine. Their Jacksonville Florida station, WPE, has listings for 2.0905, 2.182, 4.149, 6.224, 8.294, 8.297, 12.353, 16.528 and 22.168 MHz. It was nice to see containers, etc. with the company name. Unfortunately, I did not get any photos of their vessels.

In St. Maarten, Phillipsburg Harbor uses channel 12 for traffic, while the scurrying water taxis use channel 69. I could hear the vessel *Tropic Sun* and the tug *Tenacious* as they brought the fuel barge along side. In St. Thomas, channel 10 was used for the pilot and there was traffic on channel 12 as well.

I picked up San Juan, Puerto Rico harbor on channel 12. The *Explorer of the Seas* confirmed our course intentions with a container ship the *Maersk Tarragona* as we left the harbor. Weather information was on weather channel 2, 162.4 MHz.

❖ Marine Guide

If you are boating in the Virgin Islands, you should get or see a copy of the *Marine Guide*. They have a web site of **www.vimarineguide. com** for it. It has quite a bit of useful marine radio information.

For the U.S.V.I., channel 16 is listed for calling and emergency. Channel 70 is for DSC, channel 6 is used for inter-ship safety, while channel 22A is for Coast Guard Liaison. Channels 13 and 67 are for navigational purposes. Channel 13 is used worldwide for bridge to bridge communications by commercial vessels. Channels 9, 68, 69, 71, 78, 79 and 80 are listed as non commercial working channels, while commercial working channels are 1, 10, 11, 18, 19, 67, 79, and 80.

Ship to ship messages from non-commer-

Container ship **Tropic Sun,** *tug* **Tenacious** *and fuel barge in St. Maarten, Virgin islands*

cial vessels are on 67 and 72, while commercial vessels are to use 8, 67, 72 and 88A. Pubic correspondence may be on 24, 25, 26, 27, 28, 84, 85 and 86. Port operations for ship movements are on channels 1, 12, 14, 63, 65, 66, 73, 74, 75 and 76. Port operations ship to ship messages are on channel 20 and the pilots' is open channel 77. Maritime control can use channel 17. Channel 16 is monitored by most marinas as well.

Weather channels listed are 162.55, 182.4 and 162.475 MHz. Virgin Islands all hazards weather is on 162.5 MHz. You can also hear hourly forecasts on commercial radio. St. Thomas and St. John are on WWVI 1000 AM and WIVI 96.1 FM. St. Croix is on WSTX 970 AM.

The British Virgin Islands Search and Rescue monitor channel 16 as usual. Up to date weather is on weather channels 3, 4 and 6. Charter companies use channel 12, while Search and Rescue uses channel 67. Virgin Islands Ra-

MARINE CHANNELS

Chan	Frequency MHz	
1	156.050	Port operations
6	156.300	Intership Safety
8	156.400	Commercial (intership only)
9	156.450	Boater Calling
10	156.500	Commercial
11	156.550	Commercial & VTS
12	156.600	Port operations & VTS
13	156.650	Ship to Ship
14	156.700	Port operations & VTS
16	156.800	International Distress, Safety, & Calling
17	156.850	State control
18	156.900	Commercial
19	156.950	Commercial
20	157.000	Port operations
22A	157.100	Coast Guard liaison
24	157.200	Public correspondence
25	157.250	Public correspondence
26	157.300	Public correspondence
27	157.350	Public correspondence
28	157.400	Public correspondence
63	156.175	Port operations
65	156.275	Port operations
66	156.325	Port operations
67	156.375	Commercial
68	156.425	Non-commercial
69	156.475	Non-commercial
70	156.525	Digital Selective Calling (no voice)
71	156.575	Non-commercial
72	156.625	Non-commercial (intership only)
73	156.675	Port operations
74	156.725	Port operations
75	156.775	Port Operations (USVI)
76	156.825	Port Operations (USVI)
77	156.875	Port operations (intership only)
78	156.925	Non-commercial
79	156.975	Commercial (non Great Lakes only)
80	157.025	Commercial (non Great Lakes only)
84	157.225	Public correspondence
85	157.275	Public correspondence
86	157.325	Public correspondence
88A	157.425	Public correspondence only near Canada

NOAA Weather Channels

1	162.550	
2	162.400	
3	162.475	
4	162.425	
5	162.450	
6	162.500	
7	162.525	

dio uses 85 as a working channel. Ship to ship contact should use channel 68.

A scanner or marine portable can provide you with some interesting listening while you are a tourist in the area.

We met up with VA3JG, Joe Guy and his wife Wendy. Besides being very interesting and friendly people, they spent five years cruising the Caribbean on their 30 foot sailboat. They were a wealth of information and stories. It turns out they now live in Kingston and we have met over coffee a few times. You never know who will spot your amateur radio license plate in a parking lot.

❖ GLMMNet

The St. Lawrence Seaway opens for the season in late March. Usually the first ships I hear here are the icebreakers opening the main channel. However, at the time of writing we have very little ice, so the season may start earlier than usual.

Another sign of spring is the start up of the Great Lakes Marine Mobile net. Correspondence with Bernie Dekok, KC9SGV, notes they will begin the net on April 1st. Bernie and the other net controls have set up quite a system. Look for them on 7.263 at 0830 and 1930 EST as well as on 3.935 at 0845 and 1945 EST. All frequencies are plus or minus QRM. On the weekends, they have an extra session at 1030 EST on 7.263 or 7.268. They also run a VHF net on the weekends on the WA9ORC Chicago repeater. You can also access the net controls via Echolink nodes 528436 and 516288. IRLP node 8053 can also be used to access the net. They also offer access to Skype for world wide phone calls.

The net is looking for check-ins and welcomes anyone who would like to be a net control. If my interference can be cleared up I am sure to be on the net.

❖ Pacific Maritime Mobile Service Net

Another good amateur radio marine net is the Pacific Maritime Mobile Service Net. This net meets at 21.412 MHz, on the 15 meter band, from 2100 to 2400 UTC. They use a relay of net controls and there is usually quite a number of check-ins. Once the propagation goes long you may even hear Japanese stations, etc.

You can't miss the net when Roger, W1VDE is on from Oregon. Roger has 6 rhombic antennas, each of which has 900 feet of total wire length, a width of 135 feet and a height of 75 feet.

Today the amateur station from the Light Ship *Columbia* at the Columbia River Maritime Museum, W7BU, checked in.

❖ Mail

Nick, VE3NJG, commented that he enjoys my column. Nick runs the swap net on the Ontario Amateur Radio Service (ONTARS) Net and has done so for many years. John Scxhmelzer, KF5ZE was kind enough to write and give suggestions about my interference problem here. I am going to try some of his ideas on our return this spring.

Mac McCormick, KF4LMT of Savannah, Georgia noted that the Coast Guard has been using the Rescue 21 system with encryption in his area. Station Tybee used 163.1375 MHz and Charleston used 171.2375 MHz. Air ops from Savannah and Charleston were on 413 MHz. The auxiliary and contacts with local law enforcement remain on marine radio. He also hopes we activate the radio at the Alexander Henry. Believe me we are trying to do this.

Tom Corwin asked about web cams for ships in the Thousand Islands. The best one is in Alexandria Bay New York and can be accessed by Google.

Last but not least, **Terry Moorby, VE3BQ** said he liked all my columns. I appreciate that as Terry is a retired operator at the Canadian Coast Guard Radio stations. He worked at VBE Sarnia Radio back and was there when HF was on the Lakes. We both want 2.182 MHz back!

As for myself, I am going to be working as mate on the *Canadian Empress* for five trips this year. It will most likely be my last year, so I will enjoy my visits to Montreal, Ottawa and Quebec City, among other small ports, this summer.

Please send me your monitoring reports and any other suggestions for the column

73 Ron, VE3GO

Canadian Empress *approaching Kingston*

Remote Roundup!

I try to stay on top of the latest releases in the streaming world. Whether that be a new WiFi radio, a new device or a new app, I try to not get caught off-guard so that I am always able to bring all of you the latest in streaming.

Every once in a while, though, something will slip through the cracks. This month, it was something so obvious and wonderful, I literally smacked myself in the head once I found out about it.

Around the holidays, while helping to set up my mother's new Logitech Squeezebox, my father informed me of the Logitech remote app for iPhones. I hadn't heard of this new release, as the last time I checked, there were no apps for Logitech yet.
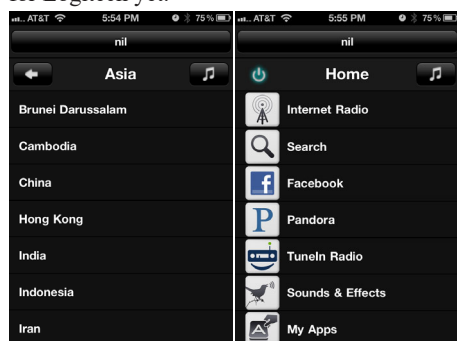
Logitech's remote control for the iPhone.

I have been a fan of the Logitech Squeezebox since I was first able to review it a couple of years ago. Ever since, it has been a mainstay bedside for listening to Internet radio stations. Now, with this remote control app for my iPhone, I am able to easily change radio stations, apps, volume and more without having to reach over to the radio.

You can purchase an infrared remote control for the Squeezebox, but even when combined with a rechargeable battery pack, it isn't cheap. But this remote control app is free at both the iTunes app store and Android Market.

With this remote, it is easy to navigate between apps, to access different streams, sound effects and change the volume. You can even turn your Squeezebox on and off with the remote from any room in the house.

Logitech isn't the only WiFi radio manufacturer to take advantage of a remote control app. Reciva has a remote control app for Reciva-enabled WiFi radios. On top of that, Grace Digital, which also uses the Reciva platform, has a remote control app specifically to use with their radios. Both of these apps work well (usually after a firmware update of your WiFi radio) and offer similar controls to what is available with the Logitech remote.

But WiFi radios aren't the only devices for which you can download a remote control app. Both Roku and Apple TV have apps that can be downloaded to control their devices from your smartphone.

The Roku remote allows you to not only switch between channels (from Netflix to Amazon Streaming Video, as an example) but also to control the player itself with pause, play, rewind and fast forward controls. The Apple TV remote allows you to control the player for Apple TV, as well as controlling AirPlay functionality of streaming music from your Mac computer, or other iOS devices.
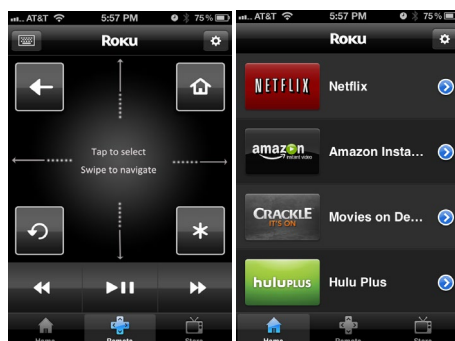
Roku's remote control for the iPhone.

So, next time you buy a new WiFi-enabled device for streaming audio or video, why not see if there is a remote control app to download for your smartphone or tablet? It could be the easiest way to take control of your device so you can experience its full potential!

❖ Spring Cleaning in the Mailbag

Even though I routinely address email inquiries received from my kind readers, it's still necessary to occasionally devote a little more space to emptying out the mailbag. I take pleasure in doing so, since in order to build a community, I can't be the only voice of the streaming world.

This month, streaming technology takes the forefront. Streaming players, devices and apps are on the minds of just about everyone interested in streaming hobby. This represents a pretty drastic change in a short amount of time.

When I first started devoting a considerable amount of resources to researching and learning the streaming industry, WiFi radio was the predominant technology for accessing streams, along with using a computer.

Within the last four years, we have seen a dramatic shift in focus from dedicated radios, to multi-use devices featuring a plethora of apps to experience the best in streaming audio and radio. While I still find myself using my WiFi radios from time-to-time, the majority of the time I spend accessing streaming content is through my phone, tablet or television device.

It seems that most of you who write me are feeling the same way!

Raving about Roku

Hi, Loyd! I love your column in Monitoring Times and am answering your call for comment about Roku. Let me assure you I have no connection to Roku other than as a happy customer. Roku makes me feel slightly like a traitor to shortwave.

I began listening to shortwave at age 10, back in 1958, and listened almost every night to shortwave stations. (I fell asleep with an earphone, to keep my roommates and later my wife happy.) Then, in April 2011, I bought a C. Crane Internet radio and programmed it for MOST shortwave stations that stream their audio of English-language programs. I still fall asleep with the earphone in my ear but now it's tuned to the clear sound of the BBC, Radio Australia, Voice of Russia, China Radio International, Radio New Zealand, Radio Nederland or some other 24-hour English service.

The bad news is that some stations that program only a few hours a day of English do not stream their programs. I purchased a Roku LT (then $50) in December and am now hooked, not only to all the same radio stations – and several more – that I can get on the TuneIn app on Roku. Essentially, if a radio station is streamed on the Internet, I can now listen to it on Roku.

Ah, but I get lots MORE. I also get live English television from countries which do not stream radio services, such as France 24, Russia Today (now simply "RT"), the BBC, Press24 from Iran, Deutsche Welle, CNN International from London, Al Jazeera, four stations in Ghana, NHK World and RTE Ireland. I also get

daily English newscasts from India, Ethiopia, CCTV-9 in China and the CBC in Canada, though these four are not live. I also get several TV stations in other languages.

For all this, I pay NOTHING beyond my original $50 purchase from Roku. It took me less than 5 minutes to get it on my Wi-Fi network and start watching.

Of course, Roku also connects you to Netflix, Amazon Instant Video and a host of other subscription or pay-per-view services in English and a ton of other languages, plus a mountain of other "channels" with video and audio on-demand, ranging from games to cooking to news to old TV shows from the 1950s and later.

George, Marblehead, MA

George – Isn't it great? Not long after I wrote that column, I took the bait and bought myself a Roku LT as well for my bedroom TV. I was already a happy customer of Apple TV's streaming player, but Roku has taken it one step further for me.

I love the abundance of free (a favorite word in the Van Horn household) apps that allow for streaming, not only Internet radio but video as you mentioned. Once I tossed in the WeatherUnderground app, my Roku became a daily part of my routine.

As I type this column, I am enjoying episodes from the first season of *Survivorman* on Netflix, streamed through my Roku. Earlier, while cleaning the house, I was streaming BBC Manchester through the same device. Sure, I have dedicated streaming players in my Logitech Squeezebox or Sangean WFR-1. But, for a single-device resource, the Roku bundles an amazing amount of features in a tiny little package.

The "I"s Have It

Good Evening Loyd, What a great article in the January issue of Monitoring Times. I do not have a smartphone yet, my wife has a cell phone. I have been putting off the decision, but have finally decided to get an iPhone.

I am 70 years old, spend lots of time on my desktop and laptop for finances; banking; bill paying; stock trading on Schwab; portfolio management; etc.

I have two sons in their 40s with iPhones and iPads. I have not seen any reason for an iPad, so I was really glad to get your analysis.

Thanks again for the article.

Stephen Coons

Stephen – You are welcome! A little behind the scenes on my column writing method for that month: I found myself doing a lot of research into tablets and wondering "yeah, but do I really need one?" Of course, there weren't any resources for tablet purchasing from a streaming perspective. When I find myself in those types of situations, I know that I can't be the only one pondering the same decision, so I decided to put my thought process into print, and voilà! A column was born.

I did end up pulling the trigger on a tablet, the Kindle Fire, which has been a great addition to my listening/viewing options. It gives me a larger screen for viewing streaming video

content, as well as a nice option for streaming audio. It isn't as mobile as my iPhone, but a great option for at-home listening. Plus, reading books, magazines or even favorite columns (cough, hint) is very enjoyable on the Kindle Fire.

Internet Radio Apps

Hello Loyd, I have seen you mention several Internet radio apps in your columns, including those that you said you use the most. Now that you have had a chance to use them for a while, are there any that stand out to you as being more reliable or useful?

Stanley, Pittsburgh, PA

Stanley – I have long been a supporter of the WiFi radios and apps that utilize the TuneIn platform. As such, I find myself going straight to the source the most often, using the TuneIn app.

On both my iPhone, my Roku and on my Kindle Fire, I am using the TuneIn app to listen to my favorite Internet radio stations.

Really though, you can't go wrong with any of the TuneIn apps. Don't get me wrong; Reciva apps aren't bad, and you will be able to access your streams with Reciva-based apps and radios, too. In my experience, though, the number of streams available, the ease in finding them, and the reliability of the streams that you can find seems to be a bit better on the TuneIn platform.

You will find with either platform that there are some streams that are hit or miss as far as reliability. Most of these are in remote areas or countries with a less-than-reliable power grid. Overall, though, the TuneIn streams seems to be a bit more reliable and plentiful.

On the bonus side of things, the TuneIn apps also provide access to a selection of public safety streams and NOAA weather radio. You won't find as much here as you would with a dedicated scanner app, but there should be enough to get you started.

Thank you, to each of you that wrote this month, and to all of you for your continued support and readership of the GlobalNet column!

❖ A Google Streaming Device?

There are reports that Google is looking to release its own streaming audio device under the Google brand, running the Android platform.

Could this be a competitor to Apple TV or Roku? Some of the information in the reports seems to indicate it could be. There would be access to the Android market, which would indicate not just music access but also video, possibly apps and more.

Other rumors of the launch are that users will use a combination of WiFi and Bluetooth to access and distribute audio throughout their home.

As of press-time, there is still not a lot known about the device specs, or if it will even make it into production or is just an idea at this point. But, with Google putting feelers out into this type of device, it helps re-enforce the notion that app-based streaming audio and video

devices are where the streaming industry seems to be headed.

Combine this with app-enabled BluRay players, video game systems and televisions, and the dream of an all-in-one interface for your home entertainment system that started years ago with Microsoft's Windows Media Center might finally be coming to pass.

Until next month, 73s and happy listening (or viewing)!

Q&As about NDBs

A reader from Wisconsin (who wishes to remain anonymous) asked several interesting questions about non-directional beacons (NDBs) regarding their power levels, who runs them, and signal enhancement techniques at the receiving end. Because I've received similar questions over the years, I thought it would be good to include my reply here, along with a little expansion on these worthy topics…

NDB output power is not readily available from any public databases that I am aware of. I would like to hear from any readers who know differently. Many years ago, this data was available, as evidenced by reviewing an old (1993) edition of the *Aero-Marine Beacon Guide* published by Joe Woodlock (SK) and Ken Stryker (SK). (As a point of interest, Joe Woodlock began the *Below 500 kHz* column here in *MT,* although I never had the opportunity to meet him.) I can say from personal knowledge that most NDBs in the US operate at 50 watts or less of output power, and probably 75% of them operate at 25 watts.

While specific wattages are hard to come by, you can use a website such as **www.pilotnav.com** to look up a beacon and get some clues on its power level. If a listing shows a code of "**MHW**" it indicates a "**M**edium-powered **H**oming" beacon running less than 50 watts (again, this is typically 25W). By the way the "**W**" denotes "**W**ithout voice" which is the case for the vast majority of beacons operating today.

A code of "**HW**" indicates a **H**igh power homing beacon with 50 watts to less than 2000 watts of power. (I realize that is quite a wide range, but I don't set the rules!) A code of "**HH**" indicates a *very high* powered beacon running 2000 watts or more. HH beacons are very scarce today, and the few that used to be widely heard (such as kingpins TUK/194 kHz (Nantucket, MA), and GNI/236 kHz (Grand Island, LA), are now out of service.

Subscription-based aeronautical data products, such those offered by Jeppesen Co., may include actual power data, I am not certain. These subscriptions can be quite costly, and it would be a recurring charge if you want to stay on top of things. By the way, limited access to power and other beacon data is one reason I am discontinuing the *BeaconFinder II* directory that I have published since 1998 (see last month's issue for close-out details: only a few copies remain).

Another question asked by our Wisconsin reader is, "Who owns and operates the U.S. beacons we hear in the 190-530 kHz range?"

The FAA oversees virtually all of these stations and owns many of them. As a government agency, they do not come under FCC jurisdiction, although they do coordinate their use of the spectrum through the National Telecommunications and Information Agency (NTIA). They also authorize privately-owned NDBs that operate at some smaller airfields, and assign the ID and frequency to be used by them. You can view the Operator/Owner information for any beacon at the same **www.pilotnav.com** website mentioned earlier.

Finally, our reader asks about an apparent enhancement of signals he noticed while standing near a metal pier with a portable LW receiver.

I have experienced a similar condition when standing on an overpass bridge with metal rails. Setting my LW receiver on the rails gave it a *huge* boost in signal pickup. My belief is that the set was inductively coupling to the metal and using it as an antenna, and that is likely what's happening with the pier.

My experience with inductive coupling came early in my longwave career. I would hike about 1/2 mile from my house to an interstate bridge that passed through our rural area for my listening sessions. All I had at the time for LF reception was a Grundig portable I found in a hamfest "grab box" for a few bucks. Since it had no provision for an external antenna, placing it atop the bridge railing became my way of enjoying a poor man's DXpedition. I'd tune slowly through the band, flashlight in hand, and log whatever I could hear until it got too cold, at which time I'd pack up and make the trek back home.

❖ Mystery Signals, Miskeyings

Another reader, **Van Wilshire** (IN), wrote with a question about a station he heard on at the upper end of the band in CW at 478 kHz: WD2XSH/31. He also heard a "gibberish" signal at 349 kHz that included the characters "AS" run together with no gap (.-...).

Hello Van, and good to hear from you. WD2XSH/31 is assigned to U.S. Amateur Radio station WA1ZMS in Center Rutland, VT. A webpage with some photos and information on this station can be viewed at **http://w4dex.com/500khz/wd2xsh31.htm**.

The ID you heard on 349 kHz is likely from a negatively-keyed beacon or other keying error. I am not aware of any beacons intentionally sending the "AS" prosign, which means to "wait." I would try tuning in AM mode near that frequency and see if you can pick up a different ID that is linked with these mystery transmissions.

Essentially, negative keying means that there will be a tone where there is silence in the true, intended ID, and vice versa. It is the result of a transmitter defect. Van concludes by noting that he's logged about 185 beacons thus far, and will be sending some logs into the column.

We were also pleased to hear from **Jim Condon**, WA2IFY (NJ). He writes: "Hi Kevin, read your comments in the February issue about **CAT** (254 kHz). I took some pictures of the beacon so you could see what it looks like. The ID is still wrong as of this writing, but it is not sending out CEM anymore. It is now sending CUT as the ID. I have emailed this information to the FAA Safety Dept.

"The NDB is used for the approach to Runway 23 at Morristown (MMU) airport in Morristown, NJ. It is maintained by Newark Airport FAA. There is a wire antenna at the station for the LF beacon, and then a smaller "V" beam antenna for the 75 MHz marker beacon. The V beam is configured as follows: The right V is the OUTER MARKER, the small dipole in the center is the MIDDLE MARKER, and the left V is the INNER MARKER. These are points that the pilot uses for an approach to the runway and the signal lights up three different color lights on a panel in the aircraft (blue, white, amber) and also gives an audio tone. I have shot this NDB approach many times when I used to fly but haven't flown in over 10 years. Hope this information helps you. Enjoy your column every month."

Thanks for writing, Jim. We have certainly received many reports on CAT/254 and it is good to have some background data on it and a view of the station. Another reader recently reported

CAT, 254 kHz, Chatham, NJ, widely reported to be miskeying as CEM, CIM, CUT, CWT, and possibly other combinations

an ID of CWT, and I have other reports of CUT and CIM being heard with uneven spacing, so it appears to be a very changeable situation! Regarding the 75 MHz beacon antenna; I appreciate the explanation of the different antenna elements and the indicator panel on board the plane. This fills a gap in my own knowledge about how these VHF stations are actually used by pilots.

❖ Loggings

Our logs this month are from **Mario Filippi**, N2HUN (NJ). He uses a Ten Tec RX-320D receiver, along with a 43-foot vertical made by S9 Antennas. Mario notes that he heard the long-reported "NEED" beacon @ 503.5 kHz during an evening listening session. This is believed to be a portable military NDB under test at Fort Rucker, AL and it may have a keying problem.

He also points out that he could not find a location for RPK/521 kHz, and that this station had a chirpy CW note. Per the NDBRNA website (**www.classaxe.com/dx/ndb/rna/**), this beacon appears to be in Middlesboro, KY, and serves the Bell County Airport.

TABLE 1. SELECTED LOGGINGS FROM NJ

kHz	ID	ST/PR/ITU*	CITY
254	CUT*	NJ	Chatham
328	BZJ	PA	Indiantown Gap
349	APG	MD	Aberdeen Pvg. Gnds.
379	BRA	NC	Asheville
379	IVV	NH	Lebanon
382	YPL	ON	Pickle Lake
384	F8	QC	Victoriaville
385	ZDH	ON	Toronto
390	JT	NL	Stephenville
417	HQT	NC	Coats-Harnett
424	RVJ	GA	Reidsville
426	IZS	GA	Savage-Montezuma
479	WD2XSH	?	Exp. Station**
515	OS	OH	Columbus
516	YWA	ON	Petawawa
520	F9	NB	Miramichi
521.5	RPK	KY	Middlesboro
523	JJH	NY	Johnstown
526	ZLS	BAH	Stella Maris

Miskeying of CAT/254 kHz
** Part of WD2XSH Experimental network. See www.500kc.com.*

❖ Bendix Navigator 420

In the last issue I mentioned a new restoration project of a longwave receiver, the Bendix Navigator 420 direction finding receiver (see Figure 1). The Bendix is a compact solid state portable receiver covering the LF, AM Broadcast, and Marine Bands. It includes a rotatable ferrite antenna, an S-meter, and a sensitivity control. It also has a BFO for Consolan reception, a specialized type of navigation aid that is no longer active.

The Bendix Navigator RDF Receiver

I was fortunate to find this set at the 2011 Antique Wireless Association Convention in Rochester, NY, last year for $10, and it included an original manual, which is a rare find in itself.

I'm pleased to report that I have powered the radio up, and it works quite well, except for a slight tuning calibration error on the AM Broadcast band. As I mentioned last time, there is a "cocoon" behind the dial window at the lower right side, so I will need to do some disassembly to get at this and remove it. The case is also dull from years of handling, and the knobs are all quite dirty. It appears that the major task will be in cleaning and polishing the set using the same techniques used with the earlier RDF-304 project.

Figure 2 shows an interior view of the radio after removing the back cover and battery pack. Everything appears to be complete and undamaged, so I see no major challenges in bringing this set back to top condition. Since it already operates well, about the only technical task I'll need to do is find the trimmer cap that controls frequency on the AM band, and touch it up.

My first task will be to remove the main PC board from the enclosure and see about accessing the backside of the dial to clean the cocoon out. I'll report next time on how this goes, and hopefully we will be well on the way toward bringing the set to completion.

That's it for this month. 73, and best LW DX!

Interior View of the Bendix Navigator Receiver

Starting Up a Vintage Radio

A few weeks ago, I got an e-mail from reader Peter Parrish, who is new to the antique radio hobby and interested in gaining some knowledge about troubleshooting techniques. I'm not sure that Peter specifically had radio receivers in mind because he did mention some (unidentified) kits that were giving him trouble. However, fixing radios is the basic thrust of "Radio Restorations," so let's talk about procedures for troubleshooting sets that have problems.

In preparation for writing the next few columns, I researched several of the classic books written for radio servicemen as well as a few aimed specifically at antique radio hobbyists. Most of the former, including the several books by Marcus, Levy, and Ghirardi, are available only on the used market but are frequently found at antique radio meets. You can browse through many of the latter on line at the Radio Daze (**www.radiodaze.com**) or Antique Radio Classified (**www.antiqueradio. com**) web sites. Amazon (**www.amazon.com**) has some of these volumes, but the out of print ones tend to be offered at crazily high prices.

The hobbyist books are helpful at providing basic information for newcomers. Check out the *Practical Radio Repair* volumes by Ray Bintliff, *Fixing up Nice Old Radios* by Ed Romney and *How to Repair Old-Time Radios* by Clayton Hallmark. However, for specific outlines of effective trouble-shooting techniques, there tends to be more material in the books for radio servicemen.

On the other hand, there are important differences between the problems faced by the repair technicians of maybe fifty years ago and those faced by the radio restoration enthusiasts of today. Yesteryear's technicians didn't have to worry as much about leaky capacitors, resistors aging out of specs, or shorts caused by deteriorating insulation. But if a profit was to be made, any problems with the radio had to be diagnosed and corrected quickly and efficiently.

The restoration enthusiast of today isn't necessarily in a hurry. Not only is there no profit motive, but he or she also derives pleasure from doing the work. Furthermore, the act of applying power to a long disused radio has to be approached with caution. An unexpected short circuit can burn up a component that might be difficult or impossible to replace.

And so, where the old-time technician might just turn on a problem radio and begin diagnosing, the enthusiast must follow a controlled start-up procedure before going to

work. Once the set is powered up, the restorer can go about correcting any problems that are keeping it from operating, or operating at top efficiency.

❖ Line Cord Issues

The first thing to do when contemplating the start-up of a newly-acquired set is to check the line cord. The rubber-covered zip cord used on early sets is almost always in a state of deterioration. Even if it looks ok, don't trust it. Make sure that the cord can withstand a sharp bend without snapping or crumbling. If not, replace it!

Check your line cord carefully. Chances are it's quite brittle and crumbly even if it seems intact.

If your radio has a heavy cloth cord with asbestos filler, it contains a resistance wire in addition to the two line wires. This is typical of small wood-cased early 30s table models. You can verify that there is a line cord resistor by looking at the cord where it enters the radio. There will be three wires coming out of it.

The line-cord resistor is part of the tube heater circuit and is almost always broken. Replacement cords of this kind are no longer available. We'll discuss how to deal with an open line-cord resistor in a future column.

❖ Transformer Testing

The next move depends on whether the radio has a power transformer or not. If it does, you'll want to test it. Replacement power transformers are extremely expensive and the variety is limited. Even if you decide to spend the money for a transformer to fix a prized radio, you may not be able to find one with the needed physical and electrical characteristics.

To test the transformer, remove the rectifier tube but leave the other tubes in place. The rectifier is removed because we don't want high voltage d.c. in the set at this time. Plug in the set and turn it on. Check to see that the tubes
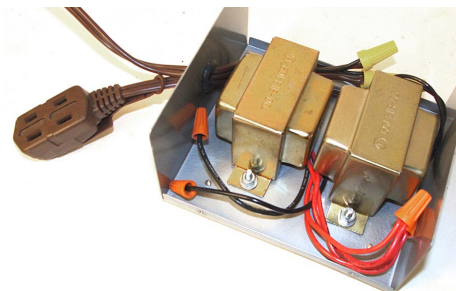
A serviceable isolation transformer can be made from a couple of Radio Shack units. See text.

are lit. If the tubes are all metal ones, wait a few minutes, then check to see if the metal shells are warm.

If at least some of the tubes light up or warm up, the heater winding of the transformer is ok. Tubes remaining dark may be burned out. If no tubes light up, use your multimeter to make sure there is power in the electrical outlet, at the line cord connections in the set, and through the on-off switch.

The high voltage winding is connected to the two-plate terminals of the rectifier tube socket. To check for high voltage, your multimeter should have a 1000 v.a.c. setting. Connect the meter leads across the terminals but be very careful! There could be as much as 700 volts between these points. If your meter can't handle that voltage, measure between each of the plate terminals and ground. Each measurement should be 350 volts, or less.

❖ Tube Checking, Contact Cleaning, Recapping

If the transformer checks ok, unplug the set. This is a good time to clean the chassis and blow out any surface dust. Use contact cleaner on all controls, working each control back and forth several times throughout its entire range.

Remove and check the tubes, one by one, using socket markings or the manufacturer's chassis diagram to make sure each tube is in the right socket. Before replacing a tube, spray a little contact cleaner on the tube pins and insert and remove the tube in its socket a few times before finally seating it.

For sets with no power transformer, there is no testing to be done at this point. Go on as with the power transformer set, cleaning and dusting the chassis, cleaning and working the controls, checking the tubes and cleaning the tube pins. Remove and resistance-check the
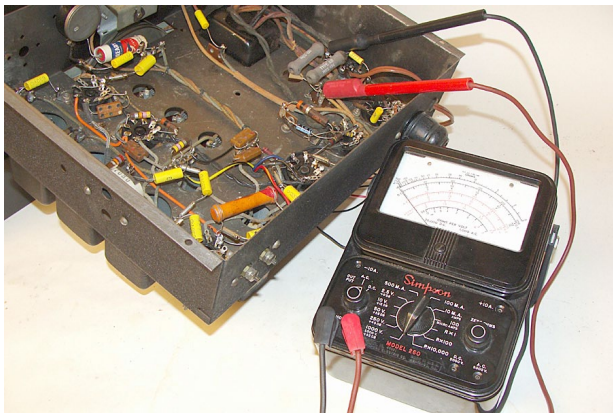
It's wise to monitor power supply output when powering up a long dormant set for the first time.

pilot light, replacing it if necessary. It is part of the rectifier tube heater circuit in most sets of this type, and the tube will eventually burn out if operated with an open pilot.

If you are going to recap the set, now is the time to do it. Some restorers – and I am one of them – like to change out every paper and electrolytic capacitor. I like the sets I restore to work as well as they did when new, and by now every one of those 50-60 year old capacitors have had plenty of time to develop at least some leakage even if it doesn't obviously affect operation. The mica caps rarely give problems, and I leave those alone.

Other folks – and I respect their opinions – are more interested in preserving the radio's looks than its operation. These people prefer to start up their radios with the original caps – replacing only those which have obviously failed. Still others, interested in both looks and performance, will melt out or otherwise remove the contents of the original capacitors and hide new caps in the old enclosures.

❖ Applying Power

Now it's time to power up (i.e. "smoke test") your radio. You'll want to monitor the power supply output, so set your multimeter to expect about 350 volts d.c. for a transformer set or about 125 volts d.c. for a transformerless (a.c.-d.c.) set. Connect it to read the voltage between the filament of the rectifier tube (or the cathode if it has one) and ground.

In some a.c.-d.c. sets, for safety's sake, there are no direct connections to chassis ground. Instead a ground wire, or ground bus, is run throughout the set and all "ground" connections are made to it. It is connected to chassis ground only through a small capacitor. Study the schematic for your set to see if it has a ground bus. If so, connect your multimeter to it instead of chassis ground.

If you are using the original capacitors, it's not a good idea to start the set on full line voltage. You'll want to bring it up the voltage gradually. It's best to use a Variac or other variable transformer device to do this, but otherwise one can power the set through a special extension cord with a lamp socket in series with one leg and experiment with raising the voltage to the set using lamps of increasing wattage.

The reason for raising the voltage slowly is primarily to protect the electrolytic capacitors in the radio (mainly the ones in the power supply filter circuit). In such capacitors, the film of material (*electrolyte*) separating the plates loses its insulating properties with disuse and might well short out if power is applied suddenly. However, this insulating membrane can heal itself (*re-form*) with slow application of power.

If your set is transformerless, there is one more important note of caution. Whether or not you are powering it through a Variac, you must also use an *isolation transformer*. This is because it is likely that one side of the power line is either directly connected to the chassis of the radio or connected to it through a capacitor that could be leaky. Depending on which way the set is plugged in, the side of the line connected to the chassis might be the "hot" side.

If that happens to be the case, you will get a nasty – maybe even lethal – shock if you come in contact with a grounded surface such as a water pipe or damp basement floor while working on the chassis. And, if you try to connect the ground wire from a piece of test equipment that itself is grounded through a 3-wire plug, you'll be treated to spectacular pyrotechnics along with your nasty shock!

Commercial isolation transformers are expensive, but you can make your own from a pair of low-voltage power transformers such as the 12.6 volt c.t., 3 ampere, Radio Shack 273-1511 (about $11.00 each). Just tie the low-voltage secondaries together, ignoring the center taps, connect an a.c. plug to one of the 115-volt primaries and a socket for the set, or variac, to the other one. You might cut an extension cord in half and connect the free ends to the transformer primaries.

An isolation transformer made in this manner is suitable for powering any of the average 5- or 6-tube a.c.-d.c. table models. Once your set is plugged in through an isolation transformer, there will no longer be any direct connection from the a.c. line to the chassis.

If you are starting up without a Variac, just plug in and turn on the power. Keep your eye on your meter to make sure that the power supply begins delivering voltage in a reasonable amount of time. Also keep your eyes (and nose) alert for any sign of smoke.

If you are using a Variac, increase the line voltage slowly until the meter begins to move upwards. From that point, keep increasing the voltage in small amounts, taking perhaps a half-hour to reach full line voltage. As before, be alert for signs of smoke.

❖ Next Steps

Now you might find that you have a working radio, a non-working one (either silent, weak, or with noise such as static or hum) having normal power supply voltage, or a radio

that has a short somewhere that has caused you to quickly shut the set off.

If your radio is working, you are ready to touch up the alignment.

Realignment will always result in a noticeable improvement, because the adjustments in your 50- or 60-year set will have certainly drifted over the years. This is a process we have gone through in this column many times, with various radios, and regular readers will be familiar with the steps. We also had a special column devoted to alignment last April.

If your radio is not working, or not working correctly, but has no short circuits, you are ready to employ the troubleshooting techniques we'll be discussing in the following column. If the set does have a short, you will need to clear it before you can address any other problems that the radio might have. The short has quite possibly been caused by a leaky capacitor in a set that still has its original ones installed. Another possible culprit is crumbling insulation in some of the wiring.

First, try to find the component that has been smoking or become overheated by the short. Use your eyes and your sense of smell. A leaky or shorted capacitor may show signs of sealing wax dribbling off its ends, or it may show no signs of trouble. An overheated resistor or wire might well show obvious discoloration or charring. If you can't spot the problem at first, only as a last resort turn on the set again, briefly, while keeping a sharp eye out for signs of smoke.

If the component that seems to have been compromised is a capacitor, replacing it should clear the problem. Other components may have been compromised by a leaky capacitor that, itself, shows no outward signs of failure. This is where you study the schematic and use your deductive facilities to identify a capacitor whose failure might apply high voltage to the troubled part. Disconnect it and power the set again. If the short has disappeared, you can go ahead with the troubleshooting steps to be discussed next month. See you then!

Diversity Antennas

Do you ever look at the bottom of a swimming pool and watch those dancing lines of light as the sun shines through some gentle waves? It's quite a complex pattern of light and dark areas. As radio waves bounce around the different layers of the Ionosphere, similar patterns of strong and weak signals form as the radio waves bounce back to the ground.

It was discovered back in the 1920s that if you had two receivers some distance apart, it was not uncommon for one radio to have a strong signal while the other radio experienced a fade. The Hallicrafters Model DD-1 Skyrider Diversity was the first commercial radio I am aware of to take advantage of this selective fading.

The idea is to have two antennas (50 to 300 feet separation in the early tests) or two antennas with different antenna patterns going to two receivers. A comparison – or as they like to say today, a voting circuit – switches back and forth such that only the receiver with the stronger S-Meter reading is connected to the speaker.

In later years AT&T microwave links would use two radios on two frequencies mounted at different heights on each leg of a microwave link. If one link experienced a fade, the other link took over. This microwave diversity would raise the reliability of a long distance telephone circuit from 99% to 99.9+%. Now this same technique has been rediscovered by the Wi-Fire world as MIMO. Multiple In – Multiple Out. What goes around comes around!

A more simple diversity technique is to have several antennas and use the one that is working best. "Working best" can be due to a variety of possible factors: as the ionosphere layers change density with the time of day, the signals arrive at different angles; and, like channel surfing though the TV Channels, your favorite shortwave programs are often moving from continent to continent; we also have local noise sources that vary as various appliances are turned on and off. So the idea is to have not one, but two or more shortwave antennas, and to switch between them for the one with the best signal to noise. Not necessarily the antenna with the strongest signal, but the one that simply sounds the best.

Figure 1 is an example in which we have a vertical, a dipole, and a long wire antenna. With many antennas with different patterns, just switch around and use the one with the best signal.

❖ Antenna Switches

For the antenna switch, those TV antenna A-B switches work just fine like the one in Photo 1. Don't be afraid of 75 Ohms; in fact, with long

Cheap Antenna Switches

wire antennas the higher impedance actually works better. But there is a more important point: I got both of these switches at local Dollar stores for one dollar!

Designed for low loss and high isolation for UHF TV channels, performance for SWL use is outstanding. The RG-59 jumpers are also plentiful and inexpensive, and old runs of cable TV RG-6 or an old run of RG-6 off a satellite dish can be recycled into that SWL dipole. I have used 75 Ohm coax with my HF antenna for nearly 30 years.
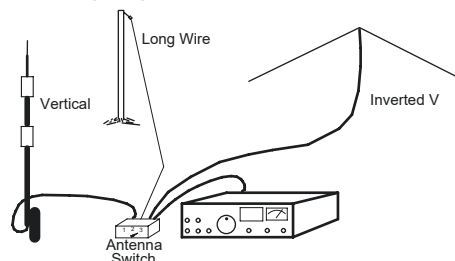
Multiple antennas for simple diversity reception.

Again, the ability to choose between several antennas will help you enjoy your SW listening.

❖ RFID and Hi Tech Pick-Pockets

I recently evaluated several products designed to shield your credit cards or any other RFID products in a wallet or a purse. This also started a round of countermeasures with countermeasures to the countermeasures. But more on that work in a moment. Much of the testing was with a Network Analyzer looking at a loop antenna near the RFID tags.

In Photo 2 you see the coil in the RFID tag and its circuitry. The coil and the capacitor are usually tuned to 13.56 MHz. When a 13.56 MHz is fed into a nearby coil, some of the energy is rectified and used to power the logic circuits in
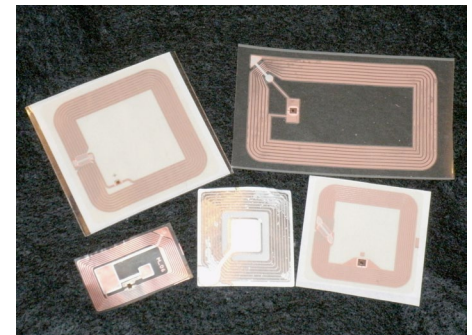
13.56 MHz RFID tags

the RFID tag. The logic circuits then control a switch that shorts out the coil in a 100110110 type pattern. The reader sees the impedance, or SWR of its coil change in the same pattern of 1's and 0's.

The larger tags catch more energy from the RFID reader, giving them a longer range. Great for crates and shipping boxes, but a bit clumsy for a consumer smart card.

In many ways the coil in the RFID tag and the coil in the RFID reader are like the coupled coils in an IF transformer as shown in Photo 3. The energy transferred between coils is all done with a magnetic field, not a classic radio wave.

For this process to start, the reader has to get enough energy into the tag's coil to power up its logic circuits. It's getting enough power

Coupled coils in an IF transformer

into the tag that usually limits the read range of the RFID tag.

In the early days of radio, one way to change the inductance of a coil was called the shorted turn. Just having a shorted loop near a tuned coil reduced the inductance of the coil and raised the resonate frequency of that circuit.

In Figure 2 is a side view of the flat coils in the typical RFID tag and what is happening when a sheet of metal gets close to the windings. The windings on both sides of the tag have stray capacitance to the sheet metal and the windings

Side view of RFID Tag
And the coil windings

Stray Capacitors   Sheet Metal
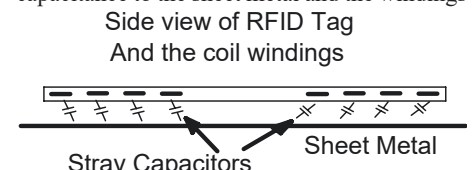
Stray capacitance detuning a coil

on the other side of the tag. Effectively this bypasses the turns.

On a network analyzer this is seen as the tag's resonance dip going up in frequency. The 13.56 MHz tuned circuit becomes a 15, 16, or even a 20 MHz tuned circuit. The tag reader running at 13.56 MHz can't couple enough energy to power the tag's active circuits and so doesn't get a response.

The Problem

So much for the basic technology of RFID tags. The modern high tech pick-pocket uses a portable RFID reader. These are easily hidden in a paper bag, computer case, handbag, or even the pocket of a trench coat. In the old days Mr. Sticky Fingers would slip out your wallet, but today just a brush pass of your wallet is enough to get the credit card numbers.

Aluminum Foil

What we need is a way to deactivate those RFID tags except when we actually need to use them. I have seen some pretty expensive shielded wallets advertised on TV, but there are some less expensive solutions that work just a well. A simple sheet of aluminum foil slipped in with your credit cards is enough. The card in front and behind the foil will not be readable by normal RFID readers, and even the next two cards in your stack are pretty safe. So just a simple sheet of thin metal or aluminum foil is pretty good protection.

Dipole type RFID tags are rarely used in credit card type transactions, but that same sheet of metal foil shuts them down as well.

Now for the counter measures and counter counter measures: Many high security operations now use RFID cards for employee access. The cards contain information about the employee, what areas they are allowed access to, and other handy tidbits of info. This is of interest to – well, let's just say people you don't want to have this information. The high security ID RFID badges have metal foil built into the badge holders blocking RFID signals until the employee removes his/her card to use a reader.

Counter Measure

My job (and I just love jobs like this) was to be the bad guy. How would I steal the ID badge security information from the employees?

My plan – that existed only on paper of course – was to start a sandwich shop across the street from the target organization. The sandwich shop would have a fancy all wood door and entrance area. And really good deals on food to lure in their employees. Built into the door frame would be a large loop antenna leading to an RFID reader running many times more power than usual.

My super reader would start at 13.56 MHz to catch people who had just put their badge into a pocket and not the shielded holder. Next I would sweep the reader up in frequency looking for the new resonant frequency of the RFID coil going as high as 20 MHz. For you analog guys, using a spectrum analyzer in Zero Span mode will let you see RFID responses that are too weak for most digital circuits to pull out.

There's a good chance that in a few weeks I could collect enough data to send a half dozen agents in with duplicate ID badges that would give the proper responses.

Counter Counter Measure

The super reader is going to have to radiate a lot of RF power. Someone in the security office needs to listen to 13.56 MHz on a regular basis for new/strong signals and to also listen above 13.56 MHz for strong frequency-sweeping signals. Again, this is a great place to use a spectrum analyzer or a software defined receiver.

We are also seeing more encrypted protocol RFID cards. But history says the encryption is vulnerable to a dedicated hacker attack.

❖ Future Topics

You, the reader, are my best source for topics for antenna columns:

If there is enough interest, I can work up a 406 MHz Yagi for the new Digital ELT beacons.

Are many of you interested in the Virtual Radar maps from the transponders in commercial aircraft? We could do a family of 1080 MHz antennas.

For the amateur radio community, I have a collection of ham antennas available as downloads from my website: **www.wa5vjb.com** Reference section.

The quickest way to contact me is at *kentbritain@monitoringtimes.com* or via snail mail to the QRZ.COM address for WA5VJB.

Now, spring is in the air; go get some more antennas in the air and keep those antenna questions coming.

COMPUTERS & RADIO

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Brian Wood, W0DZ
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Computers and Transmitters

In this column, we tend to focus on using a computer to receive short-wave and amateur transmissions, do computerized contact logging and so on. We've even shown how you can be a part of the Search for Extraterrestrial Intelligence by letting your computer process data from the Arecibo dish! But we haven't talked much about the use of a computer to transmit, to monitor signal quality or to do some of the more esoteric things involving computers and radios. So this time, we'll do just that.

While researching this column, I stumbled on a cool project that uses a single part – a 1MHz crystal oscillator – to send CW on the AM broadcast band. Don't worry – the power level is way below the Federal Communications Commission's (and other countries' agencies) legal requirements. A simple program keys the DTR (data terminal ready) line in the RS-232 port, which provides both power and modulation for the oscillator. You can then tune in the signal on your AM radio. There's a CW mode, too, in case your radio has a beat frequency oscillator (BFO). See it at **http://sci-toys.com/scitoys/scitoys/computers/radio/computer_controlled_transmitter.html**

What other esoteric things involve transmitters and computers? Here are a few things that come to mind:

❖ SO2R: "Single Operator, Two Radios."

This involves listening on one radio while having a contest exchange on another. The second radio is used to find the next contact and then a switching system switches over to the other radio to do that contact. It requires a lot of discipline, not to mention hardware – automatically switchable bandpass filters, antennas, computer-controlled radios, headphones with one receiver in one ear and the other receiver in the other ear, and so on.

It can also be achieved using a single "full-duplex" radio such as the DZKit Sienna or FlexRadio Software Defined Radios (SDRs), which can transmit on one frequency while listening on another at the same time. (Most radios mute the receiver during transmission and share circuitry so that the receiver can't be operated on a frequency that's much different than the transmit frequency, even when using Split mode. Full duplex radios have completely
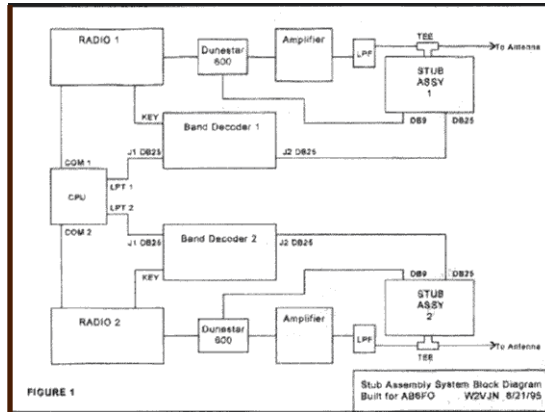
The SO2R setup of K6LA

separate transmit and receive paths.)

A block diagram of a typical SO2R station, that of K6LA, is shown below. (Courtesy NCJ, September/October, 1996)

❖ Transmit Signal Monitors

In the '60s, Heathkit® made a signal monitor (the SB-610 "Scanalyzer") that allowed you to see the quality of your transmitted signal. Today, spectrum analyzers can be used to look at a signal, and some, like the SDR-IQ, are literally "black boxes" controlled by PCs.

Oscilloscopes with bandwidths of over 100MHz are relatively cheap and can serve as analyzers, too, although none can do what

The venerable Heathkit SB-610. There's still nothing quite like it on the market today!

the SB-610 did (monitoring the RF envelope, RF trapezoid, or RTTY cross pattern, and even having a two-tone oscillator built-in for looking
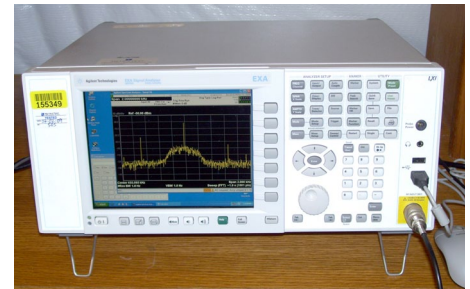
An Agilent N9010A Spectrum Analyzer. This instrument runs Microsoft Windows from an internal PC, and can be connected to an external PC via LAN.

at inter-modulation distortion [IMD]). Although many analyzers today are bench instruments, some have PC connectivity so that waveforms can be captured and saved as jpeg files for later analysis.

❖ Two-tone test oscillators

Some rigs, like the Elecraft K3, have built-in two-tone oscillators that are useful for doing IMD measurements. I have found, though, that there's some pretty good free or inexpensive software that can generate two tones from a PC sound card with lots of dynamic range and excellent purity. You have to have about 70dB of spur-free dynamic range to be able to see the actual mixing products generated by the transmitter and not be confused by crummy oscillators, and I've found that a high-def sound card does an excellent job at this! One such generator is made by NCH and can be downloaded at: **www.brothersoft.com/tone-generator-download-277337-s1.html**.

It's a little tricky finding the right button to click to download the actual tone generator and
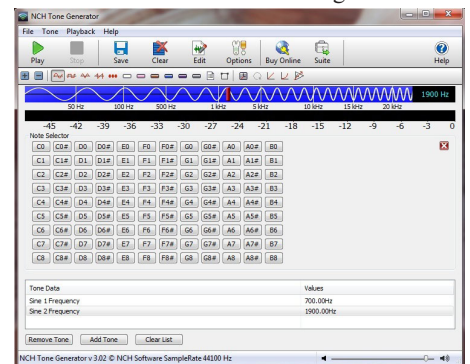
The NCH test oscillator
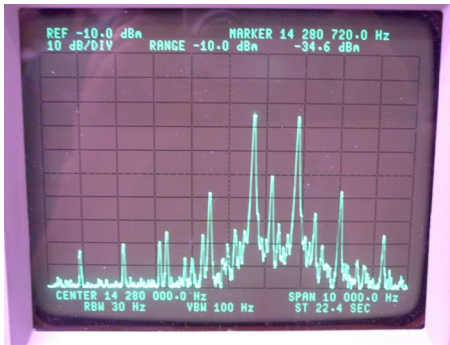
Actual spectrum of a transmitter with two-tone input

not a whole bunch of other stuff you probably don't want, so be sure to scour the page for the right link! Oscillator frequencies usually used for transmitter testing are 700Hz and 1900Hz, since they are not harmonically related and are typically within the passband of the transmitter's filters.

❖ Microphone equalizers

There's a nifty program available from RoMac Software (**www.romacsoftware.com/default.asp**) that they call the *Basic Equalizer (aka Speech Intelligibility Enhancer, $24.95)* that can be used for transmit and receive audio equalization. You cable the output of the sound card to the microphone input to a transmitter, using an isolation transformer for RFI immunity. As a transmit audio equalizer, it has the same DSP engine as their flagship product, the RoMac 10 Band Equalizer and DSP filter.

The manufacturer says, "Transmit audio may be tailored to sound like a broadcast station, or if needed, to have emphasized mid-range and highs to get through those DX pile-ups. A simple mouse click allows you to store and recall up to 6 different sets of equalization parameters."

Many high-end rigs are now incorporating equalizers in the hardware, and when added to a balanced microphone input, transmit audio
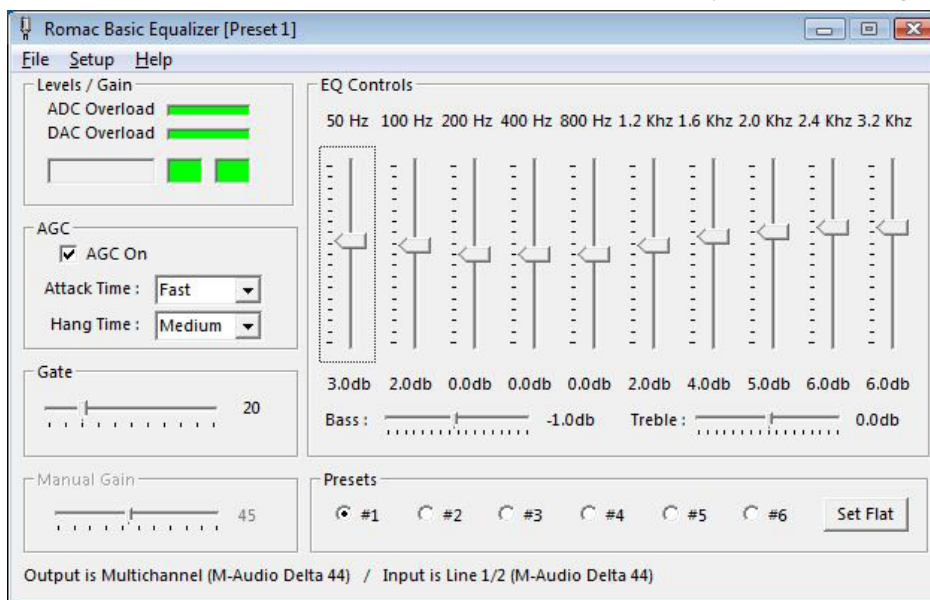
can really be made outstanding (or crummy, if you don't understand what you're doing). But routing your mic through an existing PC and running inexpensive software can make you *sound* like you've got an expensive rig without having to actually buy one!

❖ CTCSS/DTMF Generators

Most FM repeaters need to hear a low frequency tone, also called CTCSS (Continuous Tone-Coded Squelch System), PL, or sub-audible tone, typically around 100Hz, to activate the transmitter. Thus, your signal needs to generate one. Although most modern FM transceivers (handie-talkies, mobile rigs and base stations) have this built in, older ones and some HF transceivers for which FM is not their primary function do not.

If you are generating audio via your sound card, you may need to mix this with your microphone audio to access repeaters. You also may need DTMF (Dual-Tone Multi-Frequency) capability to transmit numeric telephone signals. One such program is **www.brothersoft.com/comtekk-45051.html**.

These are just a few of the many software applications available to allow you to tune your transmitter for the best audio and to see any spurious emissions so that you don't get a friendly letter from an Official Observer, or worse, the FCC or other government agency!

Bear in mind, though, that the human ear is one of the best "computers" around. Provided you are not hearing-impaired, your ear can detect subtle nuances in your transmitted signal
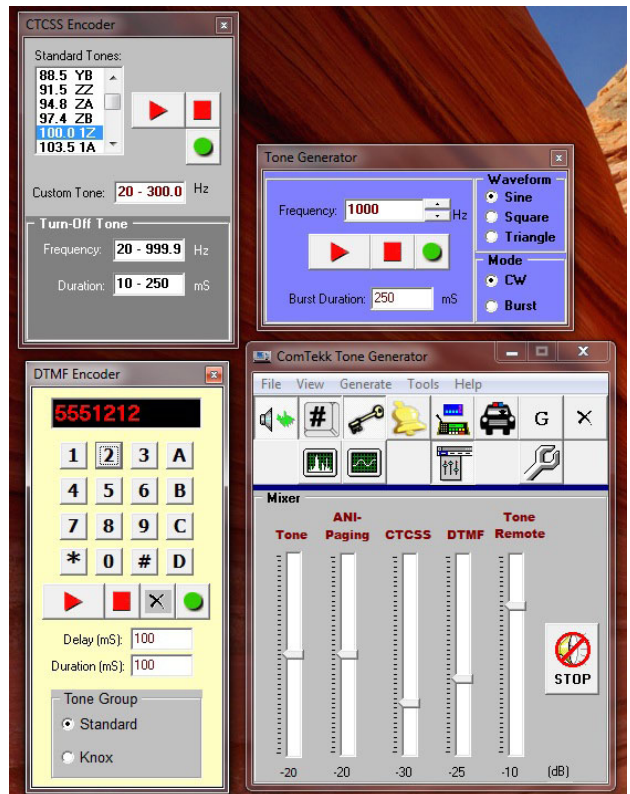
The ComTekk CTCSS/DTMF generator.

that otherwise requires expensive equipment.

I rented that Agilent N9010A, and it cost nearly $1200/mo. New, that analyzer is over $20K! But it sure does have excellent performance. It is capable of seeing signals as low as –163dBm, and covers from 10Hz to as high as 26GHz depending on options. Wow.

But don't despair; using some of the tricks in this column you can approach such sophisticated results with none of the cost – and much more fun!

RoMac's Basic Equalizer.

ON THE BENCH

PROJECTS, REVIEWS, TIPS & TECHNIQUES

The Stealthy World of Indoor SWL Antennas

Story and photos by David Payne Sr., KB8NNT

For shortwave listening, getting some wire outside is obviously your best bet whenever possible. Even without real estate, I've been known to simply dangle wire out of the window, or affix a wire to an aluminum downspout (thus using the downspout and gutter as the antenna). I've also installed quite a few antennas (both transmitting and receiving) in attics, and once I made a loop antenna by basically laying a wire on top of a roof.

But let's say you have no way of getting any length of wire outside. In my current living situation, even a couple feet of wire dangling out the window would draw unwanted attention. What can you do?

The usual approach is to simply place the radio near a window, adjust the factory-installed whip antenna or use a noisy active antenna. Some even use some kind of bowtie or rabbit-ear antenna designed for receiving UHF television frequencies, which are much higher than shortwave.

You don't have to settle for that as you break free of the whip antenna. Regardless of your situation, you can have indoor antennas that are resonant on shortwave frequencies.

One approach to stealth SWL is to have the antenna in view only when you need it. Maybe you can't have 15 feet of wire dangling out of your window all day without attracting attention, but what if it wasn't there all the time?

For the first week or so after I moved into my third-floor apartment, I simply ran a wire out of the window for a nice little vertical antenna. Naturally, I didn't want the wire dangling in front of my downstairs neighbor's window, so I ran a little bit at a time, then going outside to check that it hadn't gone down too far. When I found the right length, I marked it. Afterward, it was simple to run the perfect length of wire when I was listening to my radio in the evenings, and retract it when not in use.

Ham radio operators will tell you, there's no perfect antenna. Every antenna design is some sort of compromise, period. The problem is – if your antenna is indoors only, you're going to do a *lot* of compromising. How you deal with those compromises will determine the quality of your reception, but you do have one grace-saving advantage as you create your unique indoor antenna: You won't be transmitting on it. That opens a whole new world of possibilities in antenna design.

❖ Before You Start

Keep in mind that you will want to set up your radio where you will have access to some type of ground – even though many shortwave listeners overlook it entirely, especially if there is no dedicated ground port on their radios. There are more uses for a good ground besides plugging it into the back of your radio.

Your best option for an indoor ground is to attach your ground wire to a copper cold-water pipe (never a gas pipe). If you are unable to solder the connection, you can strip about six inches of braided wire and wrap it tightly around a small section of pipe that has been cleaned with sandpaper. You could also solder the wire to a metal hose clamp and attach that to a sanded-clean section of pipe.

Before you install your antenna, you might want to check different areas of the room for RFI. With indoor antennas, RFI is a part of life, but you can avoid spots that are especially noisy and identify appliances you may want to unplug when you listen to the radio. Pocket-size AM radios make wonderful RFI detectors.

❖ Random Wire Indoor Antennas

As the name implies, random wire antennas are just random lengths of wire run wherever you can fit it. There are a lot of places you can hide away an antenna to keep it hidden from view. Depending on what type of carpeting you have, you might be able to hide away a length of wire between the carpet and the baseboards – it could be your primary antenna or just a feedline. You can use coax mounting clips (which are available with nail-on or adhesive backs) to run antenna or feed wire around walls or anywhere with a flat surface.

With just a few of the adhesive coax clips, you can make a loop antenna on the back of a dresser or similar piece of furniture for a well-hidden aerial. Just attach the clips on the back of the dresser near the outside edges and run your antenna wire through the clips.

❖ Helical Coil, a.k.a. Slinky Antenna

According to the manufacturer, Slinkys have been used for antennas for decades and were popular among U.S. military personnel in Vietnam. A Slinky provides an 80-foot coil of flattened spring-steel wire to fit in whatever space is available.

Judging from the reviews posted on the Internet, shortwave listeners have a love-hate

So, where's the antenna in this picture? There is more than 65 feet of wire antenna hidden behind the blinds!
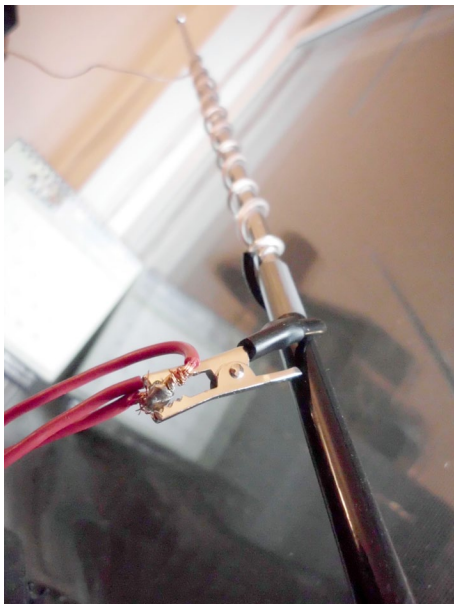
This is how you should install a wrap-around insulated feed on a telescopic antenna - insulated feed wire wrapped several times around the whip antenna, with a connection to ground. Here, the alligator clip is attached to ground.

relationship with the helical-coil-that's-fun-for-a-girl-and-a-boy antenna. Many of the negative Slinky-antenna reviewers complain about how easily it collapses and how badly it sags. Some suggest using nylon rope to support.

You can buy Slinky antennas on Ebay for anywhere from $20 to $90, but there's no need to go to quite that expense. For indoor use, a regular $5 steel Slinky will do.

I made Slinky antennas for my son and I by soldering a wire to one end of the Slinky and using an alligator clip to attach it to the telescoping antennas on our portable radios. It's portable and easy to install. I've hung them from curtain rods and out-of-sight behind a closet door.

Horizontally, Slinky antennas really are cumbersome, so I like to use them as verticals. Of course, the coils aren't evenly spaced when it's hung vertically (the coils at the top are spaced farther apart than the ones on bottom). Applying a little weight to the bottom will help stretch it a little more, but since we are not going to transmit on this antenna, that's not a big deal.

A vertical Slinky antenna can be installed easily in the corner of a room by hanging it from a small screw hook. It can then be easily hidden from view by simply taking it down when not in use.

Does it work? Yes. Does it work better than a random wire antenna? Not always. You'll just have to experiment.

❖ The SWL Window Loop

The window is more than just a place for you to gaze out at a world where radio signals fly around wantonly and think about the antennas you would put out there if you could. While usually overlooked, it is your portal to a world teeming with radio signals. With only a pane of glass separating you from the outdoors, your window might as well be outside as far as radio signals are concerned.

However, it's an easy place to overlook. Who wants to take an antenna down every time you want to open a window? How much wire can you put there anyway?

My shack/bedroom window is four feet, 10 inches by two feet, 10.5 inches. The diagonal is five feet, seven inches. Yet, I've got a 65-foot-long antenna in the window. The window opens freely and when the venetian blinds are down, the antenna is entirely hidden from view.

This antenna was the result of several weeks of researching and thinking about what might work for me in my new home. I've used outdoor longwires for years and was nervous about the antenna-free apartment I recently moved into. I decided on a 1920s-style table-top loop antenna that I could simply take out of the window when I wanted to open it. One day it occurred to me – what if I used the window frame itself as the loop?

The initial construction was very simple, I just put four screw hooks into the corners of the window frame and ran wire through the screw hooks in a loop all the way around the window frame several times until I ran out of wire.

Naturally, the antenna would work best with a way to adjust the electrical length, so the average shortwave listener would probably want to install taps along the length of the wire to adjust for resonant frequencies for different bands and I've considered building a loading coil for mine. My primary SWL radio is a Heathkit SB-310, which has a built-in preselect, so taps weren't really necessary for that radio.

I suppose it is a directional antenna, but it is directional exactly where you want it to be – out the window where the signals can come in unimpeded.

Four hook screws (adhesive coax clips would also work) like the one shown is all you need to run wire for a window loop antenna.

When you are designing a receive-only antenna, it doesn't have to be perfect at first. As you use it, you will notice issues you didn't anticipate and envision ways to make it better. On my installation, I just ran the wire through the screw hooks. Right now, the wire bunches up at the hooks. At some point, I will drill holes in a small, straight piece of plastic or wood to make a spacer to keep the wire spacing uniform.

❖ Overload!

Portables are designed to work with those dinky telescopic antennas. They take those tiny amounts of HF signal the factory antenna picks up and amplify them a great deal. When you attach

a long length of wire from a window loop, for instance, you can actually send *too much* signal to the radio and overload the circuit. Weird things ensue, such as hearing shortwave stations on the AM broadcast band.

My father, KB8NJH, has suggested using a resistor on the feed line, but so far I've not tried that. The most popular way of rectifying is to wrap the insulated lead-in wire around the telescopic antenna instead of attaching it directly with the alligator clip. This method uses the magnetic field around the lead-in wire to induce signal current in the radio instead of current flowing from the wire through a direct connection.

The problem with the way this is usually done (simply wrapping the lead in wire around the factory antenna) is that it over-corrects the signal overload problem. While you can tap into the magnetic field of the wire, there is nowhere for electrical signal current to really flow. You can strengthen that magnetic field – thus the signal your radio receives – by giving that energy somewhere to go. Wrap the wire around the antenna AND attach the alligator clip directly to ground.

This method of inducing current in the radio via magnetic field instead of direct connection is more than just a tool for dealing with overload. It can, to some extent, reduce RFI. I've noticed that while there is a negligible drop in signal strength, there is often, but not always, a slightly greater drop in RFI – thus improving the signal-to-noise ratio.

❖ Does the new antenna work better?

You need to find what makes a difference at your particular location. When you are working with indoor antennas, there are so many variables that improve or degrade reception, it's often difficult to tell whether some change you've made will improve or degrade your listening experience. That's why experimentation is so important.

If you want to measure how well something works, it's best to use a control signal that you listen to often and is steady but not too strong from day to day. You don't want to use a signal that is too strong in your locale, because you want something that has room for improvement.

I like to use the *Allan Weiner Show* on WBCQ on weekday evenings as my control. There is usually quite a bit of noise on 7490 kHz at the 8 p.m. Eastern (01:00 UTC) hour when Allan's show is on, but it's still quite listenable. I use the quality of reception from that broadcast to gauge what works for my radios.

If you find yourself in a situation like mine, hope is not lost. Sometimes, even an indoor setup at a particular location can be enviable, provided the topography is in your favor. At my former home, I had a 101-foot longwire antenna about 40 feet above ground in an oak tree. My new flat is a third-floor apartment on a hill and my reception at 7490 kHz during Allan's show is similar to what it was with the outdoor longwire at the other location.

Just because you live in an antenna-restrictive environment is no reason not to enjoy the world of radio. The signals are out there; you just have to reel them in as best you can.

Alinco DJ-V57 Hand-Held, Dual-Band Transceiver

Review by Bob Grove W8JHD

I am always amazed when a new piece of radio equipment is released which has an impressive list of features at an astonishingly low price. Such is the case with the release of a new hand-held, two-way radio from Alinco – the DJ-V57 hand held.

❖ Advantages and disadvantages of portability

If you can put an entire two-way radio in a pocket, why would anyone want to pay extra for a base/mobile transceiver? Because such compact portability comes with compromises.

Handy-talkie programming can be a challenge for large fingers on teensy keys. Displays are smaller and often harder to read than those of their base/mobile counterparts. Speakers are small, limiting fidelity. Battery power means restricted operating time before recharge. Transmit power is lower. Frequency bands may be fewer than on bigger multiband radios. Range of operation is smaller because of the shorter antennas and lower power.

With such well-acknowledged compromises, how does this new HT from Alinco measure up?

❖ The new player in the compact HT marketplace

The Alinco DJ-V57 transceiver is a dual-band (144-147.995, 420-449.995 MHz transmit, 136-173.995, 400-511.995 MHz receive) radio with selectable outputs of 0.5 low power, user-selectable 1-3 watts mid power, and 5 watts high power.

The seven-inch rubberized whip may be unscrewed, revealing an SMA connector to accommodate the user's choice of another portable, mobile, or base antenna if desired.

Ergonomically, the fist-size DJ-V57 cradles nicely in an adult hand. The 16 rubberized keys are easy to press with a fingertip without bumping into an adjacent key. A selectable backlight enables night viewing of the display and keypad.

The dual-function keypad allows direct frequency entry and up to seven characters for alphanumeric identification as well. The decimal is entered automatically as you press your frequency setting, and a beep informs you that your frequency has been accepted when the last numeral is pressed.

Clear voice reproduction is available from the internal 1-1/2 inch speaker at full volume. The actual rating is 10 percent total harmonic distortion (THD) at 500 mW of audio power.

A top-mounted mini phone jack allows attachment of an earphone and doubles as an access port for cloning another identical scanner. The port is secured by a thumb-screw cap with a rubber hermetic seal for protection against water intrusion.

This feels like a "real radio," compact (2-1/4 inches wide by 4-1/3 inches high by 1-1/3 inches deep) and husky (10 ounces). The rugged polycarbonate body resists dirt and dust accumulation and water-resistant materials make the HT stormy-weather repellant. A sturdy belt clip is included, as are a wrist strap, battery charger, 70 page manual, and schematic diagram.

Although a 120 VAC/12 VDC wall charger/adapter is included, an optional drop-in charger may be ordered. For higher power and longer charge life, the slip-off, 700 mAh, NiMH battery may also be optionally changed by ordering rechargeable 1100, 1600, or 2000 mAh NiMH and Li-ion battery options. It takes an overnight charge to fully recharge the battery. The supplied charger is intended only for charging the battery, and cannot be used to power the radio during transmit operation.

A quick-write memory procedure allows entry of a current VFO frequency into one of 200 memory channels by pressing a single key. Frequencies and channels may be manually slewed with the top tuning knob or scanned automatically. A search feature is also provided.

The DJ-57V has three operational modes: VFO (operates on any displayed frequency), memory (operates on any of the 200 memorized channels), and call (operates on one primarily-selected VHF and one UHF channel). A handy BAND key allows instant toggling between the VHF and UHF bands. Alternatively, the user may enter any valid frequency in the transceiver's dual range while currently in either band.

Two levels of receiver sensitivity attenuation are accessible for interference reduction in strong-signal environments.

A VOX (voice-activated transmit) function is also provided if desired; speaking into the HT automatically keys the transmit function, and the radio reverts back to receiving when the voice stops.

For emergency messages or signaling, a five-second bell-tone alert signal can be activated. Tone bursts of 1000, 1450, 1750, and 2100 Hz can be selected to activate repeaters requiring that function. CTCSS tone and DCS codes are available for tone-encoded repeaters so extant in the VHF/UHF ranges. The tones may be used for transmitting only, or for both transmitting and receiving. DTMF auto dialing/redialing is also provided for telephoning through suitably equipped repeaters.

Transmit/receive offset frequencies for repeater use may be custom-selected in kilohertz intervals up to 99.995 MHz separation. The input/output frequencies may be reversed by a simple key press. Band splitting is also easily key-entered, allowing transmitting in one band and receiving in another.

❖ So, can I use it as a scanner?

The DJ-V57 incorporates a very flexible scanning receiver. Any frequency between 136-174 and 406-512 MHz may be entered in up to 200 memory channels which can be sequentially scanned for activity.

In addition, any segment of a band, or the total band, may be auto-searched for signal activity in the program scan mode.

Does the 5 kHz step intervals for tuning skip some of the new narrow band channels? Not at all. It might be a couple of kilohertz off frequency, but the filters are wide enough to hear all the action.

The scanning routine includes a skip function to avoid hanging up on memory channels likely to be active but not desirable to be heard during the scan sequence.

As in virtually all receivers, there are some frequencies that detect the oscillator's own
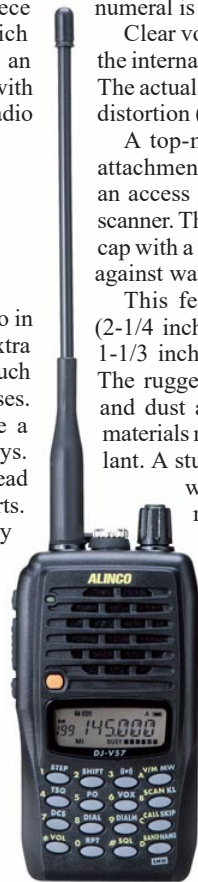
signal products. If this CPU clock noise should occur on the DV-V57, simply tap the shift key and rotate the tuning dial to change the frequency of that interference.

❖ DJ-V57 Design Specifications

Frequency modulation (FM) is the only mode used for transmitting and receiving. For transmitting, a variable-reactance modulator is used for both wide and narrow deviation (+/-5 kHz standard FM, +/-2.5 kHz narrow band FM). Spurious emissions are suppressed at least 60 dB.

Frequency steps of 5, 10, 12.5, 15, 20, 25, and 30 kHz are selectable for standard channelization band plans. Frequency stability is +/-2.5 parts per million (ppm).

The radio can be powered and the battery may be charged from any external 7-16 VDC source. Current drain during reception is 250 mA and 80 mA on standby (squelched). A battery-save function reduces the receive power drain even further (27 mA).

The receiver is a double-conversion super-heterodyne with first and second intermediate frequencies (IFs) of 38.85 MHz and 450 kHz respectively.

Sensitivity for standard 12 dB SINAD (signal-to-noise and distortion ratio) is specified as 0.2 microvolts (uV) on VHF, and 0.25 uV on UHF. An LCD bargraph shows relative received signal strengths.

Selectivity is stated as -6/-60 dB for 12 kHz (or more)/35 kHz (or more). This seems to fudge a bit on real numbers, much like saying your car gets 25 miles (or less) per gallon. In our actual on-air operational test, selectivity was barely adequate for the frequency spacing of most channelization plans, especially in this current era of narrow-banding. More specifically, the filters should be satisfactory for separating signals of its primary intent, ham radio, where adjacent-channel operation is rare and channels are more widely separated.

But, in crowded metropolitan listening to public safety channels, adjacent-channel interference may be encountered. In such cases the attenuator function can be invoked, or the squelch may be adjusted to reduce the adjacent-channel bleed-over, or the tuning dial may need to be set another step higher or lower to get away from the interference.

❖ Finally, how to hit the reset button!

One of the most desirable features of any multifunction radio is the "Boy, have I ever screwed this radio up!" reset. By simply pressing two keys as the radio turned on, the original baseline factory-presets are returned and you can start all over again!

Even better, an option allows all the factory presets to be restored, but retains your custom-entered memory channels.

❖ The bottom line

Alinco's new DJ-V57 hand-held, dual-band, VHF/UHF transceivers is a winner. Its low cost (list price $149.95), wide frequency coverage (the two most popular VHF/UHF bands), and multiple functions combine to make this a bargain radio, both for the beginner who needs easy operation, and the experienced ham who is looking for advanced functions.

The Take Charge Powersavers

Review by Bob Grove W8JHD

One of the most overlooked power wasters in our homes and offices is the AC adapter which remains on permanently even after its accessory equipment is turned off. Many pieces of electronic equipment continue to draw current after their power switches are turned off as well.

Take a look around your home at the number of AC cords plugged into the wall, not only in your hobby area, but even your home entertainment center. IPhones and tablets, cell phone and digital camera chargers, DVRs, printers, laptop computers – the list is considerable.

The wasted electric power when measured over time is consequential. According to the International Energy Association (IEA), these types of accessories cost on the average $50 a year, about twice the cost of some new accessories from Take Charge called the Power Savers.

Take Charge developed a unique method of switching off multiple accessories automatically when not in use. Looking like a conventional multiple-outlet extension, it has eight AC outlets with specific capabilities.

Two of the outlets are permanently on in the usual extension mode, but five of the outlets switch on and off automatically as the equipment or appliance plugged into the eighth (control) outlet is turned on or off by the operator.

For example, suppose you have your radio base station plugged into the control outlet. You could plug the AC adaptors or AC cords from an antenna rotator, computer, printer, scanner, and auxiliary radio into the five switched outlets, and still have two hot outlets that remain on for an electric clock and any other item you'd like to remain on.

When you switch on the main equipment – in this example your base station – all of the accessories plugged into the five controlled outlets switch on automatically. And when you're done, simply switch off the main rig and all five accessories switch off (except for the "always on" accessories).

A circuit breaker is also mounted on the unit to reset any surge-protected shutdown.

❖ Let's check it out

Plugging a lamp into one of the five switched outlets, I attempted to switch it on by activating several different appliances, from a few watts up to 1600 watts, plugged into the control outlet. It activated immediately when I turned on any equipment that's plugged into the control receptacle which provided at least a 40 watt load. Switching off the main equipment, and all the accessories switched off, just as they're supposed to do!

❖ There's more

TakeCharge has also released two timed docking bays designed to shut off those chargers after they've finished refreshing rechargeable batteries. Each has three switched receptacles and one "always-on" receptacle for a total of 10 amps of current.

Both models include two indicator lights, one to reveal an ungrounded third wire which would invalidate the surge protection, and the other to show timed charging is on. A pushbutton initiates the charge time for three hours. A circuit breaker reset button is also present.

The UTC4W is a wall-plug-mount unit that attaches directly to a conventional duplex wall outlet, while the UTC4S is a traditional power strip with the same outlets and a two-foot cord with a right-angle, three-wire plug.

All three devices are warranted against equipment damages by the following deposition:

"Will replace any connected equipment, up to $50,000, damaged by power disturbances, while connected to a functioning Take Charge Power-Saver."

The UTC8MS ($29.95), UTC4W ($24.95), and UTC4S ($27.95) are all available from Grove Enterprises (1-800-438-8155) or online at **www.grove-ent.com**.

Larry Van Horn, New Products Editor

Using Your Meter, 3rd Edition

Do you want to learn the correct way to use a multitester or multimeter? Then a new book by Alvis J Evans, and published by Master Publishing Inc., may be just the ticket you are looking for. This is a book about measuring electrical quantities – voltage, current, and resistance. It helps you understand how meters work and how they can be used to make basic electrical measurements in the home, in your workshop, at the office, and on the job.

The basic concepts of meters, both analog and digital, are presented and circuit fundamentals and measurement techniques are explained. This 176 page book includes fully-illustrated explanations of how to make many practical multimeter measurements. It is an excellent learning tool and reference for the hobbyist and radio amateur.

The author, Alvis J. Evans, was an Associate Professor of Electronics at Tarrant County College in Fort Worth, Texas, and has authored many books on electronics for audiences ranging from beginning hobbyists to advanced technicians.

Using Your Meter is a soft cover book which sells for $24.95 and is available from the W5YI Group (**www.W5YI.org**), or 800-669-9594; on Amazon.com (ISBN-13: 978-0945053729) and at select amateur radio dealers and *MT* advertisers.

Alinco DJ-G29T

If you live in an area that is heavily congested with 2m/70cm/23cm repeater activity, then you may have already discovered that the fastest growing VHF/UHF ham bands now are the 222/902 MHz bands. Alinco has responded to many requests by the ham community by making the world's first 222/902 MHz dual band HT. This new user-friendly HT will have you on the air in minutes, making contact with 5 watts on 222 MHz and 2.5 watts on 902 MHz.

One of the unique features of this HT is Alinco's user-selectable PTT delay option that eliminates the annoying squelch tail noise that some repeaters retransmit at the end of receiving non-reverse burst tone-encoded CTCSS signals.

Some of the other features and specs for the G29T include:

- 222MHz 5/2/0.8/0.3W, 902MHz 2.5/0.8/0.3W max output with a standard Li-ion pack.
- Selectable full duplex system allows operation of main band and sub (Receive-only) band simultaneously.
- Independent dials for main and sub band.
- Rugged polycarbonate body resists dirt and dust, high-grade water-resistant materials compatible to the IPX7 designation.
- 32mm internal speaker, backlit alphanumeric display, and large screen full-matrix LCD with easy-to-read icons and battery charge level.
- Patented "ChannelScope" function allows visual monitoring of nearby signals.
- "Wild key" lets you quickly change to frequently used setting.
- 39 CTCSS tone squelch (encode + decode) and 104 DCS.
- Keypad selectable wide / narrow bandwidth and mic gain; and multi-step receiver attenuator.
- Cloning capability between DJ-G29T units or through PC (optional cable needed) and quick-write memory channels, has 500 memories with memory banks. Direct frequency input through illuminated keypad.
- DTMF encode and auto-dialer, automatic repeater-setting function, and multiple scan functions: VFO, Memory, Program, Tone, DCS & Sweep.

The DJ-G29T list for $379.95 (street price about $349.95) and is available at amateur radio stores and selected *MT* advertisers.

Stealth Antenna System

DX Engineering recently released their new Stealth Antenna System – the DXE-ATSA-1, which provides hams with the flexibility to work 80-10 meters, even in the shadow of HOA controlled neighborhoods.

With a short, nearly invisible 26-foot wire, you can operate on all bands 40 meters and up. A 45-foot wire will extend coverage to 80 meters. This complete system includes an autotuner, ATSA MatchBoxx™, stainless steel radial plate, antenna wire, bias tee, two insulators, radial wire, and all hardware.

The low profile remote tuning unit is easily hidden. Just "plant" it in the bushes or shrubs with supplied spikes and lay out the minimum length radials. You can further camouflage the controller with a plastic boulder or other items available at most landscaping stores.

The ATSA-1 contains 20,000 non-volatile memories. It features an L-network with wide matching capability, 1.8 to 30 MHz coverage, heavy-duty 10 amp/1000 volt relays, and is rated at 200 watts SSB/CW. The included bias tee is used to insert 12 VDC from a user-supplied power source on the coaxial cable to the remote tuner.

DX Engineering includes the ATSA MatchBoxx™ module which allows use of almost any length wire you choose – no more "forbidden" lengths as with other end-fed systems. An optional DXE-SA80-AOK add-on coil kit allows for the adjustment of feedpoint impedance to achieve the lowest SWR on the 80 meter band without affecting operation on the higher frequency bands.

The price for this new product is $459.95, and the optional DXE-SA80-AOK 80 meter coil kit sells for $49.95. For more information or to order, visit **www.dxengineering.com** – the sole US supplier of this item.

DXtreme Station Log – Multimedia

DXtreme Software™ has released a new version of its popular logging program for amateur radio operators: DXtreme Station Log – Multimedia Edition™ Version 8.0.

Like other logging programs, DXtreme Station Log lets hams log their contacts and import ADIF files from contest programs. But unlike other logging programs, Station Log provides multimedia and advanced functions that enhance logging activities.

The **DX Spot Checker**™ receives DX spot announcements from Telnet-based DX Cluster and DXSpider servers. As each spot arrives, the DX Spot Checker optionally queries the ham's Station Log database to let him or her know, by rich text and/or audio, whether a QSO is needed with the spotted station for a new or verified DXCC® entity or band-entity. The DX Spot Checker also lets hams:

- Perform a DX Atlas azimuth plot from their location to that of a spotted station.
- See whether a QSO is needed with a spotted station for a new or verified grid locator, which is ideal for VUCC tracking.
- Tell at a glance whether spotted hams are users of the ARRL's *Logbook of the World*.
- Tune their supported radio to the frequency of a selected spot through integration with Afreet Omni-Rig, available free over the Web.
- Quickly check their personal DXCC status information without having to leave the DX Spot Checker window.
- Send incoming spot announcements to others by e-mail.
- Perform Web-based, call sign lookups on sta-

tions spotted.

The **Station Log** window is the focal point of the electronic logbook. In addition to providing the expected logging functions, the window also:

- Retrieves the frequency and mode from supported rigs through integration with Afreet Omni-Rig.
- Lets users perform a DX Atlas azimuth plot from their location to that of a logged station.
- Displays DXCC and Grid/VUCC status information for logged stations.
- Indicates whether logged hams are users of LoTW.
- Retrieves and stores current and historic Solar Flux, A-Index, and K-Index values per station; also lets hams track the propagation mode used.
- Tracks QSLs sent and received.

Multimedia functions let hams listen to previous contacts and view QSLs whenever they browse their logs. The embedded audio facility lets hams create the audio archive, and the embedded QSL Imaging™ facility lets hams scan, capture, and view the physical and electronic QSLs they receive – including LoTW QSLs.

Advanced functions of this program let hams analyze their DXCC standing using the window-based DXCC Analytics™ tool; create QSL and address labels for physical QSLs; create signed TQ8 files automatically for uploading to the LoTW server; and produce ADIF-based electronic QSLs for uploading to eQSL.cc.
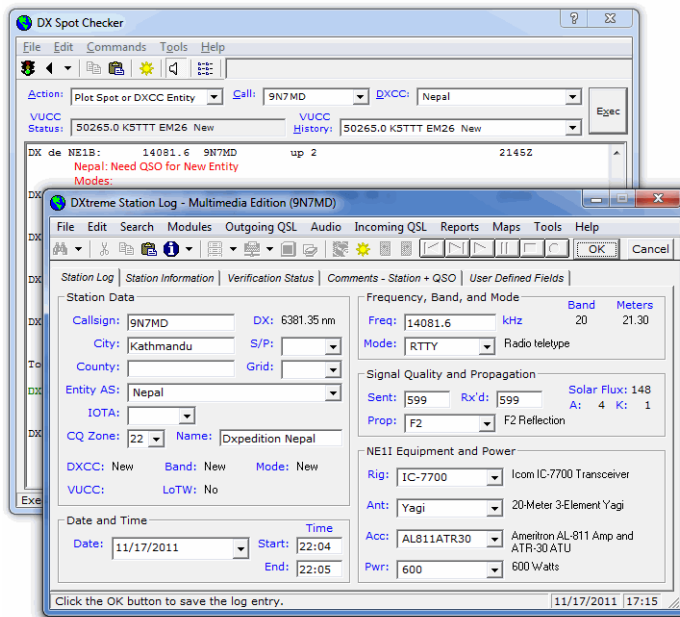
To help hams track the performance of their stations, DXtreme Station Log offers a variety of reports. Station Log can output these reports to printers, the DXtreme Active Report Viewer, the DXtreme Standard Report Viewer, and Afreet DX Atlas.

The **DXtreme Active Report Viewer** lets hams view and sort reports within Microsoft® Internet Explorer® while the DXtreme Standard Report Viewer lets hams view reports in Apple® Safari® and Google™ Chrome™ – both either locally, or over the Internet. An FTP facility

is embedded in Station Log to let hams upload their Active and Standard reports to the Web automatically, where they can be accessed remotely.

DXtreme Station Log runs in 32- and 64-bit versions of Microsoft Windows® 7, Microsoft Windows Vista®, and Windows XP. It retails for $89.95 USD in North America and $93.95 USD elsewhere for electronic delivery. (Special pricing is available for upgrading users.) All prices include lifetime product support by Internet e-mail. (CD shipment is also available at a nominal surcharge.)

Based in Nashua, NH, DXtreme Software produces powerful and easy-to-use logging applications for all kinds of radio enthusiasts – from short-wave and medium-wave listeners and DXers to amateur radio operators. For more information about DXtreme Station Log – Multimedia Edition V8.0, visit **www.dxtreme.com**, or contact Bob Raymond, NE1I, at *bobraymond@dxtreme.com*.

to the editors

editor@monitoringtimes.com

Why Does the FCC Continue to Outlaw The Manufacture of Scanners with Cellular Telephone Frequencies?

By Bob Grove

Many of our readers have inquired as to why the FCC maintains the obsolete regulation requiring scanning receivers to exclude cellular telephone frequencies now that all cell phones are digitized so that no one can eavesdrop on them. We recently posed that question to the FCC Office of Engineering and Technology. That inquiry and the Commission's response are reprinted below:

MT: With the elimination of the analog AMPS cellular service, why is it necessary to maintain a regulation prohibiting scanning receivers and frequency converters with cellular telephone frequency coverage? No scanning receiver ever manufactured had or has the capability of demodulating the digital modes now used in the cellular telephone industry, and other regulations already in place proscribe such demodulation in scanning receivers and frequency converters.

Simply rescinding FCC Part 15.121, the obsolete regulation prohibiting cellular frequency inclusion in scanning receivers, would relieve manufacturers the expense of having to produce two separate models of such receivers, one for qualified agencies, the other for the general public, and would bring this article of FCC rulemaking in line with current technology.

FCC: The specific restrictions on scanning receivers to which you refer were enacted by Congress to protect the privacy of cellular telephone conversations. The Commission adopted rules prohibiting scanning receivers from tuning cellular frequencies to implement statutory requirements in the Telephone Disclosure and Dispute Resolution Act, Pub. L. 102-556, codified in Section 302(d) of the Communications Act of 1934, 47 U.S.C. § 302(d). Specifically, this law directed the Commission to make effective regulations denying equipment authorization to scanning receivers that are capable of receiving cellular frequencies, being readily altered to receive such frequencies, or being equipped with decoders that convert digital cellular transmissions to analog voice audio. The Commission first adopted rules pursuant to this law in 1993 and updated them in 1999 to further ensure that scanning receivers could not receive cellular frequencies or be readily modified to do so.

Because the requirement for the Commission to deny equipment authorization to scanning receivers that are capable of receiving cellular frequencies, being readily altered to receive such frequencies, or being equipped with decoders that convert digital cellular transmissions to analog audio is statutory, the Commission has no authority to remove the rules it adopted to implement this requirement.

The bottom line: Since the FCC was directed by Congress to enact the prohibitive regulation, the Commission has no authority to rescind the regulation.

Encryption and Public Safety

First, here's the story Bill N1CHU told us from Connecticut:

On September 5, 2011, approximately 6:00am, while sitting outside at a breakfast eatery directly across the street from a CVS Pharmacy in Bristol, Connecticut, I noticed two motorcyclists, riding what is commonly referred to as "crotch rockets" or "rice burners" (Japanese high speed bikes) traveling at a very high rate of speed, upshifting through the gears, heading west on Ct. Rt. 6.

Unbeknownst to me, they had just robbed the pharmacy and I was witnessing their getaway. These two motorcyclists had shown a weapon in the course of the robbery.

When the police arrived, they interviewed me as a possible witness. I am enjoying a cup of coffee with the morning paper, a D-Star amateur radio portable transceiver, a 220 MHz portable amateur radio transceiver, and a Uniden BC 396XT scanning receiver when the officer approaches and starts to interview me.

The officer tells me of the robbery and my first thought (which I blurted out loud) was, "For pete's sake, you clowns went and encrypted ALL your dispatches, making it impossible for anyone to monitor, causing the loss of information I might have been able to provide you, helping in your investigation." (I clarified that the term "clowns" did not refer to the patrol officers but to the administrative staff who made the decision to encrypt.)

In my opinion this is yet another example of the police doing themselves a disservice. After Bob Grove's congressional hearing fiasco (around 15 years ago; Bob's treatment by the committee was deplorable), this is just another example of the apparent ineptitude the police display when they overstep their mistakenly perceived authority to encrypt routine radio dispatches. I do not deny their usage of encryption, but with MDT's and cell phones already available and in use, sensitive, proprietary information can be disseminated without the loss of the input the general public provides, in countless previous examples.

I was witnessing, as a first hand observer, a crime in its commission, while the cops were still three minutes away! It looks to me like a second crime, a crime of ineptitude, was committed by the authorities by not allowing the public access to a radio dispatch. A radio dispatch that clearly would have gotten me to my feet, observing, recording, and detailing in a much more comprehensive fashion, what I had just witnessed. Way to go, Bristol Police!

I am a General Class Amateur Radio License holder, retired former volunteer and professional firefighter (interacting with police with an abiding respect for what they do, my entire adult life), and a longtime subscriber of *Monitoring Times*.

Bill N1CHU

On the Central Florida Listeners Group, Stephen Wolf (Sandy) WB2MBV posted excerpts from an article entitled "Protected speech: Police seek encrypted networks," published Nov 30, 2011 by the Associated Press. The article by Eric Tucker begins, "Police departments across the country are working to shield their radio communications from the public as cheap, user-friendly technology has made it easy for anyone to use handheld devices to keep tabs on officers responding to crimes.

"The practice of encryption has grown more common from Florida to New York and west to California, with law-enforcement officials saying they want to keep criminals from using officers' internal chatter to evade them. But journalists and neighborhood watchdogs say open communications ensure that the public receives information that can be vital to their safety as quickly as possible."

MT Assistant Editor Larry Van Horn has always found it flawed logic to use possession of listening devices by criminals as an excuse to encrypt. Invariably the scanner was discovered when the criminal was apprehended: If the criminal could elude police by listening to their channels, he would not have been caught!

However, in Tucker's article, the Washington DC chief of police pointed out that carjackers in the Capitol Hill area were not caught until police *stopped* broadcasting their communications. In another instance, drug dealers at a laundromat were seen fleeing after a broadcast directed units to that location, so they are presumed to have been listening.

Agreeing with our *MT* reader from Connecticut, the article points out that, "Journalists and scanner hobbyists argue that police departments already have the capability to communicate securely and should be able to adjust to the times without reverting to full encryption. And they say alert scanner listeners have even helped police solve crimes.

"'If the police need to share sensitive information among themselves, they know how to do it,' Phil Metlin, news director of WTTG-TV in Washington, said at the council hearing. 'Special encrypted channels have been around for a long time; so have cellphones.'"

DC's Chief Lanier says the department is stepping up efforts to advise the public of developing crimes through Facebook, Twitter and an email alert system. Officers will also use an unencrypted channel to alert the public to traffic delays. But the chief has refused to give radios to media organizations.

Bob Grove is among the journalists who agree the solutions are already in place: "Yes, this has always been a two-edged concern. But there are many ways to maintain privacy without resorting to full encryption which also limits interoperability with neighboring jurisdictions."

Rachel Baughn

Reach new customers with your advertising message in *Monitoring Times*! Contact Judy Grove at **1-800-438-8155** or **email judy@grove-ent.com**

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

ANTENNA TOPICS
www.wa5vjb.com - by Kent Britain

BELOW 500KHZ
http://below500khz.blogspot.com/ - by Kevin Carey

FED FILES
http://mt-fedfiles.blogspot.com/ - by Chris Parris

LARRY'S MONITORING POST
http://monitor-post.blogspot.com/ - by Larry Van Horn

MILCOM
http://mt-milcom.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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Many thanks...from a lapsed subscriber. Its good to be back (my name was actually in an issue about a year ago...). Like many other users, I download the .pdf version of the Mag into iPad and open it with iBooks. Works nicely.

Craig

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