Scanning - Shortwave - Ham Radio - Equipment
Internet Streaming - Computers - Antique Radio

# Monitoring Times

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# The Big World of Little Radios:

## *Collecting Vintage Transistor Radios*



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### In this issue:



167 Washington St., Boston 8, Mass.

# AR-ALPHA

## *Professional Grade Communications Receiver*

## *With New I/Q Control Software!*

***AOR proudly presents the AR-ALPHA, the first in a new class of professional monitoring receivers! Designed to cover 10KHz to 3.3GHz continuous, with no interruptions*, this receiver features sophisticated I/Q control software that enables it to perform unattended datalogging for extended periods. It boasts a 6-inch color TFT display, five VFOs, 2000 alphanumeric memories that can be computer programmed as 40 banks of 50 channels, 40 search banks, a "select memory" bank of 100 frequencies, and a user designated priority channel. It also includes APCO-25 digital capability and a DVR with six channels that can record up to a total of 52 minutes of audio. Monitoring professionals will appreciate the world class engineering and attention to detail that makes the AR-ALPHA such an amazing instrument.***

- Multi-mode unit capable of receiving AM (synchronous), ISB, RZ-SSB, USB, LSB, CW, WFM including FM stereo, NFM, APCO-25 digital, and TV in both NTSC and PAL formats
- Up to 1MHz of bandwidth can be recorded for later playback and review
- 6-inch TFT color panel can display received video signals or depict spectrum activity over a wide choice of bandwidths including a "waterfall" function to show signal activity over a specified time period
- Composite video output on the rear panel of the unit
- Selectable IF bandwidths:200 Hz, 500 Hz, 1 KHz, 3 KHz, 6 KHz, 15 KHz, 30 KHz, 100 KHz, 200 KHz and 300 KHz along with the ability to shift the IF
- CTCSS and DCS selectable squelch functions; DTMF tone decode
- Built-in voice-inversion descrambling**
- CW pitch control, AGC, AFC
- Auto-notch feature
- User selectable spectrum display function from 250 KHz through 10 MHz in 1 KHz increments. Above 10 MHz bandwidth, it can display 20 MHz, 50 MHz, 100 MHz or 1 GHz, but above 20 MHz bandwidth, no audio will be available
- Resolution bandwidth is also user-selectable in increments of 1 KHz, 4 KHz, 32 KHz, 64 KHz, and 128 KHz
- Fast Fourier Transform (FFT)
- Rear panel connections include 12 VDC power, RS-232C, USB 2.0, I/Q output with 1 MHz bandwidth, two antenna ports (one SO-239 and one Type N) and up to four antennas may be selected through the receiver's controls with the optional AS5000 antenna relay selector
- Use desktop or with 19" rack mount

***The AR-ALPHA redefines excellence in professional monitoring receivers. No wonder so many monitoring professionals including government, newsrooms, laboratories, military users and more, rely on AOR.***


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Authority On Radio Communications

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*Specifications subject to change without notice or obligation.*
**Documentation required for qualified purchasers in the USA.*
***Not available on US consumer version.*

# WSS-420 HRPT/CHRPT Weather Satellite System

WiNRADiO has added a new product to its large range of innovative receivers and radio monitoring and surveillance systems: The WSS-420 turn-key weather satellite monitoring system.

The WSS-420 system is a fully integrated package, including an antenna dish, rotator, down-converter, receiver and automatic tracking software.This is complemented by an optional image-processing software application which provides a number of meteorological products such as standard NOAA Contrast Enhancement Curves, Sea Surface Temperature (SST), Land Surface Temperature (LST), Normalized Differential Vegetation Index (NDVI), RGB Mixers and others.

Individual parts of this system are also available for third-party integration. Check out for example our rugged, reliable EL-AZ antenna rotator with ±0.5 degree positioning accuracy and its compact, USB-interfaced control unit.

- Fully-integrated hardware/software weather satellite solution
- Compact stand-alone system
- Robust, heavy-duty rotator and tripod
- Easy installation, calibration and configuration
- Automatic satellite dish positioning
- Automatic real-time orbital satellite tracking
- Automatic reception scheduling and image storage
- Full support for multi-spectral AVHRR data
- Full support for NOAA (HRPT) and Feng Yun-1D (CHRPT) satellites
- Advanced image-processing software application
- Automatic updating of satellite tracking data from the Internet
- Automatic clock synchronization from the Internet
- AVHRR data export in NOAA Level 1B (HRPT) file format

Monitoring Times

Vol. 28 No. 12 December 2009


## The Big World of Little Radios: Collecting Vintage Transistor Radios

**By Michael Jack**

It was probably your first radio: cheap, poor audio and weak on reception, but you loved it dearly. The icon of an era, transistor radios predated Sony's Walkman and today's iPod. These little radios of the 1950s and 60s brought the vital musical language of the rock 'n' roll era to a whole generation.

While many of these radios have been resting quietly for decades in our national landfills, many hundreds of thousands more are still out there, waiting to be rescued, restored and given dignity of place among your radios.

In our traditional December vintage radio issue, record producer and vintage transistor radio collector Michael Jack tells about the history of these tiny marvels, lets you know which ones to look for and how to do your own restorations.

C O N T E N T S



***Cover photos:***

Lafayette 9 transistor shirt-pocket radio shows off reverse painting technique; Crown TR-55; Supersonic with dubious "10 transistor" count from Hong Kong; three unique, spherical Panasonic Panapet R-70 radios from the 70s; Candle ATR800 7 transistor; Arvin 8576 pocket radio; two matched Zenith Royal 500H portables; and a Toshiba 7TP303 with stunning case featuring ultra-modern, clean lines and a shiny chevron design on the front. All photos courtesy: Michael Jack.

*Silver 7STS-190 from lates 50s to early 60s, a large multi-band portable from Shirasuni Denki Manufacturing, Japan.*

*Sony TFM-151: Claimed to be the first solid state radio with FM cost $150 in 1958*

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# LETTERS

editor@monitoringtimes.com

***This column is open to your considered comments. Opinions expressed here are not necessarily those of Monitoring Times. Your letters may be edited or shortened for clarity and length. Please mail to Letters to the Editor, 7540 Hwy 64 West, Brasstown, NC 28902 or email editor@monitoringtimes.com***

***Happy monitoring!***
***Rachel Baughn, Editor***

## Yuletide Greetings

No one in his right mind would say 2009 has been an easy year, but it had its bright moments, along with the troubled ones. The bright spot for those of us at *MT* has been our readers. We were blown away by your responses to our reader survey as to the breadth of your curiosity and interest in radio. We will honor that by continuing to cover as broad a spectrum as we can – always with the goal of providing information you can put to immediate use.

We have made only minor adjustments to the magazine this fall. By January 2010 we will have discontinued three full-time columns, and lost four authors who have been writing for *MT* for 10-20 years. On the other hand, we will have increased our shortwave schedules and low frequency coverage, added two completely new topics, and acquired several reputable new authors. We think you readers will come out the prize winners, even though we're sorry to say good-bye to old friends in the pages of *MT*.

We are also very proud of our *MTExpress* magazine online. With printing and postage costs rising and advertising dollars shrinking, it becomes less and less affordable to publish the printed magazine. We know that for many of you it's the only viable option, so we have no plans to discontinue the printed edition of *MT*. But a solution that splits the costs between us is for you to download the publication and print out only those pages you want to refer to when you're not at the computer.

To encourage you to make the switch, we've made that option even more attractive by offering bonus material called *MTXtra*. For the $19.95 price, you get not only the entire year of the magazine, but you get Gayle Van Horn's expanded shortwave guide including *all* broadcast languages – updated monthly! There is no way we could offer 10,000 lines of frequency schedules in the printed magazine!

*Milcom* readers got a bonus document with their November *MTExpress* subscription, too: complete aerial refueling maps, frequencies, and schedules. (If you weren't an *MTExpress* subscriber in November, the only way you can access this document is by buying that issue at a single issue cost of $5.)

Come along with *MT* in 2010 and we hope you'll agree: *MT* just keeps on getting better! And *MTExpress* is the best!

## Thanks for MT Express!

"As a recently licensed Ham, I wanted to thank you for offering your low cost *MTExpress* subscription. Convincing the YL was a piece of cake, and with a couple of issues under my belt I can say nothing beats the price, convenience or speed with which I can receive issues of your fine magazine. Keep up the good work!"

*Michael Letterle, IronRuby MVP*

## Antenna Photo of the Month

John Wilson submitted the this unique photo. There's no point in asking anyone to identify this antenna's location, as it's far off the beaten path, as you'll see in John's story:

***"Does anybody know why our mobiles are having trouble hearing the base?"***

"My oldest son's home is the second highest elevation in Bristol, Virginia. Last month he passed his Tech Class license and I visited to do a site survey on the target location on this 'mini-mountain' to install antennas. The hillside is about 65-70 degrees almost straight up and straight down; I fell about 30 ft. and banged myself up pretty good. ..We installed a rotor mast, two 440 MHz stacked Yagis, a 13 el. Cushcraft 2 meter Yagi, and a mast mount preamped Scantenna, and had planned on installing a rotor and cable runs of 350 ft. A two meter bandpass filter was also installed. That gave an elevation of about 2,100 ft. and the equivalent of a 150 ft. tower at my son's house lower down.

"During installation and dragging antennas, cables, etc. up the hill, I recommended going to the top of the hill and coming down instead of fighting gravity. The Bristol, Va. PD and FD have their VHF high band repeaters on the top about 150 ft. away from our installation.

"While off loading the vehicle I noticed several pieces of tower sections ...It could be that the cut tower sections were used to install two new ones for their PD and FD repeaters at the nearby 'new' site using another tower ground section(s). The Radio Maintenance guys left the pictured tower alone and for good reason! I suspect whatever relocations and reinstallations occurred were in the '50s, as that tree had been growing in the tower for a long time.

"The tower-mounted PD/FD repeaters are not that high … But it does not matter: It is the elevation that makes the difference. I easily can monitor their PD and FD 55 miles away mobile up I81 near Marion, Va.

"Sitting in my son's driveway, mobile, I easily accessed the Mt. Mitchell, NC 2 meter repeater on 145.1900 MHz and talked to a ham near Asheville. I had no problem talking to the Gatlinburg/Pigeon Forge repeater, Holston Mtn., repeater and other mountaintop repeaters in NE TN. On an ICOM U16 UHF HT I received a good signal from the Whitetop Mtn., VA. repeater on 443.6000 MHz. Whitetop is about 30 air miles and not bad for 5 watts.

"As expected, reception on the Scantenna was great. I used my 996T that I had preprogramed for many of the SW VA counties and 75 air mile coverage was not uncommon. I gave my son some excess ham radio equipment and an older Regency analog scanner. Rarely did the Regency make a complete scan without some county or city PD/FD popping up.

"I knew his location was very good, but was totally surprised that night. In his concrete-walled basement we began setting up a Kenwood 743, but the only antenna we had available was a Diamond dual band mag mount. He set it on a washing machine. I expected to access the local repeaters, but when tuning realized I was accessing repeaters many, many miles from Bristol, such as Viking Mtn. in Green Co., TN. As I tuned I heard a net control ask for check-ins to the WV/OH two meter net. His signal was solid. I could not believe we were even hearing West Virginia and Ohio on a mobile whip antenna inside in a basement.

"Interestingly, when I gave my location on various repeaters, several hams knew of it by its local name of 'Rye Patch Hill' My son has an 'end of the rainbow' location, as far as an antenna site, that is well known to a number of area hams. He became irritated with me because I would not let him use the ham equipment I had given him. I was having too much fun and he could just wait!"

*John Wilson*

## Antenna Query Solved!

"It has been two years since I posed a question to *Monitoring Times* concerning huge antenna towers along the Interstate bend in Knoxville, Tennessee.

"Well, the mystery has finally been solved … My daughter recently visited friends in Knoxville with my question....then she consulted Wikipedia....and alas, she e-mailed me the answer via this interesting link:

**http://en.wikipedia.org/wiki/Sharp's_Ridge**

"It explains that Sharp's Ridge is an important communications hub for this part of the USA. There are multiple towers, the highest of which is 1425 feet or 430 meters. They are the highest that I have ever seen anywhere we have travelled. Sackville antenna farm has more towers, but they are dwarfed by these giants."

*Georg Simon*, longtime subscriber to *Monitoring Times*, Glenside, PA.

## EDITORS SOAPBOX

### MT Reader Survey Results

By Larry Van Horn, N5FPW, MT Assistant Editor

In the 26 years that I have been on the *Monitoring Times* staff, the readers of this publication never cease to amaze me. Not only are you some of the most knowledgeable and friendly radio monitors in the hobby, but just about the time we think we have you figured out, you throw us a giant curve ball or two.

I have had the privilege of compiling the last couple of reader surveys that we have conducted of our readership, and this latest one definitely showed us a different side of how our readers participate in the radio hobby.

After the final results were compiled, it was quite obvious *MT* readers were very technically savvy. In what was definitely a first for us, 100 percent of the respondents picked one or more responses in the technical section of the survey. More than 82 percent of our readers indicated an interest in antenna design and well over half checked off a favorable response in the propagation category.

This magazine's roots reflect the interests of Bob Grove, its publisher and founder, particularly in utility (non-broadcast) listening. In this survey more than 95 percent of the respondents indicated a monitoring preference from one of the nine choices in the non-broadcast communications category. Top monitoring interests included aero comms, federal/military monitoring, and ham radio (more about that in a moment).

The second most popular area of monitoring as voted by our readers was broadcasting, with international shortwave listening leading that category. We were pleasantly surprised at the number of readers who expressed interest in both AM domestic and FM/TV domestic monitoring.

But the biggest surprise of all was the number of amateur radio operators and those interested in ham radio who responded to that portion of the survey. More than 90 percent of *MT* readers indicated they were hams or interested in ham radio subjects. The favorite subjects of our readers in this category were ham basics (modes, bands, activities) and construction (antennas, kits, home brew).

Finally, coming in fourth place in this survey of monitoring interest and only one percent behind the amateur radio category, was scanning. Monitoring favorites in this category included public safety, aero comms, and federal/military monitoring.

In other non-monitoring activity categories, reviews still remain near the top of what *MT* readers want to see in our pages. Shortwave receivers, antennas, accessories and scanners were the most frequently selected items.

Also, scoring exceptionally well in this survey is a new area of monitoring: internet streaming, podcast and videocasting. When asked which type of streaming our readers were interested in, there was an exact 50-50 split between broadcast and scanner audio streaming.

Finally, there were the off-center topics, and yes, I can finally reveal they were compiled by Bob Grove. This was a list of some of his favorite things to explore in the radio spectrum and sort of reveals that Bob is a bit out of the norm, at least in what he likes to monitor. Top vote getters in the weird and unusual category included weather/storm monitoring, astronomy/radio astronomy, with my personal favorite, hydronics, coming in last place. (Sorry, no hydronics column in *MT*!)

We had a really good return rate with this survey, one of the biggest and best we have had. So, to reward a few of you who responded to the *You Speak, We Listen* reader survey, below are the winners of the prize drawing.

I would like to thank all of you who took the time to fill out and submit your reader preference survey to us. It was very helpful to the entire *MT* editorial team. If you have any future suggestions, we would like to hear from you. Send your comments to *editor@monitoringtimes.com*.

### "YOU SPEAK, WE LISTEN" PRIZE WINNERS

**Prizes awarded by the staff of *Monitoring Times* magazine:**

One year *MTXpress* subscription ..... Stephen Leite - Fall River MA
One year *MTXpress* subscription ..... J. Schmult – Lakewood CO
One year *MTXpress* subscription ..... Patrick Tim Lemmon – Roswell GA
One year *MTXpress* subscription ..... Raymond C. Charles - Allegany NY
*MT* 2008 Anthology CD ..... Robert E. Jost – Lindenhurst NY
*MT* 10 year Anthology DVD ..... Tom Mooningham – Maugansville MD

**Prizes courtesy of Teak Publishing in Brasstown North Carolina:**

*World QSL Book* on CD ..... Richard Bradley – Methuen MA
*International Callsign Handbook* on CD ..... Bill Riches – Cape May Court House NJ

**Grand prize awarded by Grove Enterprises:**

Kaito KA-1103 portable shortwave receiver ..... Robert Brossell – Pewaukee WI.

# COMMUNICATIONS

by Ken Reitz

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

## AMATEUR RADIO/SHORTWAVE

### Pressure to Close Radio Prague

Andy Sennitt reports, on his Radio Netherlands Worldwide (RNW) blog, that "…the Czech Ministry of Foreign Affairs is looking for Radio Prague to end all shortwave transmissions from the Czech Republic at the end of 2009." Sennitt writes that Radio Prague's former editor-in-chief, David Vaughn, fears that the closure of Radio Prague's shortwave service will be the end of Radio Prague altogether. He urged listeners to contact the service by writing Radio Prague at Vinohradska 12, 120 99 Prague 2, Czech Republic or calling 420-221-552-933 or FAX 420-221-552-903 or by e-mail at cr@radio.cz. Sennitt noted that RNW had also cut back on shortwave usage in recent years, not as a result of political or bureaucratic pressure, but as a result of "extensive research into listening patterns and a re-evaluation of our core tasks and target areas." He added, "Because of the rapidly-changing nature of international broadcasting, we now have a strategy department, of which I'm a member, that advises management and colleagues in other departments on the options available."

*Radio Prague (Courtesy: Radio Prague)*

### Library Turns Town onto Shortwave Radio

One way to get new hams is to introduce people to shortwave radio. But, how do you do that with a general public that's already attached at the ears to iPods, satellite radio, cell phones and on-line streaming? The Greater Norwalk (CT) Amateur Radio Club (GNARC) had a brilliant idea: take shortwave radio to the public. More specifically, the local public library. So, the GNARC set up a vintage shortwave set at a typical library table, attached to a 66' inverted "V" antenna on the library's roof. Library patrons can check out a set of headphones at the circulation desk, read a small booklet about using the radio, and start tuning the bands. The project started at the end of September and, according to club members, if there is enough interest generated by the project, the club will conduct scheduled shortwave demonstrations that would include foreign broadcasts as well as amateur radio contacts. But wait, there's more! The library also makes available for patrons to check out, a Kill-A-Watt meter so they can do their own home energy audits.

*Norwalk (CT) Public Library shortwave radio installation. (Courtesy: Jay Kolinsky NE2Q)*

*You can also "check out" a Kill-A-Watt meter at the Norwalk Public Library (Courtesy: P3International)*

### Antenna Accident Kills 3 in Family

Several news outlets reported the deaths of three members of one Florida family when they lost control of the ham antenna they were attempting to put up and it came into contact with overhead electric power lines. All three, a father, mother and son, had hold of the antenna as it made contact, electrocuting them. Antenna safety may seem like common sense, but many times each year veteran and novice hams alike fall from towers, roofs or are electrocuted in tragic and preventable accidents. There are many antenna safety lists available.

The following is from *MT* advertiser Universal Radio: **www.universal-radio.com/CATALOG/wideant/safewide.html**. Universal Radio recommends that you review these antenna safety guidelines as a supplement to the guidelines issued by the company that manufactured the antenna you're attempting to install. Live to join the QCWA (Quarter Century Wireless Club) and teach your grandchildren to be safe hams, don't take chances.

## BROADCASTING

### NPR Supports HD Power Increase

*Radio World* reported in mid-October that, based on results of tests conducted in various locations around the U.S. during this past summer, a 6 dB power increase for FM stations broadcasting HD-Radio signals could be put in place in order to increase HD coverage and still guard against interference to adjacent analog signals. The tests found that high powered HD signals would significantly interfere with analog stations, particularly closely-spaced, non-commercial, lower-powered stations. Tests found that the 6 dB increase was acceptable. Support for the 6 dB power increase came from iBiquity, the HD-Radio consortium, NPR and another group representing 18 broadcast organizations. A 6dB increase would mean a significant improvement in coverage for stations broadcasting HD Radio signals and could be the most important factor in public acceptance of the slowly developing technology.

***New proposed power increase for HD-Radio signals should increase reception range for radios such as this Dice table-top set. (Courtesy: Dice Electronics)***

### More LPFM Stations Coming

*Radio Magazine* reported October 8 the passage of the Local Community Radio Act out of the Subcommittee on Communications, Technology and the Internet, by a 15 to 1 vote. According to the article, the act would allow the creation of hundreds of new Low Power FM (LPFM) radio stations across the U.S.

Opponents of the bill, supported by big broadcast interests, have said that LPFM stations would somehow cause interference to full-power stations. But, according to Common Cause, a report by the independent MITRE Corporation, commissioned by Congress, proved that wasn't the case. The report caused the collapse of opposition to the bill which resulted in its overwhelming support in subcommittee. The bill now goes to the full Energy and Commerce Committee which is chaired by longtime LPFM supporter Henry Waxman (D-CA).

### BusRadio Crashes

Last month in this column you learned about BusRadio, one company's attempt to cash in on a truly captive radio audience: school children riding publicly funded school buses. After a rebuffed attempt to garner endorsement from the FCC, the fledgling project fell flat, and, facing stiff opposition from parent groups and the Harvard-based Campaign for a Commercial-Free Childhood, the company unceremoniously pulled the plug. Their web site returned only a "Service Temporarily Unavailable" page.

According to *Radio World* on-line, the company had rounded up 10,000 school busses carrying one million students in 24 states when it folded.

## SATELLITE

### Omaha Backs Down

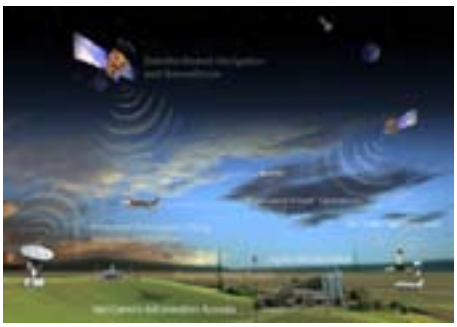
Last month this column told you about a scheme put forward by a member of the city council of Omaha, Nebraska, to tax satellite TV viewers. Hoping to get around an FCC rule against such taxes, the city planned to call it an "inspection fee."

Word of the proposed tax brought the full weight of the Satellite Broadcasting and Communications Association (SBCA), the national satellite TV industry's lobbyists, against the not insignificant weight of the National Cable and Telecommunications Association (NCTA), cable's own lobby, who were the brains behind the original tax scheme. According to *SkyReport* (SBCA's online publication), Omaha's city council voted down the proposed $50 "registration fee" following threats of a lengthy court battle promised by the SBCA who warned the city, "you will lose."

The same anti-satellite tax scheme, which ran out of time in California's state legislature, was also being considered in Michigan under the guise of a 5% "franchise" fee similar to one charged cable operators. But, DISH and DirecTV lawyers swung into action challenging the scheme by reminding legislators that "Satellite companies do not pay franchise fees for one simple reason…satellite uses an innovative technology that does not disrupt the public rights-of-way."

### Satellites to Replace Air Traffic Radar

An article in the *USA Today* from October 14 reports that the U.S. plans to shift air traffic tracking from local radar-based to satellite-based by 2020. A current experiment underway in the skies over Colorado uses such a system which allows it, the article says, "to monitor planes all the way to the ground at airports that previously had no radar coverage." The system is said to improve on flight delays and diversions at a considerable savings compared to installing local radar systems.



*The future of air-traffic control. (Courtesy: FAA)*

## PUBLIC SERVICE

### iPhone App Wows Geeks

An article in the Chicago Tribune from October 9, explains how a 25 year-old doctoral student at the University of Chicago created an iPhone application that allows users to tune into police broadcasts coming from any of Chicago's 13 dispatch zones. The application shows up as a graphic map of Chicago with dispatch zones outlined. When a call comes in, that zone is lit on the iPhone display and the audio plays through the iPhone speaker. According to the article, the student will get 70% of the $4.99 iPhone App fee for each one sold through Apple's iTunes on-line store. Comments posted on the paper's web site indicate that the app is not quite up to its potential.

*iPhone Police Radio application. (Courtesy: Apptism.com)*

Meanwhile, *MT's* Larry Van Horn reports on his blog, BTown Monitoring Post (**http://monitor-post.blogspot.com**), that Police Radio, an iPhone app that lets listeners in on police band transmissions nationwide, has reached the #5 spot on the iTunes iPhones list among 80,000 paid applications.

### Windmill Could Power Cell Towers

One of the big drawbacks to remotely stationed cell phone towers has been how to power them. Some use solar panels others use fuel-powered generators. Now, Helix Wind, a San Diego-based global renewable energy company, proposes to install small vertical windmills to power the installations. According to a company press release, Helix turbines can produce enough power to pay for themselves in as little as six months. The company is expected to have installed test sites in the U.S. and West Africa by November. If these sites prove successful the company may be in line to install hundreds of sites across Nigeria in the next few years. Ham radio clubs, where wind is in abundance, might consider this alternative power source for remote-sited repeaters.

*Helix Wind Corporation's vertical wind turbine (Courtesy: Helix Wind)*

## FCC ACTIONS

### Martin Rides Revolving Door

Washington, D.C. is the home of the most revolving doors per capita in the world, but, they're mostly figurative. Fresh from his eight year stint at the FCC during the Bush administration, the last four of which he was the chairman, Kevin Martin revolved right into the top-flight D.C. law offices of Patton Boggs. The law firm announced in a press release: "Kevin will be instrumental in helping us and our clients chart our course in this dynamic and rapidly changing industry." To which, Mr. Martin added, "I'm eager to put my eight years of experience at the FCC to work on the cutting edge issues facing the technology and telecommunications industry today."

### Smiths Warns on Obscene Language

There are festering pockets of the amateur radio bands that contain small groups of hams engaging in conversations that, in any other public domain, would quickly gain censure. The most notorious is 80 meters where there seems to be a tradition among some to get liquored up and hit the airwaves. But, this past summer FCC Special Counsel Laura L. Smith issued a series of Warning Notices to a number of hams engaged in just such operation. Three of the individuals, all from New England, two Amateur Extra operators and one Advanced Class, received Warning Letters detailing their infractions alleging "obscene or indecent words or language."

To back up the claim, their on-air antics were recorded and sent by the FCC to the letter recipients for review. In reply, one claimed to having been under medication for leg problems, another admitted to having had too much to drink. The third claimed not be able to recall any of the QSOs nor to be able to recognize his own voice. He contended that those who sent the recording to the FCC were after him because they didn't like him and that they're guilty of using the same language and engaging in the same behavior. Smith noted to all letter recipients that fines for such on-air behavior normally range from $7,500 to $10,000.

A General Class operator from Minnesota, who received a Warning Notice from Smith, also in July, had been reported by his local sheriff's department for using a hand-held radio to speak to the department on police frequencies. The ham claimed that his recollection of that evening was unclear as he had been drinking alcohol and using narcotics.

### FCC to WAQY-FM: Game Over

Hundreds of radio stations devise dozens of listener-participation games designed to keep listeners tuned in while promoting various products and shows. The vast majority of them seem to be legit but every now and then a station loses their sense of sportsmanship and the FCC is required to step in and clean up the mess. "So it was, according to FCC documents, that in 2005 a WAQY-FM (Springfield, MA) listener filed a complaint charging that the station failed to conduct a contest according to the station's advertised rules.

The complainant was the winner of the contest's grand prize that included "a free two-year lease on a 2005 Buick LaCrosse automobile or its cash equivalent…and a 'trunk load full' of Aerosmith memorabilia." While the contest was held in July, the listener said he didn't receive his cash equivalent prize for a month. Worse, by the end of the year he still hadn't received his treasure-trove of Aerosmith memorabilia despite repeatedly hounding the station to cough up.

For its defense the station maintained that the month delay cashing out the listener's prize was "within the zone of reasonableness." The station admitted that finally coming up with the Aerosmith portion of the prize only after receiving a Letter of Inquiry from the FCC was problematic. To assuage the listener, and attempt to placate the FCC, they heaped other prizes on the listener. The Commission was unmoved. As they say at the FCC: "Willful and repeated." And, that will cost you $4,000.

# The Big World of Little Radios
## *Collecting Vintage Transistor Radios*

By Michael Jack

*[Portions of this article were published previously on Collector's Weekly.com*
*All photos are by Michael Jack and Stephan Potopnyk, copyrighted by Michael Jack]*

Perhaps you recently saw a picture of a cool looking pocket radio from the early 1960s and were reminded of your carefree, youthful days. Or, maybe it was the pastel colors and atomic-aged designs like chevrons, rocket ships and automotive motifs that caught your eye. Could it have been the chrome accents that attracted your attention? Whatever it was, you now find yourself actively seeking them at the local flea market or surfing eBay for a good deal. Well, be warned: If you buy one transistor radio it will most likely lead to two, then three. By your fourth radio you will be considered a "collector" and will be hooked.

## Collectible Radio History

Regardless of your other electronic interests there will be no turning back from the appeal of these mid-century, technical and artistic marvels. But, before you spend too much money, I recommend that you take the time to do a little homework. Have fun and buy radios that appeal to your personal tastes, style and/or technological preferences. There are plenty of options!

I suggest spending some time on the Internet or scanning the pages of the few transistor radio price guides to research makes and models. Most of the price guides on the market were released well over ten years ago during the first wave of transistor radio collecting. Those books pre-date eBay and often the quoted prices are higher than present day values. Believe it or not, eBay has "relaxed" or settled prices on most radios. What we've realized over the years is that these radios are not as rare or as scarce as once thought. There are a few exceptions about which I will talk shortly. At the end of this article I have listed several books and websites to get you started.

Generally, the most collectable/historic transistor radios are those made in Japan from 1956 to 1963 and America from 1955-61. One easy way to date a transistor radio to this period is to look for small triangles or circles between the 6 & 7 and the 12 & 16 on the tuning dial. These are CD marks that appeared on all radios manufactured or sold in the U.S. from 1953 to 1963. CD stood for Civil Defense and was taken very seriously in the 50s and 60s due to the communist "red scare."

To counteract the potential for a Russian air attack on North America, the U.S. government enacted the CONELRAD program which stood for CONtrol of ELectromagnetic RADiation. CONELRAD established two civil defense frequencies, 640 and 1240 kHz (then known as kilocycles and abbreviated on many dials as kc). During times of emergencies, all stations except the CONELRAD stations at 640 and 1240 AM would cease operations. It should be noted that some Japanese radios made by Sharp, Yaou and Hitachi during the late 50s left out the Civil Defense marks.

***Regency TR-1 – the world's first transistor radio (circa 1954/55) was made in the U.S. and used a 4 (germanium) transistor circuit.***

***Regency TR-1 x5 – a grouping of Regency radios from left to right: TR-4 black, TR-1 red, TR-1 swirled green, TR-1G turquoise, front: Mantola M4-D red (a re-branded TR-4, made for B.F. Goodrich).***

## Birth of the Transistor Radio

American companies were the first out of the solid state radio gate. Regency, a division of Industrial Development Engineering Associates of Indianapolis (I.D.E.A.), was the very first with the release of the Regency TR-1. It was announced to the world on October 18, 1954 and sold well into 1955 and 1957 (for those years it was redesigned as the TR-1G and TR-4). As a transistor radio collector, I think it is important to have one example of this historic radio in your collection. They can be found on eBay ranging in price from $200 to $1000 depending on color and condition. The basic ivory and grey cabinets will fetch less money than the mandarin red and black.


***Zenith's first transistor radio, the Royal 500 (circa 1955), featured a hand-wired chassis, made in the U.S. and using a 7 transistor circuit.***

For a brief period TR-1's were released in very attractive pearlescent pink and light blue colors as well as swirled jade green and mahogany. These later examples will command top dollar on eBay. If you really want to find a great deal on a Regency TR-1, I suggest frequenting your local flea markets, garage sales and antique markets. It may be a few years until you find one, but think of the fun you'll have searching and the money you save. I found a red TR-1 at a flea market two years ago and only paid $100.

The TR-1 and TR-1G both used an odd 22.5 volt battery (Eveready 412, NEDA 215, and Burgess U15) which can be found in limited quantities today but are pricey. The TR-4 used a standard 9 volt battery. The TR-1 utilized a four transistor circuit (Texas Instruments germanium transistors). It was considered a poor performer with less-than-satisfactory selectivity, sensitivity and tone. Today the majority of them are found in not working condition. Despite the condition of internal components such as capacitors, most collectors opt to leave the radios as original as possible, thus preserving their historic value.

## Other Early Models to Watch for

Early Zenith radios like the Royal 500 series are also worthy of having in a collection. The first and rarest Royal 500 was released late in 1955 and used the 7XT40 chassis that featured a 7 transistor, hand-wired, aluminum circuit board. It was available in maroon and black. The next 500 in the series, the 500B was the first to use a printed circuit board and three new cabinet colors were added - tan, pink and ivory. In 1958 the third version, the 500D saw the addition of an eighth transistor to the circuit and an improved speaker. The 500D was only



When I do my restorations I start by dismantling the radios then cleaning the cabinet with warm soapy water and a soft bristle toothbrush. Once the majority of the dirt is off, I determine how deep the scratches and scuffs are. If they are deep, I'll consider the wet-sanding process unless the cabinet is Nylon, such as the Zenith Royal 500. For some reason Nylon does not respond well to wet-sanding. Otherwise, a Novus treatment will usually do the trick. Start with the most abrasive compound Novus #3, the #2 and a final spray with Novus #1. A great deal of elbow grease will bring back the shine.

In some cases I'll use a Dremel tool with a soft buffing wheel to bring out the luster. For metal parts I have had great success with a metal polish called *Peek*. I spend a lot of time in my basement workshop doing this while listening to talk radio, on the AM band of course!

Luckily, about 70% of my radios require very little electronic work. Usually, a fresh battery and some contact cleaner will do the trick. Changing the electrolytic capacitors will solve most other issues unless the circuit board has been broken. The Sony TR-6 pictured in the before and after pictures works very well. It looks like it had a transistor and a capacitor replaced sometime in the late 50s. I have another Sony TR-6 from 1956 with all original parts and it also works well.

I'm not the most talented electronic technician, but I can manage the simplest repairs. If there is an acid component to the corrosion, a paste of baking soda and warm water left on the corrosion for a couple of hours neutralizes the "goop" that the battery left on the contacts. Apply with a Q-tip then rinse with distilled water and contact cleaner. Ammonia mixed 50/50 with water is also effective. Rubbing with an emery board or light sandpaper with lots of elbow grease will always work to remove corrosion as well.

For removing residue caused by leaking alkaline batteries, lemon juice (a mild acid) will work. As for plastic repair, I use a product here in Canada called Plastex. The American equivalent is called Plas-T-Pair, a combination of powder and resin. For polishing, I have had great success with the Novus product line. Novus #3 is for removing deeper scratches, Novus #2 is less abrasive and does wonders on light scratches and brings the original shine and luster back to the plastic. Novus #1 also adds shine and protects.


I've found that Brasso is very effective for polishing plastic. And, I have also had great results with various other metal polishes found at any hardware store. For extreme scratches on restorations, I wet-sand the plastic, starting with 600 grit sandpaper, followed by 1200 and finish with 1500 and 2000 grit. Make sure to sand in opposite directions with each grit.

available in black, maroon and ivory.

By 1961 the fifth generation Zenith 500H was totally redesigned. It has a large oval speaker and is considered to be the best sounding and performing portable transistor radio ever. If you are looking for a daily driver or a radio that will provide some serious DXing, this is your radio. Its vernier tuner had gear-reduced action which improved the radio's selectivity.

Hundreds of thousands of Royal 500s were made over the span of a decade so they are not overly rare or hard to find today. However, an early, hand-wired 500 will fetch more money than the later versions. All Royal 500's were powered by 4 AA batteries.

Other collectable American made radios are from; RCA, G.E., Admiral, Motorola, Magnavox, Philco, Raytheon, Arvin, Sylvania and Emerson. As a collector I strive to find each company's first transistor radio. A quick Internet search will help identify these sets if you are interested in exploring the topic further.

American made radios tend to be slightly larger than their Japanese counterparts. Most U.S. radios would be considered *coat-pocket* sized; too big for your shirt-pocket, but too small to be classified as a portable. Many were also larger, leather-clad portable sets like the Zenith Royal 750 and Raytheon 8TP-1.

One of the most popular and attractive coat pocket radios was the Emerson 888 series. Emerson released several, 8 transistor radios from 1958 to 1960 such as the Vanguard, Pioneer, Explorer, Satellite, and Atlas. They were all named after various U.S. space programs and can be found in great numbers today. They are terrific looking and are reasonably priced. Examples can be found today ranging in price from $20 to $80 depending on condition.

## Made in Japan

Although Japanese manufacturers were a bit behind the American companies in producing transistor radios they quickly caught up and exceeded expectations. The first Japanese transistor ever released was Sony's TR-55. At the time 'Sony' was a brand name, the company was actually called Tokyo Tsushin Kogyo. The TR-55 is incredibly rare today. While it was sold domestically in Japan, only 50 units were imported in Canada by General Distributors (GENDIS). You may never encounter one of these in all your years of collecting. I am fortunate to have the TR-5, a slightly re-designed (and harder to find) version of the TR-55.

The Sony radio that seemed to change the entire electronics world forever was the TR-63. Released in 1957, it was considered the world's first, truly pocket-sized radio and was the first to utilize all miniature components. It was also the first Japanese radio to be imported into the U.S. (several other, early Sony radios were sold in Canada in 1956). Several TR-63s appear each year on eBay, but expect to pay top dollar for one. Even examples with cracks or chips can fetch $400. Those in mint condition will realize even higher amounts. The TR-63 was available in green, red, black and yellow. It was one of the first transistor radios to use the rectangular 9 volt battery we still use today.

An easier to find, collectible Sony radio is the TR-610. Almost half a million of these radios were sold worldwide and many have survived. The TR-610 set the standard for radio design in the late 50s and early 60s. Many manufacturers copied its award winning features.

Once Sony opened the U.S. market, other companies with brand names such as Toshiba, Hitachi, Sharp, Standard, Sanyo, Matsushita (Panasonic), Mitsubishi, Aiwa, Realtone, Global, and Zephyr arrived on North American shores. They attracted the youth market with their smaller, more affordable and more colorful pocket radios. While American radios retailed for over $60 most imports could be bought for half that price. The coincidental arrival of imported pocket radios and the advent of rock 'n' roll conspired to change the electronics industry forever!

By the late 50s and early 60s many American companies opted to have their radios made in Japan, but retained their American brand names. Even the giants like Zenith, RCA, Motorola, Philco, and G.E. had their radios made in Japan. They could no longer compete with the lower prices and more attractive designs coming from Asia.

One of the classic features of Japanese radios was reverse-painted plastic. Reverse, or back-painting, was a very popular method of ornamenting transistor radios between 1958 and 1962. By painting all artwork on the inside of the clear plastic dial cover, there would be no wear or damage to the most attractive features of the radio. A smooth protective surface remained on the outer dial. This process also gave the radio a three dimensional appearance. The depth and palette of colors were quite breathtaking. Gold on white, black accents, bright red and powder blue along with geometric shapes like starbursts, chevrons, jet wings, diamonds and parallel lines make reverse-painted radios visually stunning and highly sought after by collectors. Makers like Toshiba and Crown were exceptional with their creative use of reverse-painting.

Even Japanese radios without reverse-painting are highly collectable. The above mentioned Sony TR-610 with its sleek cabinet, upper metal escutcheon and round speaker grill, spawned a host of imitators like the Realtone TR-1088 *Comet*. These radios can be found in abundance today and range in price from $50 to $100 depending on condition and color.


***Sony TR-63 was the first Sony radio to be imported into the U.S. (March 1957) and the first pocket radio to use all miniature components. It had a 6 transistor circuit.***

## Boy's Radio Tax-dodge

In your travels you may even encounter pocket radios called *Boy's Radios*. In the 1960s Japanese firms were hit with both a domestic export tax and a North American import tax on any AM radio having three or more transistors. This would have put a dent in Japanese radio sales and forced retail prices to climb. But, the manufacturers had a solution. They developed AM radios that could operate on only two


***4 "Boy's radios", all inspired by the design of the Sony TR-610. These radios utilized a 2 transistor circuit and, classified as toys, were able to get around new U.S. tariffs against imported transistor radios.***

transistors. Basically, they were crystal radios with a transistor to power the loudspeaker. They were marketed as "toys" rather than electronic devices thus stepping around the taxes!

Often advertised in the back of comic books, these radios would either have "Boy's Radio" or "Two Transistors" prominently and proudly displayed on the cabinet. In many cases, the cabinets were identical to "real" radios with 6 or more transistors. Performance was less than stellar, but these radios could still pick up the strongest local stations. Teenagers were swayed by price and appearance, performance was low on the list. Boy's Radios show up often on eBay and range in value from $25 to $70.

Radios made in Hong Kong during the mid to late 60s are not highly desirable. Gone were the fancy colors, atomic age designs, chrome and reverse painted dials. In my travels I'd say that over half of all the radios I encounter were made in Hong Kong. Most often I pass them up unless the price tag is $5 to $10. Perhaps in another ten years these radios will become collectable. However, if you see one and you like it….buy it and enjoy it!

## Tips for Beginning Collectors

During the 1970s radio design experienced a renaissance. Bright colors and cool shapes made a comeback (perhaps inspired by disco, mood rings and the excesses of the decade). Panasonic released several radios that are highly collectable today such as the Panapet and Toot-A-Loop. They can be found at flea markets or online auctions ranging in price from $10 to $50. Be prepared to spend more if you find one in its original box.

With any transistor radio from the 1950s or early 60s it seems that the brighter the color the higher the price. Cool 50s shades like robin's egg or powder blue, sea-foam green and bright red or yellow, command higher prices. Black and ivory cabinets are considered less attractive by some and may reduce a radio's value on the collector's market.

Of course, condition is the key factor when it comes to valuing a radio. Finding a radio with its original box, leather case, earphones, owner's manual and warranty card or sales slip will increase its worth. You may have to dish out twice or three times a radio's book or eBay value with all those extras. Be sure to examine the cabinets closely when making a purchase. Small hairline cracks or chips are often found in the corners. These pocket radios experienced very active lives during the 1950s and 60s. Many were taken to picnics, ballgames, schools and other social outings. They might have been dropped, left in the sun, damaged while trying to replace the batteries or just plain neglected by their owners.

Some collectors refuse to buy damaged radios. Others are not troubled by buying less than perfect examples. I find that the time spent restoring and repairing is very rewarding and it's much easier on the pocket book! A damaged radio will most often realize half of its book or online auction value. And, there are several products on the market like plastic repair kits, polishes, cleaners and electronic replacements to bring a radio back to life if you so desire (see side bar). If you want to keep a radio historically accurate, I recommend not changing its electronic components, but the choice is yours.

In general this is a good time to buy transistor radios. Prices have dropped on most radios but not all. The truly rare and hard-to-find radios have maintained their values but most of the common ones can be found for much less than stated book prices. It is important to remember that, when the price books were published, the Internet and eBay weren't around yet. Printed prices should be thought of as one person's (the author's) opinion and not necessarily based on solid evidence or observation. eBay has changed the entire collecting industry, especially with transistor radios. Radios that were once thought of as rare (and thus expensive) have appeared over and over again on the online auction circuit. Result: Prices have dropped.

If you'd like to delve more deeply into this fascinating hobby, there are many resources on the Internet as well as many books. Here are some that may help.

**Books:**

- *"Transistor Radios: 1954-1968" By Norman Smith (Schiffer Book for Collectors)*
- *"Zenith Transistor Radios: Evolution of a Classic" By Norman R. Smith*
- *"Transistor Radios: A Collector's Encyclopedia and Price Guide" By D. R. Lane and Robert A. Lane*
- *Collector's Guide to Transistor Radios: Identification and Values" By Marty Bunis*
- *"Made in Japan" By Erbe, et al.*
- *A series of smaller booklets by Eric Wrobbel found at: www.ericwrobbel.com*

**Websites:**

**www.flickr.com/photos/transistor_radios/**
**http://tabiwallah.com/radiowallah/**
**www.fiftiesradio.com/Home.html**
**www.collectorsweekly.com/category/radios/transistor.php**
**www.geocities.com/SoHo/Atrium/1031/trans/1trans.html**

**About the Author**

*Over the past twelve years Michel Jack has acquired over 1,100 radios for his collection. Initially, he collected tube radios from the 1930's and 40's (wood and Bakelite sets), but got hooked on pocket radios about seven years ago. Though not old enough to remember the golden age of radio, he did grow up with a transistor radio pressed against his ear in the early 70s when Top 40 still ruled the AM airwaves. By day he is a recording engineer/music producer for a company called Lenz Entertainment in Toronto, Ontario.*

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## SHORTWAVE, FM AND PHONY TRANSISTOR COUNTS


There were many pocket radios with at least one shortwave band. Sony claims to have released the world's first shirt-pocket transistor radio with a shortwave band known as the TR-714. Shortly after, most other manufacturers got on board including Toshiba, Hitachi and Sharp. Two of the most collectible Toshiba shortwave radios are the 7TP-352M (Marine band) and 7TP-352S (6 to 18 MHz). Both were released in 1960.

If you buy these radios don't expect terrific performance. They were clearly designed for the consumer market and today should be thought of more as historic relics. The rarest of all shortwave pocket radios is the Realtone TR-870 *Satellite*. In all my years of collecting I have only seen two or three ever appear on eBay. The *Satellite* had terrific styling that featured a dial that was a clear plastic strip perched atop the radio cabinet. Most examples known to exist have been damaged.

Two other classic shortwave pocket radios are the Sony TR-725 (4-12 MHz) and TR-710 (6-18 MHz). Both offer terrific styling. But, if you are looking for performance you'd be better served seeking out the larger portable sets such as the Zenith Royal 3000, Zenith 790 'Navigator', Sony TFM-116L, Sony TR-711, Braun T23 and Sanyo 8S-P2 "All Wave."

FM made its first appearance in November, 1958 with the release of the Sony TFM-151. It was a larger, lunch box sized portable that utilized 15 transistors (eight of which were for the FM circuitry). Selling for a whopping $149.95 only about 1000 of these radios were sold. Sony followed that with the smaller TFM-121.

A couple of years later Zenith released the Royal 3000, the first solid state Transoceanic radio with the FM band. FM didn't catch on in shirt-pocket radios until the mid 60s. Zenith's first shirt-pocket set with FM was the Royal 51 (also found as a model 810). It used a 9 transistor circuit and was released in 1966, marketed as *The Symphonette*. I have one in my collection and it still plays strong and is a very well built American radio. By the late 60s and early 70s it was commonplace to see AM/FM portable sets for sale.

In an effort to boost sales, many radio manufacturers began marketing pocket radios with high transistor counts. By the late 1960s transistor technology was proven and accepted as common place. Consumers were no longer impressed with the term *transistorized*. Many manufacturers began using the term *solid state* and/or inflated the transistor count to sway buyers. More transistors meant better performance, right?


In the mid 60s it was common to see radios boldly displaying "12 transistors" or "14 transistors" on the front of their cabinets. In actuality, more transistors weren't better, they were just more. Most often these radios only operated on 6 to 8 transistors. The rest were duds, glued or soldered onto the chassis or, if actually wired into the circuit, performed redundant duties and did not enhance performance at all. Most radios produced during the "transistor wars" were manufactured in Hong Kong. Today they are not very collectible or valuable. I do have a few in my collection only because I want to have a good representation of the entire evolution of transistor radios.

# Air Raid on Pearl Harbor

## *December 7, 1941 as reported by radio*

By Eric Beheim

Unless noted otherwise, all photos are U.S. Navy photos from the author's private collection.

One of the most momentous events to occur during the 20th Century was the December 7th, 1941 surprise attack by Japan on United States military installations located on the Hawaiian island of Oahu. On that day, most Americans relied on radio to keep them informed about the latest developments in an unfolding crisis that everyone knew would result in war.

The following is a summary of what was reported by radio on that day. Bracketed annotations have been included to provide a better understanding of what was taking place while these programs were going out over the air, to help clarify and expand upon what was being discussed by the news commentators and military analysts.

Note also that all times given are Eastern Standard Time, but Hawaii, on that day (at least for the U.S. military there), was in a special time zone that was 10 ½ hours behind GMT according to Gordon W. Prange's book *Dec. 7 1941 - The Day The Japanese Attacked Pearl Harbor.*

**1:00 a.m.** Radio Station KGEI in San Francisco reports that President Franklin Roosevelt "had sent or was sending a message to the Emperor." [Japan's refusal to withdraw its military forces from China and its threatening moves towards Thailand, Malaya and the Dutch East Indies had made war with the United States almost inevitable. As diplomatic relations with Japan continued to deteriorate, the President hoped that a direct appeal from him to Japanese Emperor Hirohito would keep hostilities from breaking until some sort of settlement could be negotiated.] In Tokyo, American Ambassador Joseph Grew hears the KGEI broadcast at 3:00 p.m. local time.

***Even before the United States entered the war, portable radios such as this 1940 Zenith model 5G401 were being purchased for use as "black-out radios" in the event of air raids.***

**11:45 a.m**. [at 6:15 a.m. local time, the first wave of 183 Japanese aircraft are launched from six aircraft carriers located 220 miles north of Oahu. Using their radio direction-finding equipment, Japanese fliers set a course for Hawaii using the signal from Honolulu radio station KGMB, which had been broadcasting a special all-night program of music as a navigational beacon to a flight of Army B-17 bombers, inbound from the West Coast.]

**12:31 p.m.** [At 7:01 a.m. local time, two enlisted men on duty at an Army mobile radar station located at Opana Point on the northern tip of Oahu, observe "an unusually large response" on the oscilloscope. They judge it to be a large flight of approaching planes coming in from almost due north and at a distance of some 132 miles. The Opana Station calls the Information Center at Fort Shafter (the nerve center of the Army's Aircraft Warning Service) to report what they have observed. Believing that Opana is tracking the flight of B-17s, which is due to arrive at 8:00 a.m., the officer on duty tells them, "Well, don't worry about it."]

**1:03 p.m.** [at 7:33 a.m. local time, the RCA cable office in Honolulu receives a message sent from Washington by Army Chief of Staff General George C. Marshall advising Lieutenant General Walter C. Short and Admiral Husband E. Kimmel, the two senior military commanders on Oahu, that Japan would be presenting what amounted to an ultimatum to the State Department at precisely 1:00 p.m. Eastern Standard Time. Marshall's message concludes with, "Just what significance the hour set may have we do not know, but be on the alert accordingly." Since the message has no indication of priority, its delivery is handled as "routine" by the cable office.]

**1:25 p.m.** [At 7:55 a.m. local time, the first wave of Japanese aircraft begins an island-wide attack. As Japanese dive-bombers strike the airfields Kaneohe, Ford Island, Hickam, Bellows, Wheeler and Ewa, aerial torpedo planes begin their runs on ships in Pearl Harbor. Commander Logan Ramsey of the Ford Island Command Center instructs all radiomen on duty to send out in plain English: "AIR RAID PEARL HARBOR. THIS IS NO DRILL."

**1:30 p.m.** [At 8:00 a.m. local time, the flight of B-17's from the West Coast arrives at Oahu after a 14-hour flight. At this same time, aircraft from the carrier Enterprise arrive at Ford Island. Both flights are caught between enemy and friendly fire.]

***Japanese planes prepare to take off for the Pearl Harbor attack, 7 December, 1941. (Courtesy U.S. Coast Guard)***

**1:38 p.m.** At 08:08 a.m. local time, KGMB interrupts its musical program with a special announcement ordering all Army, Navy, and Marine personnel to report for duty.

**1:40 p.m.** [The forward magazines on the battleship Arizona ignite, resulting in a tremendous explosion and fireball. She sinks within nine minutes.]

### "This is the real McCoy!"

**1:42 p.m.** [General Short informs Washington and the entire Pacific Fleet that, "Hostilities with Japan commenced with air raid on Pearl Harbor."]

**1:45 p.m.** At 8:15 a.m. local time, KGMB interrupts its music program with a second special announcement, ordering all military personnel to report for duty.

**2:25 p.m.** [At 8:55 a.m. local time, the second wave of Japanese aircraft begins its attack on Oahu's military bases. In the White House press room, Presidential Press Secretary Stephen Early reads a brief statement to assembled reporters, informing them of the attack.]

**2:30 p.m.** At 9:00 a.m. local time in Honolulu, Webley Edwards makes the following special announcement on KGMB: "Alright now, listen carefully. The island of Oahu is being attacked by enemy planes. The center of this attack is

*This photo of the battleships West Virginia and Tennessee was taken while rescue operations were still underway. The Tennessee escaped major damage and was back in action by early 1942. The badly damaged West Virginia was rebuilt and rejoined the Fleet in time to participate in some of the last major battles of the Pacific war.*

Pearl Harbor, but the planes are attacking airfields as well. We are under attack. There seems to be no doubt about it. Do not go out on the streets. Keep under cover and keep calm. Some of you may think that this is just another military maneuver. This is not a maneuver. This is the real McCoy! I repeat, we have been attacked by enemy planes. The mark of the rising sun has been seen on the wings of these planes and they are attacking Pearl Harbor at this moment. Now keep your radio on and tell your neighbor to do the same. Keep off the streets and highways unless you have a duty to perform. Please don't use your telephone unless you absolutely have to do so. All of these phone facilities are needed for emergency calls. Now, stand by all military personnel and all police -- police regulars and reserves. Report for duty at once. I repeat, we are under attack by enemy planes. The mark of the rising sun has been seen on these planes. Many of you have been asking if this is a maneuver. This is not a maneuver. This is the real McCoy."

*Just as the first bulletins announcing the Pearl Harbor attack were being broadcast over the major U.S. radio networks, the destroyer Shaw blew up in a spectacular explosion. Incredibly, the Shaw was later repaired and rejoined the fleet before the war had ended.*

The NBC Red Network makes the following special announcement: "President Roosevelt said in a statement today that the Japanese have attacked Pearl Harbor in Hawaii from the air." [Meanwhile, in Pearl Harbor, the destroyer Shaw explodes, sending debris everywhere.]

**2:37 p.m.** In Washington, CBS commentator Albert Warner reports that the White House has just announced that all naval and military activities on the principal island of Oahu in Hawaii have been attacked from the air. A Japanese attack on Pearl Harbor would naturally mean war, as there is no doubt that Congress would grant such a declaration. The White House has just reported that Army and Navy bases in Manila have also been attacked. [This report proved to be untrue. The Philippines were not attacked by Japan until December 8th.]

Hostilities seem to be opening all over the Southwest Pacific. Japan's two negotiators in Washington [Ambassador Kichisaburo Nomura and special envoy Saburo Karusu] are currently meeting with Secretary of State Cordell Hull. [The envoys had been instructed to deliver Japan's ultimatum to Hull precisely at 1:00 p.m., which would have been 7:30 a.m. in Hawaii and prior to the attack beginning. Due to delays in preparing the ultimatum document, they did not arrive at the State Department until 1:45 p.m. By that time Hull had already been informed that the attack was underway. He did not admit them into his office until 2:20 p.m.]

CBS in New York attempts to contact Honolulu and then Manila without success. CBS' chief military analyst Major George Fielding Eliot speculates that the attack was most likely launched from aircraft carriers and that the attack was a "desperate attempt" to prevent the U.S. Fleet from intervening in Japanese military operations in the Far East. Japanese troop landings on Oahu are unlikely because of the logistics involved.

Calls for Honolulu police and firefighters to report for work might be an indication of some sort of uprising among the Japanese living in Hawaii. [There is no evidence that any sort of uprising by Hawaii's Japanese population took place on December 7th.] From Manila, Ford Wilkins describes the military preparations that are taking place in various Far Eastern countries. [His report ends abruptly "due to line troubles."]

A report has been received from Singapore that Japanese troop transports have been seen moving into the Bay of Siam, heading for Thailand. Elmer Davis comments that one week ago, the Japanese had asked for two more weeks to negotiate a settlement over the situation in the Far East. In view of today's events, this was obviously an attempt to stall for time and put the United States off guard. London has been "staggered" by news of the attack. Prime Minister Churchill has promised that Great Britain will declare war on Japan within the hour of the United States doing so. [Churchill was well aware that, by declaring war on Japan, the United States would also be going to war with Japan's ally Nazi Germany, which the British had been fighting since 1939.]

Congress will be meeting tomorrow and will undoubtedly be discussing the possibility of war with Japan. CBS' affiliate station KGMB in Honolulu has reported that the air raid is still going on.

**3:15 p.m.** On his regular NBC Red Network news program, H.V. Kaltenborn reports that 50 planes are believed to have participated in the attack and that "many were shot down." [Of the 353 planes that participated in the attack, 29 were lost.] The first news flash telling of the attack was received by NBC at 2:25 p.m. The Navy has refused to comment about the attack and said that all information would be channeled through the White House. [It would be almost a year before details of the attack, including the extent of the damage, were made public.] The State Department has announced that the attacks were made "wholly without warning." Kaltenborn assures listeners that "our Army and particularly our Navy were not caught by surprise by this attack." [History records otherwise.] The main targets seem to have been Hickman Field and the Pearl Harbor Naval Base.

The President has called in the Secretaries of War and the Navy as well as Congressional leaders for an emergency conference at the White House. The air attacks in Hawaii are still believed to be going on. It has just been reported that an Army transport carrying lumber was torpedoed 1300 miles west of San Francisco. The AP has issued an unverified report that an unidentified foreign warship appeared off the coast of Oahu and is firing at Pearl Harbor. [This "unidentified warship" might have been the destroyer Helm, which had shelled a midget submarine attempting to enter Pearl Harbor.] Secretary of State Hull's response to the Japanese envoys was that the Japan's response was "crowded with infamous falsehoods and distortions."

**3:25 p.m.** [At 9:55 a.m. the second wave of Japanese aircraft breaks off its attack and returns to the waiting carriers. The air raid on Oahu is over.]

**3:30 p.m.** [Planes from the first wave land onboard their assigned carriers, which have moved to within 190 miles of Oahu.]

## Sarnoff to Roosevelt: NBC Facilities Available

**4:00 p.m.** On the NBC Red Network, a sermon by Dr. Harry Emerson Fosdick is interrupted by an extended news update that includes a telephone report from a KGU correspondent in Honolulu. [During this report, a telephone company operator breaks in and asks the correspondent to get off the line for an emergency call.]

From the White House newsroom, H. R. Baukhage reports that the President will address Congress tomorrow. The cabinet will be meeting at the White House tonight at 8:30 p.m. and will be joined by Congressional leaders of both parties at 9:00 p.m. It has been reported that 5 people have been killed in Honolulu. [It was later determined that most of the "bomb damage" that occurred in Honolulu was caused by unexploded anti-aircraft shells fired from Pearl Harbor, 12 miles away.] Germany had no immediate reaction to the attack.

On the West Coast, all military leaves have been cancelled and military personnel have been ordered to report for duty. The FBI is "completely mobilized" to counter Japanese espionage. Beginning on Monday, all active duty military personnel are to report for work

in uniform. [During the military build-up that occurred in the months prior to December 7th, military personnel serving in Washington and other major cities were instructed to work in civilian attire, lest the sight of too many uniforms create a "war scare" within the civilian population.] Portions of the message that the President sent to the Japanese emperor on Saturday afternoon, is read. Parachute troops have been sighted along the northern coast of Oahu. [Another false rumor.] Sailors in the New York City area are instructed to report to their ships.

**4:30 p.m.** NBC News on the Red Network: News of the attack on Hawaii was first reported in London by the BBC about an hour and a half ago. In San Francisco, NBC's "expert on the Far East" Upton Close reports that the attack came as a complete surprise to the Japanese Consulate in San Francisco and might have come as a surprise to the Japanese Government itself. It is possible that these attacks were carried out under German influence and with German support, or by a small faction within the Japanese Navy that is trying to precipitate war. We cannot be sure as yet that the Tokyo government is behind it. Honolulu has reported that the attack has stopped.

In Los Angeles, the sheriff has taken charge of "Little Tokyo" in order to watch for any Japanese "disorders." If the Japanese Government is behind this attack, we are in for a bitter war in the Pacific. From KGU in Honolulu, a reporter gives a brief summary of events that are known to have happened so far. Considerable damage has been done to Hickham Field. Lines of communications between the various military bases seem to be down. 350 men were killed in a direct bomb hit on a barracks at Hickham Field. Bellows Field was also heavily damaged. A telegram from David Sarnoff, to President Roosevelt is read. It pledges that all NBC's facilities are now available to him as needed. Affiliate stations are advised that NBC will remain on the air on a 24-hour basis during this emergency.

### Hawaii Governor: "State of Emergency."

**4:45 p.m.** At 11:15 a.m. local time, Hawaiian Governor Poindexter comes on the radio to announce a state of emergency.

**5:12 p.m.** At 11:42 a.m. local time, the Army orders Honolulu's commercial radio stations to go off the air.

**5:14 p.m.** The NBC Red Network interrupts Metropolitan Opera "Auditions of the Air" with a flash announcement: Japanese Imperial Headquarters has announced a state of war with the United States. In San Francisco, Upton Close reports that Japanese Premier Tojo and other high-ranking Japanese military officials will speak in Tokyo at 7:30 p.m. EST. The extent of the damage done to military facilities in Hawaii is unknown at this time. The attack is believed to have come from the south. [As noted above, it was launched from the north.]

Flash: Japan has just announced a state of war with Britain. Ford Wilkins in Manila is heard via shortwave, describing war preparations being made in the Philippines. Manila is still quiet and peaceful. [Ford Wilkins was actually CBS' correspondent in Manila. NBC apparently picked up his shortwave report to CBS and aired it. Wilkins signs off, "I return you now to CBS in New York."]

From the NBC newsroom, H. V. Kaltenborn reports that a British gunboat in the harbor of Shanghai has been sunk by the Japanese. There has been no bombing attack on Manila and the original White House announcement was evidentially a mistake. It now appears that there has been serious damage in Honolulu and Pearl Harbor. [As noted above, the damage done to Honolulu was mostly from "friendly fire".] The attack appears to have come as a complete surprise.

There is now complete unity here in the United States regarding whatever course of action the President will ask Congress to follow. It is not known what Russia will do if Japan does not attack her. [Already at war with Nazi Germany, Russia did not declare war on Japan until August 8, 1945 when the Pacific war was almost over.]

**6:00 p.m.** The NBC Blue Network reports that the White House has announced that there has been heavy damage and heavy loss of life in Hawaii. Two Japanese planes are reported to have been shot down. Witnesses in Hawaii saw shell flashes out in the ocean, indicating that some sort of naval battle was taking place. Via shortwave from Manila, Bert Silan reports that there have been no bombing attacks in the Philippines. General MacArthur will decide if Manila should be evacuated. Navy Intelligence has announced that no more code messages can be sent from the Philippines. All messages must be in plain English. Honolulu was the last place that anyone expected a Japanese attack to occur.

It is believed that the Japanese are planning to invade Thailand. MacArthur's headquarters has announced that all U.S. Army and Navy personnel in the Far East are "on the alert." [As for "being on the alert," on December 8th, when the Japanese made their first air attack on Luzon, the principal island of the Philippines, the Americans were again caught by surprise and lost 86 aircraft, against only 7 Japanese Zero fighters shot down.]

**6:30 p.m.** [By 1:00 p.m. local time, the last of the Japanese planes are back on board their assigned aircraft carriers. A third wave was to have returned to Oahu to complete the destruction of the morning and to search for the American aircraft carriers Lexington and Enterprise, which had not been in port that day. However, unwilling to expose his ships to a possible American counterattack, task force commander Vice-Admiral Chuichi Nagumo, orders an immediate withdrawal back to Japan].

***Only an hour after the President spoke to Congress, a declaration of war with Japan had been approved and was ready for his signature.***

***The battleship Arizona sank nine minutes after its forward magazines exploded. Too badly damaged to refloat and repair, it was left as a permanent memorial to victims of the Pearl Harbor attack.***

NBC Blue Network: From Washington, Drew Pearson and Robert S. Allen report that the Japanese envoys in Washington have asked for their passports. The President first heard about the attack at 2:25 p.m. EST. [As noted above, General Short's message advising Washington of the attack was sent at 1:42 p.m. EST. The White House issued its official statement to the press at 2:25 p.m.] Navy Intelligence believes that the attacking planes were launched from at least several carriers. It is believed that three battleships have been hit and that the rest of the fleet has steamed out of Pearl Harbor. [Only a few ships were able to escape from Pearl Harbor during the attack. Eighteen ships, including five of the eight Pacific Fleet battleships were sunk or badly damaged.] British bases in the Pacific have been bombed.

The White House has cancelled the press credentials of all German and Japanese newspapermen effective immediately. The War and Navy Departments have been unable to reach their commanders in Manila. Both houses of the British Parliament will meet in an emergency session on Monday. It has been reported that Guam has been bombed and that Japanese planes are over Burma.

The U.S. will go on a wartime footing tomorrow. Japan is ruled by an irresponsible military clique, which is responsible to no one. It is unlikely that Russia will declare war on Japan while Hitler's army is threatening Moscow. A blackout has been ordered for the whole Panama Canal Zone.

Pearson and Allen predict that, after little discussion or debate, Congress will pass a formal declaration of war against Japan. Britain will also declare war on Japan and become a full ally of the United States. There will also be a declaration of war against the German government of Adolph Hitler. Flash: it has been reported that a Japanese aircraft carrier has been sunk off of Latin America. [This proved to be another false rumor with no basis in fact.]

**7:00 p.m.** NBC's News Roundup on the Blue Network: Via shortwave from London, Fred Bates reports that Japanese diplomats in London are burning their official papers. German radio has blamed the war on President Roosevelt's "war mongering." The NBC New York newsroom reports that the Secretary of Defense has instructed all U.S. companies involved in war work to take steps to insure that their plants are protected from sabotage. NBC facilities in New York and on the West Coast are being

***Carried live by all the major radio networks, President Roosevelt's "Day of Infamy" speech, which he delivered to Congress on December 8, 1941, was probably heard by more Americans than any other radio program up to that time.***

protected by special police squads.

From the White House newsroom, H.R. Baukhage confirms that Manila has not been bombed. President Roosevelt is currently in his White House study, working on the message he will delivery to Congress tomorrow. Baukhage describes being present when news of the attack was first announced at 2:25 p.m. EST. When told of the attack, Senator Burton K. Wheeler, the leading isolationist in the Senate, was quoted as saying, "We will have to see it through."

The broadcast switches to San Francisco for a shortwave report from Manila by Bert Silan. The Japanese military has announced that it is taking over the International Settlement in Shanghai. The U.S. Consulate in Shanghai has warned all Americans there to keep off the streets. In Manila, troops have been rushed to their battle stations. The Yokohama Bank in Manila is completely surrounded by armed guards with machine guns and sawed off shotguns to prevent sabotage. It is expected that Japanese bank officials will be taken into custody.

All Japanese stores in Manila failed to open this morning. Plans are being made to evacuate non-essential civilians from Manila shortly. Schools were closed today and will probably stay closed. Manila is calm, and is confident that U.S. forces will protect it. [Cut off from any assistance or reinforcements, U.S. forces in the Philippines held out until early May 1942 before they were forced to surrender to the Japanese.]

It has been rumored that Singapore has been bombed. In San Francisco, Upton Close reports that the Japanese Consul in Portland was surprised and unhappy when he learned about the attack. Attempts by the Japanese

***By March 1942 the U.S. Coast Guard had established a training station at the former Naval Radio Station at Wailupe. It was used for a 16 week-long Radioman School with approximately 20 students per class. (Courtesy: U.S. Coast Guard)***


***Following the Pearl Harbor attack, Commander Eugene MacDonald, president of the Zenith Radio Corporation directed that the outline of a 4-engine bomber be embroidered onto the speaker grille cloth of Zenith's new Trans-Oceanic "Clipper" radio, which was introduced in January 1942.***

Consul in San Francisco to burn confidential papers in a fireplace that was more ornamental than practical resulted in the fire department having to be called in to put out the blaze, which had gotten out of control.

**8:28 p.m.** [By 2:58 p.m. local time in Hawaii, General Marshall's warning message has finally been delivered, decoded and given to General Short and Admiral Kimmel.]

### Japan Cannot Win war against U.S.

**9:00 p.m.** (NBC Blue Network): on his "Jergens Journal" broadcast, Walter Winchell announces that the Department of Justice is moving rapidly to intern all Japanese nationals. Japanese property in the U.S. will be seized at once. The importance of the Japanese attack is that war between the United States and Hitler is imminent. "National Security" is no longer just a phrase. In an editorial, New York's leading isolationist newspaper The New York Daily News said that, "We should all stick by the President." The Japanese who attacked Hawaii were probably a suicide force that did not expect to return to base. American anti-aircraft guns went into action on the spit-second. [Once again, history records otherwise.]

**11:00 p.m.** NBC Red Network News: From Washington, D.C., H. R. Baukhage describes talking with Congressional leaders as they emerged from the White House after meeting with the President. None of them would comment on whether or not the President will ask for a declaration of war tomorrow when he speaks to Congress at 12:30 p.m. EST. In Washington, there is almost a sense of relief, now that the "war of nerves" is over.

In New York, Robert St. John reports that Canada has declared war on Japan. The Mexican congress will meet tomorrow to consider a declaration of war. There is an unconfirmed British rumor that Wake Island has been occupied by the Japanese. [Once again, this was a rumor with no basis in fact.] The Panama Canal Zone is on a full time war footing. In the U.S., all military leaves and furloughs have been cancelled.

Armed troops are now guarding defense plants. John Vandercook describes Pearl Harbor as "not a place but a location." The sprawling facility is "the most powerful maritime fortress in the world." Vandercook then reports that Japanese troops have landed in Northern Malaya. Two Japanese bombs fell on Singapore, but did little damage. Japan is now at war with about one-half of the world's population.

**11:30 p.m.** On the NBC Red Network, Ben Grauer moderates a round table discussion between some of NBC's top commentators, who are heard via 2-way radio, speaking from various locations around the country. It is now clear that the attack on Pearl Harbor was only part of a larger military move by Japan. There is speculation as to whether or not Hitler encouraged the attack, since a two-ocean war would benefit the Axis. [There is no evidence that Germany encouraged Japan to attack Pearl Harbor.]

It is believed that the President's message to the Emperor never got through. Protecting the Panama Canal will now be of vital importance. The attack on Hawaii has ended all debate over whether or not the country should become involved in the war. There is speculation on whether the President will ask for a declaration of war just with Japan or with the Axis. [The President's message, delivered to Congress on December 8th, asked for a declaration of war on Japan only. However, it was generally understood that, as Japan's ally, Germany would declare war on the United States, which it quickly did.]

There is discussion as to how soon the U.S. Navy will go on the offensive against the Japanese Navy. [The commentators were still unaware that the Pacific Fleet had been devastated and that U.S. Pacific defenses were in shambles.] There is discussion on whether or not Russia will declare war on Japan. [As noted above, this did not occur until August 8, 1945.] It is suggested that the Aleutian Islands could be used to launch bombing raids on Japan, since such raids would cause widespread panic among the Japanese people. [On April 18, 1942, sixteen B-25 bombers launched from the aircraft carrier Hornet, carried out the first air raid on Japan. Although the damage done was trivial, the psychological effect on the Japanese people was profound.] The commentators are in general agreement that, given its limited natural resources, Japan cannot possibly win a war against the United States.

On December 8, 1941, in his famous "Day of Infamy" speech, President Roosevelt asked Congress to declare "that since the unprovoked and dastardly attack by Japan on Sunday, December seventh, a state of war has existed between the United States and the Japanese Empire." Congress took only 33 minutes to approve the President's request.

### Author's Note

Most of the December 7, 1941 broadcast day was transcribed and is now generally available on audiocassettes and CDs, and in the MP3 format. Some collections offer only highlights of the news coverage, while other collections are extensive enough to include most of the programs that the major networks aired that day. Heard today, these recordings provide a unique opportunity to relive one of the most profound days of the 20th Century as it was taking place.

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# Reading, 'Riting and Radio

By Carole Perry WB2MGP

"It's something women just don't do." These were the words said to me in the late 1970s when I announced that I wanted to get an FCC-issued ham radio license. Little did the engineers I worked with at the time, who said this to me, realize what a great challenge they had given me. At the time, I was an executive vice president of a small electronics manufacturing company where most of the engineers were also ham radio operators. I saw them having so much fun on their radios during lunch breaks that I was determined to get my license too.

In a short time I did get my license and was having fun communicating with local hams as well as with hams from other countries. But, when the electronics company relocated, I decided to return to my first love, that of teaching.

A principal, seeking a teacher with innovative ideas, asked me to create a pilot program for Intermediate School 72 in Staten Island, New York, in the Arts and Technology Department. Once again there were lots of people telling me that the curriculum for a ham radio program would never get approved in New York City schools. Once again, "they" were wrong.

***Two second grade boys with their code practice oscillators practicing code on the buddy system. This photo was taken at a demo I gave at the school in February, 2009.***

## Teaching the Course

In 1981 I wrote the "Introduction to Amateur Radio" course, which uses the radio to motivate children in all areas of the school's curricula. I taught 15 classes per term with 35-40 students in each class. This hands-on, high-motivation course was a huge success with the 6th, 7th, and 8th graders for 30 years.

I didn't teach the course as a licensing

***Seventh-graders at the ham shack in 1995.***

program. I simply required that my students be open minded and be willing to try new things that they'd probably never get a chance to experience again in their school careers. A whole new world of adventures opened up to all the youngsters coming through the ham radio program. Even though it wasn't a requirement, many of the children did get their FCC licenses and went on to become enthusiastic hobbyists, or in some cases, to pursue technical careers.

The concept of putting youngsters on the air was not widely accepted back in the late 70s. Many hams told me that "others" wouldn't like the idea of school-aged children getting on the radio. They would be afraid that it would become like CB (Citizen's Band radio.) Well, in 30 years of putting thousands of young people on the air, I never experienced anything but an outpouring of support and welcome from the ham community. Once again, "they" just didn't get it.

I always had the support of our PTA (Parent-Teachers Association) because I encouraged the parents to study along with their children. I would then tell the kids: "Study at home with the person who has the money. If mom or dad gets a ham radio license, you know you'll be getting radio equipment." The parents loved working with their children, and the kids thought they were putting something over on their parents.

## Ham as a Second Language

In almost every class, there were non-English speaking children, special needs students, and youngsters with varying levels of abilities. The radio program gave me the ability as a teacher to appeal on some level to all of them. The students were always made to feel they were part of something very special. Every single student learned Morse code.

Even those who had problems with English could communicate and have fun with our specially designed code practice oscillators. The children were actually taught to listen and to concentrate. These are skills which are not usually taught in a classroom. They practiced code on the buddy system, so they were forced to listen and to concentrate in order to translate their partner's message. What fun we had when over 30 telegraph keys were being used at the same time!

The appearance of our room was different from other classrooms. After every contact we made on the air, we would send out a QSL card. We had so many thousands of QSL cards sent back to us that, when we hung them all up, you couldn't see the color of the walls anymore. Years later, former students would return and say they "missed the feel of the room."

Every student came into the program on equal footing. No one knew Morse code or anything about ham radio before they came to my class. Certainly, no one had ever spoken to astronauts and no child had ever spoken live to other school children during an earthquake or hurricane disaster. Everyone felt special because everything we did was special.

## Astronauts and Kids

Astronauts and kids; there's a winning combination! One day our class was fortunate enough to have Jay Apt N5QWL, an astronaut at the Johnson Space center, contact us on the air. He was nice enough to do a whole lesson with

***Carole Perry and Jay Apt at the Johnson Space Center at the Weightless Environmental Training Facility in April, 1991.***

the students designing a space suit. He enjoyed speaking with the kids so much that he extended an invitation to me to visit with the all-ham crew of the space shuttle Atlantis in April, 1991 at the Johnson Space Center in Houston, Texas. Within 24 hours, I was on my way to Houston. I strongly believe that when opportunity knocks, you'd better be ready to open the door and let it in.

Where else, except through this incredible ham radio, could an average teacher get the chance to have such an adventure? Jay Apt invited me up on the diving board at the Weightless Environmental Training Facility (WETF). It was the experience of a lifetime to watch him practice a spacewalk on a submerged shuttle at the bottom of the pool. We took lots of pictures, and when I got back to school I had the best "Show and Tell" ever!

Through the years we made several space shuttle contacts and spoke with many of the astronauts who were licensed hams. What percent of human beings get a chance to go into space? What percent of school kids actually get a chance to ask them questions and speak with them? Hundreds of students in the ham radio classes did get that chance; and they'll remember it always.

## School Wide Support

The ham radio program always got support from other teachers in the school. Teachers from different departments were invited to work with us. Science and math teachers were happy to coordinate their curricula with projects I had my classes doing. Social studies and foreign language teachers worked with me to provide enrichment activities in the ham radio classes.

***Carole Perry and seventh-grade kids with QSLs in the background in 1994.***

Current events were truly current in our classes, because we often spoke live to hams that were in the midst of natural disasters or occurrences. One of my classes spoke to students in a class in Los Angeles during an actual earthquake. They got to ask questions about what preparations were being made in the school for their safety. It was very exciting. Some of my students stayed in touch through letters with the students they had spoken with on the air.

It's worth mentioning, that every time we had one of these exciting adventures, we were in the local newspaper or on TV. School administrators love to have positive articles written about their students. Everyone benefits from an exciting and challenging program that captures the imaginations of the kids.

## Interesting Cultural Exchanges

There were so many great contacts that we made through the years. Many of them led to long term interactions. A contact with the Twin Wells Indian School in Holbrook, Arizona prompted us to have the classes meet once a week on the radio. We sent packages of items that were indigenous to the New York area like scrapbooks of the mall, Broadway program books, postcards of Coney Island, Rockaway Beach, video tapes of our school which had 1,500 students, and posters of the Manhattan skyline. In return, we received a package of pictures of their school which had 33 children, and handmade artifacts, jewelry, and postcards of the beautiful Navajo Indian Reservation.

***Robert and Brian organizing our cultural exchange with the Navajo Indian Reservations School in 1994.***

One year we made contact with a one room school house off the coast of Maine. We would often speak with the 7 students in total, who were in 1st grade, 3rd grade, 6th grade and 8th grade. What a contrast to our school! We sent them a video of our cafeteria at lunch time, our gymnasium with 5 classes at a time in it, and the school playground with most of the 1,500 students walking around.

In addition, we sent a refrigerated package of Nathan's famous hot dogs from Coney Island in Brooklyn, New York; pizza, bagels, and Italian pastry. Later, the local TV cameras and the press were waiting in our school lobby when the UPS truck driver delivered a refrigerated package of live Maine lobsters. The cooking teacher and a local restaurateur demonstrated the preparation of the lobsters, prepared them, and served them to all the students who had been involved in the contacts with the school in Maine. What fun!

There's no better way to teach geography than on a need to know basis. Every time we made a contact with another state or another country, we would connect a piece of woolen string on a big wall map from Staten Island, New York to the part of the world we had the contact with. The children could get a perspective on a map or a globe from where they were located and the distance to the person at the other end of the radio contact.

## The Retirement Years

In 2004 when I retired, I began to think of ways that I could help recreate my program in other schools across the country. The answer came when I got elected to the Board of Directors of a terrific organization called the Radio Club of America, which celebrated its 100th year this past November. An Education Committee was formed with the goal of encouraging radio and technology in schools for grades 12 and below. RCA has a very fine Scholarship Committee which gives support to college students pursuing technical studies. But my committee looks to encourage and support the elementary, middle school, and high school student who shows talent in wireless communications.

***Nine young speakers at the 2009 Dayton HamVention Youth Forum: Simon Boehme (17), Steven Makky (12), Carol Makky (9), Robert Makky (11), Caitlyn Reynolds (16), Austin Schaller (14), Ben Veltman (16), Ian Blodger (18), Josh Gerard (15), all gave dynamite presentations.***

We created an RCA Young Achiever's Award which is a certificate presented along with a stipend check to a deserving youngster. Eleven of these awards have been given out so far this year to kids from all across the country. Each of the nine young speakers who gave presentations at my Youth Forum at the Dayton HamVention this year received the RCA Award. We're always on the lookout for technically talented youngsters who would be encouraged by this award from such a prestigious club.

In addition, as co-chair of the Education Committee I go to different schools to encourage the incorporation of a radio/technology class or club, into the school's curricula. We rely on donations to our committee to help get these programs going. Our committee has also set up a system to receive donated radio equipment that can be inspected, and repaired if necessary, and then forwarded to a deserving school or group that works with children. A recently donated ham radio station was sent to a ham radio society in Orlando, Florida that visits schools and children's hospitals and lets the kids participate in contacting the International Space Station.

If I have managed to inspire any teachers or instructors who are reading this to consider setting up a radio/technology class, please do not hesitate to contact me for suggestions and help. It's not necessary to reinvent the wheel. I will be happy to give you the benefit of many years of having fun with a terrific educational endeavor. I welcome anyone who is interested in helping us with our goal of attracting young people into technical pursuits to join us. Look us up on the website: www.radioclubofamerica.org or contact me at:WB2MGP@ix.netcom.com

*Editor's Note: In addition to her work with the Radio Club of America, Carole Perry is also a columnist for WorldRadio magazine and has moderated the "Youth Forum" and "Instructor Forum" at the Dayton HamVention for the past 22 years.*

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# *Readers Write About:* DTV, HD-Radio and Shortwave Audio

## ❖ The Uneven Road to DTV

Many readers have written over the last couple of months, since the curtain fell on analog TV in America, to talk about their problems with the conversion to Digital Television (DTV) which, for most, has proved to be a positive change. If you live in an area that experienced a smooth transition to DTV your off-air TV life improved dramatically.

My own experience was probably more typical than not. Even though I live a fair distance from the nearest TV transmitter (30 miles) things went mostly according to plan. Only one station, that had been simulcasting on UHF for the previous five years, switched to VHF on June 12 and disappeared for thousands of viewers who had no trouble getting the UHF signal but had trouble with VHF. The station was forced to deal with a flood of indignant viewers and had to explain on their web site why viewers could no longer watch the channel and what steps they would need to take to do so. This particular station also received permission from the FCC for a power increase for their DTV VHF signal to fill in the areas they had covered earlier with their analog and DTV UHF signal.

Long-time MT reader Tim Kuryla wrote that he was surprised to learn that in some cases DTV channel assignments were adjacent numbers, for instance, there could be a channel 35 and a channel 36 in the same city, an assignment that would never have been made in the analog days. He also noted that, in his area near the Canadian border, Canadian channels that were part of the analog dial were still there in analog (he pointed out that their switch wouldn't be until 2011).

I had wondered about the spacing issue too since that had happened in my area as well. I asked MT's own answer man, Bob Grove, about it and his reply was, "I suspect the adjacent channel licensing has to do with the better sideband control of digital TV signals. It's not as likely for splatter which would cause adjacent channel interference."

The seemingly arbitrary assignment switch from UHF to VHF caught many consumers, who had installed UHF-only antennas, off guard. The extra expense of installing a VHF antenna for only one channel proved too much for some, who signed up for their local cable TV or satellite TV provider. As Tim noted, "The FCC did not do us any favors by making some of the transmitters VHF."

Another aspect of the switch also troubled me. I had been one of the first to get a DTV coupon when they became available and I still have it. I was unable to use it because I couldn't find a converter that was as good as my six year-old DigitalStream HD1150, long since discontinued. Today most TV sets sold have all the digital reception components built in and, given a strong enough signal, work well. But, my HDTV set was one of the original LCD screen HDTV sets from six years ago and had only an analog tuner. So, I needed an outboard tuner that also provided HDTV outputs as well as a digital audio output and analog outputs to a DVD recorder, which the HD1150 had. The rush to make cheaper and cheaper converters led to smaller and smaller boxes with fewer and fewer features. I can only hope to nurse the old HD1150 along until the TV quits and I can upgrade to something newer (though not necessarily better).

## ❖ HD-Radio: Digital Déjà Vu

Another long-time MT reader, Morgan Little, has been trying to lock an HD-Radio signal from nearby KUT-FM, the public radio service of the University of Texas in Austin. "I called the UT public radio station engineer and asked about the inability of their KUT-HD3 to be heard here about 35 miles away. He suggested that maybe a vertical dipole would help. It didn't." Morgan tried various other homebrew remedies that got nowhere and wondered if a UHF HDTV antenna would work, at least they're small and cheap enough, he reasoned.

Many areas, especially those around major universities, are getting some interesting programming alternatives as many stations are now experimenting with their HD2 and HD3 programming. One of my local NPR stations recently began broadcasting a mix of BBC and NPR so that I can listen to BBC World Service just by going to their HD2 channel. But, there's a problem. The signal doesn't always stay locked.

So, why is that? It's because the FCC currently allows the HD signal to be only one percent of the analog signal. That's right, one percent! That means that, for example, my local NPR station, that's transmitting 17.5 kW for the analog signal, is only putting out 175 watts for the HD signal. It's a miracle it locks in at all from 50 miles away. I checked with the FCC and found that KUT-FM transmits 100 kW so, you're getting a 1,000 watt signal to play with. At 35 miles it's not enough to lock in with an indoor antenna. But, if you put a small FM Yagi on the roof, pointed at Austin, you'll probably get it to come in just fine.

Using an HDTV/UHF antenna won't work because the FM band is 88-108 MHz while the UHF-TV band is in the 400-800 MHz range. Now, a good VHF-TV antenna would work well for FM because the FM band is located between the old VHF analog channels 6-7. But, best reception, especially for FM DX, is done with an antenna specifically designed for the FM band. There are many good ones to choose from and most are relatively cheap. I've had good experiences with both Solid Signal (www.solidsignal.com) and Stark Electronic (www.starkelectronic.com). Both companies offer a wide range of FM antennas and accessories such as mast-mounted pre-amplifiers, coax cable, rotators and masts. And, yes, the same AntennaCraft's FM 6 six element FM Yagi that The Shack used to carry is found at both. If you're only 35 miles from the targeted HD-Radio signal, a six element Yagi mounted outdoors at a reasonable height may be all you need to lock that elusive HD3 channel. And, if you don't want to spring for a mast mounted pre-amp, get two FM-6s and stack them (half a wave length apart on the same mast). Using a signal combiner and fed with coax you'll get twice the gain for just $20 more.

***AntennaCraft's standard FM 6 six element FM Yagi antenna could be all you need to nail those FMHD signals that are 30 miles away. (Courtesy: AntennaCraft)***

The reason for using a Yagi is that, to lock in an HD-Radio signal, you need all the gain you can get and you need to get rid of any interference from the back and sides that will cause a digital signal not to lock. For years I have been pursuing FM DX and have written accounts of my efforts in various columns and articles culminating in a 24 element stagger-stacked Yagi array (that unfortunately succumbed to an ice storm last winter).

Currently, I'm using an Antenna Performance Specialties APS-13 which is a 13 element Yagi on an 18 foot boom at 25 feet on a rotator. The APS-13 is made in limited quantities and you may have to pre-order yours. Check out their specs at www.antennaperformance.com

*Antenna Performance Specialties' APS-13, ultimate FMDX antenna for those more elusive HD3 signals. (Courtesy: Antenna Performance Specialties)*

and inquire about price and availability at info@antennaperformance.com. Listed price is $200 plus $20 shipping. The antenna comes in three pieces and needs to be assembled on the ground.

But, there is good news for the future of HD reception. As reported in this month's Communications column, the FCC is expected to allow increases in HDFM transmissions by 6dB. Following extensive tests done at different locations around the country, researchers from NPR labs established that running HD transmitters at high power caused significant interference to adjacent FM channels, particularly in the lower part of the non-commercial portion of the band (AM will not get a go- ahead for a power increase). They actually found that a 10dB increase was optimum for getting close to the range an analog signal would achieve without interference. But, what the industry will settle for is a 6dB interim increase. It was judged that anything less than a 6dB increase would not be noticeable.

## ❖ Better Audio for Your Shortwave Radio

Phil, in Des Moines, Iowa wrote to comment about the September Beginner's Corner "Better Audio from Your Shortwave Radio." He wrote, "One of my shortwave radios is a Realistic DX160. With a SP150 Communications Speaker it always had a harsh and lousy sound. I even bought a speaker that was supposed to correct the problem, but it didn't help. I hooked up a spare computer speaker system to it as you suggested and now it sounds great. Thanks!"

I had a lot of fun doing that column, trying out the various audio options. My favorite was the Kloss Model 1 radio. While Henry Kloss passed away several years ago, Tivoli audio still makes this model which is still carried by J&R (www.jr.com) for $150. C. Crane offers a similar radio from Sangean (WR-11) for $100.

*Tivoli Radio's Model One brings solid audio to your shortwave radio. (Courtesy: Tivoli Audio)*

*Sangean WR-11, another inexpensive way to get better audio from your shortwave radio. (Courtesy: Sangean)*

These radios are falling out of favor with retailers and manufacturers. They're being replaced with iPod docking-equipped or satellite radio-equipped sets with CD players, etc. Of course, all those models are stereo. But, for shortwave reception, stereo is unnecessary and the great thing about the Kloss Model One was that it delivered wonderful, rich monaural audio in a desk footprint that took up very little room that also had a nice AM/FM tuner built-in. The warm look and sound really go with the retro audio of shortwave.

You might have good luck, as Phil did, with generic computer speakers. In general, these speaker pairs are very inexpensive (less than $20) though they can go as high as the Bose Companion series computer speakers that deliver the expected Bose quality audio for about $100. And, if you're not interested in having AM/FM tuning, this may be the best option. I've enjoyed plugging my C. Crane FM transmitter into the back of the shortwave radio and tuning it in on the big stereo. I've also found that "communications" speakers, designed for ham transceivers, won't necessarily give you better audio. Their main concern is "clarity," which often means sacrificing wider-ranged audio for better readability on the more typically narrow-banded ham transceivers.

*Bose Companion series computer speakers for your shortwave radio. (Courtesy: Bose Corp.)*

## ❖ FCC Comments and Complaints Update

The FCC has added a new Electronic Comments Filing System (ECFS) which it says "serves as the repository for official records in the FCC's docketed proceedings and rulemakings from the year 1992 onward. Consumers can research, retrieve, view, and print any document in the system, including earlier non-electronic FCC documents that have been scanned into the system." http://www.fcc.gov/cgb/ecfs

You may also file complaints electronically by going to this page: http://esupport.fcc.gov/complaints.htm.

The site says that it works well for those using Mozilla Firefox 3.5 and my experience is that it does. However, I found that filing for an amateur radio license renewal in Firefox would not work. Once I changed to Internet Explorer there was no trouble. But, it took many calls to the FCC help desk to finally put me in touch with someone who knew that.

And, finally, In the October edition of the Beginner's Corner an inadvertent typo made its way past the keen eyes of our crack proofreading team. The FCC FAX number listed as 866-4180-0232 should have been 866-418-0232.

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# How Much is that Player in the Window?

If you are still scouring the planet for gift ideas for your special someone, might I suggest that this be the year that you give them a WiFi radio?

The surge in popularity of Internet radio has lead to a full-on flooding of the market for WiFi radios. Everything from small bedside models to sophisticated touch-screen units, there is a WiFi radio for nearly every person, ready to open up the world of Internet radio.

If you are a regular reader of *GlobalNet*, you may recognize some of these units, as they have been mentioned in previous columns. And, while this does not promise to be an exhaustive list of all that the WiFi radio market has to offer, it should be a good starting point for those looking for the radio/streaming hobbyist on their list.

### Sangean WFR-1

I would be remiss if I didn't include this model on my list. Not just because it is sold at Grove Enterprise (which it is), but because it is sitting right behind me in my living room, pumping out morning traffic reports from Manchester, England as I type this column.

The WFR-1 is a beautiful WiFi radio. The walnut finish and glossy black faceplate make it an attractive addition to any home theater system, living room, or bedroom.

The controls are a breeze. The WFR-1 uses the commonly used Reciva interface. Stations are sorted by location: continent, country, city. The included remote control enables you to set ten presets so you can only be one button-click from your favorite stations.

The audio is phenomenal: full and rumbling lows, clear mids and highs without any harsh bite.

The price tag ($349.95) is a bit steep, but worth it for those looking for an elegant and high-quality WiFi radio for their home.

### Grace GDR-IR3020

While not currently in my stable of WiFi radios, I did have the pleasure of reviewing this unit a few months ago.

A little more suited to the casual listener than the WFR-1, the 3020 has a modern styling and includes an iPod dock for added music functionality. It also has an easy to use interface, using the Reciva-based station list.

While the audio is not quite as full on the low-end side as the WFR-1, the 3020 does hold its own quite well in terms of audio quality. I found the 3020 to be a great option for those looking for a bedside Internet radio or for background music in the office

The 3020 can also be ordered at Grove Enterprises for $239.95.

### VTech IS9181

This unit was recently the centerpiece of VTech's sponsorship of the Voodoo Experience at the end of October in New Orleans, Louisiana.

The 9181 marks the entry of VTech, one of the leading cordless telephone makers, into the WiFi radio market.

The 9181 has many of the same features as the majority of WiFi radios on the market: Reciva interface, auxiliary audio input, and the ability to stream audio files from computers within a home-network and a remote control.

The 9181 can be ordered through **Amazon.com** for about $145 as of press time.

### Logitech Squeezebox Radio and Squeezebox Touch

I cannot wait to get my hands on one of these models. All of the reviews I have read are simply in awe of both the Squeezebox Radio and Touch.

Regular readers might recall my recent column where I discussed the release of these models. Logitech has taken their popular Squeezebox line to the next level with a color LCD display and, in the Touch model, a touch screen interface.

The Radio incorporates speakers for an all-in-one unit. The Touch requires that you interface it with an external audio system. Those with fancy home theater systems will undoubtedly find the Squeezebox Touch to be a sophisticated addition to your current set-up.

Both models will also incorporate support of Rhapsody, Slacker, Pandora, Sirius and Last.fm. The Radio model is even supposed to support Facebook integration.

The Squeezebox Radio retails for $199 and is already available. The Squeezebox Touch should be coming available this month, and it likely will retail for closer to $300.

### Revo Domino D1, D2, D3

The latest creation from the UK-based Revo, the Domino is a stylish WiFi radio with iPod / iPhone docking station.

There are three different models of the Domino, each with different features to suit the amount of "cool stuff" users are looking for.

The D1 is a DAB and DAB+ radio. The D2 adds Internet radio streaming and Last.fm support. The D3 has the same features of the D2 in a little more modern and stylish cabinet.

Our readers in the UK should be able to pick up their Revo Dominoes this month. The D1 will retail for about £130, the D2 at £150, the D3 at £170.

## ❖ Apple goes FM?

Rumor has it that Apple will soon release an application for their iPhone and iTouch products that will allow users to tune in FM radio stations.

No, you didn't read that wrong. Apple, holder of all things hip and cutting edge, is going to add support for good, old-fashioned, terrestrial broadcasts to their popular app-powered products.

The iPhone and iTouch have long had support for receiving (and apparently broadcasting) FM signals, but these features did not come enabled when shipped. In addition, the new iPod Nano already has an FM tuner built-in, so FM isn't exactly a "new" thing to Apple. Making a big to-do about it in their marquee product is a bit puzzling.

What is supposed to set this feature apart from the Nano FM Tuner is iTunes functionality. Apple is supposedly working on a tie-in, so that when you hear a song on the radio that you like, you can tag that song for purchase on iTunes.

Another rumored feature of the app, and one shared by the Nano FM tuner, is the ability to pause and fast-forward live FM transmissions.

As a devoted iPhone owner, I truly hope this app comes to fruition. Maybe, by the time you read this column, I will already be tuning in FM signals on my phone. If so, I will naturally give you a mini-review here in GlobalNet.

## ❖ NPR releases its own WiFi radio

Are you are fan of National Public Radio? Do you wish you could listen to your favorite NPR stations online, but are having a hard time getting on board with Internet radio?

NPR has come up with its own solution.

In conjunction with Livio, NPR has released its own WiFi radio, the aptly named: NPR Radio.

Selling for $200 through the NPR online store, NPR proclaims the radio as an easy-to-use, one-stop source for all things NPR. In addition to providing access to more than 16,000 NPR stations, the unit will also record up to two weeks of programming, in case you miss something or just want to hear it again.

The unit has an alarm clock function for those who plan to use it bedside. It comes with a built-in WiFi antenna, remote control, and built-in speaker. If you wish, you can also route audio from the radio through your home stereo system (an RCA to 1/8" stereo adapter is included). There is even an auxiliary input for those mornings when you would rather listen to your iPod than *Morning Edition*. Not that you would, would you?

## ❖ Senate panel okays royalty fees

Does it even seem possible that the holidays are once again upon us, and another year has passed? It's especially hard for me to believe that a year ago I was just getting underway as the *GlobalNet* columnist. In the past 12 months, I have learned a lot about what it takes to put together a monthly column that is both informative and meets the parameters of what we are trying to accomplish.

I have also learned a lot about the future of the industry I used to call my career. As some of you may know, I am a former broadcaster, with nearly 8 years of experience in the radio industry. In that time, I held nearly every title one can hold at a radio station: on-air personality, news director, sports director, programming director, sales manager, account executive, production assistant, talk-show host, production director, board operator, and more.

During the last few years of my stint in radio, I saw the writing on the wall: the shift to Internet broadcasting was coming. But, never in my wildest daydreams did I imagine Internet radio would become what it has in the past few years.

With stations looking to cut costs while still reaching new listeners, Internet radio has suddenly been pushed to the forefront of many terrestrial stations' broadcast package. Now, station marketing routinely places as much emphasis on the station's streaming site as it does its broadcast frequency.

However, if recent developments are any indication, we could see even more of a push towards the Web by broadcasters.

Recently, the U.S. Senate Judiciary Committee approved a bill that would require radio stations to pay a per-song royalty. Currently, stations only pay annual fees to song publishing companies such as BMI and ASCAP. The new royalty – which still must pass votes by the House and Senate – would require stations pay each artist directly per performance of their song. A similar bill passed the House Judiciary Committee earlier this year.

The National Association of Broadcasters has been fighting the bill since its inception. The NAB claims the artists are already being fairly compensated through annual royalty payments and through free promotion of their music through the stations.

However, the Recording Industry Association of America, which is backing the bill, claims that radio has for too long had a free ride. To be fair, terrestrial radio stations are the only such media outlet that does *not* pay a per-performance royalty at this time.

Under the current system, if a radio station plays a U2 version of a Beatles song, only the original owners of the song's copyright would receive royalties. Under the new bill, U2 would also receive payment.

What does this mean for streaming and radio hobbyists? Well, right now, nothing. The NAB has claimed to gather a large amount of support in the House to shoot down the bill. However, if the bill is signed into law, there could be massive changes.

While larger radio companies like Clear Channel Radio would stand to take the largest hit, the measure could also make a big impact on the bottom lines of smaller radio companies, too.

Many of these smaller companies are already operating on a shoe-string budget. While the bill allows for smaller stations to incur a flat-rate fee, any added expenses could result in further staff or other operational cuts.

Across the board, one side effect could be a stronger push to develop each station's online streaming content. Stations could reduce the number of broadcast hours or at least reduce their power, and turn to their streams to provide wider coverage. They could also turn to their streams to offer additional options to their advertisers.

Either way, we likely will not see either the House or Senate vote on the measure until sometime early in 2010. I will keep you updated on the progress of what could be a crippling blow to an already staggering radio industry.

### GLOBALNET LINKS

Grace GDR-IR3020 at Grove Enterprises
**www.grove-ent.com/product402.html**
Is Apple Going Terrestrial?
**www.fool.com/investing/general/2009/10/14/is-apple-going-terrestrial.aspx**
Logitech Squeezebox Line
**www.logitechsqueezebox.com/**
NPR Radio by Livio
**http://shop.npr.org/products/The_NPR_Radio_by_Livio-906-0.html**
NPR Unveils Its Own WiFi Radio:
**www.crainsnewyork.com/article/20091018/SUB/310189960**
Radio App for iPhone and iTouch coming soon
**http://printerinkcartridgesblog.printcountry.com/?p=5459**
Revo Domino
**http://crave.cnet.co.uk/digitalradio/0,39029435,49303823,00.htm**
Sangean WFR-1 at Grove Enterprises
**www.grove-ent.com/wfr1.html**
Senate Judiciary Committee passes bill: **http://online.wsj.com/article/SB10001424052748704112904574475621508210340.html?mod=WSJ_hpp_MIDDLTopStories**
VTech IS9181
**www.vtechphones.com/vtechui/store/music/**

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# Scanning through the Years

The end of the year is a good time to take a brief look back and see how far scanner technology has come over the past few decades. Computerized radios and increasing demand for spectrum space continue to drive our hobby forward, creating challenges for scanner listeners. Devices and techniques that worked well in the past may no longer be sufficient to keep us tuned in to what is happening around us.

## ❖ Tuning the Bands

Over the years I have had a number of multi-band radios that covered the old public safety bands. Models like the Radio Shack "Patrolman" series provide continuous tuning across the main bands of interest:

| | |
|---|---|
| Low VHF | 30 to 50 MHz |
| Aviation | 108 to 136 MHz |
| High VHF | 150 to 174 MHz |
| UHF | 450 to 470 MHz |

Spending quality time with your radio, constantly tuning up and down the dial looking for new stations, is common for shortwave listeners, but it requires your on-going attention. Doing the same kind of manual searching for police and fire calls is not terribly efficient nor effective. What was needed was a radio that could do the searching for you.

## ❖ Tunable Scanner

My first receiver that actually scanned without crystals was a mid-1970's vintage General Electric "Searcher" portable radio, with four VHF channels that could be individually tuned from 150 to 174 MHz. Each channel had a separate tuning knob hidden beneath a cover, allowing you to "set and forget" the frequency, which was displayed on an analog meter. The meter also doubled as a battery strength indicator. Each channel also had an individual lockout switch and a red LED to indicate when it was active. Scanning could be done automatically or stepped manually.

The Searcher also tuned the AM and FM commercial bands, so I could listen to music and news on it as well. Tone, volume and squelch controls were all smooth and worked rather well. The Searcher could run on batteries or AC power and had a hinged carrying handle that also served as a tilt-up stand. It sold for about $150 in 1975. According the Federal Reserve inflation calculator (found at **www.minneapolisfed.org**), $150 then is almost $600 now. That makes today's new digital-capable scanners look like feature-packed bargains!

I recall having one of the four Searcher channels tuned to the local weather radio frequency, especially during severe weather, so my "instant weather" capability was implemented by turning the lockout switch for that channel on and off. The other channels would have been set to the county sheriff, state police, and volunteer fire department.

As it turns out, there were actually two "Searcher" models. The first, larger model that I had was popular enough that a couple of years later GE introduced a pocket radio with just the tunable scanner section.

## ❖ Synthesized Frequencies

Developments in computer-controlled oscillators eventually resulted in the availability of inexpensive, stable frequency synthesizers in the late 1970s. These devices soon replaced plug-in crystals and manual tuning knobs.

My first scanner with synthesized tuning was a handheld Bearcat 100XL, bought through the mail in the mid-1980s. It offered 16 channels in the following VHF and UHF bands:

| Frequency Range | Description |
|---|---|
| 30 to 50 | VHF Low Band |
| 118 to 136 | Aircraft |
| 136 to 144 | Land Mobile (Military) |
| 144 to 148 | Amateur Radio (2-Meter) |
| 148 to 174 | VHF High Band |
| 406 to 420 | Land Mobile (Federal) |
| 420 to 450 | Amateur Radio (70 cm) |
| 450 to 470 | UHF |
| 470 to 512 | T-band |

The 100XL scanned at 15 channels per second and had a priority channel, conveniently set as memory location 1.

Programming the scanner was about as simple as you could get – choose one of the 16 channels, key in the frequency, and press the Enter key. Decide whether it needed a three-second delay and start scanning! I didn't have to buy any crystals and I didn't have to tune (and re-tune) each channel.

I found a discarded wire brochure holder that was a bit larger than the scanner and attached it to my dashboard using adhesive-backed Velcro straps. Viola, an instant mobile scanner mount that allowed me to see and hear the scanner but could be easily removed.

Sixteen channels covered the local police and fire departments as well as the county sheriff. During the winter I also had the snowplows and road crews programmed in (this was Chicago, after all).

Listening to suburban Chicago police departments in the 1980s, it was common to hear "Go secure." A few seconds would pass and the next transmission you heard sounded like Donald Duck with a bad head cold. Many departments used a process called *voice inversion scrambling*, which perhaps offered some level of privacy against new scanner users, but could be overcome either by experience (after a while you could understand what they were saying) or by an add-on device that unscrambled the voice inversion.

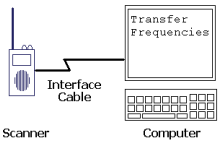
I eventually moved up to a Bearcat 200XLT that had 200 channels and 800 MHz coverage. It was nice to have so many channels, but programming became a chore, having to enter all of those frequencies by hand.

## ❖ Computers and Scanning

These days a personal computer easily handles such programming tasks. Inexpensive or free software and a data cable allow you to rapidly load new frequencies and settings into your scanner. It also allows you to share your settings with other hobbyists and to use their frequency lists in your scanner without a great deal of tedious keypad entry and double-checking.

Scanning is also moving beyond the scanner. Streaming audio feeds on the Internet provide real-time conversations from many cities and several countries. Webs sites like **www.police-scanner.info** and **www.scanamerica.us** list more than 100 available feeds and allow you to hear the action as it happens. All you need is a computer and a sufficiently fast connection to the Internet.

Because high-end cellular telephones like the Apple iPhone and the RIM Blackberry also offer Internet connectivity, it is possible to listen to these streaming feeds without a scanner. As an example, Wunder Radio (**www.wunderradio.com**) sells an iPhone application to access Internet audio streams, including



commercial radio stations and a number of police and fire departments. A similar application from Moodio (**www.moodio.fm**) makes audio feeds available to Blackberry users.

## ❖ The Villages, Florida

*I have a 25+-year-old Regency Z10 scanner. Up until a few weeks ago I was able to scan my development neighborhood watch, local police, weather and medical. Now for some reason I can only hear the weather station. Is it unlikely that they all went to trunking at once?*

*I am in The Villages, Florida (it is about half way between Orlando and Ocala). I checked and there are only a few agencies that use trunking in this area.*

*The scans that used to work are:*

*463.650 Neighborhood watch (base)*
*468.650 Neighborhood watch (mobile)*
*154.785 Town of Lady Lake police*
*155.115 Town of Lady Lake police*
*152.220 Sumter County Sheriff*
*162.500 Weather*

*Now the only one that is active is the weather. The weather was a default channel from the factory (channel 10), and I tried moving the frequency to another channel and it worked fine.*

*Terry in Florida*


The Villages is the largest residential development in central Florida and one of the fastest growing areas in the United States. It spans three counties, Lake, Marion, and Sumter, and much of the development requires that at least one person over the age of 55 reside in each home. More than 75,000 people live in The Villages and many make use of about 38,000 golf carts to get around the area.

The Regency Z10 is a 10-channel programmable scanner that covers Low VHF (30 to 50 MHz), High VHF (144 to 174 MHz) and UHF (440 to 512 MHz).

Lake County uses an APCO Project 25 system, so you will need a newer digital-capable scanner, such as the GRE PSR-500 or PSR-600, the Radio Shack PRO-106 or PRO-197, or the Uniden BCD396T or BCD996T.

Lake County transmits on the following frequencies:

North System:
769.25625, 770.75625, 771.78125, 772.45625, 851.07500, 851.18750, 851.32500, 851.62500, 852.57500, 853.05000, 853.55000 and 853.73750 MHz.

Central System:
769.26875, 770.30625, 770.76875, 771.05625, 772.00625, 772.75625, 851.26250, 851.76250, 852.26250, 852.76250, 853.41250 and 853.53750 MHz.

South System:
770.31875, 771.06875, 771.79375, 772.01875, 772.46875, 772.76875, 851.22500, 851.72500, 852.20000, 852.70000, 853.72500 and 853.90000 MHz.

Talkgroups on this fully digital system include:

| Decimal | Hex | Description |
|---|---|---|
| 4353 | 1101 | Clermont Police (Dispatch) |
| 5121 | 1401 | Eustis Police (Dispatch) |
| 5633 | 1601 | Groveland Police (Dispatch) |
| 8193 | 2001 | Lady Lake Police (Dispatch) |
| 6401 | 1901 | Leesburg Police (Dispatch) |
| 8705 | 2201 | Mount Dora Police (Dispatch) |
| 9473 | 2501 | Lake County Fire Dispatch (patched with 154.385 MHz) |
| 9474 | 2502 | Lake County Fire Tactical 2 |
| 9475 | 2503 | Lake County Fire Tactical 3 |
| 9476 | 2504 | Lake County Fire Tactical 4 |
| 9477 | 2505 | Lake County Fire Tactical 5 |
| 9729 | 2601 | Lake/Sumter Emergency Medical Services (Dispatch) |
| 9733 | 2605 | Florida Hospital |
| 9734 | 2606 | Leesburg Regional Medical Center |
| 9735 | 2607 | The Villages Regional Hospital |
| 9736 | 2608 | South Lake Hospital |
| 9749 | 2615 | Lake/Sumter Emergency Medical Services Helicopter |
| 10241 | 2801 | Lake County Sheriff (North) |
| 10242 | 2802 | Lake County Sheriff (Central) |
| 10243 | 2803 | Lake County Sheriff (South) |
| 10497 | 2901 | Tavares Police (Dispatch) |

Notice that the Lady Lake Police Department is now on the trunked system.

Sumter County public safety operates conventional (non-trunked) analog channels on the following frequencies:

| Frequency | Description |
|---|---|
| 153.965 | Sumter County Sheriff (Dispatch) |
| 154.370 | Sumter County Fire (Paging) |
| 155.040 | Sumter County Fire-Rescue (Dispatch) |
| 156.135 | Sumter County Sheriff (Tactical 5) |
| 159.015 | Sumter County Sheriff (Tactical 3) |
| 453.300 | Sumter County Transit |
| 461.450 | Sumter County Fire (Dispatch for Stations 41 - 44) |

I didn't see a listing for the Sumter Sheriff on 152.220 MHz; in fact, the FCC database doesn't show any license for that frequency in the State of Florida. I would suggest listening to any of the frequencies listed above for activity.

The two neighborhood watch frequencies you list are licensed to Village Center Community Development District (call sign WPGZ755) for operation within 40 kilometers of Lady Lake. The license is active and good through 2015, so if you can't hear them I don't think it's because they lost their license. They certainly did not go to trunked operation with just two frequencies!

It's also possible that something has finally failed in that old Regency. Perhaps it is time to consider an upgrade?

## ❖ Albertville, Alabama

*Hello,*

*I live in a small town in northeastern Alabama called Albertville. I'm looking to purchase a police scanner and as a novice I have one important question before I purchase. I do know that Albertville uses trunking and employs the Motorola Type II Smartnet.*

*My question: Is Motorola Type II Smartnet a digital system or an analog or can it be both? I know the five 800 frequencies plus the 400 dispatcher frequency. Should I purchase a trunked digital or a trunked analog? The digitals are in*

*the $500 range and are a little pricey for me.*

*Any help in this determination would be sincerely appreciated. I've searched everywhere for the answer to this and just read your article on line entitled "Tracking Motorola Systems." It was very educational for me but did not answer the digital/analog question for me.*

*Thank you in advance.*

*Bill in Alabama*


Albertville is a town of about 18,000 located in Marshall County in northeast Alabama. The town used to operate a Motorola trunked radio system with analog voice traffic, but in March of 2008 they completed a frequency rebanding process and converted to digital operation at the same time.

The new frequencies are 851.3250, 853.3000, 854.8375, 855.8875, 856.7625, 857.7625 and 858.7625 MHz. These frequencies are all transmitted from a repeater site located on a water tank about 3 kilometers north of Boaz.

Two talkgroups have been reported, although there are certainly more in use:

| Decimal | Hex | Description |
|---|---|---|
| 16016 | 3E9 | Police Dispatch |
| 16336 | 3FD | Fire Dispatch |

## ❖ Rebanded Motorola Channels

The control channel for the new Albertville system still uses the 3600-baud Motorola format. As we've covered in previous columns, the control channel carries commands and responses between the repeater site and radios. The commands that instruct radios which channel to tune to for an active talkgroup don't include the actual radio frequency of the channel. Instead, they include a number that represents the frequency. When the radio receives a command with a channel number, it converts the number into a radio frequency and then tunes to that frequency.

In order to follow trunked conversations correctly, scanners must also convert the channel number into a radio frequency. This conversion process was designed when frequencies between 851 and 854 MHz were assigned to be 25 kHz apart, for a total of 120 channels. When Motorola assigned their channel number scheme to this part of the 800 MHz band, they simply started from channel 1 and went up by 25 kHz for each subsequent channel. For instance, channel 1 would be 851.0125 MHz, channel 2 would be 851.0375 MHz, channel 3 would be 851.0625, and so on.

The rebanding process moves public safety users into frequencies between 851 and 854 MHz. Because channels in the 800 MHz are scarce and technology improvements have increased the efficiency of radio equipment, the Federal Communications Commission (FCC) decided to reallocate the channels in that space to be 12.5 kHz apart, thereby establishing 240 channels where there were only 120 before. These narrower channels allow more users to fit in the same space, but create a problem for the Motorola channel numbering plan, since the new channels don't line up with the old channels.

If you try to track trunked activity on a rebanded system and your scanner doesn't know about the new channel assignments, it will not tune to the correct radio frequency and you will not be able to hear the conversation.

## ❖ Firmware Upgrades

There are a couple of ways to fix this problem. This first (and easiest) way is to get an updated version of firmware from the scanner manufacturer and install it. This new firmware replaces the old channel conversion method with a new method that correctly calculates rebanded channel frequencies. Scanners that support firmware upgrades for rebanding include:

GRE - PSR-300, PSR-400, PSR-500, PSR-600
Radio Shack - PRO-92 (original version), PRO-96, PRO-106, PRO-107, PRO-160, PRO-162, PRO-163, PRO-164, PRO-197, PRO-2096
Uniden - BC246T, BC296D, BC346XT, BC796D, BC898T, BCD396T, BCD396XT, BCD996T, BCD996XT, BCT15, BCT15X and BR330T

However, many older scanners have their firmware permanently burned into hardware and cannot be upgraded in this manner. These models will simply not be able to correctly track activity on rebanded systems that use the new channels. Models that are limited in this way include:

Uniden - BC235XLT, BC245XLT, BC250D, BC780XLT, BC785D and BC895XLT
Radio Shack - PRO-90, PRO-91, PRO-92 ("A" and "B" versions), PRO-93, PRO-94, PRO-95, PRO-97, PRO-2050, PRO-2051, PRO-2052, PRO-2053, PRO-2055, PRO-2066 and PRO-2067

## ❖ Custom Tables

Some digital models support the use of "custom tables" that allow the user to enter alternate channel conversion parameters. These custom tables have three entries: a *base frequency*, which corresponds to the first channel; a *step size*, which indicates how far apart the channels are from each other; and an *offset value* that determines the number of the first channel. The scanner uses these entries to compute the proper radio frequency.

For instance, the Radio Shack PRO-96 supports custom table entries via a computer program called **WIN96**. You can download a copy of the program from the StarrSoft web site at **www.starrsoft.com**. Several individuals on the Radio Reference web site (**www.radioreference.com**) have tested the proper custom tables needed for Albertville (and possibly other rebanded systems) and came up with the following parameters to be entered in WIN96:

| ChLo | ChHI | Step | Offset | Base |
|---|---|---|---|---|
| 440 | 559 | 25.000 | 440 | 851.025000 |
| 000 | 719 | 25.000 | 0 | 851.012500 |

In the meantime, there are still a number of active conventional frequencies in Albertville and Marshall County, as listed below.

| Frequency | Description |
|---|---|
| 151.025 | County Highway Department |
| 151.295 | Sheriff (Detectives) |
| 154.205 | Douglas Volunteer Fire Department |
| 154.295 | Ruth Volunteer Fire Department |
| 154.325 | County Fire (Dispatch) |
| 154.445 | Albertville Weather Siren Activation |
| 154.8825 | Sheriff (Secondary) |
| 155.010 | Statewide Law Enforcement |
| 155.3175 | Sheriff (Tactical) |
| 155.430 | Sheriff (Tactical) |
| 155.700 | Sheriff (Dispatch) |
| 155.9475 | Sheriff (Jail) |
| 158.865 | Albertville Public Works/Streets |
| 453.0375 | Albertville Automated Weather Observing System |
| 460.4250 | Albertville Municipal Utilities [Mototrbo Digital] |
| 460.575 | Beulah Volunteer Fire Department |

## ❖ Albuquerque, New Mexico

*Dear Dan,*

*After years of wondering where they were, I found them!*

*The Albuquerque Public Schools (APS) school bus frequency for ABQ proper is 452.000 MHz (repeater output). For the south valley of ABQ it is 464.35 MHz.*

*During the ABQ International Balloon Fiesta of a few weeks ago, the school buses provided the transportation to the event. I rode on one of the buses and listened to the chatter coming from the radio next to the bus driver. The next day when the buses were again busy but while I was at home, I ran a search of the business bands on my scanner, and I heard the same lady talking as from the previous day. Frequency 452.000 was found!*

*Why couldn't I find the school buses on the FCC site? I scanned all of the APS frequencies listed, and I searched by school bus company name, but could not find the frequencies. Once 452.000 was found, I plugged this into the FCC site, and this frequency is licensed to Specialty Communications, which is a communications provider company. The 464.35 MHz is also provided by Specialty Communications.*

*So, now I can track school bus and school activities, especially during winter weather, via the school bus radio.*

*William in New Mexico*

Many frequencies in the business band are licensed to a service provider, who in turn resells service to end users. The bus company in Albuquerque is apparently just such an end user, contracting for service from Speciality Communications. Good detective work, William!

That's all for this month. Have a peaceful holiday season and a Happy New Year!

# ASK BOB

## GENERAL QUESTIONS RELATED TO RADIO

*Bob Grove, W8JHD*
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***Q.*** *I understand that alcohol has replaced mercury in thermometers now; is that correct? Are older thermometers with red colored liquid to make them easier to read actually pigmented mercury?*

***A.*** Red and blue colored alcohol has been substituted for mercury, which is always silver colored, in low-cost thermometers. Fever thermometers and other medical thermometers as well as industrial/scientific thermometers still use mercury, although they are gradually being replaced by electronic heat-sensing devices.

---

***Q.*** *As happens to everyone, I occasionally get shocked with static electricity; I can even see a small spark. Roughly how much voltage are we talking about here? (MB, IN)*

***A.*** When dielectrics (non-conductors like plastic and fur) are rubbed together, considerable static voltage can build up. A general rule of thumb is 30,000-70,000 volts per inch of spark depending on air pressure and humidity, so you probably are getting zapped with a few thousand volts! Fortunately, the current is so minute that no damage is done.

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***Q.*** *I am using a WiNRADiO and ICOM R75 receiver for monitoring LF beacons in the 200-400 kHz range. If I switch to an active antenna like the H800 or H900, would I get better sensitivity with the higher-gain unit? (Fred Edwards, email)*

***A.*** No; at those low frequencies, the limiting factor is atmospheric noise. All a preamp can do is to amplify both the signal and the noise equally, so when it's done, the signal is no louder over the noise than it was before. The main benefit of the H900 is its somewhat improved dynamic range, but if you aren't likely to have local AM broadcast overload, then the H800 will be just as satisfactory as the H900.

---

***Q.*** *When I install an antenna, should I use dielectric grease or an anti-oxidant like Penetrox A on the connector terminals, and would this affect the performance of the antenna? (Shon Clark, Concord, CA)*

***A.*** Anti-oxidants specifically made to prevent weather oxidation of electrical terminals are always a good idea. However, I've never used one, and I've never had a weather-induced oxidation problem! In any case, such an application will NOT improve the antenna's performance, only forestall eventual corrosion of the terminals.

If you are choosing a protectant, and the choice is between Penetrox A Anti-Oxidant and grease, go with the Penetrox. It contains zinc particles which guarantee a good electrical connection between the contacting surfaces.

Grease, on the other hand, applied between the contacting surfaces would actually insulate the layers, preventing an electrical contact. Grease could be applied over the joint after a tight electrical connection is made between the clean surfaces, but it's more risky if, over time, it could intrude between the contacting surfaces.

---

***Q.*** *On a recent road trip, as I set my scanner down on a desk in my motel room, I remembered that some disreputable motel/hotel managers install two-way mirrors in the wall to peep on the clients. How can I tell if my room has one of these?*

***A.*** 1. All commercial mirrors (except scientific) are back-surface silvered; when you put your finger tip on the surface, you will see a fractional-inch gap between the tip and its reflection. If it's a two-way glass, there will be no gap because you are relying on the front surface for a reflection.

2. Two-way glasses are actually only about 12% reflective, and mostly transparent, so you can also see through them. With the lights out in your room, look for hints of light behind it – if you press a flashlight against the mirror, you will see its beam on a wall behind it.

3. Finally, mirrors are installed against an existing wall and will have a simple frame around it at most; if you tap on in, it sounds solid. A two-way glass is mounted within the wall on a substantial window frame; if you tap on it you will ear that deeper, hollow, "bong" sound like a window.

But even those hints don't completely set you free; some motel/hotel operators cut a small peephole through the wall and scrape a tiny dot of silver off to look through. If that's the case, you will see a dark spot in the silver.

---

***Q.*** *Seriously – how do you convince your wife to allow you to purchase an expensive receiver? (Jim Monagle, Mishawaka, IN)*

***A.*** Did you really mean *my* wife? Actually, I try to isolate my hobby buying from my family budget. I sell no-longer-needed items on eBay. In fact, I keep my eyes open at yard sales and thrift shops for items that I know are worth far more than the asking price, and I'll buy them to resell on eBay to complement my radio budget.

But you are probably talking about *your* wife, who typically may not give a hoot about radio except to listen to her favorite local broadcaster. You might consider setting up a reasonable cost of living budget that reflects expenses over the last few months, then see how you can prune it to accommodate the purchase.

Give up a few frills like eating out as much; taking unnecessary, gas-guzzling trips around town; smoking (and you'll live longer to enjoy your hobby); buying without price comparing; setting your heat and air thermostat too low in the summer and high in the winter.

It's really amazing how cutting back on a just a few expenses can add up over time. Of course, when I showed this answer to my wife, she replied, "And on that money you've saved, you can take your wife on that vacation she's wanted so long!"

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***Q.*** *It was my understanding that all digital TV (DTV) stations were to be on UHF channels; are there any still on VHF? (J.J. Owens, Fayetteville, NC)*

***A.*** While the vast majority of new DTV assignments are in the UHF spectrum, a representative number remain in the VHF spectrum, mostly channels 7-13. For example, in your area:

WNTV, ch. 9 in Greenville, SC
WSPA, ch. 7 in Spartanburg, SC
WLOS, ch. 13 in Asheville, NC also shows an outlet in Raleigh-Durham, NC

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

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# Updated High-Frequency Radiofax List

I am a great fan of radio facsimile (fax). It's radio with pictures. Broadcasts are all over the high-frequency (HF, short wave) bands, from everywhere in the world.

Unlike modern office fax, HF fax is an analog mode. It works by scanning across the paper or computer screen, rendering one line at a time from black to white depending on the frequency of an audio tone. This gives fax its cyclical sound.

However, most multimode digital programs will decode it. The timing is a bit tight for ordinary computer clocks, and slanted pictures are common, but these can usually be fixed. The big problem is that noise and fading all print right to your chart. Long-distance reception, then, is a good challenge for anyone.

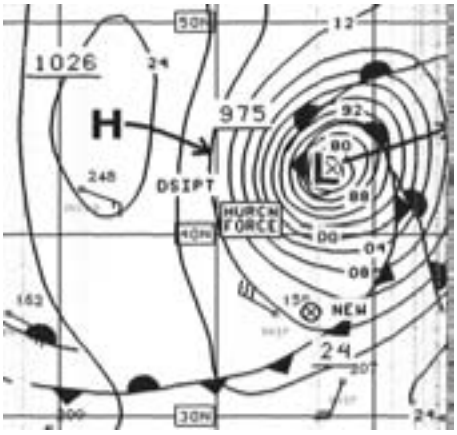
## ❖ Finding Broadcasts

While it's possible to tune the bands and find fax stations by ear, most people use published lists. There are several sources for these on the Internet.

The US National Oceanic and Atmospheric Administration (NOAA) puts out a clearly readable and frequently updated collection of frequencies and schedules. Generally, if a station is in this one, it will actually be on the air. This useful document lives in a file here: **www.nws.noaa.gov/om/marine/rfax.pdf** .

The World Meteorological Organization (WMO) publishes a guide to weather fax broadcasts that has more listings than the NOAA one, and also includes satellites. Some information may be out of date. A 2008 version is found here: **www.wmo.ch/pages/prog/www/ois/Operational_Information/VolumeC2/VolumeC2.pdf** .

Utility fans, however, have an excellent web site maintained by Marius Rensen in Germany. It has a lengthy fax schedule here: **www.hffax.de/**




WORLD HF RADIOFAX FREQUENCIES

| kHz | Call | Name | Country | LPM/IOC | Remarks |
|---|---|---|---|---|---|
| 122.5 | CFH | CF Halifax | Canada | 120/576 | Hourly, also RTTY |
| 148.0 | Unk | Pevek-Chukotka | Russia | 120/576 | Ice 0530, 1130, 1430 |
| 2054.0 | NOJ | USCG Kodiak | USA | 120/576 | 0400, 0950, 1600 |
| 2401.0 | LSB | Marambio Meteo | Antarctica | 120/576 | Listed, sporadic (6) |
| 2618.5 | GYA | UK Royal Navy | UK | 120/576 | 2000-0600 |
| 2628.0 | VMC | Charleville | Australia | 120/576 | 0900-1900 |
| 3247.4 | ZKLF | Auckland Radio | New Zealand | 120/576 | 0945-1700, hour+45 (1) |
| 3253.0 | VFF | CCG Iqaluit | Canada | 120/576 | 2100-2330 (2) |
| 3253.0 | VFR | CCG Resolute | Canada | 120/576 | 0010-0900 (2) |
| 3585.0 | HLL2 | Seoul Meteo | Korea | 120/576 | 1200-0000 |
| 3622.5 | JMH | Tokyo Meteo | Japan | 120/576 | 0000-1000, 1200-2200 (3) |
| 3855.0 | DDH3 | Hamburg Meteo | Germany | 120/576 | 0430, 1520, 1800 |
| 4014.0 | ZSJ | Cape Naval | South Africa | 120/576 | 1600-0600 |
| 4067.0 | ? | Tashkent Meteo | Uzbekistan | 120/556 | Unlisted freq (DL8AAM) |
| 4228.0 | CBV | Valparaiso Radio | Chile | 120/576 | 1115, 1630, 1915 |
| 4235.0 | NMF | USCG Boston | USA | 120/576 | 0230-1028 |
| 4235.0 | NIK | USCG Boston/ IIP | USA | 120/576 | Ice 0438 (4) |
| 4271.0 | CFH | CF Halifax | Canada | 120/576 | Hourly, also RTTY |
| 4298.0 | NOJ | USCG Kodiak | USA (AK) | 120/576 | 0400, 0950, 1600 |
| 4316.0 | JJC | Tokyo Radio | Japan | Var/576 | Kyodo News |
| 4317.9 | NMG | USCG New Orleans | USA | 120/576 | 0000, 0600, 1200, 1800 |
| 4318.0 | ? | Moscow Meteo | Russia | Var/576 | On-air |
| 4346.0 | NMC | USCG Pt. Reyes | USA | 120/576 | 0140-1608 |
| 4416.0 | VCO | CCG Sydney | Canada | 120/576 | 1121-1741 |
| 4481.0 | SVJ4 | Athens Meteo | Greece | 120/576 | 0845-1044 |
| 4610.0 | GYA | UK Royal Navy | UK | 120/576 | Continuous |
| 4616.0 | BMF | Taipei Meteo | Taiwan (ROC) | 120/576 | 0040-2200, with gaps |
| 4635.0 | RTH | Tashkent Meteo | Uzbekistan | Var/576 | 0005-1930 |
| 4777.5 | IMB51 | Rome Meteo | Italy | 120/576 | Status unknown |
| 4790.0 | 6VU | Dakar Radio | Senegal | Var/576 | Not much known |
| 4807.0 | LSB | Marambio Meteo | Antarctica | 120/576 | Listed, sporadic (6) |
| 5100.0 | VMC | Charleville | Australia | 120/576 | Continuous |
| 5103.0 | "GM-1F" | Russian, but who? | Russia | 60/576 | Parallel 7090 (DL8AAM) |
| 5108.0 | ? | Moscow Meteo | Russia | Var/576 | On-air |
| 5185.0 | L2B | Buenos Aires | Argentina | 120/576 | Listed, not much known |
| 5755.0 | VMW | Wiluna | Australia | 120/576 | 1100-2100 |
| 5807.0 | ZKLF | Auckland Radio | New Zealand | 120/576 | 0900, 2100, hour+00 (1) |
| 5850.0 | OXT | Copenhagen Meteo | Denmark | 120/576 | 0028, 0943 |
| 5857.5 | HLL2 | Seoul Meteo | Korea | 120/576 | Continuous |
| 6340.5 | NMF | USCG Boston | USA | 120/576 | 0230, 0745, 1400, 1600 |
| 6340.5 | NIK | USCG Boston/ IIP | USA | 120/576 | Ice 0438, 1600, 1810 (4) |
| 6446.0 | RBW48 | Murmansk Meteo | Russia | Var/576 | 0700, 0800, 1400, 1850 |
| 6496.4 | CFH | CF Halifax | Canada | 120/576 | Hourly, also RTTY |
| 6834.0 | GYA | UK Royal Navy | UK | 120/576 | 1800-0800, for Persian Gulf |
| 6915.1 | VCO | CCG Sydney | Canada | 120/576 | 2200-2331 |
| 7395.0 | HSW64 | Bangkok Meteo | Thailand | 120/576 | Active, may be on 7396.9 |
| 7404.9 | ATP57 | New Delhi | India | 120/576 | Unreliable, may be off |
| 7433.5 | HLL2 | Seoul Meteo | Korea | 120/576 | Continuous |
| 7470.0 | VLM | Casey Meteo | Antarctica | 120/576 | Status unknown |
| 7508.0 | ZSJ | Cape Naval | South Africa | 120/576 | 0430-2230, also RTTY |
| 7535.0 | VMW | Wiluna | Australia | 120/576 | Continuous |
| 7570.0 | RTH | Tashkent Meteo | Uzbekistan | Var/576 | 0005-1930 |
| 7670.0 | RCC76 | Moscow Meteo | Russia | Var/576 | May be active |
| 7710.0 | VFF | CCG Iqaluit | Canada | 120/576 | 0010-0900 (2) |
| 7710.0 | VFR | CCG Resolute | Canada | 120/576 | 2100-2330 (2) |
| 7795.0 | JMH2 | Tokyo Meteo | Japan | 120/576 | 0000-1000, 1200-2200 (3) |
| 7880.0 | DDK3 | Hamburg Meteo | Germany | 120/576 | 0430, 1520, 1800 |
| 7907.0 | RBW?? | Murmansk Meteo | Russia | Var/576 | Listed, not much known |
| 8040.0 | GYA | UK Royal Navy | UK | 120/576 | Continuous |
| 8105.0 | SVJ4 | Athens Meteo | Greece | 120/576 | 0845-1044 |
| 8140.0 | BMF | Taipei Meteo | Taiwan (ROC) | 120/576 | 0040-2200, with gaps |
| 8146.6 | IMB55 | Rome Meteo | Italy | 120/576 | Status unknown |
| 8444.0 | RBW?? | Murmansk Meteo | Russia | Var/576 | LSB/ Apr-Oct/ opposite offset |
| 8457.8 | VFA | CCG Inuvik | Canada | 120/576 | 0200, 1630 |
| 8459.0 | NOJ | USCG Kodiak | USA (AK) | 120/576 | 0400, 0950, 1600 |
| 8461.9 | 3SD | Beijing | China (PRC) | 120/576 | On air, times unknown |
| 8467.5 | JJC | Tokyo Radio | Japan | Var/576 | Kyodo News |
| 8503.9 | NMG | USCG New Orleans | USA | 120/576 | 0000, 0600, 1200, 1800 |
| 8555.0 | UFH | Kamchatskiy | Russia | 120/576 | 0500, 1900 |
| 8658.0 | JMH? | Tokyo | Japan | 120/576 | JFA, Status unknown (5) |
| 8677.0 | CBV | Valparaiso Radio | Chile | 120/576 | 1115, 1630, 1915 |
| 8682.0 | NMC | USCG Pt. Reyes | USA | 120/576 | 0140, 0655, 1400, 1830 |
| 8764.0 | NMG | USCG New Orleans | USA | 120/576 | Recd by Manolis - ???? |
| 9045.0 | 5YE | Nairobi Meteo | Kenya | 120/576 | Old, status unknown |

| | | | | | |
|---|---|---|---|---|---|
| 9110.0 | NMF | USCG Boston | USA | 120/576 | 0230, 0745, 1400, 1600 |
| 9110.0 | NIK | USCG Boston/ IIP | USA | 120/576 | Ice 0438, 1600, 1810 (4) |
| 9165.0 | HLL2 | Seoul Meteo | Korea | 120/576 | Continuous |
| 9340.0 | RTH | Tashkent Meteo | Uzbekistan | Var/576 | 0005-1930 |
| 9360.0 | OXT | Copenhagen Meteo | Denmark | 120/576 | 0003, 1008, 1153, 1243, 1828 |
| 9459.0 | ZKLF | Auckland Radio | New Zealand | 120/576 | 0900, 2100, hour+15 (1) |
| 9951.0 | LSB | Marambio Meteo | Antarctica | 120/576 | Listed, sporadic (6) |
| 9982.5 | KVM70 | Honolulu Meteo | USA (HI) | 120/576 | 0519-1556 |
| 10536.0 | CFH | CF Halifax | Canada | 120/576 | Hourly, also RTTY |
| 10555.0 | VMW | Wiluna | Australia | 120/576 | Continuous |
| 10720.0 | L2B | Buenos Aires | Argentina | 120/576 | Listed, not much known |
| 11030.0 | VMC | Charleville | Australia | 120/576 | Continuous |
| 11086.5 | GYA | UK Royal Navy | UK | 120/576 | 0600-2000 |
| 11090.0 | KVM70 | Honolulu Meteo | USA (HI) | 120/576 | 0519-1556, 1779-0356 |
| 12390.0 | GYA | UK Royal Navy | UK | 120/576 | Continuous, for Persian Gulf |
| 12412.5 | NOJ | USCG Kodiak | USA (AK) | 120/576 | 4000, 2200 |
| 12665.0 | PWZ33 | Rio de Janeiro | Brazil | 120/576 | 0745, 1630 |
| 12745.5 | JJC | Tokyo Radio | Japan | Var/576 | Kyodo News |
| 12750.0 | NMF | USCG Boston | USA | 120/576 | 1400-2228 |
| 12750.0 | NIK | USCG Boston/ IIP | USA | 120/576 | Ice 1600, 1810 (4) |
| 12786.0 | NMC | USCG Pt. Reyes | USA | 120/576 | 0140, 0655, 1400, 1830 |
| 12789.9 | NMG | USCG New Orleans | USA | 120/576 | 0000, 0600, 1200, 1800 |
| 12831.9 | 3SD | Beijing | China (PRC) | 120/576 | On-air, times unknown |
| 13035.0 | UFH | Kamchatskiy | Russia | 120/576 | 0500, 2000 |
| 13510.0 | CFH | CF Halifax | Canada | 120/576 | Hourly, also RTTY |
| 13538.0 | ZSJ | Cape Naval | South Africa | 120/576 | 0430-2230, also RTTY |
| 13550.5 | ZKLF | Auckland Radio | New Zealand | 120/576 | 0900, 2100, hour+30 (1) |
| 13570.0 | HLL2 | Seoul Meteo | Korea | 120/576 | 0000-1200 |
| 13667.5 | 6VU | Dakar Radio | Senegal | Var/576 | Not much known |
| 13855.0 | OXT | Copenhagen Meteo | Denmark | 120/576 | 1218, 1308, 1803 |
| 13882.5 | DDK6 | Hamburg Meteo | Germany | 120/576 | 0430, 1520, 1800 |
| 13900.0 | BMF | Taipei Meteo | Taiwan (ROC) | 120/576 | 0040-2200, with gaps |
| 13920.0 | VMC | Charleville | Australia | 120/576 | Continuous |
| 13957.4 | IMB56 | Rome Meteo | Italy | 120/576 | Status unknown |
| 13988.5 | JMH4 | Tokyo Meteo | Japan | 120/576 | 0000-1000, 1200-2200 (3) |
| 14842.0 | ATP65 | New Delhi | India | 120/576 | Unreliable, may be off |
| 14982.5 | RTH | Tashkent Meteo | Uzbekistan | Var/576 | 0005-1930 |
| 15615.0 | VMW | Wiluna | Australia | 120/576 | Continuous |
| 16035.0 | 9VF/252 | Kyodo Singapore | Singapore | 60/576 | 0740-1010, 1415-1815 |
| 16135.0 | KVM70 | Honolulu Meteo | USA (HI) | 120/576 | 1719-0356 |
| 16340.1 | ZKLF | Auckland Radio | New Zealand | 120/576 | 2145-0500, hour+45 (1) |
| 16903.9 | 3SD | Beijing | China (PRC) | 120/576 | On-air, times unknown |
| 16907.5 | JFA | Chuo Fishery | Japan | 120/576 | Confirmed active 2009 (5) |
| 16971.0 | JJC | Tokyo Radio | Japan | Var/576 | Kyodo News |
| 16978.0 | PWZ33 | Rio de Janeiro | Brazil | 120/576 | 0745, 1630 |
| 17069.6 | JJC | Tokyo Radio | Japan | Var/576 | Kyodo News |
| 17146.4 | NMG | USCG New Orleans | USA | 120/576 | 1200-2045 |
| 17146.4 | CBV | Valparaiso Radio | Chile | 120/576 | 1115, 1630, 1915 |
| 17151.2 | NMC | USCG Pt. Reyes | USA | 120/576 | 0140, 0655, 1400, 1830 |
| 17430.0 | 9VF/252 | Kyodo Singapore | Singapore | 60/576 | 0740-1010, 1415-1815 |
| 17445.5 | 5YE | Nairobi Meteo | Kenya | 120/576 | Old, status unknown |
| 17510.0 | OXT | Copenhagen Meteo | Denmark | 120/576 | 1333 |
| 17520.0 | HSW61 | Bangkok Meteo | Thailand | 120/576 | May be off-air |
| 18060.0 | VMW | Wiluna | Australia | 120/576 | 2100-1100 |
| 18093.0 | L2B | Buenos Aires | Argentina | 120/576 | Listed, not much known |
| 18238.0 | ZSJ | Cape Naval | South Africa | 120/576 | 0600-1600 |
| 18261.0 | GYA | UK Royal Navy | UK | 120/576 | 0800-1800, for Persian Gulf |
| 18560.0 | BMF | Taipei Meteo | Taiwan (ROC) | 120/576 | 0040-2200, with gaps |
| 19750.0 | 6VU | Dakar Radio | Senegal | Var/576 | Not much known |
| 20469.0 | VMC | Charleville | Australia | 120/576 | 1900-0900 |
| 22527.0 | NMC | USCG Pt. Reyes | USA | 120/576 | 1840-2356 |
| 22542.0 | JJC | Tokyo Radio | Japan | Var/576 | Kyodo News |

***Notes on the list:***
*(1) Auckland (Wellington Meteo) uses a single transmitter which changes frequency.*
*(2) Canadian Coast Guard Iqaluit and Resolute are summer only.*
*(3) JMH changed its transmitter location from Ibaraki to Kagoshima in March 2009.*
*(4) The NIK callsign is used for International Ice Patrol ice charts, in season.*
*(5) Chuo ("Central") broadcasts charts from the Japanese Fisheries Association.*
*(6) LSB is a callsign, not a mode. It's from a base named "Centro Meteo Marambio."*

**Hfax0201.txt** .

Unfortunately, Marius hasn't updated this file since 2002. Also, the version of this list which seems to be most often passed around the Internet is from 1998. In utility radio, eleven years is an eternity.

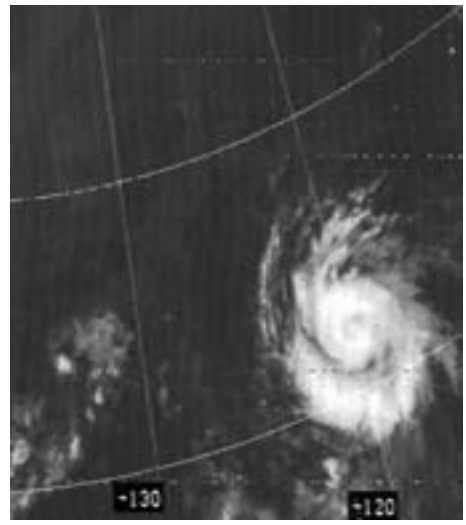
Here is my own update of Rensen's list. It required hours of work, but it's worth it because now I can find fax transmissions much faster. Best of all, now you get to use it, too.

## ❖ Making Order from Chaos

Radiofax is an odd little medium. It was invented in 1926, and weather charts were on the radio by the 1930s. They were sent by optically scanning a document wrapped around a drum, and printed out much the same way. Machines were intended for commercial users, and they cost like it.

Digital technology has solved the cost problem, but of course it has also allowed more modern systems to replace grainy old radiofax. Today, HF fax is something of a legacy product, nearly always intended for ships at sea. A significant number of mariners appreciate the simplicity and low cost of radiofax, and this is the only reason it still exists at all.

Most stations, then, depend on uncertain funding from governments, militaries, or cost-conscious telecom companies. Fax transmissions




may vanish for any number of reasons.

Finding information usually involves seeking the one person in some bureaucratic maze who understands the situation. This can be amazingly tough. International fax listings include web links and e-mail addresses, but most of these seem to go nowhere. Cold calling on the phone usually gives lengthy holds, while employees try to find anyone who's ever heard of radiofax at all.

The easy way out is to drop the missing stations, but all too often they'll surprise you by coming back from the dead. Also, some active schedules just don't get reported by utility listeners very often. Therefore, I've listed many frequencies as "status unknown." It's worth checking these from time to time for signs of life.

## ❖ Using the List

Technically, fax is a type of frequency modulation called F3C in official documents. However, we nearly always tune it in upper sideband (USB). Most frequencies in this list are the assigned channel centers. These are 1.9 kilohertz (kHz) higher than what your USB dial will show.

The fax tone deviates approximately 400 hertz up (white), and 400 down (black) from this 1.9-kHz center. When a signal is more or less between 1500 and 2300 hertz, you're there. If the copy looks reversed, try lower sideband (LSB) and the opposite 1.9-kHz offset.

The LPM/IOC numbers are a bit esoteric, coming as they do from the old drum scanners. LPM, Lines Per Minute, is also known as RPM, Revolutions Per Minute. Most weather broadcasts are 120, though 60 is also common. Russian equipment can also use 90 or 180.

IOC stands for Index Of Cooperation. In scanning, it's the product of the total line length and the number of lines per unit length, divided by pi. Fortunately, we can just set it to 576 and forget about it.

These are not, by any means, the only stations using HF radiofax. There are quite a few mystery transmissions, possibly for fishing fleets. No one has been able to identify these, let alone find a schedule, if one even exists.

There's still a lot to discover on HF. Good hunting!

# UTILITY WORLD

## UTILITY LOGS

*Hugh Stegman*

### ABBREVIATIONS USED IN THIS COLUMN

AFB.....Air Force Base
ALE.....Automatic Link Establishment
CAMSLANT.....Communications Area Master Station, Atlantic
CIS.....Commonwealth of Independent States
Coq-8.....Coquelet; old French 8-tone teleprinting system
CW.....On-off keyed "Continuous Wave" Morse telegraphy
DSC.....Digital Selective Calling
EAM.....Emergency Action Message
E03.....UK Cherry Ripe, 5-figure groups in female voice
FAX.....Radiofacsimile
FEMA.....US Federal Emergency Management Agency
HFDL.....High-Frequency Data Link
HF-GCS.....High-Frequency Global Communication System
LDOC.....Long Distance Operational Control
LSB.....Lower Sideband
MARS.....US Military Affiliate Radio System
MFA.....Ministry of Foreign Affairs
PR.....Puerto Rico
RTTY.....Radio Teletype
Selcal.....Selective Calling
SHARES.....Shared Resources
SITOR-A/B.....Simplex Telex Over Radio, mode A or B
UK.....United Kingdom
Unid.....Unidentified
US.....United States
USAF.....US Air Force
USCG.....US Coast Guard
VOLMET.....Formatted voice aviation weather

*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 ().*

544.0 LF5U-ConocoPhillips Ekofisk 2/4-H oil platform, North Sea, CW heliport beacon at 2135 (ALF-Germany).
2097.3 "A"-CW beacon, possibly in AZ, CW at 1033 (Jim-GA).
2187.5 ZIR06-UK registry liquefied gas tanker Philine Schulte, DSC with Lyngby Radio, Denmark, at 2053 (Michel Lacroix-France).
2748.0 YQI-Constanta Radio, Romania, information broadcast at 1940 (Lacroix-France).
3173.0 Unid-CIS military, CW 5-letter group message for "ZEKI," at 1940 (MPJ-UK).
3228.5 Unid- Russian Air Defense (PVO), formatted CW time-stamped datagrams, mostly question marks (missing data), at 1956 (MPJ-UK).
3449.8 OK-CW beacon, OK, CW at 0952 (Jim-GA).
3485.0 New York Radio-US VOLMET, signing off after aviation weather, Gander (Canada) followed, also 6604, 10051, and 13270, at 1046 (Jim-GA).
3673.0 PBK-Dutch Coast Guard, Ijmuiden, weather at 2148 (Lacroix-France).
3810.0 HD2IOA-Ecuadorian Navy, Guayaquil, standard time beeps and Spanish announcement once per minute, weak at 0804 (William Hassig-IL).
3890.0 UWS3-Kiev Radio, Ukraine, CW marker and traffic at 2230 (MPJ-UK).
4077.4 MO-CW beacon, OK, drifts around, CW at 0956 (Jim-GA).
4078.2 WW-CW beacon, CO, weak CW at 0914 (Jim-GA).
4079.6 TMP-CW temperature beacon, CA, ID plus temperature in Fahrenheit, at 0958 (Jim-GA).
4096.2 "Hexie" CW dasher beacon, CA, at 1037 (Jim-GA).
4096.6 "Kelsie" CW dasher beacon, CA, at 0921 (Jim-GA).
4097.5 KX-CW telemetry beacon, OK, ID plus numbers for inside/outside temperatures and battery voltage, at 0923 (Jim-GA).
4102.3 "W"-CW wind beacon, CA, letter plus anemometer pips, good signal at 0100 (Hugh Stegman-CA).
4830.0 KYAASF-Kentucky Army Aviation Support Facility, ALE sounding at 2111 (Jack Metcalfe-KY).
5157.6 "Blinky"-CW dasher beacon, FL, at 1305 (Jim-GA).
5450.0 UK Royal Air Force VOLMET, also 11253, weather at 0210 (Jim-GA).
5673.0 Beijing VOLMET-Female voice with weather, at 1223 (Eddy Waters-Australia).
5680.0 Kinloss Rescue-UK Aeronautical Rescue Coordination Centre, calling unid flight at 2002 (Lacroix-France).
6679.0 Honolulu-VOLMET, HI, at 1035. Probably Auckland VOLMET, New Zealand, at 1051 (Jim-GA).
6693.0 Samara VOLMET, Russia, weather in Russian at 1615 (Patrice Privat-France). Tyumen VOLMET, weather in Russian, at 1923 (Lacroix-France).
6754.0 Trenton Military-Canadian Forces VOLMET, also on 15034, signing at 0936 (Jim-GA).
6781.7 Unid-Egyptian MFA, possible Algiers embassy, SITOR-A at 1923 (Lacroix-France).
6921.0 Unid-Russian government, with short coded messages in high-speed RTTY, also on 8075, at 1003 (ALF-Germany).
6994.0 Unid-Russian military, CW message at 1350 (Waters-Australia).
7357.0 1W1S-Venezuelan Navy, calling T8R1, LSB ALE at 0245 (MDMonitor-MD).
7530.0 CAMSLANT Chesapeake-USCG, VA, radio checks with Coast Guard Air Station Savanna, GA, at 1307 (MDMonitor-MD).
7535.0 Blue Lions-US Navy, radio checks with Norfolk SESEF (Shipboard Electronics Systems Evaluation Facility), VA, at 1807. Cold Warrior-USN, calling Norfolk SESEF at 1847 (Metcalfe-KY).
7675.0 RIT-Russian Navy, Severomorsk, CW message for warship RJQ84, then went to 5774, at 0917 (MPJ-UK).
7710.0 VFR-Canadian Coast Guard, Iqaluit, FAX ice chart at 2245 (ALF-Germany).
7759.7 SSE-Egyptian MFA, Cairo, calling Algiers in SITOR-A, at 1901 (ALF-Germany).
7880.0 DDK3-Hamburg/Pinneburg Meteo, Germany, FAX weather chart at 2214 (MDMonitor-MD).
7986.0 LTA-Probably Argentine Army, alphabetical CW check-ins with LTL, LTN, LTO, others, at 2247 (ALF-Germany).
8000.3 "S"-CW beacon, AZ, weak at 1020 (Jim-GA).
8003.3 "Pike 78"-CW beacon, CO, about 78 dits per minute, at 0930 (Jim-GA).
8023.7 SSE-Egyptian MFA, Cairo, working selcal TVVQ, Khartoum embassy, in Arabic SITOR-A at 1750 (ALF-Germany).
8040.0 GYA-Northwood Radio, UK, FAX weather maps at 2329 (MDMonitor-MD).
8050.0 PASTOR-Mexican military, ALE sounding at 0000 (ALF-Germany). GRECIA, calling PASTOR, ALE at 0200 (MDMonitor-MD). FUERZA, link checks with PASTOR, ALE at 2327 (Stegman-CA). [Freq is also FEMA, but this is almost certainly Mexican mil. -Hugh]
8072.0 L8AG-CIS Military, duplex CW with 9YYN, setting up secure voice circuits, at 1521 (MPJ-UK).
8132.0 BP21-German Sea Police (coast guard) boat Bredstedt, calling BPLEZS (Headquarters, Cuxhaven), ALE at 0200 (MDMonitor-MD).
8220.0 Nairobi-Unknown shipping company, Kenya, working several vessels at 1824 (ALF-Germany).
8280.0 1Z8C-Venezuelan Navy, possibly survey ship Punta Brava, calling 1PZ2 in LSB ALE at 0351 (MDMonitor-MD).
8285.0 2TB9-Venezuelan Navy vessel Goijaira, working T5L1 (commander), LSB ALE at 0030 (MDMonitor-MD).
8340.0 1C3Z-Venezuelan Navy frigate General Soublette, relay messages to T8R1 (Headquarters), LSB ALE at 2200 (MDMonitor-MD).
8344.0 RMUW-Russian Navy, CW messages for RCV and RIW (Headquarters, Moscow), at 0230 (MDMonitor-MD).
8345.0 RGMB-Russian Navy, CW messages for RJH45, RJE73 & RJH74, at 0001 (MDMonitor-MD). RJF78, duplex CW traffic with RIT, at 0850 (MPJ-UK).
8376.5 VFF-Canadian Coast Guard, Iqaluit, SITOR-B weather in French, at 2121 (Lacroix-France).
8414.5 VQGP6-UK registry bulk carrier Cape Merlin, DSC with Lyngby at 1218 (Lacroix-France).
8497.9 "Pike 26"-CW beacon, CO, about 26 dashes/minute, at 1030 (Jim-GA).
8502.0 NMG-USCG, New Orleans, LA, "Iron Mike" voice synthesized weather at 2320 (MDMonitor-MD).
8540.0 T8R1-Venezuelan Navy, calling 1F5G, vessel Amario, LSB ALE at 0030 (MDMonitor-MD).
8743.0 HSA-Bangkok Radio, Thailand, voice mirror with frequency information, at 1210 (Waters-Australia).
8764.0 NMN-USCG CAMSLANT Chesapeake, "Iron Mike" weather at 2322 (MDMonitor-MD).
8885.0 9V-SLK-SilkAir flight 478, an A320, HFDL position for Muharraq at 1702 (MPJ-UK).
8888.8 Unid-Probable Gulf of Mexico shrimp boat, working another one at 2352 (MDMonitor-MD). [Won't forget THAT frequency! -Hugh]
8903.0 VP-BJT-Bombardier Challenger 300 bizjet, working Niamey (Niger), at 2013 (Privat-France).
8912.0 500-USCG Coast Guard 1500, an HC-130H, ALE and voice with CAMSLANT at 1130 (MDMonitor-MD).
8930.0 Blue Panorama 331-Flight out of Bangkok asking Stockholm LDOC for a phone patch, at 2108 (Lacroix-France).
8983.0 Coast Guard 2112-USCG HU-25, coded position for CAMSLANT at 1340 (MDMonitor-MD).
9075.0 F21-Venezuelan Navy Frigate Mariscal Sucre, calling CGA2 (Naval Headquarters), LSB ALE at 0300 (MDMonitor-MD).
9110.0 NMF-USCG, Boston, MA, FAX weather chart at 2214 (MPJ-UK).
9462.0 FC8FEM006-FEMA Region 8, CO, calling 460FEMAUX, a FEMA Auxiliary Station, ALE at 1400 (MDMonitor-MD).
9945.0 Unid-Belawan Meteo, Indonesia, CW weather at 1203 (Waters-Australia).
10194.0 FC8FEM-FEMA Region 8, CO, calling FM1FEM, Region 1, MA, ALE at 1600 (MDMonitor-MD).
11003.1 CO-CW beacon, CO, drift and slight whoop, at 2204 (Jim-GA).
11175.0 Puerto Rico-USAF HF-GCS, Salinas, calling Andrews, then Andrews calling Offutt, all at 1312. (Jim-GA) Offutt-USAF HF-GCS, Offutt AFB, NE, patching Navy LC 919, a US Navy P-3C, to Fiddle (Jacksonville, FL), at 1414. Andrews-USAF HF-GCS control station, Andrews AFB, MD, EAM at 1817 (Stern-FL).
11312.0 7T-VJW-Air Algérie flight 205, an A330, HFDL position for Muharraq, at 1709 (MPJ-UK).
11345.0 EC-JQG-Air Europa flight 27, an A330, calling Stockholm LDOC, at 1252 (Lacroix-France).
11387.0 Sydney VOLMET, Australia, weather at 1630 (Privat-France).
12129.0 FC8FEM002-FEMA Region 8, CO, ALE sounding at 2342 (Metcalfe-KY).
13510.0 CFH-Canadian Forces, Halifax, NS, RTTY weather at 1337 (Lacroix-France).
13527.8 "M"-Russian Navy, Magadan, different CW single-letter beacon than usual for this frequency, at 0530 (Waters-Australia).
13927.0 AFA7HS-USAF MARS, KS, radio checks with USAF Reserve C-130P King 64 (920th Rescue Wing, FL), at 1422. AFA9PF-USAF MARS, CA, sending Torch 55 (IL Air National Guard C-130H) to frequency 7633.5 kHz, at 1544 (Stern-FL).
14396.5 KEY 798-Possible US National Institutes of Health, MD, SHARES check-in with NN0VUV (US Navy/ Marine Corps MARS, CA), at 1600 (MDMonitor-MD).
14400.5 UFO-CW beacon, CO, drifts a lot, at 1837 (Jim-GA).
14757.0 CN3-Singapore Navy, working 70, ALE, at 0730 (Waters-Australia).
15867.0 LNT-CAMSLANT, calling J15 (USCG MH-60J Coast Guard 6015), ALE at 1515 (MDMonitor-MD).
16525.0 Cherry Ripe-UK MI6/SIS, musical tune and numbers message (E03), simulcast on 18465, at 0530 (Waters-Australia).
16540.0 Maribel-Unknown sailor speaking Tagalog and English, gave location as Maryland, at 1748 (MDMonitor-MD). Calypso-Unknown vessel calling Gypsy Dragon, said they were in the Atlantic Ocean, at 2030 (MDMonitor-MD).
16907.5 JFA-Chuo Fishery Radio, Japan, FAX fishing chart at 0630 (Waters-Australia).
18528.0 Unid-Algerian MFA, Algiers, Coq-8 diplomatic messages in French, at 0810 (Waters-Australia).

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# US Naval HF Broadcast Network

Regular readers of this column will be familiar with a number of articles over the past year concerning a variety of encrypted RTTY signals that emanate from US Naval stations. In the November 2008 and January 2009 issues, we documented which of these more commonly 75bd/850Hz encrypted RTTY heard signals were simulcast (i.e., the same messages sent on different frequencies at the same time).

In September 2009, we revealed that the US Naval Station at Cutler, Maine was alive and well as a presence on the HF bands and was the origin of a number of 50bd/850Hz as well as 75bd/850Hz encrypted RTTY signals.

While the US Navy's VLF communications network has been relatively well studied, the same cannot be said for the HF side. I was also aware that there were a number of gaps in the previous stories mentioned above and some further early morning listening had brought some new US Navy suspects to light.

So, like a bad itch that needs to be scratched, we present the next installment of this continuing story for your reading pleasure.

Despite the dismal propagation for much of this year, using a combination of a number of month's worth of listening, careful comparison of signals, and the ITU monitoring files, I think we now have a pretty good picture of the main broadcasts and their origins. Of course, due to the poor conditions, most of the observations have been limited to below 17 MHz, and there may well be other frequencies of interest audible from other locations and at higher frequencies.

The main HF network is likely comprised of four main stations serving various oceanic regions around the continental US:

- NAA at Cutler, Maine which serves the Arctic, North Atlantic (NCTAMS LANT DET CUTLER) and is located at 44.700782N 67.277806W.
- NAR at Saddlebunch Key, Florida which serves the Southern Atlantic, Gulf and Caribbean (NAVCOMSTA JAX DET) and is located at 24.647671N 81.6049W.
- NPG at Dixon, California which serves the Eastern Pacific Ocean and is located at 38.372196N 121.775508W.
- NPM at Lualualei, Hawaii which serves the Western Pacific and is located at 21.429421N 158.159931W.

I also suspect that there is still some use made of facilities in NCTAMS WESTPAC Barrigada, Guam (NPN), Diego Garcia (NKW), and NCTS Far East Yokosuka (NDT). There is also one ITU log that possibly points towards NSS Annapolis (Davidsonville) as the origin of at least one transmission.

To date, none of the observations or ITU logs appear to support 75bd or 50bd traffic emanating from the other US Navy facilities at Sigonella (Italy), Roosevelt Roads (Puerto Rico) or Keflavik (Iceland).

Here is the current table of transmissions identified with the network thus far:

**US Navy HF RTTY Network**

| Freq (kHz) | System | Callsign | Location |
|---|---|---|---|
| 3123 | 75bd/850 | NAR | Saddlebunch |
| 3127 | 75bd/850 | NAR | Saddlebunch |
| 3133 | 75bd/850 | NAA | Cutler |
| 4005 | 50bd/850 | NAR | Saddlebunch |
| 5340 | 75bd/850 | NAR | Saddlebunch |
| 5345 | 75bd/850 | NPG | Dixon |
| 5412.5 | 50bd/850 | NAR | Saddlebunch |
| 6489 | 75bd/850 | NAR | Saddlebunch |
| 6726 | 75bd/850 | NAA | Cutler |
| 7455 | 50bd/850 | NAA | Cutler |
| 7593 | 75bd/850 | NPG | Dixon |
| 7663 | 75bd/850 | NAR | Saddlebunch |
| 8095 | 50bd/850 | NKW | Diego Garcia |
| 8656 | 50bd/850 | NPN | Guam |
| 8678 | 50bd/850 | NPM | Lualualei |
| 9030 | 75bd/850 | NAR | Saddlebunch |
| 9085 | 75bd/850 | NPG | Dixon |
| 9112 | 75bd/850 | NAR | Saddlebunch |
| 9215.2 | 75bd/850 | NAR | Saddlebunch |
| 9440 | 75bd/850 | NPM | Lualualei |
| 9830 | 50bd/850 | NAR | Saddlebunch |
| 9960 | 75bd/850 | NPM | Lualualei |
| 10130 | 50bd/850 | NAA | Cutler |
| 10426 | 75bd/850 | NPG | Dixon |
| 10428 | 75bd/850 | NPG | Dixon |
| 10832 | 50bd/850 | NDT | Yokosuka |
| 11687.5 | 50bd/850 | NAA | Cutler |
| 12015 | 50bd/850 | NAR | Saddlebunch |
| 12120 | 75bd/850 | NAR | Saddlebunch |
| 12682.5 | 75bd/850 | NPM | Lualualei |
| 14436.3 | 50bd/850 | NPM | Lualualei |
| 15959 | 75bd/850 | NAA | Cutler |
| 16122.3 | 50bd/850 | NAA | Cutler |
| 16264.5 | 75bd/850 | NPG | Dixon |

As ever, I would be grateful for any additional reports, observations, or, better still, first-hand confirmations of any of the above.

## ❖ Canadian Forces STANAG4285 Transmissions

While researching the US Naval network for this month's article, some particularly poor propagation conditions one morning drew my attention to the fact that the RTTY transmissions from the Canadian Forces station CFH were very strong across a large portion of the dial.

The usual fax and 75bd/850Hz Baudot RTTY transmissions from CFH on 73.6, 122.5, 4271, 4997, 5097, 6389, 6496.4, 10536, 13510 and 15920kHz are pretty well known, but the identity of their STANAG4285 (see July 2009 *Digital Digest*) high speed channels has, to my knowledge, not been mentioned or logged by any monitors.

I believe that CFH actually originates from the transmitters of Naval Radio Station (NRS) Newport Corner, Nova Scotia which is remotely operated from Canadian Forces Base (CFB) Trinity in Halifax. Newport Corner is located at 44.967348N 63.983238W.

Armed with the realization that CFH seemed to be the only strong signal present on many days, I took a look at the ITU logs for a number of suspected CFH channels. Most of these transmissions were identified as of US origin with bearings suggesting NAA, Cutler in many cases. However, the reality is that many of these are most likely associated with the Newport Corner facility.

Here are the likely channels sending encrypted traffic using STANAG4285 with either 300bd or 600bd and long interleaving:

2842.2, 4244.7, 4253.2, 4281.2, 4345.7, 6384.7, 6423.2, 6428.2, 8540.2, 8564.2, 8695.2, 12724.2, 12811.2 and 12847.2 kHz USB.

Note that there are three channels in each of the 4, 6, 8 and 12MHz maritime frequency allocations. As is the case with the US naval network, under better conditions, there are sure to be more channels on higher bands.

That's all for this month. My thanks to RU for help with the US article. As ever, please keep the letter and emails coming with your questions and suggestions for future articles.

# PROGRAMMING SPOTLIGHT

**WHAT'S ON WHEN AND WHERE?**

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# Endings and a New Beginning

As another year comes to an end, one looks back and says, "Hey, where did it go?" It seems like we just started 2009, and here we are approaching 2010!

As 2009 comes to a close, we'll shine the *Programming Spotlight* on stations that have left the short waves this year, and two more that may be gone from the shortwave bands by the time we ring in 2010. Then, we'll look at some of the seasonal gems that are available for your listening pleasure at Christmastime and we'll ring in the New Year. Lots to squeeze in this month, so let's get right to it!

In 2009 transmissions from the once powerful HCJB broadcasting complex near Quito, Ecuador came to a close. While the English Service left us some time ago, almost all the rest have finally ceased. The transmitter towers had to come down to make way for an airport expansion.

HCJB was one of the first international band stations I ever heard (and my first QSL). I listened to them weekly if not daily. I'm old enough to remember when Clayton Howard hosted the *DX Partyline. Musical Mailbag* and other programs brought me countless hours of entertainment. *Musica del Ecuador* introduced me to the fabulous rhythms of the country.

WBOH reportedly will be gone by the time you read this as well (at the end of October). There seems to be an increasing exodus from the shortwave bands. The latest stations threatened with closure, by the end of 2010, may be both Radio Prague, and Radio Slovakia International's shortwave services.

Almost exactly three years ago, in January 2007, this column was devoted to the programming of Radio Prague and Radio Slovakia International (RSI). At that time, RSI had ceased broadcasting on shortwave in 2006, but had returned a few months later in October. It seems that RSI shortwave broadcasts are threatened every few years. 2009 is no exception.

As this column was being prepared, news of the threatened closure of Radio Prague was flying around the DX community. Ironically, the platform threatening the need for shortwave broadcasts at all – the internet – seems to be the rallying point for those trying to save these same shortwave broadcasts!

I first became aware of this issue through Facebook and the creation of a group called Save Radio Prague. The creator of this group, Jonathan Murphy, is circulating an open letter written by David Vaughan, the former head of the English section, which David would like circulated as widely as possible. Some of the salient points include

ČESKÝ ROZHLAS

1) The future of Radio Prague – the international service of Czech Radio – is under serious threat.
2) Radio Prague is facing a 20% cut in its budget for 2010.
3) At first glance, this figure does not seem like a mortal blow, but its impact will be devastating. The Foreign Ministry has stated explicitly that it considers shortwave to be an anachronistic means of broadcasting and has called on Radio Prague to terminate its shortwave broadcasts entirely from January 2010.
4) The transmitter in Litomysl (east of Prague) will almost certainly be dismantled. Radio Prague will continue primarily as a website.
5) The saving to the state budget will be tiny. In order to save around half a million euro, Radio Prague will end as a shortwave broadcaster after more than 70 years.
6) "Shortwave broadcasts are in decline, but they have to be seen as part of a broader mosaic. Today's international broadcasters have long been aware of the need to broadcast on a number of different platforms: shortwave, medium wave, FM, satellite, internet and others. The more forward-looking among them have learned to be flexible and innovatory.

"In this respect, the modern transformation at Radio Prague began over fifteen years ago when it was one of the first international broadcasters to set up its own website. That was back in 1994. This was quickly followed by its daily email news service and other innovations, including its enthusiastic commitment to satellite broadcasting. At the same time it has modernized the way that radio is produced; its journalists today take it for granted that they are working in a multi-media environment, where the spoken word is reinforced by text and image."
7) Radio Prague has learnt to be extremely cost effective, broadcasting around the world in six languages for the equivalent of less than three million euro a year.

"That is why I am writing this letter – to encourage listeners around the world to rally behind Radio Prague at this difficult time. With warmest regards, David Vaughan"

Mr. Murphy adds: "Radio Prague needs to get listeners support at this time. Their address is: Radio Prague, Vinohradská 12, 120 99 Prague 2, Czech Republic, E-mail: ***cr@radio.cz***. Listeners should also contact The Ministry of Foreign Affairs of the Czech Republic (e-mail: ***podatelna@mzv.cz***)

"We have a chance to make a difference by making our voice heard. Please take the time to do so, even if it is only two lines via email to say you listen to Radio Prague. Let's keep Radio Prague on the air!" (Jonathan Murphy, Ireland, Save Radio Prague Facebook group)

Radio Slovakia International shortwave is also reportedly under threat. While I would be happy if we could at least keep both Radio Prague and Radio Slovakia as web based entities, I hope they find a way to remain on shortwave. Lets hope it's not "dobre vecer" (Good night in Slovak) for either shortwave service.

While neither station has posted its winter frequencies yet as I write this, try for Radio Prague on 7345 kHz at 00, 01 and 03 UTC, and try for RSI on 7230 and 9440 kHz at 01 UTC. Or consult the frequency tables in this magazine, or in MTXTRA. Now might be the time to log them both.

In a final note of irony, RSI on Oct 7 presented a report on the dangers of spending too much time on…the internet.


## ❖ Special Seasonal Programming

If you enjoy the holiday season as I do, a few annual favorites are in the category of "must listen."

For many years, CBC Radio's ***As It Happens*** has featured a reading of "The Shepherd," an unusual story about a Christmas miracle involving a lost plane over the English Channel. What really makes this program special is the dramatic reading by the late Alan "Fireside Al" Maitland. He was a treasure.

It should be heard on Christmas Eve, sometime after 6:30 pm local time on CBC stations, or at 2330 UTC on the CBC Northern Quebec Shortwave Service 9265 kHz.

Also on Christmas Eve (and Christmas Day) my all time favorite Christmas program can be heard on 900 CHML (Hamilton, Ontario) and CJAD 800 (Montreal). The program is ***A Paul Reid Christmas***. It can also be heard online, of course, if you are unable to hear these stations on your radio.

The late Paul Reid was the consummate storyteller. In this program, one of the only surviving recordings he made, he reminisces about his childhood Christmases in working class Canada, and shares stories of the Christmas season. It is a wonderfully touching program, which I never miss.

CHML runs it at 6pm on Christmas Eve, and again on Christmas Day. CJAD runs it a bit more often in the lead up to Christmas. Read more about Paul and the program at **http://paulreidchristmas.com/Paul_Reid_-_The_Night_Is_Ours.html**

Of course, two annual favorites from the BBC are the ***Queen's Christmas Message*** (usually at 1500 UTC on Christmas day via the various BBC networks), and the annual ***Festival of Nine Lessons and Carols*** should be heard via the World Service and Radio 4 at 1500UTC Christmas Eve.

Not into Christmas? On Christmas Day Mark LaMarr has hosted a program on BBC Radio 2 for all those people "bummed out" by all the celebrations, playing requests and sharing their "pain." There is a lot of programming on BBC Radio 2 and all the other BBC networks for the "festive season." In 2008, many listings were found at **www.bbc.co.uk/radio2/events/festivehighlights/** which may work for 2009 as well.

Listen between Christmas and New Year's Day for end of the year surveys and other recorded programs, marking the end of one year and the beginning of another. There's a lot out there to keep you informed, entertained and amused!

Speaking of keeping you amused, I recommend listening to Radio New Zealand National's ***Matinee Idle*** between December 26 (Boxing Day) and the end of January, weekdays in North American evenings. I stumbled onto this one a few years ago and wouldn't miss it. It seems the boys will be back again this year:

"I'm dying to tell you about some of the plans for ***Idle*** next summer (*summer in New Zealand is winter here in North America –fw*), but I really need to wait a little while until things are confirmed. However, I CAN tell you that Kelle, Simon and I are going to be around the country a lot more after the success of last years' Akaroa / Christchurch extravaganzas. So it's a case of '***Matinee Idle*** - coming to a town / city near you' and I'll confirm the details as soon as I'm able." (I (Heart) Matinee Idle Facebook group)

Phil O'Brien and Simon Morris present an afternoon of music and entertainment, including a Classic Concert.

"***Matinee Idle*** is Radio New Zealand's Mufti Day. They let me and Simon 'loose in the asylum.' We get to be the guys testing the outer limits of listener patience and we benignly abuse this privilege.' says O'Brien. 'They let us play whatever we want! It's every radio presenter's dream.'" **www.radionz.co.nz/national/programmes/matineeidle**

## ❖ New Years Celebrations

One of my New Year's traditions is to listen to radio stations around the world, as each country says goodbye to the old year and hello to the new. My first ever contribution to *Monitoring Times* was a January 2006 article entitled "Happy New Year, Around the World in 24 Hours." It holds up pretty well for the most part, and you can read it at this web address: **www.monitoringtimes.com/Around-in-24-hrs.pdf**

Beginning at 1100 on December 31 in New Zealand, one can begin a 24 hour, round the world audio celebration via the internet and shortwave. 1300 UTC is midnight in Eastern Australia and at Radio Australia. Thanks to the internet, one can sample any number of local stations, including 3AW in Melbourne (my personal favorite **www.3aw.com.au**). At 1500 Japan joins the party. Radio Japan has had special programming over the years, but it has proven difficult to hear.

This year at 1600, join the special **Happy Station** New Year broadcast via studios in Hong Kong. Listen on WRMI on 9955 kHz or online via the WRMI website.

"The transmission at 1600UTC will be LIVE from Hong Kong. My friends at RTHK (Radio Television Hong Kong) are giving us a studio over looking Victoria Harbor where at 1659UTC we will do the countdown to 2010. They are also letting us patch into the audio feeds for RTHK, so you will be able to hear the countdown live as it happens in Hong Kong." (Keith Perron, Happy Station host)

1600 is local midnight in Perth, Western Australia (**www.6pr.com.au**) Taiwan, The Philippines, and Singapore also ring in the New Year at 1600.

You'll probably need the internet to hear the New Year in Asia, but such nations as Pakistan at 1800, New Delhi at 1830, Kabul at 1930 and Iran at 2000 are next up. At 2200 most of Africa, Israel and much of Eastern Europe join the party, followed at 0000 UTC by the UK.

Can't hear the World Service on shortwave? No worries, almost every BBC network online relays the peels of Big Ben, and if you miss those, thanks to the online archive you can go back later (up to 7 days after) and listen. (In 2008 and 2009, I listened to midnight in Ireland via the internet, great programming indeed.)

At 0200, 2010 arrives in Brazil and 3 hours later at 0500 in Eastern North America. It can be a fascinating experience to listen in on the celebrations around the world. And remember to log into internet broadcasts early, because the servers do get busy!

Another New Year tradition originates in Vienna on New Years' Day itself. The annual **Vienna Philharmonic New Year Concert** is seen or heard by an audience estimated at 1 billion persons. With audience participation reminiscent of the BBC Proms, the lively Strauss music is an annual treat. It has been heard via shortwave on ORF, on BBC Radio 3, and can usually be seen on PBS television in North America. (For many years it was hosted by the late Walter Cronkite.) Check out the Vienna Philharmonic website closer to the time.

In Canada, New Years Day features something of a tradition with Roy Forbes presenting one of his ***Snap, Crackle and Pop*** programs. Over the years these have varied from 90 minutes to two and a half hours. Roy shares some of his massive collection of delicious sounding vinyl, including 78s and LPs. It's a great way to start a new year. Check the CBC website, or my website (see below), closer to the time.

For up to the minute program listings, consult ***World of Radio*** (and its website), various internet groups, such as the DXLD and ODXA yahoo groups, and my own website **www.doghousecharlie.com/seasonal-programs-2009-10/**

Another year has come to an end. And so has another edition of the *Programming Spotlight*. Thank you to all those who have read or responded to the column in 2009 and I hope you all have a wonderful 2010. See you next month in a brand new year!

# THE QSL REPORT

**VERIFICATIONS RECEIVED BY OUR READERS**

*Gayle Van Horn, W4GVH*
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## Tune in the Holidays from a QSL Perspective

Ready or not, the holiday season is here, and for shortwave listeners it's a month of annual holiday programming favorites. This is a great opportunity to preserve your favorites by QSLing the best of the season. Listeners can find a variety of programs from around the world featuring classical music, comedy, choral, plays, religious services and nostalgic favorites.

Between Christmas and New Year, look for year-end retrospectives, looking back at the events of 2009 and forward to 2010. New Year celebrations begin in New Zealand at 1100 UTC on December 31, as you follow the New Year around the globe. (Go easy on the toasting.) Follow the latest holiday schedules from *MT's Programming Spotlight* columnist, Fred Waterer as he keeps you abreast of the holidays in his informative column and on his *DogHouseCharlie* website at **www.doghousecharlie.com/christmas-programming/** Consult *MT's SW Guide* and *MTXtra* Shortwave Broadcast Guides (available with an *MTXpress* subscription) for current by-hour frequency schedules.

Radio Free Asia is offering their *13th Anniversary* QSL card until December 31, 2009. The card not only commemorates RFA's anniversary, but also helps capture the spirit of RFA's family and friends around the world while promoting freedom, democracy and peace. This year's anniversary card is a sketch drawn by the children of RFA personnel.

Complete language listings for RFA are listed in the *MTXtra Shortwave Broadcast Guide*. Reception reports may be submitted at the *QSL Reports* link at **www.techweb.rfa.org** or by email at *qsl@rfa.org* Postal address: Radio Free Asia, 2025 M. Street NW, Suite 300, Washington, DC 20036 USA.

European readers should look for Radio Bila Hora, broadcasting from the Czech Republic, on New Years Eve. Each year the annual pirate broadcaster operates on 3333 kHz, and was heard last year at 1530-1600 and 1900-2000 UTC from the United Kingdom. Send program details to *rbh@email.cz*. The station's Czech website at **http://czechian.net/** may be translated using Google language tools. You Tube video at **www.youtube.com/watch?v=FTreCgFS0z4**

After an absence of several months, listeners are hearing Radio Amanecer Internacional again on 6015.02 kHz from the Dominican Republic. Monitoring has been from 2300-0300 UTC in Spanish, and reception reports may be sent to: Apartado Postal 1500, Santo Domingo, Dominican Republic (or) Juan Sánchez Ramírez #40, San Domingo, Domnican Republic.

^ Streaming audio and podcast at **www.radioamanecer.org**

An amateur radio DXpedition is planned for December 29-January 4, 2010 from Robertson Island, Houtman Abrolhos (OC-211). Located off the west coast of Australia, the Abrolhos were activated for the first and only time in 1996. Consult **www.westozdx.net/IOTA/OC211.html** for broadcasting details, QSL via VK4AAR-Alan Roocroft, 376 Old Toowomba Road, Placid Hills, QLD 4343 Australia.

The following web addresses and email updates may be used for surfing and QSLing.

- Clandestine, Radio Free Chosun **www.rfcosun.org/eng email**: *rfchosun@rfchosun.org*
- Euro Pirate, Playback International, email: ***playbackinternational@gmail.com***
- Israel World Federation Inc. (via WHRI), **www.british-israel-world-fed.ca** email: ***biwf.canada@bellnet.ca***
- Polish Radio, ***english.section@polishradio.pl***
- RAE Argentina, ***argentinainternationalradio@gmail.com***
- Radio Miraya FM, email: mirayasudan@mirayafm.org
- Radio Tirana, Albania english@hotmail.com
- Southern Sudan Interactive Radio, ottok@sentech.co.za
- U.S. pirate, Northwoods Radio has changed their email address to northwoodsradio@gmail, while WBNY/Commander Bunny has a new web address at http://wbny.webhop.org
- Voice of Vietnam, englishsection@vov.org.vn

**AMATEUR RADIO**

Falkland Islands, VP8KF, 21 MHz SSB, CQ Zone: 13 Locator GD 18bh. Full data color scenery card. Received in 28 days for $2.00 US. QSL address: John Wright G3VPW, 2 Barnfield, Charney Bassett, Wantage, Oxfordshire, OX12 0HA England (Larry Van Horn, NC).

**BELGIUM**

The following clandestine stations were verified from the Transmitter Documentation Project. Loggings were obtained in the U.S. and Bao Loc, Lam Dong, Vietnam. TDP has its headquarters in Rikevorsel, Belgium, and leases airtime over world band transmitters. Reports were verified by seven full data blue TDP cards, without transmitter site notation. QSL address: TDP, P.O. Box 1, B-2310, Rijkevorsel, Belgium.

- Denge Mezopatamya, Grigoriopol, Moldova 12,115 kHz in seven years.
- Voice of Oromiyaa 12,115 kHz in seven years.
- Voice of Liberty Eritrea, Samara, Russia 15,675 kHz in 52 months.
- Que Huong Radio, Vladivostok, Russia 15,680 kHz in 52 months.
- Radio Free Vietnam via KWHR 11,855 kHz in 52 months.
- Radio Voice of ENUF, Samara, Russia, 12,120 kHz in four years.
- Radio Free South Cameroon 11,840 kHz in 42 months.

(Wendal Craighead, Kansas)

**BHUTAN**

Bhutan Broadcasting Service, 6035 kHz. Full data card signed by Ngawang Dorji-BBS Transmission Head. Received in 65 days for email report to bbs@com.bt; received from ngawangdorji23@gmail.com (Roberto Pavanello, Italy/playdx). Postal address: Department of Information and Broadcasting, Ministry of Communications, P.O. Box 101, Thimphu, Bhutan.

Streaming audio www.bbs.com.bt

**CLANDESTINE**

Nippon Kaze (Korean BCB) via T8WH Palau. Electronic reply received for my email report and Mp3 recording to info@rachi.go.jp Response stated "thanks for your interest." The station does not QSL, but recommended "please check our website for additional information about abductions." Did not note the transmitter site despite my request. Verified with full data card commemorating Twenty Years of Shortwave Ministry to the World. Received in six months via WHRI-KWHR. QSL address: P.O. Box 12, South Bend, IN 46624 USA (or) LeSEA Broadcasting , 61300 Ironwood Road, South Bend, IN 46614 USA.

Streaming audio www.whr.org (Edward Kusalik, Alberta, Canada)

**GERMANY**

Radio Free Asia, 7470 kHz. Full data, Year of the Ox card with site notation. Received in 18 days for an email report to qsl@rfa.org. Ox cards received in 16 days from email reports for Iranawila, Sri Lanka 9385; 18 days for Dushanbe, Tajikistan (Kusalik).


**INDIA/GOA**

All India Radio-Panaji 9705 kHz. Full data color scenery card of Fatehpur Sikri ruins, signed with illegible signature. Received in five years and 23 days, 45 days from last English follow-up report with SAE (not used) and souvenir postcards. Follow-up was posted online at: spectrum-manager@air.org.in and also mailed to postal address, verified from: Directorate General-All India Radio, Akashvani Bhawan, Sansad Marg, New Delhi 110001, India. Very pleased to verify AIR-Panaji, which counts as Goa, after a five year wait. :) (Gayle Van Horn, NC)

Additional QSLs, tips, photos and information excluded for space constraints are posted at the Shortwave Central Blog at: http://mt-shortwave.blogspot.com/

***Seasons Greetings from QSL Report***

# How to Use the Shortwave Guide

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

① ② ⑤ ③ ④ ⑥ ⑦

## Convert your time to UTC.

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

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

## Find the station you want to hear.

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

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

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

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

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

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

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

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

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


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***Additional Contributors to This Month's Shortwave Guide:***

*Thank You to …*

AOKI; *BCL News; Ardic DX Club*; *DX Asia*; *British DX Club*; *Cumbre DX*; DSWCI-DX Window, EIBI; *HFCC; Hard-Core DX; Radio Bulgaria DX Mix News*; Media Broadcast, *Play DX 2003; WWDXC*- BC DX, *Top News; World DX Club/Contact, World News, World Radio TV Handbook.*

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## Shortwave Broadcast Bands

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

**Notes**

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

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

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

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

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0000 | 0000 | | UK, BBC World Service | 5970as | 6195as | |
| | | | 7360as | 9410as | 9740as | 13735as |
| | | | 15335as | 15360as | | |
| 0000 | 0005 | Sat | Greece, Voice of Greece | 7475va | 9420va | |
| 0000 | 0020 | | Japan, NHK World/ Radio Japan | | 5960eu | |
| | | | 6145na | 13650as | 17810as | |
| 0000 | 0030 | | Australia, HCJB Global | 15400as | | |
| 0000 | 0030 | | Egypt, Radio Cairo11590na | | | |
| 0000 | 0030 | | Thailand, Radio Thailand World Service | | 15275na | |
| 0000 | 0030 | | USA, Voice of America | 7555va | | |
| 0000 | 0045 | | India, All India Radio | 9705as | 9950as | |
| | | | 11620as | 11645as | | |
| 0000 | 0045 | | USA, WYFR/Family Radio Worldwide | | 6085na | |
| | | | 11720sa | | | |
| 0000 | 0057 | | Canada, Radio Canada International | | 9880as | |
| 0000 | 0100 | | Anguilla, Worldwide Univ Network | | 6090am | |
| 0000 | 0100 | | Australia, ABC NT Alice Springs | | 4835do | |
| 0000 | 0100 | | Australia, ABC NT Katherine | 5025do | | |
| 0000 | 0100 | | Australia, ABC NT Tennant Creek | | 4910do | |
| 0000 | 0100 | | Australia, Radio Australia | 9660as | 12080as | |
| | | | 13690as | 15240pa | 17665as | 17715as |
| | | | 17750va | 17775va | 17795va | |
| 0000 | 0100 | | Bahrain, Radio Bahrain | 6010me | 9745al | |
| 0000 | 0100 | | Bulgaria, Radio Bulgaria | 5900na | 7400na | |
| 0000 | 0100 | | Canada, CFRX Toronto ON | 6070na | | |
| 0000 | 0100 | | Canada, CFVP Calgary AB | 6030na | | |
| 0000 | 0100 | | Canada, CKZN St John's NF | 6160na | | |
| 0000 | 0100 | | Canada, CKZU Vancouver BC | 6160na | | |
| 0000 | 0100 | | China, China Radio International | | 6020na | |
| | | | 6075as | 6180as | 7415as | 9570na |
| | | | 11790as | 11885as | 13750as | 15125as |
| 0000 | 0100 | | Germany, Deutsche Welle | 7265as | 9785as | |
| | | | 15640as | | | |
| 0000 | 0100 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 0000 | 0100 | | New Zealand, Radio NZ International | | 15720pa | |
| 0000 | 0100 | | Russia, Voice of Russia | 9480sa | 9665sa | |
| 0000 | 0100 | | Spain, Radio Exterior de Espana | | 6055na | |
| 0000 | 0100 | | USA, American Forces Network | | 4319usb | |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 0000 | 0100 | | USA, EWTN Vandiver AL | 11520af | | |
| 0000 | 0100 | | USA, WBCQ Monticello ME | 5110am | 7415am | |
| 0000 | 0100 | | USA, WHRA Greenbush ME | 7385eu | | |
| 0000 | 0100 | | USA, WHRI Cypress Creek SC | 5875na | 7315va | |
| 0000 | 0100 | | USA, WINB Red Lion PA | 9265am | | |
| 0000 | 0100 | vl | USA, WRMI Miami FL | 9955va | | |
| 0000 | 0100 | | USA, WTJC Newport NC | 9370na | | |
| 0000 | 0100 | | USA, WWCR Nashville TN | 5070na | 5935na | |
| | | | 7465na | 9980na | | |
| 0000 | 0100 | | USA, WWRB Manchester TN | 3185va | 5050va | |
| | | | 5745va | 6890va | | |
| 0000 | 0100 | | USA, WYFR/Family Radio Worldwide | | 5950na | |
| | | | 9595na | 15440na | | |
| 0000 | 0100 | | Zambia CVC Intl/ The Voice Africa | | 4965af | |
| 0000 | 1500 | DRM | New Zealand, Radio NZ International | | 17675pa | |
| 0005 | 0100 | twhfa | Canada, Radio Canada International | | 9755na | |
| 0005 | 0100 | m | Greece, Voice of Greece | 7475va | 9420va | |
| 0013 | 0017 | twhfa | Austria, ORF/Radio Austria Intl | 9820am | | |
| 0025 | 0100 | | Sri Lanka, SLBC | 6005as | 9770as | 15745as |
| 0030 | 0045 | Sun | Germany, Pan American Broadcasting | | 9640as | |
| 0030 | 0100 | | Australia, Radio Australia | 15415as | 17665as | |
| 0030 | 0100 | | China, China Radio International | | 11730as | |
| 0030 | 0100 | mtwhfa | Serbia, International Radio of Serbia | | 9675na | |
| 0030 | 0100 | | Thailand, Radio Thailand World Service | | 15275na | |
| 0030 | 0100 | fas | UK, Bible Voice Broadcasting | 9490as | | |
| 0030 | 0100 | | USA, Voice of America/Special English | | 7430as | |
| | | | 9715as | 9780as | 11725as | 15205as |
| | | | 15560as | 17820as | | |
| 0030 | 0100 | | Uzbekistan, CVC Intl/ The Voice Asia | | 11800as | |
| 0043 | 0047 | twhfa | Austria, ORF/Radio Austria Intl | 9820am | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0100 | 0104 | | Canada, Radio Canada International | | 9755na | |
| 0100 | 0105 | m | Greece, Voice of Greece | 7475va | 9420va | |
| | | | 15630va | | | |
| 0100 | 0125 | | Vietnam, Voice of Vietnam | 6175na | | |
| 0100 | 0127 | | Czech Republic, Radio Prague | 6200na | 7355na | |
| 0100 | 0127 | | Slovakia, Radio Slovakia International | | 5930am | |
| | | | 9440am | | | |
| 0100 | 0130 | | Australia, Radio Australia | 9660as | 12080as | |
| | | | 13690as | 15240pa | 17665as | 17715as |
| | | | 17750va | 17775va | 17795va | |
| 0100 | 0130 | | Serbia, International Radio of Serbia | | 9675na | |
| 0100 | 0156 | | Romania, Radio Romania International | | 6145na | |
| | | | 9800na | | | |
| 0100 | 0157 | | Canada, Radio Canada International | | 6165as | |
| | | | 7255as | | | |
| 0100 | 0157 | | North Korea, Voice of Korea | 7140as | 9345as | |
| | | | 9730as | 11735sa | 13760sa | 15180sa |
| 0100 | 0200 | | Anguilla, Worldwide Univ Network | | 6090am | |
| 0100 | 0200 | | Australia, ABC NT Alice Springs | | 4835do | |
| 0100 | 0200 | | Australia, ABC NT Katherine | 5025do | | |
| 0100 | 0200 | | Australia, ABC NT Tennant Creek | | 4910do | |
| 0100 | 0200 | | Australia, HCJB Global | 15400as | | |
| 0100 | 0200 | | Bahrain, Radio Bahrain | 6010me | 9745al | |
| 0100 | 0200 | | Canada, CFRX Toronto ON | 6070na | | |
| 0100 | 0200 | | Canada, CFVP Calgary AB | 6030na | | |
| 0100 | 0200 | | Canada, CKZN St John's NF | 6160na | | |
| 0100 | 0200 | | Canada, CKZU Vancouver BC | 6160na | | |
| 0100 | 0200 | | China, China Radio International | | 6175as | |
| | | | 9410eu | 9470eu | 9535as | 9580na |
| | | | 9790na | 11870as | 15125as | 15785as |
| 0100 | 0200 | DRM | China, China Radio International | | 6080na | |
| 0100 | 0200 | | Cuba, Radio Havana Cuba | 6000na | 6140na | |
| 0100 | 0200 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 0100 | 0200 | | New Zealand, Radio NZ International | | 15720pa | |
| 0100 | 0200 | DRM | New Zealand, Radio NZ International | | 17675pa | |
| 0100 | 0200 | | Palau, T8WH/World Harvest | 15710as | | |
| 0100 | 0200 | | Russia, Voice of Russia | 9480sa | 9665sa | |
| 0100 | 0200 | | Sri Lanka, SLBC | 6005as | 9770as | 15745as |
| 0100 | 0200 | | Taiwan, Radio Taiwan International | | 11875as | |
| 0100 | 0200 | | UK, BBC World Service | 5940as | 5970as | |
| | | | 9410as | 9740as | 11750as | 11955as |
| | | | 15335as | 15360as | 17615as | |
| 0100 | 0200 | | Ukraine, Radio Ukraine International | | 7440na | |
| 0100 | 0200 | | USA, American Forces Network | | 4319usb | |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 0100 | 0200 | | USA, EWTN Vandiver AL | 11520af | | |
| 0100 | 0200 | | USA, KJES Vado NM | 7555na | | |
| 0100 | 0200 | | USA, Voice of America | 7430va | 9780va | |
| | | | 11705va | | | |
| 0100 | 0200 | mtwhfa | USA, WBCQ Monticello ME | 5110am | 7415am | |
| 0100 | 0200 | | USA, WHRA Greenbush ME | 7385eu | | |
| 0100 | 0200 | | USA, WHRI Cypress Creek SC | 5875na | 7315va | |
| 0100 | 0200 | mtwhf | USA, WHRI Cypress Creek SC | 5850na | | |
| 0100 | 0200 | Sat/Sun | USA, WHRI Cypress Creek SC | 7315na | | |
| 0100 | 0200 | | USA, WINB Red Lion PA | 9265am | | |
| 0100 | 0200 | vl | USA, WRMI Miami FL | 9955va | | |
| 0100 | 0200 | | USA, WRNO New Orleans LA | 7505am | | |
| 0100 | 0200 | | USA, WTJC Newport NC | 9370na | | |
| 0100 | 0200 | | USA, WWCR Nashville TN | 5070na | 5935na | |
| | | | 7465na | 9980na | | |
| 0100 | 0200 | | USA, WWRB Manchester TN | 3185va | 5050va | |
| | | | 5745va | 6890va | | |
| 0100 | 0200 | | USA, WYFR/Family Radio Worldwide | | 7455na | |
| | | | 9505na | 15440na | | |
| 0100 | 0200 | | Uzbekistan, CVC Intl/ The Voice Asia | | 11790as | |
| | | | 11880as | | | |
| 0100 | 0200 | | Zambia CVC Intl/ The Voice Africa | | 4965af | |
| 0105 | 0200 | | Canada, Radio Canada International | | 9755na | |
| 0113 | 0117 | twhfa | Austria, ORF/Radio Austria Intl | 9820am | | |
| 0130 | 0145 | twhfas | Albania, Radio Tirana | 7425na | | |
| 0130 | 0200 | | Australia, Radio Australia | 9660as | 12080as | |
| | | | 13690as | 15240pa | 15415as | 17665as |
| | | | 17715va | 17750va | 17795va | |
| 0130 | 0200 | | Iran, Voice of Islamic Rep. of Iran | | 7235na | |
| | | | 9495na | | | |
| 0130 | 0200 | twhfa | USA, Voice of America/Special English | | 6040ca | |
| | | | 9820ca | | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0200 | 0204 | | Canada, Radio Canada International | | 9755na | |
| 0200 | 0227 | | Czech Republic, Radio Prague | 6200na | 7355na | |
| 0200 | 0227 | | Iran, Voice of Islamic Rep. of Iran | | 7235na | |
| | | | 9495na | | | |
| 0200 | 0230 | | Thailand, Radio Thailand World Service | | 15275na | |
| 0200 | 0230 | | USA, KJES Vado NM | 7555na | | |
| 0200 | 0257 | | North Korea, Voice of Korea | 13650as | 15100as | |
| 0200 | 0258 | DRM | Germany, Deutsche Welle | 15205eu | | |
| 0200 | 0300 | | Anguilla, Worldwide Univ Network | | 6090am | |
| 0200 | 0300 | | Argentina, Radio Nacional 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, HCJB Global | 15400as | | |
| 0200 | 0300 | | Australia, Radio Australia | 9660as | 12080as | |
| | | | 13690as | 15240pa | 15415as | 15515as |
| | | | 17750va | 21725va | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0200 | 0300 | | Bahrain, Radio Bahrain | 6010me | 9745al | |
| 0200 | 0300 | | Canada, CFRX Toronto ON | 6070na | | |
| 0200 | 0300 | | Canada, CFVP Calgary AB | 6030na | | |
| 0200 | 0300 | | Canada, CKZN St John's NF | 6160na | | |
| 0200 | 0300 | | Canada, CKZU Vancouver BC | 6160na | | |
| 0200 | 0300 | | China, China Radio International | | | 11770as |
| | | | 13640as | | | |
| 0200 | 0300 | | Cuba, Radio Havana Cuba | 6000na | 6140na | |
| 0200 | 0300 | | Egypt, Radio Cairo7540na | | | |
| 0200 | 0300 | | Indonesia, Voice of Indonesia | 9525va | 11785al | |
| | | | 15150al | | | |
| 0200 | 0300 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 0200 | 0300 | | New Zealand, Radio NZ International | | | 15720pa |
| 0200 | 0300 | DRM | New Zealand, Radio NZ International | | | 17675pa |
| 0200 | 0300 | | Palau, T8WH/World Harvest | 15710as | | |
| 0200 | 0300 | | Philippines, PBS/ Radyo Pilipinas | | | 11880me |
| | | | 15285me | 15510me | | |
| 0200 | 0300 | | Russia, Voice of Russia | 9480sa | 9665sa | |
| | | | 15425na | | | |
| 0200 | 0300 | | South Korea, KBS World Radio | | | 9580sa |
| 0200 | 0300 | | Sri Lanka, SLBC 6005as | | 9770as | 15745as |
| 0200 | 0300 | | Taiwan, Radio Taiwan International | | | 5950na |
| | | | 9680na | | | |
| 0200 | 0300 | | Uganda, UBC Radio | 4976do | | |
| 0200 | 0300 | | UK, BBC World Service | 5940as | | 6005af |
| | | | 6195me | 9410as | 15310as | |
| 0200 | 0300 | | USA, American Forces Network | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 0200 | 0300 | | USA, EWTN Vandiver AL | 11520af | | |
| 0200 | 0300 | mtwhfa | USA, WBCQ Monticello ME | 5110am | 7415am | |
| 0200 | 0300 | | USA, WHRA Greenbush ME | 7385eu | | |
| 0200 | 0300 | | USA, WHRI Cypress Creek SC | 5875na | 7315va | |
| 0200 | 0300 | | USA, WINB Red Lion PA | 9265am | | |
| 0200 | 0300 | vl | USA, WRMI Miami FL | 9955va | | |
| 0200 | 0300 | | USA, WRNO New Orleans LA | 7505am | | |
| 0200 | 0300 | | USA, WTJC Newport NC | 9370na | | |
| 0200 | 0300 | | USA, WWCR Nashville TN | 3215na | 5070na | |
| | | | 5890na | 5935na | | |
| 0200 | 0300 | | USA, WWRB Manchester TN | 3185va | 5050va | |
| | | | 5745va | 6890va | | |
| 0200 | 0300 | | USA, WYFR/Family Radio Worldwide | | | 4985na |
| | | | 6890na | 7455na | 9505na | 9525na |
| 0200 | 0300 | | Uzbekistan, CVC Intl/ The Voice Asia | | | 11790as |
| | | | 11880as | | | |
| 0200 | 0300 | | Zambia CVC Intl/ The Voice Africa | | | 4965af |
| 0215 | 0230 | | Nepal, Radio Nepal | 5005as | | |
| 0230 | 0300 | | China, China Radio International | | | 15435as |
| 0230 | 0300 | | Sweden, Radio Sweden | 6010na | | 11550va |
| 0245 | 0300 | twhfas | Albania, Radio Tirana | 7425eu | | |
| 0245 | 0300 | | Zambia, Zambia Natl Broadcasting Corp | | | 6165do |
| 0250 | 0300 | | Vatican City State, Vatican Radio | | | 6040am |
| | | | 7305am | | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0300 | 0330 | | Egypt, Radio Cairo7540na | | | |
| 0300 | 0330 | | Philippines, PBS/ Radyo Pilipinas | | | 11880me |
| | | | 15285me | 15510me | | |
| 0300 | 0330 | | Uzbekistan, CVC Intl/ The Voice Asia | | | 11800as |
| | | | 11880as | | | |
| 0300 | 0330 | | Vatican City State, Vatican Radio | | | 7360af |
| | | | 9660af | | | |
| 0300 | 0357 | | North Korea, Voice of Korea | 7140as | 9345as | |
| | | | 9730as | | | |
| 0300 | 0400 | | Anguilla, Worldwide Univ Network | | | 6090am |
| 0300 | 0400 | | Australia, ABC NT Alice Springs | | | 4835do |
| 0300 | 0400 | | Australia, ABC NT Katherine | 5025do | | |
| 0300 | 0400 | | Australia, ABC NT Tennant Creek | | | 4910do |
| 0300 | 0400 | | Australia, Radio Australia | 9660as | 12080as | |
| | | | 13690as | 15240pa | 15415as | 15515as |
| | | | 17750va | 21725va | | |
| 0300 | 0400 | | Bahrain, Radio Bahrain | 6010me | 9745al | |
| 0300 | 0400 | | Bulgaria, Radio Bulgaria | 5900na | 7400na | |
| 0300 | 0400 | twhfas | Canada, CBC NQ SW Service | 9625na | | |
| 0300 | 0400 | | Canada, CFRX Toronto ON | 6070na | | |
| 0300 | 0400 | | Canada, CFVP Calgary AB | 6030na | | |
| 0300 | 0400 | | Canada, CKZN St John's NF | 6160na | | |
| 0300 | 0400 | | Canada, CKZU Vancouver BC | 6160na | | |
| 0300 | 0400 | | China, China Radio International | | | 9690na |
| | | | 9790na | 11770as | 13750as | 15110as |
| | | | 15120as | 15785as | | |
| 0300 | 0400 | | Cuba, Radio Havana Cuba | 6000na | 6140na | |
| 0300 | 0400 | | Germany, Deutsche Welle | 11695as | 17800as | |
| 0300 | 0400 | | Italy, IRRS/NEXUS 9835va | | | |
| 0300 | 0400 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 0300 | 0400 | | Malaysia, RTM/Voice of Malaysia | | | 6175as |
| | | | 9750as | 15295as | | |
| 0300 | 0400 | | New Zealand, Radio NZ International | | | 15720pa |
| 0300 | 0400 | DRM | New Zealand, Radio NZ International | | | 17675pa |
| 0300 | 0400 | | Oman, Radio Oman | 15355af | | |
| 0300 | 0400 | | Palau, T8WH/World Harvest | 15700as | | |
| 0300 | 0400 | DRM | Russia, Voice of Russia | 15735as | | |
| 0300 | 0400 | | Russia, Voice of Russia | 9665sa | 15425na | |
| | | | 15585as | 15755as | | |
| 0300 | 0400 | | South Africa, Channel Africa | 3345af | 6135af | |
| 0300 | 0400 | | Sri Lanka, SLBC 6005as | | 9770as | 15745as |
| 0300 | 0400 | | Taiwan, Radio Taiwan International | | | 5950na |
| | | | 15320as | | | |
| 0300 | 0400 | | Uganda, UBC Radio | 4976do | | |
| 0300 | 0400 | | UK, BBC World Service | 3255af | 6005af | |
| | | | 6105af | 6145af | 6190af | 6195as |
| | | | 7255af | 7445af | 9410as | 12095as |
| | | | 15310as | 17790as | | |
| 0300 | 0400 | | USA, American Forces Network | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 0300 | 0400 | | USA, EWTN Vandiver AL | 11520af | | |
| 0300 | 0400 | | USA, Voice of America | 4930af | 6080af | |
| | | | 9885af | 15580af | | |
| 0300 | 0400 | twhfa | USA, WBCQ Monticello ME | 7415am | | |
| 0300 | 0400 | | USA, WHRA Greenbush ME | 7385eu | | |
| 0300 | 0400 | | USA, WHRI Cypress Creek SC | 5875na | 7315na | |
| 0300 | 0400 | vl | USA, WRMI Miami FL | 9955va | | |
| 0300 | 0400 | | USA, WRNO New Orleans LA | 7505am | | |
| 0300 | 0400 | | USA, WTJC Newport NC | 9370na | | |
| 0300 | 0400 | | USA, WWCR Nashville TN | 3215na | 5070na | |
| | | | 5890na | 5935na | | |
| 0300 | 0400 | | USA, WWRB Manchester TN | 3185va | 5050va | |
| | | | 5745va | 6890va | | |
| 0300 | 0400 | | USA, WYFR/Family Radio Worldwide | | | 9505na |
| | | | 9930af | 9985eu | | |
| 0300 | 0400 | | Uzbekistan, CVC Intl/ The Voice Asia | | | 13680as |
| 0300 | 0400 | | Zambia CVC Intl/ The Voice Africa | | | 4965af |
| 0300 | 0400 | | Zambia, Zambia Natl Broadcasting Corp | | | 6165do |
| 0330 | 0400 | twhfas | Albania, Radio Tirana | 6150na | | |
| 0330 | 0400 | | Sweden, Radio Sweden | 6010na | | |
| 0330 | 0400 | | UK, BBC World Service | 11945af | | |
| 0330 | 0400 | | Uzbekistan, CVC Intl/ The Voice Asia | | | 15555as |
| 0345 | 0400 | vl/Sat/Sun | Uganda, UBC Radio | 4976do | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0400 | 0427 | | Czech Republic, Radio Prague | 6200na | 7345na | |
| 0400 | 0430 | | Australia, Radio Australia | 9660as | 12080as | |
| | | | 13690as | 15160as | 15240pa | 15515as |
| | | | 17750va | 21725va | | |
| 0400 | 0430 | mtwhf | France, Radio France International | | | 9805af |
| | | | 11995af | | | |
| 0400 | 0445 | | USA, WYFR/Family Radio Worldwide | | | 7445na |
| | | | 9505na | | | |
| 0400 | 0455 | | Turkey, Voice of Turkey | 6020va | 6040me | |
| | | | 7240na | | | |
| 0400 | 0456 | | Romania, Radio Romania International | | | 6130na |
| | | | 7310na | 9690as | 11895as | |
| 0400 | 0458 | | New Zealand, Radio NZ International | | | 15720pa |
| 0400 | 0458 | DRM | New Zealand, Radio NZ International | | | 17675pa |
| 0400 | 0500 | | Anguilla, Worldwide Univ Network | | | 6090am |
| 0400 | 0500 | | Australia, ABC NT Alice Springs | | | 4835do |
| 0400 | 0500 | | Australia, ABC NT Katherine | 5025do | | |
| 0400 | 0500 | | Australia, ABC NT Tennant Creek | | | 4910do |
| 0400 | 0500 | | Bahrain, Radio Bahrain | 6010me | 9745al | |
| 0400 | 0500 | twhfas | Canada, CBC NQ SW Service | 9625na | | |
| 0400 | 0500 | | Canada, CFRX Toronto ON | 6070na | | |
| 0400 | 0500 | | Canada, CKZN St John's NF | 6160na | | |
| 0400 | 0500 | | Canada, CKZU Vancouver BC | 6160na | | |
| 0400 | 0500 | | China, China Radio International | | | 6020na |
| | | | 6080na | 6190na | 13750as | 15120as |
| | | | 15785as | 17730as | 17855as | |
| 0400 | 0500 | | Cuba, Radio Havana Cuba | 6000na | 6140na | |
| 0400 | 0500 | | Germany, Deutsche Welle | 5905af | 5945af | |
| | | | 6180af | 15600af | | |
| 0400 | 0500 | | Italy, IRRS/NEXUS 9835va | | | |
| 0400 | 0500 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 0400 | 0500 | | Malaysia, RTM/Voice of Malaysia | | | 6175as |
| | | | 9750as | 15295as | | |
| 0400 | 0500 | | Palau, T8WH/World Harvest | 15700as | | |
| 0400 | 0500 | DRM | Russia, Voice of Russia | 15735as | | |
| 0400 | 0500 | | Russia, Voice of Russia | 13755na | 15585as | |
| | | | 15755as | | | |
| 0400 | 0500 | | South Africa, Channel Africa | 3345af | | |
| 0400 | 0500 | | Sri Lanka, SLBC 6005as | | 9770as | 15745as |
| 0400 | 0500 | | Uganda, UBC Radio | 4976do | | |
| 0400 | 0500 | | UK, BBC World Service | 3255af | 6005af | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 6190af | 7255af | 7445af | 9410as | |
| | | | 11945af | 12035af | 15310as | 15360as | |
| | | | 17790as | | | | |
| 0400 | 0500 | | Ukraine, Radio Ukraine International | | | 7440na | |
| 0400 | 0500 | | USA, American Forces Network | | | 4319usb | |
| | | | 5446usb | 5765usb | 6350usb | 7812usb | |
| | | | 10320usb | 12133usb | 12759usb | 13362usb | |
| 0400 | 0500 | | USA, EWTN Vandiver AL | | | 11520af | |
| 0400 | 0500 | | USA, Voice of America | | | 4930af | 4960af |
| | | | 6080af | 9885af | 15580af | | |
| 0400 | 0500 | | USA, WHRA Greenbush ME | | | 7385eu | |
| 0400 | 0500 | | USA, WHRI Cypress Creek SC | | | 5875na | 7315va |
| 0400 | 0500 | smtwhf | USA, WHRI Cypress Creek SC | | | 5850na | |
| 0400 | 0500 | Sat | USA, WHRI Cypress Creek SC | | | 9825na | |
| 0400 | 0500 | vl | USA, WRMI Miami FL | | | 9955va | |
| 0400 | 0500 | | USA, WTJC Newport NC | | | 9370na | |
| 0400 | 0500 | | USA, WWCR Nashville TN | | | 3215na | 5070na |
| | | | 5890na | 5935na | | | |
| 0400 | 0500 | | USA, WWRB Manchester TN | | | 3185va | 5745va |
| 0400 | 0500 | | USA, WYFR/Family Radio Worldwide | | | | 6915na |
| | | | 9680na | | | | |
| 0400 | 0500 | | Uzbekistan, CVC Intl/ The Voice Asia | | | | 13680as |
| | | | 15555as | | | | |
| 0400 | 0500 | | Zambia CVC Intl/ The Voice Africa | | | | 4965af |
| | | | 9430af | | | | |
| 0400 | 0500 | | Zambia, Zambia Natl Broadcasting Corp | | | | 6165do |
| 0430 | 0457 | | Czech Republic, Radio Prague | | | 9855va | |
| 0430 | 0500 | twhfas | Albania, Radio Tirana | | | 6100na | |
| 0430 | 0500 | | Australia, Radio Australia | | | 9660as | 12080as |
| | | | 13690as | 15240pa | 15415as | 15515as | |
| | | | 17750va | 21725va | | | |
| 0430 | 0500 | mtwhf | Swaziland, TWR Swaziland | | | 3200af | |
| 0459 | 0500 | | New Zealand, Radio NZ International | | | | 11725pa |
| 0459 | 0500 | DRM | New Zealand, Radio NZ International | | | | 13730pa |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0500 | 0507 | twhfas | Canada, CBC NQ SW Service | | | 9625na | |
| 0500 | 0530 | | Australia, Radio Australia | | | 9660as | 12080as |
| | | | 13690as | 15160as | 15240pa | 15515as | |
| | | | 17750va | | | | |
| 0500 | 0530 | mtwhf | France, Radio France International | | | | 11995af |
| | | | 13680af | 15160as | | | |
| 0500 | 0530 | | Germany, Deutsche Welle | | | 6130af | 6180af |
| | | | 9755af | 12045af | 15600af | | |
| 0500 | 0530 | | Japan, NHK World/ Radio Japan | | | | 5975eu |
| | | | 6110na | 11970af | 15325as | 17810as | |
| 0500 | 0530 | | Vatican City State, Vatican Radio | | | | 7360af |
| | | | 9660af | 11625af | | | |
| 0500 | 0600 | | Anguilla, Worldwide Univ Network | | | | 6090am |
| 0500 | 0600 | | Australia, ABC NT Alice Springs | | | | 4835do |
| 0500 | 0600 | | Australia, ABC NT Katherine | | | 5025do | |
| 0500 | 0600 | | Australia, ABC NT Tennant Creek | | | | 4910do |
| 0500 | 0600 | | Bahrain, Radio Bahrain | | | 6010me | 9745al |
| 0500 | 0600 | | Bhutan, Bhutan Broadcasting Service | | | | 6035as |
| 0500 | 0600 | | Canada, CFRX Toronto ON | | | 6070na | |
| 0500 | 0600 | | Canada, CKZN St John's NF | | | 6160na | |
| 0500 | 0600 | | Canada, CKZU Vancouver BC | | | 6160na | |
| 0500 | 0600 | | China, China Radio International | | | | 6020na |
| | | | 11710af | 11880as | 11895as | 15350as | |
| | | | 15465as | 17505va | 17540as | 17730as | |
| | | | 17855as | | | | |
| 0500 | 0600 | | Cuba, Radio Havana Cuba | | | 6060na | 6140na |
| | | | 11760na | 13790na | | | |
| 0500 | 0600 | | Italy, IRRS/NEXUS | | | 9835va | |
| 0500 | 0600 | | Kuwait, Radio Kuwait | | | 15110as | |
| 0500 | 0600 | | Malaysia, RTM/Traxx FM | | | 7295do | |
| 0500 | 0600 | | Malaysia, RTM/Voice of Malaysia | | | | 6175as |
| | | | 9750as | 15295as | | | |
| 0500 | 0600 | | New Zealand, Radio NZ International | | | | 11725pa |
| 0500 | 0600 | DRM | New Zealand, Radio NZ International | | | | 13730pa |
| 0500 | 0600 | | Nigeria, Voice of Nigeria/External Service | | | | 15120af |
| 0500 | 0600 | | Palau, T8WH/World Harvest | | | 15700as | |
| 0500 | 0600 | | Russia, Voice of Russia | | | 13755na | |
| 0500 | 0600 | | South Africa, Channel Africa | | | 7230af | |
| 0500 | 0600 | | Swaziland, TWR Swaziland | | | 3200af | |
| 0500 | 0600 | | Taiwan, Radio Taiwan International | | | | 5950na |
| 0500 | 0600 | | Uganda, UBC Radio | | | 4976do | |
| 0500 | 0600 | | UK, BBC World Service | | | 3255af | 3995eu |
| | | | 5875eu | 6005af | 6190af | 7255af | |
| | | | 9410as | 11765af | 11945af | 12095eu | |
| | | | 15310as | 15360as | 17640af | 17790as | |
| 0500 | 0600 | smtwhf | UK, BBC World Service | | | 15420af | |
| 0500 | 0600 | | USA, American Forces Network | | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | 7812usb | |
| | | | 10320usb | 12133usb | 12759usb | 13362usb | |
| 0500 | 0600 | | USA, EWTN Vandiver AL | | | 11520af | |
| 0500 | 0600 | | USA, Voice of America | | | 4930af | 6080af |
| | | | 12080af | 15580af | | | |
| 0500 | 0600 | | USA, WHRA Greenbush ME | | | 7390af | |
| 0500 | 0600 | | USA, WHRI Cypress Creek SC | | | 5875na | 11565na |
| 0500 | 0600 | Sun | USA, WHRI Cypress Creek SC | | | 7365na | |
| 0500 | 0600 | vl | USA, WRMI Miami FL | | | 9955va | |
| 0500 | 0600 | | USA, WTJC Newport NC | | | 9370na | |
| 0500 | 0600 | | USA, WWCR Nashville TN | | | 3215na | 5070na |
| | | | 5890na | 5935na | | | |
| 0500 | 0600 | | USA, WWRB Manchester TN | | | 3185va | |
| 0500 | 0600 | | USA, WYFR/Family Radio Worldwide | | | | 6915na |
| | | | 9680na | | | | |
| 0500 | 0600 | | Uzbekistan, CVC Intl/ The Voice Asia | | | | 13680as |
| | | | 15555as | | | | |
| 0500 | 0600 | | Zambia CVC Intl/ The Voice Africa | | | | 4965af |
| | | | 9430af | | | | |
| 0500 | 0600 | | Zambia, Zambia Natl Broadcasting Corp | | | | 6165do |
| 0515 | 0530 | | Rwanda, Radio Rwanda | | | 6055do | |
| 0530 | 0600 | | Australia, Radio Australia | | | 9660as | 12080as |
| | | | 13690as | 15160as | 15240pa | 15415as | |
| | | | 15515as | 17750va | | | |
| 0530 | 0600 | | Clandestine, Sudan Radio Service | | | | 13720af |
| 0530 | 0600 | mtwh | Italy, IRRS/NEXUS | | | 5990va | |
| 0530 | 0600 | | Thailand, Radio Thailand World Service | | | | 17655va |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0600 | 0603 | | Croatia, Voice of Croatia | | | 7355eu | |
| 0600 | 0615 | Sat/Sun | South Africa, Trans World Radio | | | | 11640af |
| 0600 | 0630 | Sat/Sun | Australia, Radio Australia | | | 15180as | 15290as |
| 0600 | 0630 | | Australia, Radio Australia | | | 9660as | 11650as |
| | | | 12080as | 13690as | 15160as | 15240pa | |
| | | | 15515as | 17750va | | | |
| 0600 | 0630 | mtwhf | France, Radio France International | | | | 9765af |
| | | | 15160af | | | | 17800af |
| 0600 | 0630 | | Germany, Deutsche Welle | | | 5945af | 7240af |
| | | | 12045af | | | | |
| 0600 | 0630 | | Laos, Lao National Radio | | | 7145as | |
| 0600 | 0630 | | Vatican City State, Vatican Radio | | | | 4005eu |
| | | | 5965eu | 7520eu | | | |
| 0600 | 0645 | mtwhf | South Africa, Trans World Radio | | | | 11640af |
| 0600 | 0658 | | New Zealand, Radio NZ International | | | | 11725pa |
| 0600 | 0658 | DRM | New Zealand, Radio NZ International | | | | 13730pa |
| 0600 | 0700 | | Anguilla, Worldwide Univ Network | | | | 6090am |
| 0600 | 0700 | | Australia, ABC NT Alice Springs | | | | 4835do |
| 0600 | 0700 | | Australia, ABC NT Katherine | | | 5025do | |
| 0600 | 0700 | | Australia, ABC NT Tennant Creek | | | | 4910do |
| 0600 | 0700 | | Bahrain, Radio Bahrain | | | 6010me | 9745al |
| 0600 | 0700 | | Canada, CFRX Toronto ON | | | 6070na | |
| 0600 | 0700 | | Canada, CFVP Calgary AB | | | 6030na | |
| 0600 | 0700 | | Canada, CKZN St John's NF | | | 6160na | |
| 0600 | 0700 | | Canada, CKZU Vancouver BC | | | 6160na | |
| 0600 | 0700 | | China, China Radio International | | | | 11710af |
| | | | 11870as | 11880as | 11895as | 13660as | |
| | | | 15140as | 15350as | 15465as | 17505va | |
| | | | 17540as | 17710as | | | |
| 0600 | 0700 | | Cuba, Radio Havana Cuba | | | 6000na | 6140na |
| | | | 11760na | 13790na | | | |
| 0600 | 0700 | | Greece, Voice of Greece | | | 11645eu | |
| 0600 | 0700 | | Italy, IRRS/NEXUS | | | 9835va | |
| 0600 | 0700 | mtwh | Italy, IRRS/NEXUS | | | 5990va | |
| 0600 | 0700 | | Kuwait, Radio Kuwait | | | 15110as | |
| 0600 | 0700 | | Malaysia, RTM/Traxx FM | | | 7295do | |
| 0600 | 0700 | | Malaysia, RTM/Voice of Malaysia | | | | 6175as |
| | | | 9750as | 15295as | | | |
| 0600 | 0700 | | Nigeria, Voice of Nigeria/External Service | | | | 15120af |
| 0600 | 0700 | | Palau, T8WH/World Harvest | | | 15700as | |
| 0600 | 0700 | | Russia, Voice of Russia | | | 17635pa | |
| 0600 | 0700 | | South Africa, Channel Africa | | | 7230af | 15255af |
| 0600 | 0700 | | UK, BBC World Service | | | 3995eu | 5875eu |
| | | | 6005af | 6190af | 9860af | 11760as | |
| | | | 11765af | 12015af | 12095eu | 15310as | |
| | | | 17640af | 17790as | | | |
| 0600 | 0700 | Sat/Sun | UK, BBC World Service | | | 15420af | |
| 0600 | 0700 | | Ukraine, Radio Ukraine International | | | | 7440na |
| 0600 | 0700 | | USA, American Forces Network | | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | 7812usb | |
| | | | 10320usb | 12133usb | 12759usb | 13362usb | |
| 0600 | 0700 | | USA, EWTN Vandiver AL | | | 11520af | |
| 0600 | 0700 | | USA, Voice of America | | | 6080af | 12080af |
| | | | 15580af | | | | |
| 0600 | 0700 | | USA, WHRA Greenbush ME | | | 7390af | |
| 0600 | 0700 | | USA, WHRI Cypress Creek SC | | | 5875va | 7365na |
| | | | 11565na | | | | |
| 0600 | 0700 | vl | USA, WRMI Miami FL | | | 9955va | |
| 0600 | 0700 | | USA, WTJC Newport NC | | | 9370na | |
| 0600 | 0700 | | USA, WWCR Nashville TN | | | 3215na | 5070na |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 5890na | 5935na | | | |
| 0600 | 0700 | | USA, WWRB Manchester TN | 3185va | | | |
| 0600 | 0700 | | USA, WYFR/Family Radio Worldwide | | | | 5745sa |
| | | | 6000ca | 9680na | 9985eu | | 11530va |
| 0600 | 0700 | | Uzbekistan, CVC Intl/ The Voice Asia | | | | 15555as |
| 0600 | 0700 | | Zambia CVC Intl/ The Voice Africa | | | | 6065af |
| | | | 13590af | | | | |
| 0600 | 0700 | | Zambia, Zambia Natl Broadcasting Corp | | | | 6165do |
| 0609 | 0613 | mtwhf | Austria, ORF/Radio Austria Intl | 6155eu | | | 13730eu |
| 0630 | 0646 | | Romania, Radio Romania International | | | | 7370eu |
| | | | 17780pa | 21600pa | | | |
| 0630 | 0700 | | Australia, Radio Australia | 9660as | | | 11650as |
| | | | 12080as | 13690as | 15160as | | 15240pa |
| | | | 15415as | 15515as | 17750va | | |
| 0630 | 0700 | DRM | Romania, Radio Romania International | | | | 6020eu |
| 0630 | 0700 | | Swaziland, TWR Swaziland | 6120af | | | |
| 0630 | 0700 | | Vatican City State, Vatican Radio | | | | 7360af |
| | | | 9660af | 11625af | | | |
| 0659 | 0700 | | New Zealand, Radio NZ International | | | | 9765pa |
| 0659 | 0700 | DRM | New Zealand, Radio NZ International | | | | 13730pa |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0700 | 0727 | | Slovakia, Radio Slovakia International | | | | 9440va |
| | | | 11650va | | | | |
| 0700 | 0730 | mtwhf | France, Radio France International | | | | 13675af |
| 0700 | 0730 | mtwh | Italy, IRRS/NEXUS | 5990va | | | |
| 0700 | 0730 | Sun | UK, Bible Voice Broadcasting | 5945eu | | | |
| 0700 | 0745 | | USA, WYFR/Family Radio Worldwide | | | | 5745sa |
| | | | 5950na | | | | |
| 0700 | 0800 | | Anguilla, Worldwide Univ Network | | | | 6090am |
| 0700 | 0800 | | Australia, ABC NT Alice Springs | | | | 4835do |
| 0700 | 0800 | | Australia, ABC NT Katherine | 5025do | | | |
| 0700 | 0800 | | Australia, ABC NT Tennant Creek | | | | 4910do |
| 0700 | 0800 | | Australia, Radio Australia | 9475as | | | 9660as |
| | | | 9710as | 11650as | 11945as | | 12080as |
| | | | 13630pa | 15160va | 15240pa | | 17750va |
| 0700 | 0800 | | Bahrain, Radio Bahrain | 6010me | | | 9745al |
| 0700 | 0800 | DRM | Belgium, TDP Radio | 17755as | | | |
| 0700 | 0800 | | Canada, CFRX Toronto ON | 6070na | | | |
| 0700 | 0800 | | Canada, CFVP Calgary AB | 6030na | | | |
| 0700 | 0800 | | Canada, CKZN St John's NF | 6160na | | | |
| 0700 | 0800 | | Canada, CKZU Vancouver BC | 6160na | | | |
| 0700 | 0800 | | China, China Radio International | | | | 11880as |
| | | | 11895as | 13660as | 13710eu | | 15125as |
| | | | 15350as | 15465as | 17490eu | | 17540as |
| | | | 17710as | | | | |
| 0700 | 0800 | | Cuba, Radio Havana Cuba | 6060na | | | |
| 0700 | 0800 | mtwhf | Equatorial Guinea, Radio Africa # 2 | | | | 15190af |
| 0700 | 0800 | Sat/Sun | Equatorial Guinea, Radio East Africa | | | | 15190af |
| 0700 | 0800 | DRM | Germany, Deutsche Welle | 3995eu | | | 6130eu |
| 0700 | 0800 | | Kuwait, Radio Kuwait | 15110as | | | |
| 0700 | 0800 | Sat | Latvia, Radio SWH | 9290eu | | | |
| 0700 | 0800 | | Malaysia, RTM/Traxx FM | 7295do | | | |
| 0700 | 0800 | | Malaysia, RTM/Voice of Malaysia | | | | 6175as |
| | | | 9750as | 15295as | | | |
| 0700 | 0800 | | Myanmar, Myanma Radio | 9730do | | | |
| 0700 | 0800 | | New Zealand, Radio NZ International | | | | 9765pa |
| 0700 | 0800 | DRM | New Zealand, Radio NZ International | | | | 9870pa |
| 0700 | 0800 | | Palau, T8WH/World Harvest | 9930as | | | 15700as |
| 0700 | 0800 | | Russia, Voice of Russia | 17635as | | | 21790as |
| 0700 | 0800 | | South Africa, Channel Africa | 7230af | | | |
| 0700 | 0800 | | Swaziland, TWR Swaziland | 6120af | | | |
| 0700 | 0800 | | UK, BBC World Service | 3995eu | | | 6190af |
| | | | 9860af | 11760me | 11765af | | 13820af |
| | | | 15310as | 15400af | 15575as | | 17790as |
| | | | 17830af | | | | |
| 0700 | 0800 | Sat/Sun | UK, BBC World Service | 15420af | | | |
| 0700 | 0800 | Sat | UK, Bible Voice Broadcasting | 5945eu | | | |
| 0700 | 0800 | | USA, American Forces Network | | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | | 13362usb |
| 0700 | 0800 | | USA, EWTN Vandiver AL | 11520af | | | |
| 0700 | 0800 | | USA, WHRA Greenbush ME | 11565pa | | | |
| 0700 | 0800 | | USA, WHRI Cypress Creek SC | 7385va | | | 7390na |
| | | | 11565na | | | | |
| 0700 | 0800 | vl | USA, WRMI Miami FL | 9955va | | | |
| 0700 | 0800 | | USA, WTJC Newport NC | 9370na | | | |
| 0700 | 0800 | | USA, WWCR Nashville TN | 3215na | | | 5070na |
| | | | 5890na | 5935na | | | |
| 0700 | 0800 | | USA, WWRB Manchester TN | 3185va | | | |
| 0700 | 0800 | | USA, WYFR/Family Radio Worldwide | | | | 6915na |
| | | | 7455na | 9495ca | 11580va | | |
| 0700 | 0800 | | Uzbekistan, CVC Intl/ The Voice Asia | | | | 15555as |
| 0700 | 0800 | | Zambia CVC Intl/ The Voice Africa | | | | 6065af |
| | | | 13590af | | | | |
| 0700 | 0800 | | Zambia, Zambia Natl Broadcasting Corp | | | | 6165do |
| 0730 | 0800 | | Australia, HCJB Global | 11750as | | | |
| 0730 | 0800 | | Bulgaria, Radio Bulgaria | 5900eu | | | 7400eu |
| 0730 | 0800 | | Clandestine, Cotton Tree News | | | | 15220af |
| 0745 | 0800 | Sun | Germany, TWR Europe | 6105eu | | | |
| 0745 | 0800 | Sun | Monaco, TWR Europe | 9800eu | | | |
| 0745 | 0800 | f | UK, Bible Voice Broadcasting | 5945eu | | | |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0800 | 0815 | Sat | UK, Bible Voice Broadcasting | 5945eu | | | |
| 0800 | 0825 | | Malaysia, RTM/Voice of Malaysia | | | | 6175as |
| | | | 9750as | 15295as | | | |
| 0800 | 0827 | | Czech Republic, Radio Prague | 7345eu | | | 9860eu |
| 0800 | 0830 | | Australia, ABC NT Alice Springs | | | | 4835do |
| 0800 | 0830 | | Australia, ABC NT Katherine | 5025do | | | |
| 0800 | 0830 | | Australia, ABC NT Tennant Creek | | | | 4910do |
| 0800 | 0830 | | Myanmar, Myanma Radio | 9730do | | | |
| 0800 | 0845 | | USA, WYFR/Family Radio Worldwide | | | | 11580va |
| 0800 | 0850 | mtwhf | Germany, TWR Europe | 6105eu | | | |
| 0800 | 0850 | Sun | Germany, TWR Europe | 6105eu | | | |
| 0800 | 0850 | mtwhf | Monaco, TWR Europe | 9800eu | | | |
| 0800 | 0850 | Sun | Monaco, TWR Europe | 9800eu | | | |
| 0800 | 0858 | DRM | Germany, Deutsche Welle | 12005as | | | |
| 0800 | 0900 | | Anguilla, Worldwide Univ Network | | | | 6090am |
| 0800 | 0900 | | Australia, HCJB Global | 11750pa | | | |
| 0800 | 0900 | | Australia, Radio Australia | 5995as | | | 9475as |
| | | | 9580va | 9590as | 9710as | | 11945pa |
| | | | 12080as | 13630pa | | | |
| 0800 | 0900 | | Bahrain, Radio Bahrain | 6010me | | | 9745al |
| 0800 | 0900 | m/DRM | Belgium, TDP Radio | 6015eu | | | |
| 0800 | 0900 | | Canada, CFRX Toronto ON | 6070na | | | |
| 0800 | 0900 | | Canada, CFVP Calgary AB | 6030na | | | |
| 0800 | 0900 | | Canada, CKZN St John's NF | 6160na | | | |
| 0800 | 0900 | | Canada, CKZU Vancouver BC | 6160na | | | |
| 0800 | 0900 | | China, China Radio International | | | | 11620as |
| | | | 11880as | 11895as | 13710eu | | 15125af |
| | | | 15350as | 15465as | 15625as | | 17490eu |
| | | | 17540as | | | | |
| 0800 | 0900 | | China, Guangxi FBS/Beibu Bay Radio | | | | 5050as |
| | | | 9820as | | | | |
| 0800 | 0900 | | Cuba, Radio Havana Cuba | 6060na | | | |
| 0800 | 0900 | mtwhf | Equatorial Guinea, Radio Africa # 2 | | | | 15190af |
| 0800 | 0900 | Sat/Sun | Equatorial Guinea, Radio East Africa | | | | 15190af |
| 0800 | 0900 | DRM | Germany, Deutsche Welle | 9610eu | | | 13810eu |
| 0800 | 0900 | | Malaysia, RTM/Traxx FM | 7295do | | | |
| 0800 | 0900 | | New Zealand, Radio NZ International | | | | 9765pa |
| 0800 | 0900 | DRM | New Zealand, Radio NZ International | | | | 9870pa |
| 0800 | 0900 | | Nigeria, Voice of Nigeria/External Service | | | | 9690af |
| 0800 | 0900 | | Palau, T8WH/World Harvest | 9930as | | | 15700as |
| 0800 | 0900 | DRM | Russia, Voice of Russia | 12060eu | | | |
| 0800 | 0900 | | Russia, Voice of Russia | 17635as | | | 21790as |
| 0800 | 0900 | | South Africa, Channel Africa | 9625af | | | |
| 0800 | 0900 | Sun | South Africa, SA Radio League | 7205af | | | 17570af |
| 0800 | 0900 | | South Korea, KBS World Radio | | | | 9570as |
| 0800 | 0900 | | Swaziland, TWR Swaziland | 6120af | | | |
| 0800 | 0900 | | UK, BBC World Service | 6190af | | | 9860af |
| | | | 11760me | 15310as | 15400af | | 15575as |
| | | | 17640af | 17790as | 17830af | | 21470af |
| 0800 | 0900 | | USA, American Forces Network | | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | | 13362usb |
| 0800 | 0900 | | USA, EWTN Vandiver AL | 11520af | | | |
| 0800 | 0900 | | USA, KNLS Anchor Point AK | 7355as | | | |
| 0800 | 0900 | | USA, WHRA Greenbush ME | 11565pa | | | |
| 0800 | 0900 | | USA, WHRI Cypress Creek SC | 7385va | | | |
| 0800 | 0900 | vl | USA, WRMI Miami FL | 9955va | | | |
| 0800 | 0900 | | USA, WTJC Newport NC | 9370na | | | |
| 0800 | 0900 | | USA, WWCR Nashville TN | 3215na | | | 5070na |
| | | | 5890na | 5935na | | | |
| 0800 | 0900 | | USA, WWRB Manchester TN | 3185va | | | |
| 0800 | 0900 | | USA, WYFR/Family Radio Worldwide | | | | 5950na |
| | | | 6915na | 7455na | | | |
| 0800 | 0900 | | Uzbekistan, CVC Intl/ The Voice Asia | | | | 15555as |
| 0800 | 0900 | | Zambia CVC Intl/ The Voice Africa | | | | 6065af |
| | | | 13590af | | | | |
| 0800 | 0900 | | Zambia, Zambia Natl Broadcasting Corp | | | | 6165do |
| 0815 | 0850 | Sat | Germany, TWR Europe | 6105eu | | | |
| 0815 | 0850 | Sat | Monaco, TWR Europe | 9800eu | | | |
| 0820 | 0900 | smtwhf | Guam, KTWR/TWR | 15170as | | | |
| 0830 | 0900 | | Australia, ABC NT Alice Springs | | | | 2310do |
| 0830 | 0900 | | Australia, ABC NT Katherine | 2485do | | | |
| 0830 | 0900 | | Australia, ABC NT Tennant Creek | | | | 2325do |
| 0830 | 0900 | | Australia, CVC International | 15555as | | | |
| 0830 | 0900 | mtwhfa | Guam, KTWR/TWR | 11840pa | | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0900 | 0910 | mtwhfa | Guam, KTWR/TWR | 11840pa | | |
| 0900 | 0930 | | Australia, HCJB Global | 11750pa | | |
| 0900 | 0930 | | Japan, NHK World/ Radio Japan | 9625pa | | |
| | | | 9825pa | 11815as | 15590as | |
| 0900 | 0930 | | Uzbekistan, CVC Intl/ The Voice Asia | 15555as | | |
| 0900 | 1000 | | Anguilla, Worldwide Univ Network | 6090am | | |
| 0900 | 1000 | | Australia, ABC NT Alice Springs | 2310do | | |
| 0900 | 1000 | | Australia, ABC NT Katherine | 2485do | | |
| 0900 | 1000 | | Australia, ABC NT Tennant Creek | 2325do | | |
| 0900 | 1000 | | Australia, Radio Australia | 9475va | 9580va | |
| | | | 9590va | 11945as | 12080as | |
| 0900 | 1000 | | Bahrain, Radio Bahrain | 6010me | 9745al | |
| 0900 | 1000 | t/DRM | Belgium, TDP Radio | 6015eu | | |
| 0900 | 1000 | | Bhutan, Bhutan Broadcasting Service | 6035as | | |
| 0900 | 1000 | | Canada, CFRX Toronto ON | 6070na | | |
| 0900 | 1000 | | Canada, CFVP Calgary AB | 6030na | | |
| 0900 | 1000 | | Canada, CKZN St John's NF | 6160na | | |
| 0900 | 1000 | | Canada, CKZU Vancouver BC | 6160na | | |
| 0900 | 1000 | | China, China Radio International | 11620as | | |
| | | | 15210va | 15270eu | 15350as | 15625af |
| | | | 17490eu | 17570eu | 17690va | 17750as |
| 0900 | 1000 | | China, Guangxi FBS/Beibu Bay Radio | 5050as | | |
| | | | 9820as | | | |
| 0900 | 1000 | | Cuba, Radio Havana Cuba | 6060na | | |
| 0900 | 1000 | mtwhf | Equatorial Guinea, Radio Africa # 2 | 15190af | | |
| 0900 | 1000 | Sat/Sun | Equatorial Guinea, Radio East Africa | 15190af | | |
| 0900 | 1000 | 2nd Sun | Germany, Blue Star Radio | 6140eu | | |
| 0900 | 1000 | | Germany, Deutsche Welle | 17710as | 21780as | |
| 0900 | 1000 | 3rd Sun | Germany, European Music Radio | 6140eu | | |
| 0900 | 1000 | 4th Sun | Germany, Radio Gloria International | 6140eu | | |
| 0900 | 1000 | Sat | Italy, IRRS/NEXUS | 9510va | | |
| 0900 | 1000 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 0900 | 1000 | | New Zealand, Radio NZ International | 9765pa | | |
| 0900 | 1000 | DRM | New Zealand, Radio NZ International | 9870pa | | |
| 0900 | 1000 | | Nigeria, Voice of Nigeria/External Service | 9690af | | |
| 0900 | 1000 | | Palau, T8WH/World Harvest | 9930as | 15700as | |
| 0900 | 1000 | DRM | Russia, Voice of Russia | 12060eu | | |
| 0900 | 1000 | | Russia, Voice of Russia | 15470as | 15610as | |
| | | | 21790as | | | |
| 0900 | 1000 | | South Africa, Channel Africa | 9625af | | |
| 0900 | 1000 | | Tajikistan, Voice of Tajik/Radio 2 | 7245as | | |
| 0900 | 1000 | DRM | UK, BBC World Service | 9610eu | 13810eu | |
| 0900 | 1000 | | UK, BBC World Service | 6190af | 6195as | |
| | | | 9740as | 9860af | 11760me | 15310as |
| | | | 15400af | 15575as | 17640af | 17760as |
| | | | 17830af | 21470af | | |
| 0900 | 1000 | | Ukraine, Radio Ukraine International | 9950eu | | |
| 0900 | 1000 | | USA, American Forces Network | 4319usb | | |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 0900 | 1000 | | USA, EWTN Vandiver AL | 11640as | | |
| 0900 | 1000 | | USA, WHRA Greenbush ME | 11565pa | | |
| 0900 | 1000 | | USA, WHRI Cypress Creek SC | 7385va | | |
| 0900 | 1000 | smtwhf | USA, WHRI Cypress Creek SC | 9425na | | |
| 0900 | 1000 | Sat | USA, WHRI Cypress Creek SC | 7465na | | |
| 0900 | 1000 | vl | USA, WRMI Miami FL | 9955va | | |
| 0900 | 1000 | | USA, WTJC Newport NC | 9370na | | |
| 0900 | 1000 | | USA, WWCR Nashville TN | 5070na | 5890na | |
| | | | 5935na | 9985na | | |
| 0900 | 1000 | | USA, WWRB Manchester TN | 3185va | | |
| 0900 | 1000 | | USA, WYFR/Family Radio Worldwide | 5950na | | |
| | | | 6915na | 7455na | 9465as | |
| 0900 | 1000 | | Zambia CVC Intl/ The Voice Africa | 6065af | | |
| | | | 13590af | | | |
| 0900 | 1000 | | Zambia, Zambia Natl Broadcasting Corp | 6165do | | |
| 0930 | 1000 | | Australia, CVC International | 15555as | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1000 | 1004 | | Pakistan, Radio Pakistan | 15100as | 17835as | |
| 1000 | 1029 | | Czech Republic, Radio Prague | 9955sa | 15700as | |
| | | | 21745af | | | |
| 1000 | 1030 | Sat/Sun DRM | Bulgaria, Radio Bulgaria | 11900eu | | |
| 1000 | 1030 | | Vietnam, Voice of Vietnam | 9840as | 12020as | |
| 1000 | 1057 | | Netherlands, R Netherlands Worldwide | 6040va | | |
| | | | 9720as | 12065as | | |
| 1000 | 1057 | | North Korea, Voice of Korea | 11710sa | 11735as | |
| | | | 13650as | 15180sa | | |
| 1000 | 1058 | | New Zealand, Radio NZ International | 9765pa | | |
| 1000 | 1100 | | Anguilla, Worldwide Univ Network | 11775am | | |
| 1000 | 1100 | | Australia, ABC NT Alice Springs | 2310do | | |
| 1000 | 1100 | | Australia, ABC NT Katherine | 2485do | | |
| 1000 | 1100 | | Australia, ABC NT Tennant Creek | 2325do | | |
| 1000 | 1100 | | Australia, CVC International | 15555as | | |
| 1000 | 1100 | | Australia, Radio Australia | 9475va | 9580va | |
| | | | 9590va | 11945as | 12080as | |
| 1000 | 1100 | | Bahrain, Radio Bahrain | 6010me | 9745al | |
| 1000 | 1100 | w/DRM | Belgium, TDP Radio | 6015eu | | |
| 1000 | 1100 | | Canada, CFRX Toronto ON | 6070na | | |
| 1000 | 1100 | | Canada, CFVP Calgary AB | 6030na | | |
| 1000 | 1100 | | Canada, CKZN St John's NF | 6160na | | |
| 1000 | 1100 | | Canada, CKZU Vancouver BC | 6160na | | |
| 1000 | 1100 | | China, China Radio International | 6040na | | |
| | | | 6090as | 11610as | 11635as | 11750na |
| | | | 13590as | 13620as | 13720as | 15190as |
| | | | 15350as | 17490eu | | |
| 1000 | 1100 | | Cuba, Radio Havana Cuba | 6060na | | |
| 1000 | 1100 | mtwhf | Equatorial Guinea, Radio Africa # 2 | 15190af | | |
| 1000 | 1100 | Sat/Sun | Equatorial Guinea, Radio East Africa | 15190af | | |
| 1000 | 1100 | | India, All India Radio | 7270as | 13695va | |
| | | | 15070as | 15260as | 15410pa | 17510pa |
| | | | 17800pa | 17895pa | | |
| 1000 | 1100 | | Indonesia, Voice of Indonesia | 9525va | 11785al | |
| 1000 | 1100 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 1000 | 1100 | DRM | New Zealand, Radio NZ International | 9870pa | | |
| 1000 | 1100 | | Nigeria, Voice of Nigeria/External Service | 9690af | | |
| 1000 | 1100 | | Palau, T8WH/World Harvest | 9930as | 15700as | |
| 1000 | 1100 | | Russia, Voice of Russia | 15470as | 15610as | |
| 1000 | 1100 | | Saudi Arabia, BSKSA/External Service | 15250af | | |
| 1000 | 1100 | | South Africa, Channel Africa | 9625af | | |
| 1000 | 1100 | Sat/Sun | UK, BBC World Service | 15400af | 17830af | |
| 1000 | 1100 | DRM | UK, BBC World Service | 9545eu | 13810eu | |
| 1000 | 1100 | | UK, BBC World Service | 6190af | 6195as | |
| | | | 9545eu | 9740as | 9860af | 11760me |
| | | | 11895as | 15310as | 15575as | 17640af |
| | | | 17790as | 21470af | | |
| 1000 | 1100 | | USA, American Forces Network | 4319usb | | |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 1000 | 1100 | | USA, EWTN Vandiver AL | 11640as | | |
| 1000 | 1100 | | USA, KNLS Anchor Point AK | 6890as | | |
| 1000 | 1100 | | USA, WHRA Greenbush ME | 11565pa | | |
| 1000 | 1100 | | USA, WHRI Cypress Creek SC | 7385va | | |
| 1000 | 1100 | | USA, WINB Red Lion PA | 9265am | | |
| 1000 | 1100 | vl | USA, WRMI Miami FL | 9955va | | |
| 1000 | 1100 | | USA, WTJC Newport NC | 9370na | | |
| 1000 | 1100 | | USA, WWCR Nashville TN | 5070na | 5890na | |
| | | | 5935na | 9985na | | |
| 1000 | 1100 | | USA, WWRB Manchester TN | 3185va | | |
| 1000 | 1100 | | USA, WYFR/Family Radio Worldwide | 5950na | | |
| | | | 6890na | 6915na | 9465as | |
| 1000 | 1100 | | Zambia CVC Intl/ The Voice Africa | 6065af | | |
| | | | 13590af | | | |
| 1000 | 1100 | | Zambia, Zambia Natl Broadcasting Corp | 6165do | | |
| 1015 | 1045 | Sun | UK, Bible Voice Broadcasting | 5910as | | |
| 1030 | 1100 | | Australia, HCJB Global | 15400as | | |
| 1030 | 1100 | | Iran, Voice of Islamic Rep. of Iran | 15600as | | |
| | | | 17660as | | | |
| 1030 | 1100 | Sun | Italy, IRRS/NEXUS | 9510va | | |
| 1030 | 1100 | | Mongolia, Voice of Mongolia | 12085as | | |
| 1059 | 1100 | | New Zealand, Radio NZ International | 13660pa | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1100 | 1103 | mtwhf | Croatia, Voice of Croatia | 6165eu | | |
| 1100 | 1112 | | Cuba, Radio Nacional de Venezuela | 6060ca | | |
| 1100 | 1127 | | Iran, Voice of Islamic Rep. of Iran | 15600as | | |
| | | | 17660as | | | |
| 1100 | 1130 | | Australia, CVC International | 15555as | | |
| 1100 | 1130 | | China, China Radio International | 6060as | | |
| 1100 | 1130 | f/ DRM | Japan, NHK World/ Radio Japan | 9760eu | | |
| 1100 | 1130 | | Vietnam, Voice of Vietnam | 7285as | | |
| 1100 | 1145 | | USA, WYFR/Family Radio Worldwide | 5950na | | |
| | | | 6000ca | | | |
| 1100 | 1158 | DRM | New Zealand, Radio NZ International | 9870pa | | |
| 1100 | 1200 | | Anguilla, Worldwide Univ Network | 11775am | | |
| 1100 | 1200 | | Australia, ABC NT Alice Springs | 2310do | | |
| 1100 | 1200 | | Australia, ABC NT Katherine | 2485do | | |
| 1100 | 1200 | | Australia, ABC NT Tennant Creek | 2325do | | |
| 1100 | 1200 | | Australia, HCJB Global | 15400as | | |
| 1100 | 1200 | DRM | Australia, Radio Australia | 12080pa | | |
| 1100 | 1200 | | Australia, Radio Australia | 6020va | 9475as | |
| | | | 9560as | 9580va | 9590va | 11945as |
| 1100 | 1200 | | Bahrain, Radio Bahrain | 6010me | 9745al | |
| 1100 | 1200 | h/DRM | Belgium, TDP Radio | 6015eu | | |
| 1100 | 1200 | Sat/Sun | Canada, CBC NQ SW Service | 9625na | | |
| 1100 | 1200 | | Canada, CFRX Toronto ON | 6070na | | |
| 1100 | 1200 | | Canada, CFVP Calgary AB | 6030na | | |
| 1100 | 1200 | | Canada, CKZN St John's NF | 6160na | | |
| 1100 | 1200 | | Canada, CKZU Vancouver BC | 6160na | | |
| 1100 | 1200 | | China, China Radio International | 5955as | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 6040na | 11650as | 11660as | 11795as |
| | | | 13645as | 13650eu | 13790eu | 17490eu |
| 1100 | 1200 | mtwhf | Equatorial Guinea, Radio Africa # 2 | | | 15190af |
| 1100 | 1200 | Sat/Sun | Equatorial Guinea, Radio East Africa | | | 15190af |
| 1100 | 1200 | DRM | Germany, Deutsche Welle | | 9545eu | 13810eu |
| 1100 | 1200 | Sun | Italy, IRRS/NEXUS 9510va | | | |
| 1100 | 1200 | | Malaysia, RTM/Traxx FM | | 7295do | |
| 1100 | 1200 | | New Zealand, Radio NZ International | | | 13660pa |
| 1100 | 1200 | | Nigeria, Voice of Nigeria/External Service | | | 9690af |
| 1100 | 1200 | | Palau, T8WH/World Harvest | | 9930as | 15700as |
| 1100 | 1200 | | Russia, Voice of Russia | | 12065as | 15470as |
| 1100 | 1200 | | Saudi Arabia, BSKSA/External Service | | | 15250af |
| 1100 | 1200 | | South Africa, Channel Africa | | 9625af | |
| 1100 | 1200 | | Taiwan, Radio Taiwan International | | | 7445as |
| | | | 11715as | | | |
| 1100 | 1200 | Sat/Sun | UK, BBC World Service | | 15400af | |
| 1100 | 1200 | | UK, BBC World Service | | 6190af | 6195as |
| | | | 9545eu | 9605as | 9740as | 9860af |
| | | | 11760me | 11895as | 15310as | 15575as |
| | | | 17640af | 17790as | 17830as | 21470af |
| 1100 | 1200 | | Ukraine, Radio Ukraine International | | | 9950eu |
| 1100 | 1200 | | USA, American Forces Network | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 1100 | 1200 | | USA, EWTN Vandiver AL | | 11640as | |
| 1100 | 1200 | | USA, WHRI Cypress Creek SC | | 7315va | 7385va |
| 1100 | 1200 | | USA, WINB Red Lion PA | | 9265am | |
| 1100 | 1200 | vl | USA, WRMI Miami FL | | 9955va | |
| 1100 | 1200 | | USA, WTJC Newport NC | | 9370na | |
| 1100 | 1200 | | USA, WWCR Nashville TN | | 5890na | 5935na |
| | | | 7490na | 15830na | | |
| 1100 | 1200 | | USA, WWRB Manchester TN | | 3185va | |
| 1100 | 1200 | | USA, WYFR/Family Radio Worldwide | | | 6890na |
| | | | 7455na | 11725ca | 11830sa | |
| 1100 | 1200 | | Zambia CVC Intl/ The Voice Africa | | | 6065af |
| | | | 13590af | | | |
| 1100 | 1200 | | Zambia, Zambia Natl Broadcasting Corp | | | 6165do |
| 1115 | 1130 | mtwhfa | UK, Bible Voice Broadcasting | | 5945as | |
| 1115 | 1145 | Sun | UK, Bible Voice Broadcasting | | 5945as | |
| 1130 | 1157 | | Czech Republic, Radio Prague | | 11640eu | 175454va |
| 1130 | 1200 | | Australia, CVC International | | 13635as | |
| 1130 | 1200 | sthf | Guam, KSDA/ AWR | | 15260as | |
| 1130 | 1200 | f | Vatican City State, Radio | | | 15595as |
| | | | 17765as | | | |
| 1130 | 1200 | | Vietnam, Voice of Vietnam | | 9840as | 12020as |
| 1145 | 1200 | | Australia, HCJB Global | | 15340as | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1200 | 1225 | | Saudi Arabia, BSKSA/External Service | | | 15250af |
| 1200 | 1230 | | China, China Radio International | | | 11780as |
| 1200 | 1230 | mtwhf | France, Radio France International | | | 13640af |
| | | | 21620af | | | |
| 1200 | 1230 | | Germany, AWR-Europe | | 15495as | |
| 1200 | 1230 | | Japan, NHK World/ Radio Japan | | | 6120na |
| | | | 9625pa | 9695as | 9790eu | |
| 1200 | 1245 | | USA, WYFR/Family Radio Worldwide | | | 6890na |
| 1200 | 1256 | | Romania, Radio Romania International | | | 11970eu |
| | | | 15105eu | 15430af | 17760af | |
| 1200 | 1258 | | New Zealand, Radio NZ International | | | 13660pa |
| 1200 | 1300 | | Anguilla, Worldwide Univ Network | | | 11775am |
| 1200 | 1300 | | Australia, ABC NT Alice Springs | | | 2310do |
| 1200 | 1300 | | Australia, ABC NT Katherine | | 2485do | |
| 1200 | 1300 | | Australia, ABC NT Tennant Creek | | | 2325do |
| 1200 | 1300 | | Australia, CVC International | | 13635as | |
| 1200 | 1300 | | Australia, HCJB Global | | 15400as | |
| 1200 | 1300 | DRM | Australia, Radio Australia | | 5995pa | 12080pa |
| 1200 | 1300 | | Australia, Radio Australia | | 6020va | 9475as |
| | | | 9560pa | 9580va | 9590va | 11945as |
| 1200 | 1300 | | Bahrain, Radio Bahrain | | 6010me | 9745al |
| 1200 | 1300 | f/DRM | Belgium, TDP Radio | | 6015eu | |
| 1200 | 1300 | Sat/Sun | Canada, CBC NQ SW Service | | 9625na | |
| 1200 | 1300 | | Canada, CFRX Toronto ON | | 6070na | |
| 1200 | 1300 | | Canada, CFVP Calgary AB | | 6030na | |
| 1200 | 1300 | | Canada, CKZN St John's NF | | 6160na | |
| 1200 | 1300 | | Canada, CKZU Vancouver BC | | 6160na | |
| 1200 | 1300 | | China, China Radio International | | | 5955as |
| | | | 9460as | 9600as | 9645as | 9730as |
| | | | 9760va | 11650as | 11660as | 11690as |
| | | | 11760va | 11980as | 13645as | 13650eu |
| | | | 17490eu | | | |
| 1200 | 1300 | Sat/Sun | Equatorial Guinea, Radio East Africa | | | 15190af |
| 1200 | 1300 | DRM | Germany, Deutsche Welle | | 9545eu | 13810eu |
| 1200 | 1300 | Sun | Italy, IRRS/NEXUS 9510va | | | |
| 1200 | 1300 | Sun | Latvia, Radio SWH 9290eu | | | |
| 1200 | 1300 | | Libya, LJB/Voice of Africa | | 17725af | 21695af |
| 1200 | 1300 | | Malaysia, RTM/Traxx FM | | 7295do | |
| 1200 | 1300 | | Nigeria, Voice of Nigeria/External Service | | | 9690af |
| 1200 | 1300 | | Palau, T8WH/World Harvest | | 9930as | 12130as |
| 1200 | 1300 | | Russia, Voice of Russia | | 7330as | 12065as |
| | | | 15470as | | | |
| 1200 | 1300 | | South Korea, KBS World Radio | | | 9650na |
| 1200 | 1300 | | UK, BBC World Service | | 5875as | 6190af |
| | | | 6195as | 9545eu | 9605as | 9740as |
| | | | 9860af | 11760me | 15310as | 15575as |
| | | | 17640af | 17790as | 17830af | 21470af |
| 1200 | 1300 | | USA, American Forces Network | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 1200 | 1300 | | USA, EWTN Vandiver AL | | 12160as | |
| 1200 | 1300 | | USA, KNLS Anchor Point AK | | 7355as | 9780as |
| 1200 | 1300 | | USA, Voice of America | | 6140va | 7575va |
| | | | 9510va | 9760va | 12075va | |
| 1200 | 1300 | | USA, WHRI Cypress Creek SC | | 7315va | 7385va |
| 1200 | 1300 | | USA, WINB Red Lion PA | | 9265am | |
| 1200 | 1300 | vl | USA, WRMI Miami FL | | 9955va | |
| 1200 | 1300 | | USA, WTJC Newport NC | | 9370na | |
| 1200 | 1300 | | USA, WWCR Nashville TN | | 7490na | 9980na |
| | | | 13845na | 15830na | | |
| 1200 | 1300 | | USA, WWRB Manchester TN | | 9385va | |
| 1200 | 1300 | | USA, WYFR/Family Radio Worldwide | | | 7455na |
| | | | 11530sa | 11970am | | |
| 1200 | 1300 | | Zambia CVC Intl/ The Voice Africa | | | 6065af |
| | | | 13590af | | | |
| 1200 | 1300 | | Zambia, Zambia Natl Broadcasting Corp | | | 6165do |
| 1209 | 1213 | mtwhf | Austria, ORF/Radio Austria Intl | | 17715va | |
| 1230 | 1300 | | Bangladesh, Bangladesh Betar | | | 7250as |
| 1230 | 1300 | mtwhf | Ethiopia, Radio Ethiopia/National Service | | | 5990do |
| | | | 7110do | 9704do | | |
| 1230 | 1300 | | India, All India Radio | | 4920as | 4970as |
| | | | 5040as | 5050as | | |
| 1230 | 1300 | | Thailand, Radio Thailand World Service | | | 9890va |
| 1230 | 1300 | | Vietnam, Voice of Vietnam | | 9840as | 12020as |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1300 | 1330 | | Egypt, Radio Cairo | | | 17835as |
| 1300 | 1345 | | USA, WYFR/Family Radio Worldwide | | | 7455na |
| | | | 11970na | | | |
| 1300 | 1357 | | North Korea, Voice of Korea | | 9335na | 11710na |
| | | | 13760eu | 15245eu | | |
| 1300 | 1400 | | Anguilla, Worldwide Univ Network | | | 11775am |
| 1300 | 1400 | | Australia, ABC NT Alice Springs | | | 2310do |
| 1300 | 1400 | | Australia, ABC NT Katherine | | 2485do | |
| 1300 | 1400 | | Australia, CVC International | | 13635as | |
| 1300 | 1400 | | Australia, HCJB Global | | 15340as | 15400as |
| 1300 | 1400 | DRM | Australia, Radio Australia | | 5995pa | 12080pa |
| 1300 | 1400 | | Australia, Radio Australia | | 6020va | 9560as |
| | | | 9580va | 9590va | | |
| 1300 | 1400 | | Bahrain, Radio Bahrain | | 6010me | 9745al |
| 1300 | 1400 | a/DRM | Belgium, TDP Radio | | 6015eu | |
| 1300 | 1400 | Sat/Sun | Canada, CBC NQ SW Service | | 9625na | |
| 1300 | 1400 | | Canada, CFRX Toronto ON | | 6070na | |
| 1300 | 1400 | | Canada, CFVP Calgary AB | | 6030na | |
| 1300 | 1400 | | Canada, CKZN St John's NF | | 6160na | |
| 1300 | 1400 | | Canada, CKZU Vancouver BC | | 6160na | |
| 1300 | 1400 | | China, China Radio International | | | 5995as |
| | | | 9570na | 9650na | 9730as | 9760va |
| | | | 9870as | 11660as | 11980as | 13610eu |
| | | | 13755as | 13790eu | 15260na | |
| 1300 | 1400 | Sat/Sun | Equatorial Guinea, Radio East Africa | | | 15190af |
| 1300 | 1400 | DRM | Germany, Deutsche Welle | | 9545eu | 13810eu |
| 1300 | 1400 | | Indonesia, Voice of Indonesia | | 9525va | 11785al |
| 1300 | 1400 | Sun | Italy, IRRS/NEXUS 9510va | | | |
| 1300 | 1400 | | Libya, LJB/Voice of Africa | | 17725af | 21695af |
| 1300 | 1400 | | Malaysia, RTM/Traxx FM | | 7295do | |
| 1300 | 1400 | | New Zealand, Radio NZ International | | | 6170pa |
| 1300 | 1400 | | Nigeria, Voice of Nigeria/External Service | | | 9690af |
| 1300 | 1400 | | Palau, T8WH/World Harvest | | 9930as | |
| 1300 | 1400 | | Poland, Polish Radio | | 11675eu | 11860eu |
| 1300 | 1400 | | Russia, Voice of Russia | | 7330as | 12065as |
| 1300 | 1400 | | South Korea, KBS World Radio | | | 9570na |
| | | | 9770as | | | |
| 1300 | 1400 | | Uganda, UBC Radio | | 4976do | |
| 1300 | 1400 | | UK, BBC World Service | | 5875as | 6190af |
| | | | 6195as | 9410as | 9545eu | 9740as |
| | | | 9860af | 11760me | 11835as | 15310as |
| | | | 15420af | 15575eu | 21470af | |
| 1300 | 1400 | | USA, American Forces Network | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 1300 | 1400 | | USA, EWTN Vandiver AL | | 12160as | |
| 1300 | 1400 | | USA, KJES Vado NM | | 11715na | |
| 1300 | 1400 | | USA, Voice of America | | 7575va | 9340va |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 9510va | 9760va | | |
| 1300 | 1400 | Sat/Sun | USA, WHRA Greenbush ME | 15195va | | |
| 1300 | 1400 | | USA, WHRI Cypress Creek SC | 7315va | | |
| 1300 | 1400 | Sat/Sun | USA, WHRI Cypress Creek SC | 9840va | | |
| 1300 | 1400 | | USA, WINB Red Lion PA | 9265am | | |
| 1300 | 1400 | vl | USA, WRMI Miami FL | 9955va | | |
| 1300 | 1400 | | USA, WTJC Newport NC | 9370na | | |
| 1300 | 1400 | | USA, WWCR Nashville TN | 7490na | 9980na | |
| | | | 13845na | 15830na | | |
| 1300 | 1400 | | USA, WWRB Manchester TN | 9385va | | |
| 1300 | 1400 | | USA, WYFR/Family Radio Worldwide | | 11520as | |
| | | | 11560as | 11830as | 11855as | |
| 1300 | 1400 | | Zambia CVC Intl/ The Voice Africa | | 6065af | |
| | | | 13590af | | | |
| 1300 | 1400 | | Zambia, Zambia Natl Broadcasting Corp | | 6165do | |
| 1305 | 1400 | Sun | Greece, Voice of Greece | 9420va | 15630va | |
| 1310 | 1340 | | Japan, NHK World/ Radio Japan | | 11985as | |
| 1330 | 1357 | fa/ DRM | Czech Republic, Radio Prague | 9850eu | | |
| 1330 | 1400 | mtwhfa | Guam, KSDA/ AWR | 15660as | | |
| 1330 | 1400 | | India, All India Radio | 9690as | 11620as | |
| | | | 13710as | | | |
| 1330 | 1400 | | Laos, Lao National Radio | 7145as | | |
| 1330 | 1400 | | Sweden, Radio Sweden | 7465va | | |
| 1330 | 1400 | | Turkey, Voice of Turkey | 12035eu | 15300as | |
| 1330 | 1400 | | Vietnam, Voice of Vietnam | 9840as | 12020as | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1400 | 1425 | | Turkey, Voice of Turkey | 12035eu | 15300as | |
| 1400 | 1429 | | Czech Republic, Radio Prague | 11600as | 13580na | |
| 1400 | 1430 | | Australia, HCJB Global | 15400as | | |
| 1400 | 1430 | | Australia, Radio Australia | 5995va | 6080va | |
| | | | 7240va | 9590va | | |
| 1400 | 1430 | | China, China Radio International | | 7325as | |
| 1400 | 1430 | f | Clandestine, Shiokaze/Sea Breeze | | 6120as | |
| 1400 | 1430 | Sun | Germany, Pan American Broadcasting | | 15205as | |
| 1400 | 1430 | ` | Japan, NHK World/ Radio Japan | | 11705as | |
| | | | 11985as | 13630eu | 21560af | |
| 1400 | 1430 | | Laos, Lao National Radio | 6130as | | |
| 1400 | 1430 | | Thailand, Radio Thailand World Service | | 9455va | |
| 1400 | 1430 | Sun | United Arab Emirates, FEBA Radio | | 12045as | |
| 1400 | 1440 | | Guam, KTWR/TWR | 9975as | | |
| 1400 | 1459 | | Netherlands, R Netherlands Worldwide | | 12080va | |
| | | | 15595va | | | |
| 1400 | 1500 | | Anguilla, Worldwide Univ Network | | 11775am | |
| 1400 | 1500 | | Australia, ABC NT Alice Springs | | 2310do | |
| 1400 | 1500 | | Australia, ABC NT Katherine | 2485do | | |
| 1400 | 1500 | | Australia, ABC NT Tennant Creek | | 2325do | |
| 1400 | 1500 | | Australia, CVC International | 13635as | | |
| 1400 | 1500 | | Bahrain, Radio Bahrain | 6010me | 9745al | |
| 1400 | 1500 | s/DRM | Belgium, TDP Radio | 6015eu | | |
| 1400 | 1500 | | Bhutan, Bhutan Broadcasting Service | | 6035as | |
| 1400 | 1500 | Sat/Sun | Canada, CBC NQ SW Service | 9625na | | |
| 1400 | 1500 | | Canada, CFRX Toronto ON | 6070na | | |
| 1400 | 1500 | | Canada, CFVP Calgary AB | 6030na | | |
| 1400 | 1500 | | Canada, CKZN St John's NF | 6160na | | |
| 1400 | 1500 | | Canada, CKZU Vancouver BC | 6160na | | |
| 1400 | 1500 | | China, China Radio International | | 5955as | |
| | | | 9870as | 11675as | 11765as | 13740na |
| | | | 13710eu | 13790eu | | |
| 1400 | 1500 | Sat/Sun | Equatorial Guinea, Radio East Africa | | 15190af | |
| 1400 | 1500 | | Germany, CVC Intl-Christian Vision | | 17770af | |
| 1400 | 1500 | | Germany, Overcomer Ministries | | 6110eu | |
| | | | 13810as | | | |
| 1400 | 1500 | | India, All India Radio | 9690as | 11620as | |
| | | | 13710as | | | |
| 1400 | 1500 | | Libya, LJB/Voice of Africa | 17725af | 21695af | |
| 1400 | 1500 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 1400 | 1500 | | New Zealand, Radio NZ International | | 6170pa | |
| 1400 | 1500 | | Nigeria, Voice of Nigeria/External Service | | 9690af | |
| 1400 | 1500 | | Oman, Radio Oman | 15140va | | |
| 1400 | 1500 | | Palau, T8WH/World Harvest | 9930as | 9965as | |
| 1400 | 1500 | DRM | Russia, Voice of Russia | 9445as | 9750eu | |
| 1400 | 1500 | | Russia, Voice of Russia | 6045as | 7330as | |
| | | | 9850as | 15605as | | |
| 1400 | 1500 | | South Africa, Channel Africa | 9625af | | |
| 1400 | 1500 | | Uganda, UBC Radio | 4976do | | |
| 1400 | 1500 | | UK, BBC World Service | 5875as | 5975as | |
| | | | 6190af | 6195as | 9410as | 9545as |
| | | | 9625as | 9740as | 9860af | 11760as |
| | | | 15420af | 17640af | | |
| 1400 | 1500 | DRM | UK, BBC World Service | 9545eu | 13590eu | |
| 1400 | 1500 | Sat/Sun | UK, Bible Voice Broadcasting | 17805as | | |
| 1400 | 1500 | | USA, American Forces Network | | 4319usb | |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 1400 | 1500 | | USA, EWTN Vandiver AL | 12160as | | |
| 1400 | 1500 | | USA, KJES Vado NM | 11715na | | |
| 1400 | 1500 | | USA, KNLS Anchor Point AK | 7355as | | |
| 1400 | 1500 | | USA, Voice of America | 4930af | 6080af | |
| | | | 7575va | 9760va | 11715va | 13750af |
| | | | 15580af | 17585af | | |
| 1400 | 1500 | Sat/Sun | USA, WHRA Greenbush ME | 15195va | | |
| 1400 | 1500 | Sat/Sun | USA, WHRI Cypress Creek SC | 9840va | | |
| 1400 | 1500 | | USA, WINB Red Lion PA | 13570am | | |
| 1400 | 1500 | vl | USA, WRMI Miami FL | 9955va | | |
| 1400 | 1500 | | USA, WTJC Newport NC | 9370na | | |
| 1400 | 1500 | | USA, WWCR Nashville TN | 7490na | 9980na | |
| | | | 13845na | 15830na | | |
| 1400 | 1500 | | USA, WWRB Manchester TN | 9385va | | |
| 1400 | 1500 | | USA, WYFR/Family Radio Worldwide | | 11560as | |
| | | | 11565na | 11855as | 13695na | 17760na |
| 1400 | 1500 | | Zambia CVC Intl/ The Voice Africa | | 6065af | |
| | | | 13590af | | | |
| 1400 | 1500 | | Zambia, Zambia Natl Broadcasting Corp | | 6165do | |
| 1415 | 1430 | | Nepal, Radio Nepal | 5005as | | |
| 1415 | 1439 | mtwhfa | Germany, Pan American Broadcasting | | 15205as | |
| 1430 | 1445 | Sun | Germany, Pan American Broadcasting | | 15205as | |
| 1430 | 1500 | | Australia, Radio Australia | 5995va | 6080va | |
| | | | 7240va | 9475as | 9590va | 11660pa |
| 1430 | 1500 | | China, CPBS/CNR Business Radio | | 6155do | |
| | | | 7245do | 7315as | 7335as | 7375as |
| | | | 9820as | 9775as | | |
| 1430 | 1500 | f/ DRM | South Korea, KBS World Radio | | 9660eu | |
| 1430 | 1500 | | Sweden, Radio Sweden | 9400va | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1500 | 1510 | mtwhfa | Turkmenistan, Turkmen Radiosi | | 5015eu | |
| 1500 | 1515 | Sun | UK, Bible Voice Broadcasting | 15680as | | |
| 1500 | 1525 | Sun | China, Voice of the Strait | 9505as | | |
| 1500 | 1527 | | Czech Republic, Radio Prague | 9955na | | |
| 1500 | 1530 | | Australia, HCJB Global | 15340as | | |
| 1500 | 1530 | | China, China Radio International | | 9600as | |
| 1500 | 1530 | Sat/Sun | Clandestine, Sudan Radio Service | | 17745af | |
| 1500 | 1530 | | Guam, KSDA/ AWR | 15255as | | |
| 1500 | 1530 | | UK, BBC World Service | 9410af | 11860af | |
| | | | 15105af | | | |
| 1500 | 1530 | Sat | UK, Bible Voice Broadcasting | 15295as | | |
| 1500 | 1530 | | UK, Sudan Radio Service | 17745af | | |
| 1500 | 1530 | | Vietnam, Voice of Vietnam | 7285va | 9840va | |
| | | | 12020va | | | |
| 1500 | 1545 | | USA, WYFR/Family Radio Worldwide | | 15210sa | |
| 1500 | 1550 | | New Zealand, Radio NZ International | | 6170pa | |
| 1500 | 1557 | | Canada, Radio Canada International | | 9635as | |
| | | | 11975as | | | |
| 1500 | 1557 | | Libya, LJB/Voice of Africa | 17725af | 21695af | |
| 1500 | 1557 | | Netherlands, R Netherlands Worldwide | | 12080as | |
| | | | 15595va | | | |
| 1500 | 1557 | | North Korea, Voice of Korea | 9335na | 11710na | |
| | | | 13760eu | 15245eu | | |
| 1500 | 1600 | | Anguilla, Worldwide Univ Network | | 11775am | |
| 1500 | 1600 | | Australia, ABC NT Alice Springs | | 2310do | |
| 1500 | 1600 | | Australia, ABC NT Katherine | 2485do | | |
| 1500 | 1600 | | Australia, CVC International | 11730as | | |
| 1500 | 1600 | | Australia, Radio Australia | 5995va | 6080va | |
| | | | 7240va | 9475as | 9590va | 11660pa |
| 1500 | 1600 | | Bahrain, Radio Bahrain | 6010me | 9745al | |
| 1500 | 1600 | DRM | Belgium, TDP Radio | 6015eu | | |
| 1500 | 1600 | Sat/Sun | Canada, CBC NQ SW Service | 9625na | | |
| 1500 | 1600 | | Canada, CFRX Toronto ON | 6070na | | |
| 1500 | 1600 | | Canada, CFVP Calgary AB | 6030na | | |
| 1500 | 1600 | | Canada, CKZN St John's NF | 6160na | | |
| 1500 | 1600 | | Canada, CKZU Vancouver BC | 6160na | | |
| 1500 | 1600 | | China, China Radio International | | 5955as | |
| | | | 6095as | 7160as | 7325as | 7405as |
| | | | 9720as | 9800as | 9870as | 11965eu |
| | | | 13640as | 13740na | | |
| 1500 | 1600 | Sat/Sun | Equatorial Guinea, Radio East Africa | | 15190af | |
| 1500 | 1600 | | Germany, CVC Intl-Christian Vision | | 17770af | |
| 1500 | 1600 | | Germany, Overcomer Ministries | | 6110eu | |
| | | | 13810as | 17485af | | |
| 1500 | 1600 | | Italy, IRRS/NEXUS | 15650va | | |
| 1500 | 1600 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 1500 | 1600 | | Myanmar, Myanma Radio | 5985as | | |
| 1500 | 1600 | | Palau, T8WH/World Harvest | 9965as | | |
| 1500 | 1600 | | Russia, Voice of Russia | 4975me | 9625as | |
| | | | 9660as | 9735me | 9850as | 11985me |
| | | | 12040eu | 15605as | | |
| 1500 | 1600 | | South Africa, Channel Africa | 9625af | | |
| 1500 | 1600 | | Uganda, Dunamis Shortwave | 4750af | | |
| 1500 | 1600 | | Uganda, UBC Radio | 4976do | | |
| 1500 | 1600 | | UK, BBC World Service | 5790eu | 5875as | |
| | | | 5975as | 6190af | 6195as | 7395as |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 9740as | 9855as | 9860af | 12095eu | |
| | | | 15400af | 15420af | 17640af | | |
| 1500 | 1600 | DRM | UK, BBC World Service | | 5790eu | 13590eu | |
| 1500 | 1600 | | USA, American Forces Network | | | 4319usb | |
| | | | 5446usb | 5765usb | 6350usb | 7812usb | |
| | | | 10320usb | 12133usb | 12759usb | 13362usb | |
| 1500 | 1600 | | USA, EWTN Vandiver AL | | 15610eu | | |
| 1500 | 1600 | | USA, Voice of America | | 4930af | 6080af | |
| | | | 7545va | 7575va | 9700va | 12005va | |
| | | | 12150va | 13750va | 15530va | 17740va | |
| | | | 17895af | 15580af | 17895af | | |
| 1500 | 1600 | | USA, Voice of America/Special English | | | 6160va | |
| | | | 7520va | 9485va | 9760va | 15550va | |
| 1500 | 1600 | Sat/Sun | USA, WHRA Greenbush ME | | 15195va | | |
| 1500 | 1600 | Sat/Sun | USA, WHRI Cypress Creek SC | | 9840va | 11785va | |
| 1500 | 1600 | | USA, WINB Red Lion PA | | 13570am | | |
| 1500 | 1600 | vl | USA, WRMI Miami FL | | 9955na | | |
| 1500 | 1600 | | USA, WTJC Newport NC | | 9370na | | |
| 1500 | 1600 | | USA, WWCR Nashville TN | | 7490na | 9980na | |
| | | | 13845na | 15830na | | | |
| 1500 | 1600 | | USA, WWRB Manchester TN | | 9385va | | |
| 1500 | 1600 | | USA, WYFR/Family Radio Worldwide | | | 6280as | |
| | | | 11565na | 11855as | 17760na | | |
| 1500 | 1600 | | Zambia CVC Intl/ The Voice Africa | | | 6065af | |
| | | | 13590af | | | | |
| 1500 | 1600 | | Zambia, Zambia Natl Broadcasting Corp | | | 6165do | |
| 1530 | 1545 | | India, All India Radio | | 7255as | 9820as | |
| | | | 9910as | | | | |
| 1530 | 1600 | mtwhfa | Albania, Radio Tirana | | 13640na | | |
| 1530 | 1600 | | Iran, Voice of Islamic Rep. of Iran | | | 7305as | |
| | | | 9600as | 9635as | | | |
| 1530 | 1600 | | Mongolia, Voice of Mongolia | | 9665as | | |
| 1530 | 1600 | | Sweden, Radio Sweden | | 9360me | | |
| 1530 | 1600 | Sat | UK, BBC World Service | | 9410af | 11860af | |
| | | | 15105af | | | | |
| 1530 | 1600 | Sun | UK, Bible Voice Broadcasting | | 13590me | | |
| 1530 | 1600 | ha | UK, Bible Voice Broadcasting | | 15680as | | |
| 1530 | 1600 | Sat | Vatican City State, Vatican Radio | | | 7585as | |
| | | | 11850as | 13765as | | | |
| 1545 | 1600 | mw | UK, Bible Voice Broadcasting | | 13590me | | |
| 1545 | 1600 | thf | UK, Bible Voice Broadcasting | | 13590me | | |
| 1551 | 1600 | | New Zealand, Radio NZ International | | | 6170pa | |
| 1551 | 1600 | DRM | New Zealand, Radio NZ International | | | 7440pa | |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1600 | 1605 | Sun | Croatia, Voice of Croatia | | 6165eu | | |
| 1600 | 1615 | mtwhfa | Croatia, Voice of Croatia | | 6165eu | | |
| 1600 | 1615 | | Pakistan, Radio Pakistan | | 9385va | 11565va | |
| | | | 15100as | | | | |
| 1600 | 1615 | | UK, Bible Voice Broadcasting | | 13590me | | |
| 1600 | 1627 | | Iran, Voice of Islamic Rep. of Iran | | | 7305as | |
| | | | 9600as | | | | |
| 1600 | 1630 | Sun | Germany, Pan American Broadcasting | | | 13830as | |
| 1600 | 1630 | | Guam, KSDA/ AWR | | 9585as | 11690as | |
| 1600 | 1630 | | Myanmar, Myanma Radio | | 9730do | | |
| 1600 | 1630 | | Vietnam, Voice of Vietnam | | 7220va | 7280va | |
| | | | 9550va | 9730va | | | |
| 1600 | 1630 | | Yemen, Rep of Yemen Radio/ Radio Sana'a | | | | |
| | | | 9780me | | | | |
| 1600 | 1645 | h | UK, Bible Voice Broadcasting | | 13590me | | |
| 1600 | 1645 | | USA, WYFR/Family Radio Worldwide | | | 11565na | |
| | | | 11830na | 17760na | | | |
| 1600 | 1657 | | North Korea, Voice of Korea | | 9990va | 11545va | |
| 1600 | 1700 | | Anguilla, Worldwide Univ Network | | | 11775am | |
| 1600 | 1700 | | Australia, ABC NT Alice Springs | | | 2310do | |
| 1600 | 1700 | | Australia, ABC NT Katherine | | 2485do | | |
| 1600 | 1700 | | Australia, CVC International | | 9680as | | |
| 1600 | 1700 | | Australia, Radio Australia | | 5995va | 6080va | |
| | | | 7240as | 9475va | 9580va | 9710as | |
| | | | 11660pa | | | | |
| 1600 | 1700 | | Bahrain, Radio Bahrain | | 6010me | 9745al | |
| 1600 | 1700 | Sat | Canada, CBC NQ SW Service | | 9625na | | |
| 1600 | 1700 | | Canada, CFRX Toronto ON | | 6070na | | |
| 1600 | 1700 | | Canada, CFVP Calgary AB | | 6030na | | |
| 1600 | 1700 | | Canada, CKZN St John's NF | | 6160na | | |
| 1600 | 1700 | | Canada, CKZU Vancouver BC | | 6160na | | |
| 1600 | 1700 | | China, China Radio International | | | 6095af | |
| | | | 6180as | 7235as | 7420af | 9570af | |
| | | | 9720af | 9760as | 11650eu | 11900af | |
| | | | 11940eu | 11965eu | 13760eu | | |
| 1600 | 1700 | Sat | Clandestine, Cheetah Radio | | 11730as | | |
| 1600 | 1700 | | Egypt, Radio Cairo12170af | | | | |
| 1600 | 1700 | | Ethiopia, Radio Ethiopia/External Service | | | 7165af | |
| | | | 9560af | | | | |
| 1600 | 1700 | mtwhf | France, Radio France International | | | 15605af | |
| | | | 17605af | | | | |
| 1600 | 1700 | | Germany, CVC Intl-Christian Vision | | | 17770af | |
| 1600 | 1700 | | Germany, Deutsche Welle | | 5965as | | |
| 1600 | 1700 | | Italy, IRRS/NEXUS 15650va | | | | |
| 1600 | 1700 | | Malaysia, RTM/Traxx FM | | 7295do | | |
| 1600 | 1700 | | New Zealand, Radio NZ International | | | 6170pa | |
| 1600 | 1700 | DRM | New Zealand, Radio NZ International | | | 7440pa | |
| 1600 | 1700 | | Palau, T8WH/World Harvest | | 9965as | | |
| 1600 | 1700 | | Russia, Voice of Russia | | 4975me | 11985va | |
| | | | 12040af | 13855af | | | |
| 1600 | 1700 | | South Korea, KBS World Radio | | | 9515eu | |
| 1600 | 1700 | | Taiwan, Radio Taiwan International | | | 9785as | |
| | | | 11550as | | | | |
| 1600 | 1700 | | Uganda, Dunamis Shortwave | | 4750af | | |
| 1600 | 1700 | | Uganda, UBC Radio | | 4976do | | |
| 1600 | 1700 | | UK, BBC World Service | | 3255af | 3995eu | |
| | | | 5790eu | 5975as | 6190af | 7255as | |
| | | | 9740as | 11860af | 12095eu | 13820af | |
| | | | 15400af | 15420af | 17640af | | |
| 1600 | 1700 | DRM | UK, BBC World Service | | 3995eu | 5790eu | |
| 1600 | 1700 | Sat | UK, BBC World Service | | 9410af | | |
| 1600 | 1700 | t | UK, Bible Voice Broadcasting | | 13590me | | |
| 1600 | 1700 | Sun | UK, Bible Voice Broadcasting | | 13590me | | |
| 1600 | 1700 | | USA, American Forces Network | | | 4319usb | |
| | | | 5446usb | 5765usb | 6350usb | 7812usb | |
| | | | 10320usb | 12133usb | 12759usb | 13362usb | |
| 1600 | 1700 | | USA, EWTN Vandiver AL | | 15610eu | | |
| 1600 | 1700 | | USA, Voice of America | | 4930af | 6080af | |
| | | | 9885af | 15580af | 17715af | | |
| 1600 | 1700 | | USA, Voice of America/Special English | | | 12080va | |
| | | | 13570va | 17895va | | | |
| 1600 | 1700 | | USA, WHRA Greenbush ME | | 17520af | | |
| 1600 | 1700 | | USA, WHRI Cypress Creek SC | | 9840va | 11785va | |
| 1600 | 1700 | | USA, WINB Red Lion PA | | 13570am | | |
| 1600 | 1700 | vl | USA, WRMI Miami FL | | 9955na | | |
| 1600 | 1700 | | USA, WTJC Newport NC | | 9370na | | |
| 1600 | 1700 | | USA, WWCR Nashville TN | | 9980na | 12160na | |
| | | | 13845na | 15830na | | | |
| 1600 | 1700 | | USA, WWRB Manchester TN | | 9385va | | |
| 1600 | 1700 | | USA, WYFR/Family Radio Worldwide | | | 6085na | |
| | | | 13695na | 17690af | 18980eu | 21455eu | |
| 1600 | 1700 | | Zambia CVC Intl/ The Voice Africa | | | 6065af | |
| | | | 13590af | | | | |
| 1600 | 1700 | | Zambia, Zambia Natl Broadcasting Corp | | | 6165do | |
| 1605 | 1700 | | Canada, Radio Canada International | | | 9610na | |
| 1605 | 1700 | DRM | Canada, Radio Canada International | | | 9800na | |
| 1615 | 1700 | | UK, BBC World Service | | 9410af | 11860af | |
| | | | 15105af | | | | |
| 1630 | 1657 | | Slovakia, Radio Slovakia International | | | 5920eu | |
| | | | 6055eu | | | | |
| 1630 | 1700 | | Guam, KSDA/ AWR | | 9840as | | |
| 1640 | 1650 | mtwhfa | Turkmenistan, Turkmen Radiosi | | | 4930eu | |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1700 | 1704 | | Canada, Radio Canada International | | | 9610na | |
| 1700 | 1704 | DRM | Canada, Radio Canada International | | | 9800na | |
| 1700 | 1725 | | Vietnam, Voice of Vietnam | | 9725eu | | |
| 1700 | 1727 | | Czech Republic, Radio Prague | | 5930eu | 15710af | |
| 1700 | 1730 | | Australia, CVC International | | 9680as | | |
| 1700 | 1730 | | Sweden, Radio Sweden | | 7465me | | |
| 1700 | 1730 | | USA, Voice of America | | 6080af | 9885af | |
| | | | 11835af | 15580af | | | |
| 1700 | 1745 | | USA, WYFR/Family Radio Worldwide | | | 18980eu | |
| 1700 | 1746 | | UK, BBC World Service | | 6005af | 9410af | |
| 1700 | 1750 | | New Zealand, Radio NZ International | | | 6170pa | |
| 1700 | 1750 | DRM | New Zealand, Radio NZ International | | | 7440pa | |
| 1700 | 1800 | | Anguilla, Worldwide Univ Network | | | 11775am | |
| 1700 | 1800 | | Australia, ABC NT Alice Springs | | | 2310do | |
| 1700 | 1800 | | Australia, ABC NT Katherine | | 2485do | | |
| 1700 | 1800 | | Australia, Radio Australia | | 5995va | 6080va | |
| | | | 9475as | 9580va | 9710as | 11880as | |
| 1700 | 1800 | | Bahrain, Radio Bahrain | | 6010me | 9745al | |
| 1700 | 1800 | Sat | Canada, CBC NQ SW Service | | 9625na | | |
| 1700 | 1800 | | Canada, CFRX Toronto ON | | 6070na | | |
| 1700 | 1800 | | Canada, CFVP Calgary AB | | 6030na | | |
| 1700 | 1800 | | Canada, CKZN St John's NF | | 6160na | | |
| 1700 | 1800 | | Canada, CKZU Vancouver BC | | 6160na | | |
| 1700 | 1800 | | China, China Radio International | | | 6060as | |
| | | | 6090as | 6140as | 6145eu | 6165as | |
| | | | 7235as | 7265as | 7315va | 7335eu | |
| | | | 7410as | 7420as | 9570af | 9695eu | |
| | | | 11900af | 11940eu | 13760eu | | |
| 1700 | 1800 | | Egypt, Radio Cairo12170af | | | | |
| 1700 | 1800 | | Equatorial Guinea, Radio Africa | | | 7190af | |
| | | | 15190af | | | | |
| 1700 | 1800 | | Germany, CVC Intl-Christian Vision | | | 17770af | |
| 1700 | 1800 | | Italy, IRRS/NEXUS 15650va | | | | |

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|---|---|---|---|---|---|---|
| 1700 | 1800 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 1700 | 1800 | | Nigeria, Voice of Nigeria/External Service | 15120af | | |
| 1700 | 1800 | | Palau, T8WH/World Harvest | 9965as | | |
| 1700 | 1800 | | Russia, Voice of Russia | 4975me | 11610me | |
| | | | 11985af | 12040af | 12070af | 13855af |
| 1700 | 1800 | | South Africa, Channel Africa | 15235af | | |
| 1700 | 1800 | | Swaziland, TWR Swaziland | 3200af | | |
| 1700 | 1800 | | Taiwan, Radio Taiwan International | | 11850af | |
| 1700 | 1800 | | Tajikistan, Voice of Tajik/Radio 2 | | 7245as | |
| 1700 | 1800 | | Uganda, Dunamis Shortwave | 4750af | | |
| 1700 | 1800 | | Uganda, UBC Radio | 4976do | | |
| 1700 | 1800 | | UK, BBC World Service | 3255af | 3995eu | |
| | | | 5975as | 6190af | 7355as | 12095af |
| | | | 13820af | 15400af | 15420af | 17830af |
| 1700 | 1800 | Sat | UK, Bible Voice Broadcasting | 9430me | | |
| 1700 | 1800 | Sun | UK, Bible Voice Broadcasting | 13590me | | |
| 1700 | 1800 | | USA, American Forces Network | | 4319usb | |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 1700 | 1800 | | USA, EWTN Vandiver AL | 15610na | | |
| 1700 | 1800 | Sat/Sun | USA, Voice of America | 15675af | | |
| 1700 | 1800 | | USA, WBCQ Monticello ME | 15420am | | |
| 1700 | 1800 | | USA, WHRA Greenbush ME | 17520af | | |
| 1700 | 1800 | | USA, WHRI Cypress Creek SC | 11785va | | |
| 1700 | 1800 | smtwhf | USA, WHRI Cypress Creek SC | 9840va | | |
| 1700 | 1800 | Sat | USA, WHRI Cypress Creek SC | 9495va | | |
| 1700 | 1800 | | USA, WINB Red Lion PA | 13570am | | |
| 1700 | 1800 | vl | USA, WRMI Miami FL | 9955va | | |
| 1700 | 1800 | | USA, WTJC Newport NC | 9370na | | |
| 1700 | 1800 | | USA, WWCR Nashville TN | 9980na | 12160na | |
| | | | 13845na | 15830na | | |
| 1700 | 1800 | | USA, WWRB Manchester TN | 9385va | | |
| 1700 | 1800 | | USA, WYFR/Family Radio Worldwide | | 13695na | |
| | | | 17555na | 21455eu | | |
| 1700 | 1800 | | Zambia CVC Intl/ The Voice Africa | | 4965af | |
| | | | 13590af | | | |
| 1700 | 1800 | | Zambia, Zambia Natl Broadcasting Corp | | 6165do | |
| 1705 | 1800 | | Canada, Radio Canada International | | 9610na | |
| 1705 | 1800 | DRM | Canada, Radio Canada International | | 9800na | |
| 1720 | 1740 | fas | USA, Voice of America | 4930va | 11605va | |
| | | | 15775va | | | |
| 1730 | 1800 | | Clandestine, Sudan Radio Service | | 9590af | |
| 1730 | 1800 | fa | UK, Bible Voice Broadcasting | 13590me | | |
| 1730 | 1800 | mtwhf | UK, Sudan Radio Service | 9840af | | |
| 1730 | 1800 | | USA, Voice of America | 6080af | 9885af | |
| | | | 15580af | 17895af | | |
| 1730 | 1800 | mtwh | USA, Voice of America | 4930va | 11605va | |
| | | | 15775va | | | |
| 1730 | 1800 | | Vatican City State, Vatican Radio | | 9755af | |
| | | | 11625af | 13765af | | |
| 1745 | 1800 | | Bangladesh, Bangladesh Betar | | 7250as | |
| 1745 | 1800 | DRM | India, All India Radio | 9950eu | | |
| 1745 | 1800 | | India, All India Radio | 7410eu | 9445af | |
| | | | 11620eu | 11935af | 13605as | 15155af |
| | | | 17670af | | | |
| 1751 | 1800 | | New Zealand, Radio NZ International | | 9765pa | |
| 1751 | 1800 | DRM | New Zealand, Radio NZ International | | 9890pa | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1800 | 1804 | | Canada, Radio Canada International | | 9610na | |
| 1800 | 1804 | DRM | Canada, Radio Canada International | | 9800na | |
| 1800 | 1815 | Sun | UK, Bible Voice Broadcasting | 13590me | | |
| 1800 | 1827 | | Czech Republic, Radio Prague | 5930eu | 9400va | |
| 1800 | 1830 | w | Austria, AWR Europe | 9515af | | |
| 1800 | 1830 | | China, China Radio International | | 6020eu | |
| | | | 7265eu | | | |
| 1800 | 1830 | DRM | Romania, Radio Romania International | | 5895eu | |
| 1800 | 1830 | | South Africa, AWR Africa | 3215af | 3345af | |
| | | | 11830af | | | |
| 1800 | 1830 | | UK, BBC World Service | 5975as | 7260as | |
| | | | 7355as | | | |
| 1800 | 1830 | Sat | UK, Bible Voice Broadcasting | 13590as | | |
| 1800 | 1830 | | USA, Voice of America | 6080af | 9885af | |
| | | | 15580af | | | |
| 1800 | 1830 | Sat/Sun | USA, Voice of America | 4930af | | |
| 1800 | 1845 | smtwhf | Swaziland, TWR Swaziland | 9500af | | |
| 1800 | 1845 | Sat | UK, Bible Voice Broadcasting | 6130eu | | |
| 1800 | 1850 | | New Zealand, Radio NZ International | | 9765pa | |
| 1800 | 1856 | | Romania, Radio Romania International | | 7215eu | |
| 1800 | 1856 | DRM | Romania, Radio Romania International | | 6065eu | |
| 1800 | 1857 | | Netherlands, R Netherlands Worldwide | | 6020af | |
| | | | 11655af | 12045af | | |
| 1800 | 1857 | | North Korea, Voice of Korea | 13760eu | 15245eu | |
| 1800 | 1859 | | Canada, Radio Canada International | | 9740af | |
| | | | 11845af | 13650af | 15365af | 17790af |
| 1800 | 1900 | | Anguilla, Worldwide Univ Network | | 11775am | |
| 1800 | 1900 | mtwhf | Argentina, Radio Nacional RAE | | 9690eu | |
| | | | 15345eu | | | |
| 1800 | 1900 | | Australia, ABC NT Alice Springs | | 2310do | |
| 1800 | 1900 | | Australia, ABC NT Katherine | 2485do | | |
| 1800 | 1900 | | Australia, Radio Australia | 6080va | 7240as | |
| | | | 9475va | 9580as | 9710as | 11880as |
| 1800 | 1900 | | Bahrain, Radio Bahrain | 6010me | 9745al | |
| 1800 | 1900 | | Bangladesh, Bangladesh Betar | | 7250eu | |
| 1800 | 1900 | | Canada, CFRX Toronto ON | 6070na | | |
| 1800 | 1900 | | Canada, CFVP Calgary AB | 6030na | | |
| 1800 | 1900 | | Canada, CKZN St John's NF | 6160na | | |
| 1800 | 1900 | | Canada, CKZU Vancouver BC | 6160na | | |
| 1800 | 1900 | | China, China Radio International | | 6030eu | |
| | | | 9600eu | 13760eu | | |
| 1800 | 1900 | | Equatorial Guinea, Radio Africa | | 7190af | |
| | | | 15190af | | | |
| 1800 | 1900 | | Germany, CVC Intl-Christian Vision | | 17770af | |
| 1800 | 1900 | DRM | Germany, Deutsche Welle | 3995eu | | |
| 1800 | 1900 | DRM | India, All India Radio | 9950eu | | |
| 1800 | 1900 | | India, All India Radio | 7410eu | 9445af | |
| | | | 11620eu | 11935af | 13605as | 15155af |
| | | | 17670af | | | |
| 1800 | 1900 | | Italy, IRRS/NEXUS | 15650va | | |
| 1800 | 1900 | fas | Italy, IRRS/NEXUS | 7290va | | |
| 1800 | 1900 | | Kuwait, Radio Kuwait | 11990va | | |
| 1800 | 1900 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 1800 | 1900 | DRM | New Zealand, Radio NZ International | | 9890pa | |
| 1800 | 1900 | | Nigeria, Voice of Nigeria/External Service | | 15120af | |
| 1800 | 1900 | | Palau, T8WH/World Harvest | 9965as | | |
| 1800 | 1900 | | Poland, Polish Radio | 9650eu | | |
| 1800 | 1900 | DRM | Poland, Polish Radio | 6130eu | | |
| 1800 | 1900 | | Russia, Voice of Russia | 4975me | 12040af | |
| | | | 12070af | | | |
| 1800 | 1900 | | South Korea, KBS World Radio | | 7275eu | |
| 1800 | 1900 | | Swaziland, TWR Swaziland | 3200af | | |
| 1800 | 1900 | Sat | Swaziland, TWR Swaziland | 9500af | | |
| 1800 | 1900 | | Taiwan, Radio Taiwan International | | 3965eu | |
| 1800 | 1900 | | Uganda, Dunamis Shortwave | 4750af | | |
| 1800 | 1900 | | Uganda, UBC Radio | 4976do | | |
| 1800 | 1900 | | UK, BBC World Service | 3255af | 3995eu | |
| | | | 5875eu | 5945as | 5955as | 6190af |
| | | | 7390eu | 11810af | 12095af | 13820af |
| | | | 15400af | 15420af | | |
| 1800 | 1900 | | USA, American Forces Network | | 4319usb | |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 1800 | 1900 | | USA, EWTN Vandiver AL | 15610na | | |
| 1800 | 1900 | | USA, Voice of America | 17895af | | |
| 1800 | 1900 | | USA, WBCQ Monticello ME | 15420am | | |
| 1800 | 1900 | | USA, WHRA Greenbush ME | 17520af | | |
| 1800 | 1900 | | USA, WHRI Cypress Creek SC | 9840va | 11785va | |
| 1800 | 1900 | | USA, WINB Red Lion PA | 13570am | | |
| 1800 | 1900 | vl | USA, WRMI Miami FL | 9955ca | | |
| 1800 | 1900 | | USA, WTJC Newport NC | 9370na | | |
| 1800 | 1900 | | USA, WWCR Nashville TN | 9980na | 12160na | |
| | | | 13845na | 15830na | | |
| 1800 | 1900 | | USA, WWRB Manchester TN | 9385va | | |
| 1800 | 1900 | | USA, WYFR/Family Radio Worldwide | | 6915na | |
| | | | 13695na | 15115af | 17535na | 17555na |
| 1800 | 1900 | | Yemen, Rep of Yemen Radio/ Radio Sana'a | | | |
| | | | 9780me | | | |
| 1800 | 1900 | | Zambia CVC Intl/ The Voice Africa | | 4965af | |
| | | | 13590af | | | |
| 1800 | 1900 | | Zambia, Zambia Natl Broadcasting Corp | | 6165do | |
| 1805 | 1810 | Sat | Croatia, Voice of Croatia | 6165eu | | |
| 1805 | 1815 | mtwhf | Croatia, Voice of Croatia | 6165eu | | |
| 1810 | 1820 | f | USA, Voice of America | 4930va | 11605va | |
| | | | 15775va | | | |
| 1815 | 1845 | Sun | UK, Bible Voice Broadcasting | 9430me | | |
| 1830 | 1845 | | Rwanda, Radio Rwanda | 6055do | | |
| 1830 | 1857 | | Slovakia, Radio Slovakia International | | 5920eu | |
| | | | 6055eu | | | |
| 1830 | 1900 | | Bulgaria, Radio Bulgaria | 6200eu | 7400eu | |
| 1830 | 1900 | DRM | Bulgaria, Radio Bulgaria | 9700eu | | |
| 1830 | 1900 | | Serbia, International Radio of Serbia | | 6100eu | |
| 1830 | 1900 | | UK, BBC World Service | 6005af | 9410af | |
| 1830 | 1900 | f | UK, Bible Voice Broadcasting | 9430me | | |
| 1830 | 1900 | | USA, Voice of America | 4930af | 6080af | |
| | | | 9885af | 15580af | 17895af | |
| 1845 | 1900 | Sun | UK, Bible Voice Broadcasting | 11830af | | |
| 1851 | 1900 | | New Zealand, Radio NZ International | | 11725pa | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1900 | 1930 | | Germany, Deutsche Welle | 9735af | 11690af | |
| | | | 13780af | | | |
| 1900 | 1930 | | Vietnam, Voice of Vietnam | 7280va | 9730va | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1900 | 1935 | DRM | New Zealand, Radio NZ International | | | | 9890pa |
| 1900 | 1945 | DRM | India, All India Radio | 9950eu | | | |
| 1900 | 1945 | | India, All India Radio | 7410eu | 9445af | | |
| | | | 11620eu | 11935af | 13605as | | 15155af |
| | | | 17670af | | | | |
| 1900 | 1945 | | USA, WYFR/Family Radio Worldwide | | | | 6085na |
| | | | 15565as | | | | |
| 1900 | 1957 | | Netherlands, R Netherlands Worldwide | | | | 7425af |
| | | | 12080af | | | | |
| 1900 | 1957 | | North Korea, Voice of Korea | 7100af | 9975va | | |
| | | | 11910af | 11535va | | | |
| 1900 | 2000 | | Anguilla, Worldwide Univ Network | | | | 11775am |
| 1900 | 2000 | | Australia, ABC NT Alice Springs | | | | 2310do |
| 1900 | 2000 | | Australia, ABC NT Katherine | 2485do | | | |
| 1900 | 2000 | | Australia, Radio Australia | 6080va | 7240as | | |
| | | | 9500va | 9580va | 9710as | | 11880as |
| 1900 | 2000 | | Bahrain, Radio Bahrain | 6010me | 9745al | | |
| 1900 | 2000 | | Canada, CFRX Toronto ON | 6070na | | | |
| 1900 | 2000 | | Canada, CFVP Calgary AB | 6030na | | | |
| 1900 | 2000 | | Canada, CKZN St John's NF | 6160na | | | |
| 1900 | 2000 | | Canada, CKZU Vancouver BC | 6160na | | | |
| 1900 | 2000 | | China, China Radio International | | | | 7285eu |
| | | | 7295va | 9435va | 9440va | | |
| 1900 | 2000 | | Egypt, Radio Cairo | 11510af | | | |
| 1900 | 2000 | | Equatorial Guinea, Radio Africa | | | | 7190af |
| | | | 15190af | | | | |
| 1900 | 2000 | | Germany, CVC Intl-Christian Vision | | | | 17770af |
| 1900 | 2000 | DRM | Germany, Deutsche Welle | 3995eu | | | |
| 1900 | 2000 | | Germany, Overcomer Ministries | | | | 6175eu |
| 1900 | 2000 | fas | Italy, IRRS/NEXUS | 7290va | | | |
| 1900 | 2000 | | Kuwait, Radio Kuwait | 11990va | | | |
| 1900 | 2000 | | Malaysia, RTM/Traxx FM | 7295do | | | |
| 1900 | 2000 | | New Zealand, Radio NZ International | | | | 11725pa |
| 1900 | 2000 | | Nigeria, Voice of Nigeria/External Service | | | | 15120af |
| 1900 | 2000 | | Palau, T8WH/World Harvest | 9965as | | | |
| 1900 | 2000 | | Russia, Voice of Russia | 12040af | 12070af | | |
| 1900 | 2000 | mtwhf | Spain, Radio Exterior de Espana | | | | 9665eu |
| | | | 11620af | | | | |
| 1900 | 2000 | | Swaziland, TWR Swaziland | 3200af | | | |
| 1900 | 2000 | | Thailand, Radio Thailand World Service | | | | 7570eu |
| 1900 | 2000 | | Uganda, UBC Radio | 4976do | | | |
| 1900 | 2000 | | UK, BBC World Service | 3255af | 5875eu | | |
| | | | 5955as | 6005af | 6190af | 7390eu | |
| | | | 9410af | 11810af | 12095af | 13820af | |
| 1900 | 2000 | Sun | UK, Bible Voice Broadcasting | 11830af | | | |
| 1900 | 2000 | | USA, American Forces Network | | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | 7812usb | |
| | | | 10320usb | 12133usb | 12759usb | 13362usb | |
| 1900 | 2000 | | USA, EWTN Vandiver AL | 15610na | | | |
| 1900 | 2000 | | USA, Voice of America | 4930af | 4940af | | |
| | | | 6120af | 9885af | 15580af | 17895af | |
| 1900 | 2000 | | USA, Voice of America/Special English | | | | 7480va |
| | | | 9780va | | | | |
| 1900 | 2000 | smtwhf | USA, WBCQ Monticello ME | 7415am | | | |
| 1900 | 2000 | twhfas | USA, WHRA Greenbush ME | 9840af | | | |
| 1900 | 2000 | | USA, WHRI Cypress Creek SC | 11785va | | | |
| 1900 | 2000 | | USA, WINB Red Lion PA | 13570am | | | |
| 1900 | 2000 | vl | USA, WRMI Miami FL | 9955ca | | | |
| 1900 | 2000 | | USA, WTJC Newport NC | 9370na | | | |
| 1900 | 2000 | | USA, WWCR Nashville TN | 9980na | 12160na | | |
| | | | 13845na | 15830na | | | |
| 1900 | 2000 | | USA, WWRB Manchester TN | 9385va | | | |
| 1900 | 2000 | | USA, WYFR/Family Radio Worldwide | | | | 6915na |
| | | | 13695na | 15115af | 17535na | | 17555na |
| 1900 | 2000 | | Zambia CVC Intl/ The Voice Africa | | | | 4965af |
| | | | 5940af | | | | |
| 1900 | 2000 | | Zambia, Zambia Natl Broadcasting Corp | | | | 6165do |
| 1905 | 1920 | Sat | Mali, RDTV Du Mali | 5995do | | | |
| 1905 | 2000 | Mon | South Africa, SA Radio League | 3215af | | | |
| 1930 | 2000 | Sat/Sun | Germany, Pan American Broadcasting | | | | 9515af |
| 1930 | 2000 | | Iran, Voice of Islamic Rep. of Iran | | | | 5940eu |
| | | | 6205eu | 7205eu | 9800af | | 9925af |
| 1930 | 2000 | | South Africa, RTE Radio One | 6225af | | | |
| 1930 | 2000 | | Turkey, Voice of Turkey | 6050eu | | | |
| 1936 | 1950 | DRM | New Zealand, Radio NZ International | | | | 11675pa |
| 1945 | 2000 | mtwhfa | Albania, Radio Tirana | 7465eu | 11635na | | |
| 1945 | 2000 | mtwhf | UK, Bible Voice Broadcasting | 11830af | | | |
| 1951 | 2000 | DRM | New Zealand, Radio NZ International | | | | 11675pa |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2000 | 2005 | Mon | South Africa, SA Radio League | 3215af | | | |
| 2000 | 2015 | Sat/Sun | Germany, Pan American Broadcasting | | | | 9515af |
| 2000 | 2015 | mtwhf | UK, Bible Voice Broadcasting | 11830af | | | |
| 2000 | 2025 | | Turkey, Voice of Turkey | 6050eu | | | |
| 2000 | 2028 | | Iran, Voice of Islamic Rep. of Iran | | | | 5940eu |
| | | | 6205eu | 7205eu | 9800af | | 9925af |
| 2000 | 2030 | mtwhfa | Albania, Radio Tirana | 7465eu | 13640na | | |
| 2000 | 2030 | | Egypt, Radio Cairo | 11510af | | | |
| 2000 | 2030 | Sat | Germany, Pan American Broadcasting | | | | 9515af |
| 2000 | 2030 | | South Africa, RTE Radio One | 6225af | | | |
| 2000 | 2030 | | Swaziland, TWR Swaziland | 3200af | | | |
| 2000 | 2030 | | USA, Voice of America | 4930af | 4940af | | |
| | | | 6080af | 9885af | 15580af | 17895af | |
| 2000 | 2030 | | Vatican City State, Vatican Radio | | | | 7365af |
| | | | 9755af | 11625af | | | |
| 2000 | 2045 | | USA, WYFR/Family Radio Worldwide | | | | 5745eu |
| 2000 | 2050 | | New Zealand, Radio NZ International | | | | 11725pa |
| 2000 | 2050 | DRM | New Zealand, Radio NZ International | | | | 11675pa |
| 2000 | 2057 | | Netherlands, R Netherlands Worldwide | | | | 7425af |
| | | | 11655af | 21525af | | | |
| 2000 | 2100 | | Anguilla, Worldwide Univ Network | | | | 11775am |
| 2000 | 2100 | | Australia, ABC NT Alice Springs | | | | 2310do |
| 2000 | 2100 | | Australia, ABC NT Katherine | 2485do | | | |
| 2000 | 2100 | | Australia, ABC NT Tennant Creek | | | | 2325do |
| 2000 | 2100 | Sat/Sun | Australia, Radio Australia | 6080va | 7240va | | |
| | | | 12080as | | | | |
| 2000 | 2100 | | Australia, Radio Australia | 9500va | 11650as | | |
| | | | 11660pa | 11880as | | | |
| 2000 | 2100 | | Bahrain, Radio Bahrain | 6010me | 9745al | | |
| 2000 | 2100 | | Belarus, Radio Belarus | 7210eu | 7255as | | |
| | | | 7390eu | | | | |
| 2000 | 2100 | | Canada, CFRX Toronto ON | 6070na | | | |
| 2000 | 2100 | | Canada, CFVP Calgary AB | 6030na | | | |
| 2000 | 2100 | | Canada, CKZN St John's NF | 6160na | | | |
| 2000 | 2100 | | Canada, CKZU Vancouver BC | 6160na | | | |
| 2000 | 2100 | | China, China Radio International | | | | 5960eu |
| | | | 5985af | 7275va | 7285eu | 7415eu | |
| | | | 9600eu | 11640af | 13630af | | |
| 2000 | 2100 | | Equatorial Guinea, Radio Africa | | | | 7190af |
| | | | 15190af | | | | |
| 2000 | 2100 | | Germany, CVC Intl-Christian Vision | | | | 17770af |
| 2000 | 2100 | | Germany, Deutsche Welle | 9690af | 9735af | | |
| | | | 13780af | | | | |
| 2000 | 2100 | | Indonesia, Voice of Indonesia | 9525va | 11785al | | |
| 2000 | 2100 | fas | Italy, IRRS/NEXUS | 7290va | | | |
| 2000 | 2100 | | Kuwait, Radio Kuwait | 11990va | | | |
| 2000 | 2100 | | Malaysia, RTM/Traxx FM | 7295do | | | |
| 2000 | 2100 | | Nigeria, Voice of Nigeria/External Service | | | | 15120af |
| 2000 | 2100 | | Palau, T8WH/World Harvest | 9965as | | | |
| 2000 | 2100 | | Russia, Voice of Russia | 12040af | 12070af | | |
| 2000 | 2100 | | Uganda, UBC Radio | 4976do | | | |
| 2000 | 2100 | | UK, BBC World Service | 3255af | 6005af | | |
| | | | 6190af | 9410af | 11810af | 12095af | |
| | | | 15400af | | | | |
| 2000 | 2100 | | Ukraine, Radio Ukraine International | | | | 7510eu |
| 2000 | 2100 | | USA, American Forces Network | | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | 7812usb | |
| | | | 10320usb | 12133usb | 12759usb | 13362usb | |
| 2000 | 2100 | | USA, EWTN Vandiver AL | 15610me | | | |
| 2000 | 2100 | | USA, WBCQ Monticello ME | 7415am | | | |
| 2000 | 2100 | | USA, WHRA Greenbush ME | 15665af | | | |
| 2000 | 2100 | mtwhf | USA, WHRI Cypress Creek SC | 7520va | | | |
| 2000 | 2100 | Sun | USA, WHRI Cypress Creek SC | 9495va | | | |
| 2000 | 2100 | | USA, WHRI Cypress Creek SC | 11785va | 15665na | | |
| 2000 | 2100 | | USA, WINB Red Lion PA | 13570am | | | |
| 2000 | 2100 | vl | USA, WRMI Miami FL | 9955ca | | | |
| 2000 | 2100 | | USA, WTJC Newport NC | 9370na | | | |
| 2000 | 2100 | | USA, WWCR Nashville TN | 9980na | 12160na | | |
| | | | 13845na | 15830na | | | |
| 2000 | 2100 | | USA, WWRB Manchester TN | 9385va | | | |
| 2000 | 2100 | | USA, WYFR/Family Radio Worldwide | | | | 6915na |
| | | | 15115af | 17535na | 17555na | 17575as | |
| 2000 | 2100 | | Zambia CVC Intl/ The Voice Africa | | | | 4965af |
| | | | 5940af | | | | |
| 2000 | 2100 | | Zambia, Zambia Natl Broadcasting Corp | | | | 6165do |
| 2000 | 2105 | | Uganda, UBC Radio | 4976do | | | |
| 2030 | 2045 | | Thailand, Radio Thailand World Service | | | | 9680eu |
| 2030 | 2100 | | Cuba, Radio Havana Cuba | 11760va | 17660va | | |
| | | | 17750va | | | | |
| 2030 | 2100 | | Sweden, Radio Sweden | 9490va | | | |
| 2030 | 2100 | | USA, Voice of America | 4930af | 6080af | | |
| | | | 7555va | 9885af | 15580af | 17895af | |
| 2030 | 2100 | | Vietnam, Voice of Vietnam | 7220va | 7280va | | |
| | | | 9550va | 9730va | | | |
| 2045 | 2100 | | India, All India Radio | 7410eu | 9445eu | | |
| | | | 9910pa | 9950eu | 11620va | 11715pa | |
| 2050 | 2100 | | Vatican City State, Vatican Radio | | | | 4005eu |
| | | | 5885eu | 7250eu | | | |
| 2051 | 2100 | | New Zealand, Radio NZ International | | | | 17675pa |
| 2051 | 2200 | DRM | New Zealand, Radio NZ International | | | | 15720pa |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 2100 | 2120 | | Vatican City State, Vatican Radio | | | 4005eu |
| | | | 5885eu | 7250eu | | |
| 2100 | 2127 | | Czech Republic, Radio Prague | 5930va | | 9430va |
| 2100 | 2130 | | Australia, ABC NT Alice Springs | | | 2310do |
| 2100 | 2130 | | Australia, ABC NT Alice Springs | | | 2310do |
| 2100 | 2130 | | Australia, ABC NT Katherine | 2485do | | |
| 2100 | 2130 | | Australia, ABC NT Tennant Creek | | | 2325do |
| 2100 | 2130 | | Austria, AWR Europe | 9830af | | |
| 2100 | 2130 | Sat | Canada, CBC NQ SW Service | 9625na | | |
| 2100 | 2130 | | China, China Radio International | | | 6135eu |
| | | | 7225eu | 7415eu | 9490eu | 9600eu |
| | | | 11640af | 13630af | | |
| 2100 | 2130 | | Cuba, Radio Havana Cuba | 11760va | | 17660va |
| | | | 17750va | | | |
| 2100 | 2130 | | Serbia, International Radio of Serbia | | | 6100eu |
| 2100 | 2130 | | South Korea, KBS World Radio | | | 3955eu |
| 2100 | 2145 | | USA, WYFR/Family Radio Worldwide | | | 6915na |
| | | | 15115af | 17535na | 17555na | |
| 2100 | 2157 | | North Korea, Voice of Korea | 13760eu | | 15245eu |
| 2100 | 2200 | | Angola, Radio Nacional de Angola | | | 7217do |
| 2100 | 2200 | | Anguilla, Worldwide Univ Network | | | 11775am |
| 2100 | 2200 | | Australia, Radio Australia | 9500as | | 9660as |
| | | | 11650pa | 11660pa | 11695as | 12080as |
| | | | 13630as | 15515as | | |
| 2100 | 2200 | | Bahrain, Radio Bahrain | 6010me | | 9745al |
| 2100 | 2200 | | Belarus, Radio Belarus | 7210eu | | 7255as |
| | | | 7390eu | | | |
| 2100 | 2200 | | Canada, CFRX Toronto ON | 6070na | | |
| 2100 | 2200 | | Canada, CFVP Calgary AB | 6030na | | |
| 2100 | 2200 | | Canada, CKZN St John's NF | 6160na | | |
| 2100 | 2200 | | Canada, CKZU Vancouver BC | 6160na | | |
| 2100 | 2200 | | China, China Radio International | | | 5990eu |
| | | | 7205af | 7285eu | 7325af | |
| 2100 | 2200 | | Equatorial Guinea, Radio Africa | | | 7190af |
| | | | 15190af | | | |
| 2100 | 2200 | | Germany, Deutsche Welle | 7280af | | 9545af |
| | | | 11690af | 13780af | | |
| 2100 | 2200 | | Germany, Overcomer Ministries | | | 6175eu |
| 2100 | 2200 | | India, All India Radio | 7410eu | | 9445eu |
| | | | 9910pa | 9950eu | 11620va | 11715pa |
| 2100 | 2200 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 2100 | 2200 | | New Zealand, Radio NZ International | | | 17675pa |
| 2100 | 2200 | | Palau, T8WH/World Harvest | 9965as | | |
| 2100 | 2200 | | Russia, Voice of Russia | 12040af | | 12070af |
| 2100 | 2200 | Sat/Sun | Spain, Radio Exterior de Espana | | | 9650eu |
| 2100 | 2200 | | Syria, Radio Damascus | 9330eu | | 12085as |
| 2100 | 2200 | DRM | UK, BBC World Service | 3995eu | | |
| 2100 | 2200 | | UK, BBC World Service | 3255af | | 3915as |
| | | | 5875as | 5965as | 6005af | 6190af |
| | | | 6195as | 7445af | 9410af | 9915af |
| | | | 12095af | | | |
| 2100 | 2200 | | USA, American Forces Network | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 2100 | 2200 | | USA, EWTN Vandiver AL | 15610me | | |
| 2100 | 2200 | | USA, Voice of America | 6080af | | 7555va |
| | | | 15580af | | | |
| 2100 | 2200 | | USA, WBCQ Monticello ME | 7415am | | |
| 2100 | 2200 | | USA, WHRA Greenbush ME | 15665af | | |
| 2100 | 2200 | | USA, WHRI Cypress Creek SC | 11785va | | 11885na |
| 2100 | 2200 | mtwhfa | USA, WHRI Cypress Creek SC | 15665na | | |
| 2100 | 2200 | Sun | USA, WHRI Cypress Creek SC | 9690na | | |
| 2100 | 2200 | | USA, WINB Red Lion PA | 9265am | | |
| 2100 | 2200 | vl | USA, WRMI Miami FL | 9955ca | | |
| 2100 | 2200 | | USA, WTJC Newport NC | 9370na | | |
| 2100 | 2200 | | USA, WWCR Nashville TN | 7465na | | 9980na |
| | | | 12160na | 15830na | | |
| 2100 | 2200 | | USA, WWRB Manchester TN | 9385va | | |
| 2100 | 2200 | | USA, WYFR/Family Radio Worldwide | | | 5950na |
| 2100 | 2200 | | Zambia CVC Intl/ The Voice Africa | | | 4965af |
| | | | 5940af | | | |
| 2100 | 2200 | | Zambia, Zambia Natl Broadcasting Corp | | | 6165do |
| 2115 | 2200 | | Egypt, Radio Cairo6255eu | | | |
| 2130 | 2156 | | Romania, Radio Romania International | | | 6030eu |
| | | | 6115na | 7380eu | 9755na | |
| 2130 | 2200 | | Australia, ABC NT Alice Springs | | | 4835do |
| 2130 | 2200 | | Australia, ABC NT Katherine | 5025do | | |
| 2130 | 2200 | mtwhfa | Canada, CBC NQ SW Service | 9625na | | |
| 2130 | 2200 | | China, China Radio International | | | 6135eu |
| | | | 7225eu | 7325eu | 7365eu | 7415eu |
| | | | 9600eu | | | |
| 2130 | 2200 | | Guam, KSDA/ AWR | 9625as | | |
| 2130 | 2200 | | Sweden, Radio Sweden | 7425va | | |
| 2130 | 2200 | | Turkey, Voice of Turkey | 9610va | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 2200 | 2205 | | Zambia, Zambia Natl Broadcasting Corp | | | 6165do |
| 2200 | 2220 | | Japan, NHK World/ Radio Japan | | | 13640pa |
| 2200 | 2225 | | Turkey, Voice of Turkey | 9610va | | |
| 2200 | 2230 | mwf | Guam, KSDA/ AWR | 11850as | | |
| 2200 | 2230 | | India, All India Radio | 7410eu | | 9445eu |
| | | | 9910pa | 9950eu | 11620va | 11715pa |
| 2200 | 2235 | | New Zealand, Radio NZ International | | | 17625pa |
| 2200 | 2235 | DRM | New Zealand, Radio NZ International | | | 15720pa |
| 2200 | 2245 | | Egypt, Radio Cairo6255eu | | | |
| 2200 | 2245 | | USA, WYFR/Family Radio Worldwide | | | 17690af |
| 2200 | 2300 | | Anguilla, Worldwide Univ Network | | | 6090am |
| 2200 | 2300 | | Australia, ABC NT Alice Springs | | | 4835do |
| 2200 | 2300 | | Australia, ABC NT Katherine | 5025do | | |
| 2200 | 2300 | | Australia, HCJB Global | 15525as | | |
| 2200 | 2300 | | Australia, Radio Australia | 12010va | | 13630pa |
| | | | 15230va | 15240pa | 15515as | 15560pa |
| | | | 17795va | | | |
| 2200 | 2300 | | Bahrain, Radio Bahrain | 6010me | | 9745al |
| 2200 | 2300 | | Bulgaria, Radio Bulgaria | 6200eu | | 7400eu |
| 2200 | 2300 | smtwhf | Canada, CBC NQ SW Service | 9625na | | |
| 2200 | 2300 | | Canada, CFRX Toronto ON | 6070na | | |
| 2200 | 2300 | | Canada, CFVP Calgary AB | 6030na | | |
| 2200 | 2300 | | Canada, CKZN St John's NF | 6160na | | |
| 2200 | 2300 | | Canada, CKZU Vancouver BC | 6160na | | |
| 2200 | 2300 | DRM | Canada, Radio Canada International | | | 9800na |
| 2200 | 2300 | | China, China Radio International | | | 7240as |
| | | | 7350eu | 7360eu | 9590as | |
| 2200 | 2300 | | Equatorial Guinea, Radio Africa | | | 7190af |
| | | | 15190af | | | |
| 2200 | 2300 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 2200 | 2300 | | Palau, T8WH/World Harvest | 9965as | | |
| 2200 | 2300 | | Russia, Voice of Russia | 9890na | | 12040af |
| | | | 12070af | | | |
| 2200 | 2300 | | Uganda, UBC Radio | 4976do | | |
| 2200 | 2300 | | UK, BBC World Service | 3915as | | 5875as |
| | | | 5910af | 6135as | 6195as | 9740as |
| | | | 9915af | 12095af | | |
| 2200 | 2300 | DRM | UK, BBC World Service | 3995eu | | |
| 2200 | 2300 | | Ukraine, Radio Ukraine International | | | 5840eu |
| 2200 | 2300 | | USA, American Forces Network | | | 4319usb |
| | | | 5446usb | 5765usb | 6350usb | 7812usb |
| | | | 10320usb | 12133usb | 12759usb | 13362usb |
| 2200 | 2300 | | USA, EWTN Vandiver AL | 15610me | | |
| 2200 | 2300 | | USA, Voice of America | 5895va | | 5915va |
| | | | 7480va | 7555va | 9415va | 11955va |
| 2200 | 2300 | | USA, WBCQ Monticello ME | 5110am | | 7415am |
| 2200 | 2300 | | USA, WHRA Greenbush ME | 11885af | | |
| 2200 | 2300 | | USA, WHRI Cypress Creek SC | 11785va | | 11885na |
| 2200 | 2300 | | USA, WINB Red Lion PA | 9265am | | |
| 2200 | 2300 | vl | USA, WRMI Miami FL | 9955ca | | |
| 2200 | 2300 | | USA, WTJC Newport NC | 9370na | | |
| 2200 | 2300 | | USA, WWCR Nashville TN | 7465na | | 9980na |
| | | | 12160na | 13845na | | |
| 2200 | 2300 | | USA, WWRB Manchester TN | 5050va | | 6890va |
| | | | 9385va | | | |
| 2200 | 2300 | | USA, WYFR/Family Radio Worldwide | | | 5950na |
| | | | 11740na | 15440na | | |
| 2200 | 2300 | | Zambia CVC Intl/ The Voice Africa | | | 4965af |
| 2215 | 2230 | mtwhs | Moldova, (Transnistria) Radio PMR | | | 9665na |
| 2230 | 2257 | | Czech Republic, Radio Prague | 5930na | | 7355af |
| 2230 | 2300 | | Guam, KSDA/ AWR | 15320as | | |
| 2230 | 2300 | | USA, Voice of America/Special English | | | 9570va |
| | | | 11705va | 15145va | | |
| 2236 | 2300 | | New Zealand, Radio NZ International | | | 15720pa |
| 2236 | 2300 | DRM | New Zealand, Radio NZ International | | | 17675pa |
| 2245 | 2300 | | India, All India Radio | 9705eu | | 9950as |
| | | | 11620as | 11645as | 13605as | |

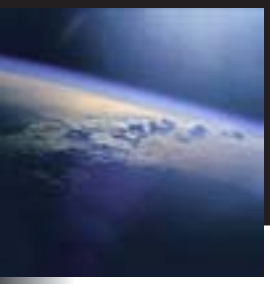
## 2300 UTC - 6PM EST / 5PM CST / 3PM PST

| | | | | | | |
|---|---|---|---|---|---|---|
| 2300 | 0000 | | Anguilla, Worldwide Univ Network | | | 6090am |
| 2300 | 0000 | | Australia, ABC NT Alice Springs | | | 4835do |
| 2300 | 0000 | | Australia, ABC NT Katherine | 5025do | | |
| 2300 | 0000 | | Australia, HCJB Global | 15525as | | |
| 2300 | 0000 | | Bahrain, Radio Bahrain | 6010me | | 9745al |
| 2300 | 0000 | DRM | Belgium, TDP Radio | 9790na | | |
| 2300 | 0000 | smtwhf | Canada, CBC NQ SW Service | 9625na | | |
| 2300 | 0000 | | Canada, CFRX Toronto ON | 6070na | | |
| 2300 | 0000 | | Canada, CFVP Calgary AB | 6030na | | |
| 2300 | 0000 | | Canada, CKZN St John's NF | 6160na | | |
| 2300 | 0000 | | Canada, CKZU Vancouver BC | 6160na | | |
| 2300 | 0000 | | China, China Radio International | | | 5915as |
| | | | 5990na | 6145na | 7410na | 9610as |
| | | | 11690as | 11790as | 11840na | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2300 | 0000 | | Cuba, Radio Havana Cuba | 13790sa | | |
| 2300 | 0000 | | Egypt, Radio Cairo | 11590na | | |
| 2300 | 0000 | | India, All India Radio | 9705eu | 9950as | |
| | | | 11620as | 11645as | 13605as | |
| 2300 | 0000 | | Malaysia, RTM/Traxx FM | 7295do | | |
| 2300 | 0000 | | New Zealand, Radio NZ International | | 15720pa | |
| 2300 | 0000 | DRM | New Zealand, Radio NZ International | | 17675pa | |
| 2300 | 0000 | | Russia, Voice of Russia | 9665sa | 9890na | |
| 2300 | 0000 | | UK, BBC World Service | 3915as | 5875as | |
| | | | 6135as | 6195as | 7385as | 9740as |
| | | | 11955as | | | |
| 2300 | 0000 | | USA, American Forces Network | | 4319usb | |
| | | | 5446va | 5765va | 6350va | 7812va |
| | | | 10320va | 12133va | 12759va | 13362va |
| 2300 | 0000 | | USA, EWTN Vandiver AL | 15610me | | |
| 2300 | 0000 | | USA, Voice of America | 5895va | 5915va | |
| | | | 7480va | 9415va | 11955va | |
| 2300 | 0000 | | USA, WBCQ Monticello ME | 5110am | 7415am | |
| 2300 | 0000 | | USA, WHRA Greenbush ME | 9615eu | | |
| 2300 | 0000 | | USA, WHRI Cypress Creek SC | 5875na | 7315va | |
| | | | 11785va | | | |
| 2300 | 0000 | | USA, WINB Red Lion PA | 9265am | | |
| 2300 | 0000 | vl | USA, WRMI Miami FL | 9955ca | | |
| 2300 | 0000 | | USA, WTJC Newport NC | 9370na | | |
| 2300 | 0000 | | USA, WWCR Nashville TN | 5070na | 7465na | |
| | | | 9980na | 13845na | | |
| 2300 | 0000 | | USA, WWRB Manchester TN | 5050va | 6890va | |
| | | | 9385va | | | |
| 2300 | 0000 | | USA, WYFR/Family Radio Worldwide | | 9430sa | |
| | | | 15400sa | 15440na | | |
| 2300 | 0000 | | Zambia CVC Intl/ The Voice Africa | | 4965af | |
| 2300 | 2330 | | Australia, Radio Australia | 9660as | 12010pa | |
| | | | 12080pa | 13690pa | 15230va | 15240pa |
| | | | 15560va | 17795va | | |
| 2300 | 2330 | | Cuba, Radio Nacional de Venezuela | | 13680ca | |
| | | | 15250ca | | | |
| 2300 | 2330 | | Palau, T8WH/World Harvest | 15550as | | |
| 2300 | 2330 | | USA, Voice of America/Special English | | 9570va | |
| | | | 13755va | 15145va | | |
| 2300 | 2345 | | USA, WYFR/Family Radio Worldwide | | 11740na | |
| 2300 | 2355 | | Turkey, Voice of Turkey | 5960va | | |
| 2300 | 2356 | | Romania, Radio Romania International | | 5915as | |
| | | | 6015va | 7220eu | 7300as | |
| 2305 | 0000 | Sat | Greece, Voice of Greece | 7475va | 9420va | |
| 2315 | 2330 | | Croatia, Voice of Croatia | 3985eu | 7375sa | |
| 2330 | 0000 | | Australia, Radio Australia | 9660as | 12010as | |
| | | | 12080as | 13690as | 15230va | 15415as |
| | | | 15560va | 17750va | 17795va | |
| 2330 | 0000 | | UK, BBC World Service | 6170as | | |
| 2330 | 0000 | | USA, Voice of America/Special English | | 7460va | |
| | | | 9570va | 13755va | 15145va | 15340va |
| 2330 | 2357 | | Czech Republic, Radio Prague | 5930na | 7355af | |
| 2330 | 2358 | | Vietnam, Voice of Vietnam | 9840as | 12020as | |
| 2345 | 0000 | | Australia, HCJB Global | 15400as | | |

## MT SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana ..... **http://rtsh.sil.at/**
Angola, Radio Nacional de Angola..... **www.rna.ao/**
Anguilla, Worldwide Univ Network ..... **www.worldwideuniversitynetwork.com/**
Argentina, Radio Nacional RAE..... **www.radionacional.com.ar/**
Australia, ABC NT Alice Springs..... **www.abc.net.au/radio/**
Australia, ABC NT Katherine..... **www.abc.net.au/radio/**
Australia, ABC NT Tennant Creek ..... **www.abc.net.au/radio/**
Australia, CVC International ..... **www.christianvision.com/**
Australia, HCJB Global ..... **www.hcjb.org/**
Australia, Radio Australia ..... **www.abc.net.au/ra/**
Austria, AWR Europe..... **www.awr2.org/**
Austria, ORF/Radio Austria Intl ..... **http://oe1.orf.at/service/international**
Bahrain, Radio Bahrain..... **www.radiobahrain.net**
Bangladesh, Bangladesh Betar ..... **www.betar.org.bd/**
Belarus, Radio Belarus ..... **www.radiobelarus.tvr.by/eng/**
Belgium, TDP Radio ..... **www.airtime.be/schedule.html**
Bhutan, Bhutan Broadcasting Service ..... **www.bbs.com.bt/**
Bulgaria, Radio Bulgaria ..... **www.bnr.bg/**
Canada, CBC NQ SW Service..... **www.cbc.ca/north/**
Canada, CFRX Toronto ON..... **www.cfrb.com**
Canada, CFVP Calgary AB..... **www.classiccountryam1060.com**
Canada, CKZN St John's NF ..... **www.cbc.ca/listen/index.html**
Canada, CKZU Vancouver BC..... **www.cbc.ca/bc**
Canada, Radio Canada International ..... **www.rcinet.ca/**
China, China Radio International ..... **www.cri.cn/**
China, CPBS/CNR Business Radio..... **www.rcinet.ca/**
China, Guangxi FBS/Beibu Bay Radio ..... **www.gxradio.com/index/index.asp**
China, Voice of the Strait..... **www.vos.com.cn**
Clandestine, Cotton Tree News..... **www.cottontreenews.org/**
Clandestine, Shiokaze/Sea Breeze ..... **www.chosa-kai.jp**
Clandestine, Sudan Radio Service..... **www.sudanradio.org**
Croatia, Voice of Croatia..... **www.hrt.hr/**
Cuba, Radio Havana Cuba ..... **www.radiohc.cu/**
Czech Republic, Radio Prague ..... **www.radio.cz/**
Egypt, Radio Cairo..... **www.sis.gov.eg/**
Ethiopia, Radio Ethiopia/External Service.. **www.angelfire.com/biz/radioethiopia/**
France, Radio France International..... **http://rfienglish.com**
Germany, AWR-Europe ..... **www.awr2.org/**
Germany, CVC Intl-Christian Vision ..... **www.christianvision.com/**
Germany, Deutsche Welle ..... **www.dw-world.de/**
Germany, European Music Radio..... **www.emr.org.uk/**
Germany, Overcomer Ministries..... **www.overcomerministry.org/**
Germany, Pan American Broadcasting ..... **www.radiopanam.com/**
Germany, TWR Europe..... **www.twr.org**
Greece, Voice of Greece ..... **www.voiceofgreece.gr/**
Guam, KSDA/ AWR ..... **www.awr2.org/**
Guam, KTWR/TWR ..... **www.twr.org/**
India, All India Radio ..... **www.allindiaradio.org/**
Indonesia, Voice of Indonesia..... **www.voi.co.id**
Iran, Voice of Islamic Rep. of Iran ..... **www.irib.ir/English/**
Italy, IRRS/NEXUS ..... **www.nexus.org**
Japan, NHK World/ Radio Japan..... **www.nhk.or.jp/english/**
Kuwait, Radio Kuwait..... **www.media.gov.kw/**
Laos, Lao National Radio ..... **www.lnr.org.la**
Latvia, Radio SWH ..... **www.radioswh.lv/index.php**
Libya, LJB/Voice of Africa ..... **www.voiceofafrica.com.ly**
Malaysia, RTM/Traxx FM..... **www.traxxfm.net/index.php**
Malaysia, RTM/Voice of Malaysia..... **www.rtm.gov.my**
Mali, RDTV Du Mali ..... **www.ortm.ml**
Monaco, TWR Europe ..... **www.twr.org/**
Nepal, Radio Nepal..... **www.radionepal.org/**
Netherlands, R Netherlands Worldwide .... **www.radionetherlands.nl/**
New Zealand, Radio NZ International ..... **www.rnzi.com**
Nigeria, Voice of Nigeria/External Service **www.voiceofnigeria.org**
Oman, Radio Oman..... **www.oman-tv.gov.om**
Pakistan, Radio Pakistan ..... **www.radio.gov.pk**
Palau, T8WH/World Harvest..... **www.whr.org/**
Philippines, PBS/ Radyo Pilipinas..... **www.pbs.gov.ph/**
Poland, Polish Radio ..... **www.polskieradio.pl**
Romania, Radio Romania International .... **www.rri.ro/**
Russia, Voice of Russia ..... **www.ruvr.ru/**
Rwanda, Radio Rwanda ..... **www.orinfor.gov.rw/**
Saudi Arabia, BSKSA/External Service ..... **www.saudiradio.net/**
Slovakia, Radio Slovakia International..... **www.rsi.sk**
South Africa, RTE Radio One ..... **www.rte.ie/radio1/**
South Africa, AWR Africa ..... **www.awr2.org/**
South Africa, Channel Africa..... **www.channelafrica.org**
South Africa, SA Radio League..... **www.channelafrica.org**
South Africa, Trans World Radio..... **www.twr.org/**
South Korea, KBS World Radio ..... **http://rki.kbs.co.kr/english/**
Spain, Radio Exterior de Espana ..... **www.ree.rne.es/**
Sri Lanka, SLBC ..... **www.slbc.lk**
Swaziland, TWR Swaziland ..... **www.twr.org.za**
Sweden, Radio Sweden ..... **www.sr.se/rs/english/**
Syria, Radio Damascus..... **www.rtv.gov.sy/**
Taiwan, Radio Taiwan International ..... **http://english.rti.org.tw/**
Thailand, Radio Thailand World Service ... **www.hsk9.com/**
Turkey, Voice of Turkey..... **www.trt.net.tr**
Uganda, Dunamis Shortwave ..... **www.biblevoice.org/stations/east-africa**
UK, BBC World Service..... **www.bbc.co.uk/worldservice/**
UK, Bible Voice Broadcasting..... **www.biblevoice.org/**
UK, Sudan Radio Service..... **www.sudanradio.org/**
Ukraine, Radio Ukraine International ..... **www.nrcu.gov.ua/**
United Arab Emirates, FEBA Radio ..... **www.febaradio.info**
USA, American Forces Network ..... **http://myafn.dodmedia.osd.mil/**
USA, EWTN Vandiver AL ..... **www.ewtn.com**
USA, KNLS Anchor Point AK..... **www.knls.org/**
USA, Voice of America ..... **www.voanews.com/**
USA, Voice of America/Special English..... **www.voanews.com/**
USA, WBCQ Monticello ME..... **www.wbcq.com/**
USA, WHRA Greenbush ME..... **www.whr.org/**
USA, WHRI Cypress Creek SC ..... **www.whr.org/**
USA, WINB Red Lion PA ..... **www.winb.com/**
USA, WRMI Miami FL..... **www.wrmi.net/**
USA, WRNO New Orleans LA ..... **www.wrnoworldwide.org/**
USA, WTJC Newport NC..... **www.fbnradio.com/**
USA, WWCR Nashville TN..... **www.wwcr.com**
USA, WWRB Manchester TN..... **www.wwrb.org/**
USA, WYFR/Family Radio Worldwide ..... **www.worldwide.familyradio.org**
Uzbekistan, CVC Intl/ The Voice Asia ..... **www.christianvision.com/**
Vatican City State, Vatican Radio..... **www.vaticanradio.org**
Vietnam, Voice of Vietnam..... **www.vov.org.vn**
Zambia CVC Intl/ The Voice Africa ..... **www.christianvision.com/**
Zambia, Zambia Natl Broadcasting Corp. **www.znbc.co.zm**



# 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.



*(continued from last month's Spanish listings)*

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1200 | 1227 | | Netherlands, R Netherlands Worldwide | | | 6165sa |
| | | | 9835ca | | | |
| 1200 | 1230 | | France, Radio France Internationale | | | 13640sa |
| 1200 | 1230 | | Peru, Radio San Nicolas | 5470do | | |
| 1200 | 1230 | | USA, Voice of America | 9885ca | | 13715sa |
| | | | 15590ca | | | |
| 1200 | 1300 | mtwhf | Argentina, Radio Nacional RAE | | | 11710am |
| 1200 | 1300 | | Bolivia, Radio Estambul | 4498do | | |
| 1200 | 1300 | | Bolivia, Radio Illimani/Radio Patria Nueva | | | |
| | | | 6025do | | | |
| 1200 | 1300 | | Bolivia, Radio Nacional de Huanuni | | | 5967do |
| 1200 | 1300 | | Bolivia, Radio San Jose | 5580do | | |
| 1200 | 1300 | | Bolivia, Radio San Miguel | 4699do | | |
| 1200 | 1300 | | Bolivia, Radio Santa Ana | 4451do | | |
| 1200 | 1300 | | Bolivia, Radio Tacana | 4781do | | |
| 1200 | 1300 | | Chile, La Voz Crista | 9635sa | | 17680sa |
| 1200 | 1300 | | Colombia, La Voz de tu Conciencia | | | 6010do |
| | | | 5910al | | | |
| 1200 | 1300 | | Colombia, La Voz del Guaviare | | | 6035do |
| 1200 | 1300 | | Colombia, Radio Marfil Estereo | | | 5910do |
| | | | 6010al | | | |
| 1200 | 1300 | | Cuba, Radio Havana Cuba | 6000na | | 6180na |
| | | | 9600na | 11760am | 12000va | 13760eu |
| | | | 15120va | 15360sa | | |
| 1200 | 1300 | | Cuba, Radio Nacional de Venezuela | | | 11705ca |
| 1200 | 1300 | | Cuba, Radio Rebelde | 5025na | | |
| 1200 | 1300 | | Dominican Rep. Radio Amanecer Internacional | | | |
| | | | 6025va | | | |
| 1200 | 1300 | | Ecuador, HCJB Global | 6050sa | | 11960sa |
| 1200 | 1300 | | Ecuador, Radio Quito | 4919do | | |
| 1200 | 1300 | | Guatemala, Radio Verdad | 4052do | | |
| 1200 | 1300 | | Honduras, HRMI/ Radio Misiones Intl | | | 3340do |
| 1200 | 1300 | | Honduras, Radio Luz y Vida | 3250do | | |
| 1200 | 1300 | | Mexico, XEOI/Radio Mil | 6010do | | |
| 1200 | 1300 | | Mexico, XERTA/Radio Transcontinental | | | 4800do |
| 1200 | 1300 | | Mexico, XEXQ/Radio Universidad | | | 6045do |
| 1200 | 1300 | | Mexico, XEXQ/Radio Universidad | | | 6045do |
| 1200 | 1300 | | Peru, Radio Bethel 5949do | | | |
| 1200 | 1300 | | Peru, Radio Bolivar | 5460do | | |
| 1200 | 1300 | | Peru, Radio Cusco 6195do | | | |
| 1200 | 1300 | | Peru, Radio La Reyna de la Selva | | | 5486do |
| 1200 | 1300 | Sun | Peru, Radio La Voz de la Selva 4824do | | | |
| 1200 | 1300 | | Peru, Radio La Voz de las Huarinjas | | | 5059do |
| 1200 | 1300 | | Peru, Radio Libertad de Junin | 5039do | | |
| 1200 | 1300 | | Peru, Radio Madre de Dios | 4950do | | |
| 1200 | 1300 | | Peru, Radio Maranon | 4835do | | |
| 1200 | 1300 | | Peru, Radio Melodia | 5940do | | |
| 1200 | 1300 | | Peru, Radio Santa Rosa | 6047do | | |
| 1200 | 1300 | | Peru, Radio Tarma 4775do | | | |
| 1200 | 1300 | | Peru, Radio Union 6114do | | | |
| 1200 | 1300 | | Peru, Radio Vision 4790do | | | |
| 1200 | 1300 | | Spain, Radio Exterior de Espana | | | 11910as |
| | | | 21540af | 21610me | | |
| 1200 | 1300 | mtwhf | Spain, Radio Exterior de Espana | | | 5930sa |
| | | | 5970sa | 13720eu | 15170na | 15585eu |
| | | | 17795sa | | | |
| 1200 | 1300 | Sat/Sun | Spain, Radio Exterior de Espana | | | 11815sa |
| 1200 | 1300 | Sun | Spain, Radio Exterior de Espana | | | 9765sa |
| 1200 | 1300 | mtwhf | UK, BBC World Service | 9410ca | | 11860ca |
| 1200 | 1300 | | USA, EWTN Vandiver AL | 7555ca | | 12050sa |
| 1200 | 1300 | | USA, Radio Marti 6030ca | 7405ca | | 9805ca |
| 1200 | 1300 | | USA, WYFR/Family Radio Worldwide | | | 6085ca |
| | | | 7730sa | 11970ca | 13800sa | 15130ca |
| | | | 15770sa | | | |
| 1200 | 1300 | | Venezuela, Radio Amazonas | 4940do | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1300 | 1345 | | USA, WYFR/Family Radio Worldwide | | | 7730sa |
| | | | 9605ca | | | |
| 1300 | 1400 | mtwhf | Argentina, Radio Nacional RAE | | | 11710am |
| 1300 | 1400 | | Bolivia, Radio Estambul | 4498do | | |
| 1300 | 1400 | | Bolivia, Radio Illimani/Radio Patria Nueva | | | |
| | | | 6025do | | | |
| 1300 | 1400 | | Bolivia, Radio Nacional de Huanuni | | | 5967do |
| 1300 | 1400 | | Bolivia, Radio San Jose | 5580do | | |
| 1300 | 1400 | | Bolivia, Radio San Miguel | 4699do | | |
| 1300 | 1400 | | Bolivia, Radio Santa Ana | 4451do | | |
| 1300 | 1400 | | Bolivia, Radio Tacana | 4781do | | |
| 1300 | 1400 | | Chile, La Voz Crista | 9635sa | | 17680sa |
| 1300 | 1400 | | Colombia, La Voz de tu Conciencia | | | 6010do |
| | | | 5910al | | | |
| 1300 | 1400 | | Colombia, La Voz del Guaviare | | | 6035do |
| 1300 | 1400 | | Colombia, Radio Marfil Estereo | | | 5910do |
| | | | 6010al | | | |
| 1300 | 1400 | | Cuba, Radio Havana Cuba | 6000na | | 11760na |
| | | | 13680na | 13740am | 13780va | 15120va |
| | | | 15360sa | | | |
| 1300 | 1400 | | Cuba, Radio Rebelde | 5025na | | |
| 1300 | 1400 | | Dominican Rep. Radio Amanecer Internacional | | | |
| | | | 6025va | | | |
| 1300 | 1400 | | Ecuador, HCJB Global | 6050sa | | 11690sa |
| | | | 11960ca | | | |
| 1300 | 1400 | | Ecuador, Radio Quito | 4919do | | |
| 1300 | 1400 | | Guatemala, Radio Verdad | 4052do | | |
| 1300 | 1400 | | Honduras, HRMI/ Radio Misiones Intl | | | 3340do |
| 1300 | 1400 | | Honduras, Radio Luz y Vida | 3250do | | |
| 1300 | 1400 | | Mexico, XEOI/Radio Mil | 6010do | | |
| 1300 | 1400 | | Mexico, XERTA/Radio Transcontinental | | | 4800do |
| 1300 | 1400 | | Mexico, XEXQ/Radio Universidad | | | 6045do |
| 1300 | 1400 | | Peru, Radio Bethel 5949do | | | |
| 1300 | 1400 | | Peru, Radio Cusco 6195do | | | |
| 1300 | 1400 | | Peru, Radio La Reyna de la Selva | | | 5486do |
| 1300 | 1400 | Sun | Peru, Radio La Voz de la Selva 4824do | | | |
| 1300 | 1400 | | Peru, Radio Libertad de Junin | 5039do | | |
| 1300 | 1400 | | Peru, Radio Madre de Dios | 4950do | | |
| 1300 | 1400 | | Peru, Radio Melodia | 5940do | | |
| 1300 | 1400 | | Peru, Radio Santa Rosa | 6047do | | |
| 1300 | 1400 | | Peru, Radio Tarma 4775do | | | |
| 1300 | 1400 | | Peru, Radio Union 6114do | | | |
| 1300 | 1400 | | Peru, Radio Vision 4790do | | | |
| 1300 | 1400 | | Spain, Radio Exterior de Espana | | | 5930sa |
| | | | 11910as | 15170na | 17595sa | 21570sa |
| | | | 21610me | | | |
| 1300 | 1400 | mtwhf | Spain, Radio Exterior de Espana | | | 5970sa |
| 1300 | 1400 | Sat/Sun | Spain, Radio Exterior de Espana | | | 11815sa |
| | | | 13720eu | 21540af | | |
| 1300 | 1400 | Sun | Spain, Radio Exterior de Espana | | | 9765sa |
| 1300 | 1400 | | USA, EWTN Vandiver AL | 11550ca | | 12050sa |
| 1300 | 1400 | | USA, KVOH Rancho Simi CA | 9975ca | | |
| 1300 | 1400 | | USA, Radio Marti 11845ca | 13820ca | | |
| 1300 | 1400 | | USA, WYFR/Family Radio Worldwide | | | 6085ca |
| | | | 13800sa | 15130ca | 15770sa | |
| 1300 | 1400 | | Venezuela, Radio Amazonas | 4940do | | |
| 1305 | 1400 | | Canada, Radio Canada International | | | 7310na |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1400 | 1404 | | Canada, Radio Canada International | | | 7310na |
| 1400 | 1415 | | Vatican City State, Vatican Radio | | | 7250eu |
| | | | 9645eu | | | |
| 1400 | 1427 | | Czech Republic, Radio Prague | 11625eu | | 13580eu |
| 1400 | 1500 | | Bolivia, Radio Estambul | 4498do | | |
| 1400 | 1500 | | Bolivia, Radio Illimani/Radio Patria Nueva | | | |
| | | | 6025do | | | |
| 1400 | 1500 | | Bolivia, Radio Nacional de Huanuni | | | 5967do |
| 1400 | 1500 | | Bolivia, Radio San Jose | 5580do | | |
| 1400 | 1500 | | Bolivia, Radio San Miguel | 4699do | | |
| 1400 | 1500 | | Bolivia, Radio Santa Ana | 4451do | | |
| 1400 | 1500 | | Bolivia, Radio Tacana | 4781do | | |
| 1400 | 1500 | | Chile, La Voz Crista | 9635sa | | 17680sa |
| 1400 | 1500 | | Colombia, La Voz de tu Conciencia | | | 6010do |
| | | | 5910al | | | |
| 1400 | 1500 | | Colombia, La Voz del Guaviare | | | 6035do |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1400 | 1500 | | Colombia, Radio Marfil Estereo 6010al | | | 5910do |
| 1400 | 1500 | | Cuba, Radio Havana Cuba 13760eu | 11760na 13780va | 13680na 15120va | 15360sa |
| 1400 | 1500 | | Cuba, Radio Rebelde | | 5025na | |
| 1400 | 1500 | | Dominican Rep. Radio Amanecer Internacional 6025va | | | |
| 1400 | 1500 | | Ecuador, HCJB Global 11960ca | | 6050sa | 11690sa |
| 1400 | 1500 | | Ecuador, Radio Quito | | 4919do | |
| 1400 | 1500 | | Guatemala, Radio Verdad | | 4052do | |
| 1400 | 1500 | | Honduras, HRMI/ Radio Misiones Intl | | | 3340do |
| 1400 | 1500 | | Honduras, Radio Luz y Vida | | 3250do | |
| 1400 | 1500 | | Mexico, XEOI/Radio Mil | | 6010do | |
| 1400 | 1500 | | Mexico, XERTA/Radio Transcontinental | | | 4800do |
| 1400 | 1500 | | Mexico, XEXQ/Radio Universidad | | | 6045do |
| 1400 | 1500 | | Peru, Radio Bethel 5949do | | | |
| 1400 | 1500 | | Peru, Radio Cusco 6195do | | | |
| 1400 | 1500 | | Peru, Radio La Reyna de la Selva | | | 5486do |
| 1400 | 1500 | Sun | Peru, Radio La Voz de la Selva 4824do | | | |
| 1400 | 1500 | | Peru, Radio La Voz de las Huarinjas | | | 5059do |
| 1400 | 1500 | | Peru, Radio Libertad de Junin | | 5039do | |
| 1400 | 1500 | | Peru, Radio Madre de Dios | | 4950do | |
| 1400 | 1500 | | Peru, Radio Maranon | | 4835do | |
| 1400 | 1500 | | Peru, Radio Melodia | | 5940do | |
| 1400 | 1500 | | Peru, Radio Santa Rosa | | 6047do | |
| 1400 | 1500 | | Peru, Radio Tarma 4775do | | | |
| 1400 | 1500 | | Peru, Radio Union 6114do | | | |
| 1400 | 1500 | | Peru, Radio Vision 4790do | | | |
| 1400 | 1500 | | Spain, Radio Exterior de Espana 17595sa | 21570sa | 21610me | 15585eu |
| 1400 | 1500 | mtwhf | Spain, Radio Exterior de Espana 5970sa | 21440af | | 5930sa |
| 1400 | 1500 | Sat/Sun | Spain, Radio Exterior de Espana 17755af | | | 11815sa |
| 1400 | 1500 | Sun | Spain, Radio Exterior de Espana | | | 9765sa |
| 1400 | 1500 | | USA, EWTN Vandiver AL | | 11550ca | 12050sa |
| 1400 | 1500 | | USA, KVOH Rancho Simi CA | | 9975ca | |
| 1400 | 1500 | | USA, Radio Marti 7405ca | | 11845ca | 11930ca 13820ca |
| 1400 | 1500 | | USA, WYFR/Family Radio Worldwide 11670ca 15130ca | 11865na 17555sa | 11970ca 18980sa | 13800sa |
| 1400 | 1500 | | Venezuela, Radio Amazonas | | 4940do | |
| 1430 | 1500 | | Slovakia, Radio Slovakia International 11600eu | | | 9440eu |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1500 | 1545 | | USA, WYFR/Family Radio Worldwide 11970ca | 13800sa | 15130ca | 11670ca 17555sa |
| 1500 | 1555 | | Turkey, Voice of Turkey | | 7335va | |
| 1500 | 1600 | | Bolivia, Radio Eco 4409do | | | |
| 1500 | 1600 | | Bolivia, Radio Estambul | | 4498do | |
| 1500 | 1600 | | Bolivia, Radio Illimani/Radio Patria Nueva 6025do | | | |
| 1500 | 1600 | | Bolivia, Radio Nacional de Huanuni | | | 5967do |
| 1500 | 1600 | | Bolivia, Radio San Jose | | 5580do | |
| 1500 | 1600 | | Bolivia, Radio San Miguel | | 4699do | |
| 1500 | 1600 | | Bolivia, Radio Santa Ana | | 4451do | |
| 1500 | 1600 | | Bolivia, Radio Tacana | | 4781do | |
| 1500 | 1600 | | Chile, La Voz Crista | | 9635sa | 17680sa |
| 1500 | 1600 | | Colombia, La Voz de tu Conciencia 5910al | | | 6010do |
| 1500 | 1600 | | Colombia, La Voz del Guaviare | | | 6035do |
| 1500 | 1600 | | Colombia, Radio Marfil Estereo 6010al | | | 5910do |
| 1500 | 1600 | | Cuba, Radio Havana Cuba 11690eu 13760eu | 11760am 13780eu | 11800sa 15360sa | 13680na |
| 1500 | 1600 | | Cuba, Radio Nacional de Venezuela | | | 11680sa |
| 1500 | 1600 | | Cuba, Radio Rebelde | | 5025na | |
| 1500 | 1600 | | Dominican Rep. Radio Amanecer Internacional 6025va | | | |
| 1500 | 1600 | | Ecuador, Radio Quito | | 4919do | |
| 1500 | 1600 | | Guatemala, Radio Verdad | | 4052do | |
| 1500 | 1600 | | Honduras, HRMI/ Radio Misiones Intl | | | 3340do |
| 1500 | 1600 | | Honduras, Radio Luz y Vida | | 3250do | |
| 1500 | 1600 | | Mexico, XEOI/Radio Mil | | 6010do | |
| 1500 | 1600 | | Mexico, XERTA/Radio Transcontinental | | | 4800do |
| 1500 | 1600 | | Mexico, XEXQ/Radio Universidad | | | 6045do |
| 1500 | 1600 | | Peru, Radio Bethel 5949do | | | |
| 1500 | 1600 | | Peru, Radio Cusco 6195do | | | |
| 1500 | 1600 | | Peru, Radio La Reyna de la Selva | | | 5486do |
| 1500 | 1600 | Sun | Peru, Radio La Voz de la Selva 4824do | | | |
| 1500 | 1600 | | Peru, Radio La Voz de las Huarinjas | | | 5059do |
| 1500 | 1600 | | Peru, Radio Madre de Dios | | 4950do | |
| 1500 | 1600 | | Peru, Radio Maranon | | 4835do | |
| 1500 | 1600 | | Peru, Radio Melodia | | 5940do | |
| 1500 | 1600 | | Peru, Radio Santa Rosa | | 6047do | |
| 1500 | 1600 | | Peru, Radio Union 6114do | | | |
| 1500 | 1600 | | Peru, Radio Vision 4790do | | | |
| 1500 | 1600 | | Spain, Radio Exterior de Espana 17595sa | 21570sa | 21610me | 15585eu |
| 1500 | 1600 | mtwhf | Spain, Radio Exterior de Espana | | | 15385af |
| 1500 | 1600 | Sat/Sun | Spain, Radio Exterior de Espana 17755af | | | 11815sa |
| 1500 | 1600 | Sun | Spain, Radio Exterior de Espana 17850na | | | 9765sa |
| 1500 | 1600 | | USA, EWTN Vandiver AL | | 11520sa | 11550ca |
| 1500 | 1600 | | USA, KJES Vado NM | | 11715na | |
| 1500 | 1600 | | USA, KVOH Rancho Simi CA | | 17775ca | |
| 1500 | 1600 | | USA, Radio Marti 11845ca | | 11930ca | 13820ca |
| 1500 | 1600 | | USA, WYFR/Family Radio Worldwide 13695na | | | 6085ca |
| 1500 | 1600 | | Venezuela, Radio Amazonas | | 4940do | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1600 | 1700 | | Bolivia, Radio Eco 4409do | | | |
| 1600 | 1700 | | Bolivia, Radio Estambul | | 4498do | |
| 1600 | 1700 | | Bolivia, Radio Illimani/Radio Patria Nueva 6025do | | | |
| 1600 | 1700 | | Bolivia, Radio Nacional de Huanuni | | | 5967do |
| 1600 | 1700 | | Bolivia, Radio San Jose | | 5580do | |
| 1600 | 1700 | | Bolivia, Radio San Miguel | | 4699do | |
| 1600 | 1700 | | Bolivia, Radio Santa Ana | | 4451do | |
| 1600 | 1700 | | Bolivia, Radio Tacana | | 4781do | |
| 1600 | 1700 | | Chile, La Voz Crista | | 9635sa | 17680sa |
| 1600 | 1700 | | Colombia, La Voz de tu Conciencia 5910al | | | 6010do |
| 1600 | 1700 | | Colombia, La Voz del Guaviare | | | 6035do |
| 1600 | 1700 | | Colombia, Radio Marfil Estereo 6010al | | | 5910do |
| 1600 | 1700 | | Cuba, Radio Havana Cuba 11690eu 13760eu | 11760am 13780eu | 11800sa 15360sa | 13680na |
| 1600 | 1700 | | Cuba, Radio Rebelde | | 5025na | |
| 1600 | 1700 | | Dominican Rep. Radio Amanecer Internacional 6025va | | | |
| 1600 | 1700 | | Ecuador, Radio Quito | | 4919do | |
| 1600 | 1700 | | Guatemala, Radio Verdad | | 4052do | |
| 1600 | 1700 | | Honduras, HRMI/ Radio Misiones Intl | | | 3340do |
| 1600 | 1700 | | Mexico, XEOI/Radio Mil | | 6010do | |
| 1600 | 1700 | | Mexico, XERTA/Radio Transcontinental | | | 4800do |
| 1600 | 1700 | | Mexico, XEXQ/Radio Universidad | | | 6045do |
| 1600 | 1700 | | Peru, Radio Bethel 5949do | | | |
| 1600 | 1700 | | Peru, Radio Cusco 6195do | | | |
| 1600 | 1700 | | Peru, Radio La Reyna de la Selva | | | 5486do |
| 1600 | 1700 | Sun | Peru, Radio La Voz de la Selva 4824do | | | |
| 1600 | 1700 | | Peru, Radio La Voz de las Huarinjas | | | 5059do |
| 1600 | 1700 | | Peru, Radio Madre de Dios | | 4950do | |
| 1600 | 1700 | | Peru, Radio Maranon | | 4835do | |
| 1600 | 1700 | | Peru, Radio Melodia | | 5940do | |
| 1600 | 1700 | | Peru, Radio Santa Rosa | | 6047do | |
| 1600 | 1700 | | Peru, Radio Union 6114do | | | |
| 1600 | 1700 | | Peru, Radio Vision 4790do | | | |
| 1600 | 1700 | | Spain, Radio Exterior de Espana 21570sa | 17595sa | 21610me | 15585eu |
| 1600 | 1700 | mtwhf | Spain, Radio Exterior de Espana | | | 15385af |
| 1600 | 1700 | Sat/Sun | Spain, Radio Exterior de Espana 17755af | | | 11815sa |
| 1600 | 1700 | Sun | Spain, Radio Exterior de Espana 17850na | | | 9765sa |
| 1600 | 1700 | | USA, EWTN Vandiver AL | | 11520sa | 11550ca |
| 1600 | 1700 | | USA, KVOH Rancho Simi CA | | 17775ca | |
| 1600 | 1700 | | USA, Radio Marti 11845ca | | 11930ca | 13820ca |
| 1600 | 1700 | | USA, WYFR/Family Radio Worldwide | | | 15130ca |
| 1600 | 1700 | | Venezuela, Radio Amazonas | | 4940do | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1700 | 1800 | | Bolivia, Radio Estambul | | 4498do | |
| 1700 | 1800 | | Bolivia, Radio Illimani/Radio Patria Nueva 6025do | | | |
| 1700 | 1800 | | Bolivia, Radio San Miguel | | 4699do | |
| 1700 | 1800 | | Bolivia, Radio Tacana | | 4781do | |
| 1700 | 1800 | | Chile, La Voz Crista | | 9635sa | 17680sa |
| 1700 | 1800 | | Colombia, La Voz de tu Conciencia 5910al | | | 6010do |
| 1700 | 1800 | | Colombia, La Voz del Guaviare | | | 6035do |
| 1700 | 1800 | | Colombia, Radio Marfil Estereo 6010al | | | 5910do |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1700 | 1800 | | Cuba, Radio Havana Cuba | 5965ca | 6000na | |
| | | | 11690eu | 11760am | 11800sa | 13680na |
| | | | 13760eu | 13780eu | 15360sa | |
| 1700 | 1800 | | Cuba, Radio Rebelde | 5025na | | |
| 1700 | 1800 | | Dominican Rep. Radio Amanecer Internacional | 6025va | | |
| 1700 | 1800 | | Ecuador, Radio Quito | 4919do | | |
| 1700 | 1800 | | Guatemala, Radio Verdad | 4052do | | |
| 1700 | 1800 | | Honduras, HRMI/ Radio Misiones Intl | 3340do | | |
| 1700 | 1800 | | Mexico, XEOI/Radio Mil | 6010do | | |
| 1700 | 1800 | | Mexico, XERTA/Radio Transcontinental | 4800do | | |
| 1700 | 1800 | | Mexico, XEXQ/Radio Universidad | 6045do | | |
| 1700 | 1800 | | Peru, Radio Bethel 5949do | | | |
| 1700 | 1800 | | Peru, Radio Cusco 6195do | | | |
| 1700 | 1800 | | Peru, Radio La Reyna de la Selva | 5486do | | |
| 1700 | 1800 | Sun | Peru, Radio La Voz de la Selva | 4824do | | |
| 1700 | 1800 | | Peru, Radio La Voz de las Huarinjas | 5059do | | |
| 1700 | 1800 | | Peru, Radio Madre de Dios | 4950do | | |
| 1700 | 1800 | | Peru, Radio Maranon | 4835do | | |
| 1700 | 1800 | | Peru, Radio Melodia | 5940do | | |
| 1700 | 1800 | | Peru, Radio Santa Rosa | 6047do | | |
| 1700 | 1800 | | Peru, Radio Union 6114do | | | |
| 1700 | 1800 | | Peru, Radio Vision 4790do | | | |
| 1700 | 1800 | | Spain, Radio Exterior de Espana | 7275eu | | |
| | | | 17715sa | 17755af | 17595sa | |
| 1700 | 1800 | Sat/Sun | Spain, Radio Exterior de Espana | 9665eu | | |
| | | | 11815sa | | | |
| 1700 | 1800 | Sun | Spain, Radio Exterior de Espana | 9765sa | | |
| | | | 17850na | | | |
| 1700 | 1800 | | USA, EWTN Vandiver AL | 11550ca | 17510sa | |
| 1700 | 1800 | | USA, KVOH Rancho Simi CA | 17775ca | | |
| 1700 | 1800 | | USA, Radio Marti 9565ca | 11930ca | 13820ca | |
| 1700 | 1800 | | USA, WYFR/Family Radio Worldwide | 6085ca | | |
| | | | 13615na | 15130ca | 21670eu | |
| 1700 | 1800 | | Venezuela, Radio Amazonas | 4940do | | |
| 1730 | 1800 | | Bulgaria, Radio Bulgaria | 5900eu | 9400eu | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1800 | 1827 | | Czech Republic, Radio Prague | 5930eu | 13580eu | |
| 1800 | 1830 | | Indonesia, Voice of Indonesia | 9525va | | |
| 1800 | 1830 | Sun | UK, Bible Voice Broadcasting | 9435eu | | |
| 1800 | 1845 | | USA, WYFR/Family Radio Worldwide | 21670eu | | |
| 1800 | 1900 | | Bolivia, Radio Estambul | 4498do | | |
| 1800 | 1900 | | Bolivia, Radio Illimani/Radio Patria Nueva | 6025do | | |
| 1800 | 1900 | | Bolivia, Radio San Miguel | 4699do | | |
| 1800 | 1900 | | Bolivia, Radio Tacana | 4781do | | |
| 1800 | 1900 | | Chile, La Voz Crista | 9635sa | 17680sa | |
| 1800 | 1900 | | Colombia, La Voz de tu Conciencia | 6010do | | |
| | | | 5910al | | | |
| 1800 | 1900 | | Colombia, La Voz del Guaviare | 6035do | | |
| 1800 | 1900 | | Colombia, Radio Marfil Estereo | 5910do | | |
| | | | 6010al | | | |
| 1800 | 1900 | | Cuba, Radio Havana Cuba | 5965ca | 6000na | |
| | | | 11690eu | 11760am | 11800sa | 13680na |
| | | | 13760eu | 13780eu | 15360sa | |
| 1800 | 1900 | | Cuba, Radio Rebelde | 5025na | | |
| 1800 | 1900 | | Dominican Rep. Radio Amanecer Internacional | 6025va | | |
| 1800 | 1900 | | Ecuador, Radio Quito | 4919do | | |
| 1800 | 1900 | | Guatemala, Radio Verdad | 4052do | | |
| 1800 | 1900 | | Honduras, HRMI/ Radio Misiones Intl | 3340do | | |
| 1800 | 1900 | | Mexico, XEOI/Radio Mil | 6010do | | |
| 1800 | 1900 | | Mexico, XERTA/Radio Transcontinental | 4800do | | |
| 1800 | 1900 | | Mexico, XEXQ/Radio Universidad | 6045do | | |
| 1800 | 1900 | | Peru, Radio Bethel 5949do | | | |
| 1800 | 1900 | | Peru, Radio Cusco 6195do | | | |
| 1800 | 1900 | | Peru, Radio La Reyna de la Selva | 5486do | | |
| 1800 | 1900 | Sun | Peru, Radio La Voz de la Selva | 4824do | | |
| 1800 | 1900 | | Peru, Radio La Voz de las Huarinjas | 5059do | | |
| 1800 | 1900 | | Peru, Radio Madre de Dios | 4950do | | |
| 1800 | 1900 | | Peru, Radio Melodia | 5940do | | |
| 1800 | 1900 | | Peru, Radio Santa Rosa | 6047do | | |
| 1800 | 1900 | | Peru, Radio Union 6114do | | | |
| 1800 | 1900 | | Peru, Radio Vision 4790do | | | |
| 1800 | 1900 | | Spain, Radio Exterior de Espana | 7275eu | | |
| | | | 9765sa | 11815sa | 17715sa | 17755af |
| 1800 | 1900 | Sat/Sun | Spain, Radio Exterior de Espana | 9665eu | | |
| | | | 17595sa | | | |
| 1800 | 1900 | | USA, EWTN Vandiver AL | 11550ca | 17510sa | |
| 1800 | 1900 | | USA, KVOH Rancho Simi CA | 17775ca | | |
| 1800 | 1900 | | USA, Radio Marti 9565ca | 11930ca | 13820ca | |
| 1800 | 1900 | | USA, WYFR/Family Radio Worldwide | 6085ca | | |
| | | | 9635eu | 15130ca | | |
| 1800 | 1900 | | Venezuela, Radio Amazonas | 4940do | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1900 | 1927 | | Czech Republic, Radio Prague | 5930eu | 13580eu | |
| 1900 | 1930 | | Serbia, International Radio of Serbia | 6100eu | | |
| 1900 | 1930 | Sat | Vatican City State, Vatican Radio | 9755af | | |
| | | | 11625af | | | |
| 1900 | 2000 | mtwhf | Antarctica, Radio Nacional LRA36 | 15476va | | |
| 1900 | 2000 | | Bolivia, Radio Estambul | 4498do | | |
| 1900 | 2000 | | Bolivia, Radio Illimani/Radio Patria Nueva | 6025do | | |
| 1900 | 2000 | | Bolivia, Radio San Miguel | 4699do | | |
| 1900 | 2000 | | Bolivia, Radio Tacana | 4781do | | |
| 1900 | 2000 | | Chile, La Voz Crista | 9635sa | 17680sa | |
| 1900 | 2000 | | Colombia, La Voz de tu Conciencia | 6010do | | |
| | | | 5910al | | | |
| 1900 | 2000 | | Colombia, La Voz del Guaviare | 6035do | | |
| 1900 | 2000 | | Colombia, Radio Marfil Estereo | 5910do | | |
| | | | 6010al | | | |
| 1900 | 2000 | | Cuba, Radio Havana Cuba | 5965ca | 6000na | |
| | | | 11690eu | 11760am | 11800sa | 13680na |
| | | | 13760eu | 13780eu | 15360sa | |
| 1900 | 2000 | | Cuba, Radio Nacional de Venezuela | 15290na | | |
| 1900 | 2000 | | Cuba, Radio Rebelde | 5025na | | |
| 1900 | 2000 | | Dominican Rep. Radio Amanecer Internacional | 6025va | | |
| 1900 | 2000 | | Ecuador, HCJB Global | 6050sa | | |
| 1900 | 2000 | | Ecuador, Radio Quito | 4919do | | |
| 1900 | 2000 | | Guatemala, Radio Verdad | 4052do | | |
| 1900 | 2000 | | Honduras, HRMI/ Radio Misiones Intl | 3340do | | |
| 1900 | 2000 | | Mexico, XEOI/Radio Mil | 6010do | | |
| 1900 | 2000 | | Mexico, XERTA/Radio Transcontinental | 4800do | | |
| 1900 | 2000 | | Mexico, XEXQ/Radio Universidad | 6045do | | |
| 1900 | 2000 | | North Korea, Voice of Korea | 13760eu | 15245eu | |
| 1900 | 2000 | | Peru, Radio Bethel 5949do | | | |
| 1900 | 2000 | | Peru, Radio Cusco 6195do | | | |
| 1900 | 2000 | | Peru, Radio La Reyna de la Selva | 5486do | | |
| 1900 | 2000 | Sun | Peru, Radio La Voz de la Selva | 4824do | | |
| 1900 | 2000 | | Peru, Radio La Voz de las Huarinjas | 5059do | | |
| 1900 | 2000 | | Peru, Radio Madre de Dios | 4950do | | |
| 1900 | 2000 | | Peru, Radio Melodia | 5940do | | |
| 1900 | 2000 | | Peru, Radio Santa Rosa | 6047do | | |
| 1900 | 2000 | | Peru, Radio Union 6114do | | | |
| 1900 | 2000 | | Peru, Radio Vision 4790do | | | |
| 1900 | 2000 | | Spain, Radio Exterior de Espana | 7275eu | | |
| | | | 9765sa | 11815sa | 15110na | |
| 1900 | 2000 | Sun | Spain, Radio Exterior de Espana | 17850na | | |
| 1900 | 2000 | mtwhf | Spain, Radio Exterior de Espana | 15110na | | |
| 1900 | 2000 | Sat/Sun | Spain, Radio Exterior de Espana | 9665eu | | |
| | | | 17595sa | 17755af | | |
| 1900 | 2000 | | USA, EWTN Vandiver AL | 11550ca | 17510sa | |
| 1900 | 2000 | | USA, KVOH Rancho Simi CA | 17775ca | | |
| 1900 | 2000 | | USA, Radio Marti 9565ca | 11930ca | 13820ca | |
| 1900 | 2000 | | USA, WYFR/Family Radio Worldwide | 15130ca | | |
| 1900 | 2000 | | Venezuela, Radio Amazonas | 4940do | | |
| 1930 | 2000 | | Bolivia, Radio Santa Ana | 4451do | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 2000 | 2030 | | Slovakia, Radio Slovakia International | 9695eu | | |
| | | | 11650eu | | | |
| 2000 | 2100 | | Bolivia, Radio Estambul | 4498do | | |
| 2000 | 2100 | | Bolivia, Radio Illimani/Radio Patria Nueva | 6025do | | |
| 2000 | 2100 | | Bolivia, Radio Nacional de Huanuni | 5967do | | |
| 2000 | 2100 | | Bolivia, Radio San Miguel | 4699do | | |
| 2000 | 2100 | | Bolivia, Radio Santa Ana | 4451do | | |
| 2000 | 2100 | | Bolivia, Radio Tacana | 4781do | | |
| 2000 | 2100 | | Chile, La Voz Crista | 9635sa | 17680sa | |
| 2000 | 2100 | | Colombia, La Voz de tu Conciencia | 6010do | | |
| | | | 5910al | | | |
| 2000 | 2100 | | Colombia, La Voz del Guaviare | 6035do | | |
| 2000 | 2100 | | Colombia, Radio Marfil Estereo | 5910do | | |
| | | | 6010al | | | |
| 2000 | 2100 | | Cuba, Radio Havana Cuba | 12000na | 12010na | |
| | | | 13740ca | 13750ca | 17660va | 17750va |
| 2000 | 2100 | | Cuba, Radio Nacional de Venezuela | 17705ca | | |
| 2000 | 2100 | | Cuba, Radio Rebelde | 5025na | | |
| 2000 | 2100 | | Dominican Rep. Radio Amanecer Internacional | 6025va | | |
| 2000 | 2100 | | Ecuador, HCJB Global | 6050sa | | |
| 2000 | 2100 | | Ecuador, Radio Quito | 4919do | | |
| 2000 | 2100 | | Guatemala, Radio Verdad | 4052do | | |
| 2000 | 2100 | | Honduras, HRMI/ Radio Misiones Intl | 3340do | | |
| 2000 | 2100 | | Mexico, XEOI/Radio Mil | 6010do | | |
| 2000 | 2100 | | Mexico, XERTA/Radio Transcontinental | 4800do | | |
| 2000 | 2100 | | Mexico, XEXQ/Radio Universidad | 6045do | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2000 | 2100 | | Peru, Radio Bethel 5949do | | | |
| 2000 | 2100 | | Peru, Radio Cusco 6195do | | | |
| 2000 | 2100 | | Peru, Radio La Reyna de la Selva | | | 5486do |
| 2000 | 2100 | Sun | Peru, Radio La Voz de la Selva 4824do | | | |
| 2000 | 2100 | | Peru, Radio La Voz de las Huarinjas | | | 5059do |
| 2000 | 2100 | | Peru, Radio Madre de Dios | 4950do | | |
| 2000 | 2100 | | Peru, Radio Melodia | 5940do | | |
| 2000 | 2100 | | Peru, Radio Santa Rosa | 6047do | | |
| 2000 | 2100 | | Peru, Radio Tarma 4775do | | | |
| 2000 | 2100 | | Peru, Radio Union 6114do | | | |
| 2000 | 2100 | | Peru, Radio Vision 4790do | | | |
| 2000 | 2100 | | Russia, Voice of Russia | 5920eu | 7310eu | 7440eu |
| 2000 | 2100 | | Spain, Radio Exterior de Espana | | | 7275eu |
| | | | 15110na | 17595va | | |
| 2000 | 2100 | Sun | Spain, Radio Exterior de Espana | | | 9765sa |
| | | | 17850na | | | |
| 2000 | 2100 | Sat/Sun | Spain, Radio Exterior de Espana | | | 9665eu |
| | | | 11815sa | 17755af | | |
| 2000 | 2100 | | Taiwan, Radio Taiwan International | | | 3965eu |
| 2000 | 2100 | | USA, EWTN Vandiver AL | 11550ca | 17510sa | |
| 2000 | 2100 | | USA, KVOH Rancho Simi CA | 17775ca | | |
| 2000 | 2100 | | USA, WYFR/Family Radio Worldwide | | | 5985ca |
| | | | 11855ca | 13690na | 15130ca | |
| 2000 | 2100 | | Venezuela, Radio Amazonas | 4940do | | |
| 2030 | 2057 | | Czech Republic, Radio Prague | 5930eu | 11600eu | |
| 2030 | 2100 | | Iran, Voice of Islamic Rep. of Iran | | | 6055eu |
| | | | 7300eu | 9800eu | | |
| 2055 | 2100 | mtwhf | Austria, ORF/Radio Austria Intl | 6155eu | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 2100 | 2127 | | Iran, Voice of Islamic Rep. of Iran | | | 6055eu |
| | | | 7300eu | 9800eu | | |
| 2100 | 2130 | | France, Radio France Internationale | | | 17630sa |
| 2100 | 2200 | | Bolivia, Radio Estambul | 4498do | | |
| 2100 | 2200 | | Bolivia, Radio Illimani/Radio Patria Nueva | | | |
| | | | 6025do | | | |
| 2100 | 2200 | | Bolivia, Radio Nacional de Huanuni | | | 5967do |
| 2100 | 2200 | | Bolivia, Radio San Jose | 5580do | | |
| 2100 | 2200 | | Bolivia, Radio San Miguel | 4699do | | |
| 2100 | 2200 | | Bolivia, Radio Santa Ana | 4451do | | |
| 2100 | 2200 | | Bolivia, Radio Tacana | 4781do | | |
| 2100 | 2200 | | Bolivia, Radio Virgen de Remedios | | | 4834do |
| 2100 | 2200 | | Chile, La Voz Crista | 9635sa | | 17680sa |
| 2100 | 2200 | | China, China Radio International | | | 7335eu |
| | | | 9640eu | | | |
| 2100 | 2200 | | Colombia, La Voz de tu Conciencia | | | 6010do |
| | | | 5910al | | | |
| 2100 | 2200 | | Colombia, La Voz del Guaviare | | | 6035do |
| 2100 | 2200 | | Colombia, Radio Marfil Estereo | | | 5910do |
| | | | 6010al | | | |
| 2100 | 2200 | | Cuba, Radio Havana Cuba | 11770eu | | 11800eu |
| | | | 13740ca | 13760eu | 13790eu | |
| 2100 | 2200 | | Cuba, Radio Rebelde | 5025na | | |
| 2100 | 2200 | | Dominican Rep. Radio Amanecer Internacional | | | |
| | | | 6025va | | | |
| 2100 | 2200 | | Ecuador, HCJB Global | 6050sa | | 12000sa |
| 2100 | 2200 | | Ecuador, Radio Quito | 4919do | | |
| 2100 | 2200 | | Guatemala, Radio Verdad | 4052do | | |
| 2100 | 2200 | | Honduras, HRMI/ Radio Misiones Intl | | | 3340do |
| 2100 | 2200 | | Mexico, XEOI/Radio Mil | 6010do | | |
| 2100 | 2200 | | Mexico, XERTA/Radio Transcontinental | | | 4800do |
| 2100 | 2200 | | Mexico, XEXQ/Radio Universidad | | | 6045do |
| 2100 | 2200 | | Peru, Radio Bethel 5949do | | | |
| 2100 | 2200 | | Peru, Radio Cusco 6195do | | | |
| 2100 | 2200 | | Peru, Radio La Reyna de la Selva | | | 5486do |
| 2100 | 2200 | Sun | Peru, Radio La Voz de la Selva 4824do | | | |
| 2100 | 2200 | | Peru, Radio La Voz de las Huarinjas | | | 5059do |
| 2100 | 2200 | | Peru, Radio Madre de Dios | 4950do | | |
| 2100 | 2200 | | Peru, Radio Melodia | 5940do | | |
| 2100 | 2200 | | Peru, Radio Santa Rosa | 6047do | | |
| 2100 | 2200 | | Peru, Radio Tarma 4775do | | | |
| 2100 | 2200 | | Peru, Radio Union 6114do | | | |
| 2100 | 2200 | | Spain, Radio Exterior de Espana | | | 7275eu |
| | | | 15110na | | | |
| 2100 | 2200 | Sun | Spain, Radio Exterior de Espana | | | 9765sa |
| | | | 17850na | | | |
| 2100 | 2200 | Sat/Sun | Spain, Radio Exterior de Espana | | | 11815sa |
| | | | 17595sa | 17755af | | |
| 2100 | 2200 | | USA, EWTN Vandiver AL | 11550ca | 17510sa | |
| 2100 | 2200 | | USA, KVOH Rancho Simi CA | 17775ca | | |
| 2100 | 2200 | | USA, Radio Marti | 9565ca | 11930ca | 13820ca |
| 2100 | 2200 | | USA, WYFR/Family Radio Worldwide | | | 5985ca |
| | | | 11855ca | 15130ca | 15600eu | 17805sa |
| 2100 | 2200 | | Venezuela, Radio Amazonas | 4940do | | |
| 2120 | 2140 | | Vatican City State, Vatican Radio | | | 4005eu |
| | | | 5885eu | 7250eu | | |
| 2130 | 2200 | | Vietnam, Voice of Vietnam/Overseas Service | | | |
| | | | 7220va | 9550va | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 2200 | 2230 | | Ecuador, HCJB Global | 12000sa | | |
| 2200 | 2300 | | Bolivia, Radio Estambul | 4498do | | |
| 2200 | 2300 | | Bolivia, Radio Illimani/Radio Patria Nueva | | | |
| | | | 6025do | | | |
| 2200 | 2300 | | Bolivia, Radio Nacional de Huanuni | | | 5967do |
| 2200 | 2300 | | Bolivia, Radio San Jose | 5580do | | |
| 2200 | 2300 | | Bolivia, Radio San Miguel | 4699do | | |
| 2200 | 2300 | | Bolivia, Radio Santa Ana | 4451do | | |
| 2200 | 2300 | | Bolivia, Radio Tacana | 4781do | | |
| 2200 | 2300 | | Bolivia, Radio Virgen de Remedios | | | 4834do |
| 2200 | 2300 | | Chile, La Voz Crista | 9635sa | | 17680sa |
| 2200 | 2300 | | China, China Radio International | | | 6175eu |
| | | | 7210eu | 7250eu | 7335eu | 9640eu |
| 2200 | 2300 | | Colombia, La Voz de tu Conciencia | | | 6010do |
| | | | 5910al | | | |
| 2200 | 2300 | | Colombia, La Voz del Guaviare | | | 6035do |
| 2200 | 2300 | | Colombia, Radio Marfil Estereo | | | 5910do |
| | | | 6010al | | | |
| 2200 | 2300 | | Cuba, Radio Havana Cuba | 11760am | 11770sa | |
| | | | 13740ca | 13750ca | 13760am | 13790va |
| | | | 17660va | | | |
| 2200 | 2300 | | Cuba, Radio Nacional de Venezuela | | | 11670na |
| 2200 | 2300 | | Cuba, Radio Rebelde | 5025na | | |
| 2200 | 2300 | | Dominican Rep. Radio Amanecer Internacional | | | |
| | | | 6025va | | | |
| 2200 | 2300 | | Ecuador, HCJB Global | 6050sa | | |
| 2200 | 2300 | | Ecuador, Radio Quito | 4919do | | |
| 2200 | 2300 | | Guatemala, Radio Verdad | 4052do | | |
| 2200 | 2300 | | Honduras, HRMI/ Radio Misiones Intl | | | 3340do |
| 2200 | 2300 | | Honduras, Radio Luz y Vida | 3250do | | |
| 2200 | 2300 | | Mexico, XEOI/Radio Mil | 6010do | | |
| 2200 | 2300 | | Mexico, XERTA/Radio Transcontinental | | | 4800do |
| 2200 | 2300 | | Mexico, XEXQ/Radio Universidad | | | 6045do |
| 2200 | 2300 | | North Korea, Voice of Korea | 13760eu | | 15245eu |
| 2200 | 2300 | | Peru, Radio Bethel 5949do | | | |
| 2200 | 2300 | | Peru, Radio Bolivar | 5460do | | |
| 2200 | 2300 | | Peru, Radio Cusco 6195do | | | |
| 2200 | 2300 | | Peru, Radio La Reyna de la Selva | | | 5486do |
| 2200 | 2300 | Sun | Peru, Radio La Voz de la Selva 4824do | | | |
| 2200 | 2300 | | Peru, Radio La Voz de las Huarinjas | | | 5059do |
| 2200 | 2300 | | Peru, Radio Madre de Dios | 4950do | | |
| 2200 | 2300 | | Peru, Radio Melodia | 5940do | | |
| 2200 | 2300 | | Peru, Radio Santa Rosa | 6047do | | |
| 2200 | 2300 | | Peru, Radio Tarma 4775do | | | |
| 2200 | 2300 | | Peru, Radio Union 6114do | | | |
| 2200 | 2300 | | Peru, Radio Vision 4790do | | | |
| 2200 | 2300 | | Spain, Radio Exterior de Espana | | | 7275eu |
| | | | 9570af | 15110na | | |
| 2200 | 2300 | Sun | Spain, Radio Exterior de Espana | | | 9765sa |
| | | | 17850na | | | |
| 2200 | 2300 | Sat/Sun | Spain, Radio Exterior de Espana | | | 11650af |
| | | | 11815sa | | | |
| 2200 | 2300 | | Syria, Radio Damascus | 9330va | 12085va | |
| | | | 13610al | | | |
| 2200 | 2300 | | USA, EWTN Vandiver AL | 5810ca | 17510sa | |
| 2200 | 2300 | | USA, KVOH Rancho Simi CA | 17775ca | | |
| 2200 | 2300 | | USA, Radio Marti | 6030ca | 9565ca | 11930ca |
| 2200 | 2300 | | USA, WYFR/Family Radio Worldwide | | | 5985ca |
| | | | 11855ca | 15130ca | 15215sa | 15255sa |
| 2200 | 2300 | | Venezuela, Radio Amazonas | 4940do | | |
| 2230 | 2300 | | Bolivia, Radio Eco | 4409do | | |
| 2230 | 2300 | | Bulgaria, Radio Bulgaria | 5900eu | 9400eu | |
| 2230 | 2300 | | Peru, Radio Rasuwilca | 4805do | | |
| 2230 | 2300 | | Peru, Radio San Nicolas | 5470do | | |
| 2230 | 2300 | | Peru, Radio Super Sensacion | 6536do | | |

*continued next month*

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# November-Foxtrot-India-India-Four-Sierra

*"November Foxtrot India India Four Sierra, I say again, November Foxtrot India India Four Sierra, this is Andrews out."*

So, you just heard a transmission like the one above on 8992 kHz, and now it has you scratching your head wondering what it was? Most likely it was an EAM or Emergency Action Message transmitted by the U.S. military.

It really doesn't seem that long ago that I first wrote about this topic here in the pages of *MT*. In reality it has been over 15 years ago, while I was still writing the *Utility World* column, that I first discussed what an EAM was. Since that time the learning process has not stopped.

Dedicated monitors continue to intercept these unique, high priority messages and learn about how the military uses them in their operations. To bear fruit, this sort of effort takes a long time to monitor the broadcast, compile information, compare it to public information, analyze it, and come to some sort of conclusions based upon what has been compiled.

I need to put in a caveat here for those of you who prowl the Internet. I have seen a lot written about these military messages over my many years as a monitor and writer, and unfortunately, quite a bit of it is just plain junk. Fortunately for our radio hobby, several monitors have dedicated a major portion of their listening hobby to the study of these broadcasts and have slowly, but surely, uncovered some of the basic facts that surround the usage of these U.S. Department of Defense transmissions.

In this edition of *MT's Milcom*, I will publish some of the new information we have found that has never before been released within our radio hobby on these interesting DoD messages. But first, I'm going to wind the clock back a bit. We'll start with what we knew 15 years ago and bring it forward to the information we've recently uncovered regarding EAM transmissions.

## ❖ So what is an EAM really?

This is from Jeff Haverlah's "What is an EAM?" available on the *Monitoring Times* website:

"From *Strategic Command, Control, and Communication - Alternative Approaches For Modernization*; John J Hare, Richard H. Davison, and Peter Tarpgaars; Congressional Budget Office (CBO), October 1981 –

> **Page 12:** "....Proper coding and formatting of EAMs is of crucial importance, since nuclear forces are prepared to execute any messages they receive that meet rigid specifications. In addition to specific instructions contained in an EAM, proper coding provides the means by which a commander expresses his authority to release nuclear weapons and an officer controlling those weapons verifies that authority."
>
> **Page 44:** "EAM: Though generally referring to a category of urgent messages from commanders to deployed forces, EAM is often used as a short-hand expression for a specially coded nuclear attack directive."

From the May 1995 *MT* page 33, *Monitoring Times Utility World* column by this author: "Several issues ago (Dec 94) we talked about the U.S. military's Emergency Action Messages (EAM) broadcasts. Here is an interesting explanation, taken from a U.S. Air Force manual, of what an EAM is:

> "Joint Chiefs of Staff Emergency Action Messages (EAMs) contain key instructions or information from high level authority and have predetermined formats (pro forma). Such messages are transmitted by various communications systems and normally carry FLASH precedence. They are vital messages of an extremely time-sensitive nature, and rapid processing is mandatory to obtain the fast reaction required by their content. Usage and handling procedures are of the highest classification and have been issued by the JCS only to those who have a need to know." *(AFM-01-1-18, sub 3, amended 01 Jan 1990)."*

Since that information was published, I have uncovered a few more sources with information on EAM messages. A 2001 U.S. Army regulation, issued at the Rock Island Arsenal, gave a slightly different twist on EAMs from their service viewpoint.

"EAMs come in as FLASH or IMMEDIATE messages. Ordinarily, they provide notification of a change in Defense Readiness Condition (DEFCON) status, but they are also used to alert personnel of any emergency situation needing immediate action."

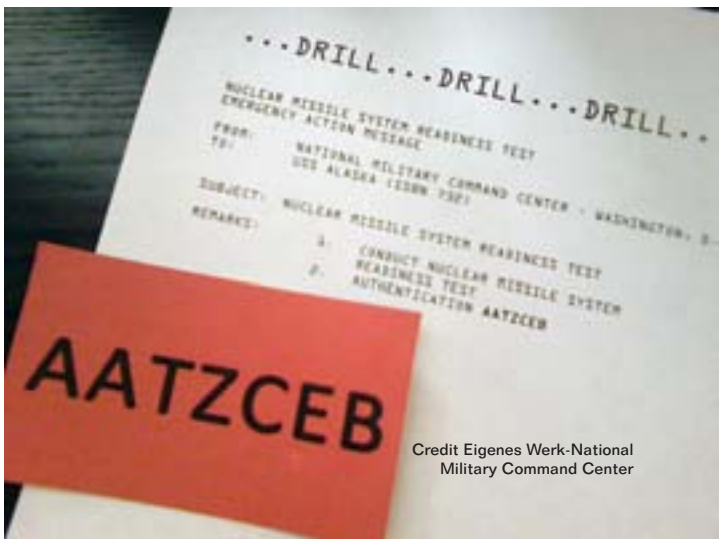
According to the instruction above, an EAM may pertain to "a real emergency, a scheduled exercise, or a special test." So, one of the important things that monitors need to keep in mind is that not "all" EAMs involve critical real world events.

In a recent USAF Wing instruction, it indicated that an EAM could be used for emergencies, contingencies and exercises as well. In this instruction, one possible result based on the unit receiving an EAM follows: "The 403 WG will notify the 81 TRW Command Post upon receipt of an emergency action message directing recall for the 403 WG."

In fact, during one of our recent sweeps of the Internet, we uncovered an unclassified document that clearly stated that TACAMO aircraft regularly receive "exercise equivalents of actual emergency action messages."

## ❖ The Navy and EAMs

Every time I think of EAMs and the Navy, I always think about one of my favorite movie dramas – *Crimson Tide*. We certainly saw a lot of EAM traffic in that movie. How accurate was that portrayal compared to the real world? I really can't say for sure, as I have never wanted to go the submarine route. Based on some information that I have uncovered, it may not be totally accurate and some license was definitely taken when compared with what actually happens regarding how a submarine



Credit Eigenes Werk-National Military Command Center

finds out it has an EAM message when it is doing the underwater gig.

In the world of Navy SSBN submarines, they operate a bit differently when working with and using EAM transmissions. The Navy ELF communications system broadcast three letter codes – as described by Douglas Waller in *Big Red: Inside the Secret World of a Trident Nuclear Submarine* – that didn't seem to be authorization codes to launch nuclear weapons:

"If the sub had to operate more covertly, still another wire antenna could be reeled out for two thousand feet to receive extremely low frequency (ELF) signals that penetrated deep into the water. The ELF signal came in agonizingly slowly, so the message consisted of only three letter codes. The shack had an inch-thick book in its safe that could translate each trigraph, often sent as a bell-ringer to order the sub to sail nearer the surface so it could pick up a lengthier message on another frequency."

At this point, if you're on the sub, you would probably hear, "Conn, Radio, receiving EAM."

The Emergency Action Message, according to Waller, contained much more information – sets of instructions identifying the warplan indicating the number of weapons and targets; date and time window for attack; combination to the safe containing the launch keys and an authentication code.

## ❖ The Definitive Word?

But I think the best information comes from the top dogs in DoD, the Joint Chiefs of Staff (JCS). In a JCS instruction 5721.01D dated February 8, 2008 on *Nuclear Command, Control, and Communications (NC3) Hybrid Solution (HS)*, they wrote:

"(1) The NC3 HS Emergency Action Message (EAM) architecture supports fixed and mobile EAM injectors and recipients and provides for EAM dissemination to time critical (TC) and non-TC users... In addition to EAM dissemination, the NC3 HS provides transport for the general service (GENSER) traffic up to TOP SECRET OPLAN 8044...

"(2) EAMs are highly structured, authenticated messages primarily used in the C2 of nuclear forces. EAMs are disseminated over numerous survivable and non-survivable communication systems, including terrestrial and space systems. The NC3 HS is the principal means of dissemination of EAMs in a pre-attack environment. The NC3 HS is comprised of several existing systems including the Navy's Nova, the Air Force's Strategic Automated Command Control System, the Defense Improved Emergency Message Automatic Transmission System Replacement Command and Control Terminal, the DMS, and the Pentagon Telecommunications Center."

In another online publication published in 2008, the *Nuclear Matters: A Practical Guide,* Chapter 5 had these two statements:

"Emergency Action Message – Use Authorization Control. An Emergency Action Message (EAM) is the medium through which actions involving nuclear weapons are authorized. These messages are encrypted and sent to lower-echelon units for action. The messages have different formats and may require authentication with sealed authentication code cards depending on the intent of the message.

"National Military Command and Control System. The Joint Staff Director for Operations (J-3) operates the C2 system. EAMs are conveyed to the Combatant Commands through secure communications links."

But this still may not be the whole story. In another publication we recently uncovered on the Internet it clearly indicated that the JCS may not be the only originator of EAM messages that we hear coming from our radio speakers. There are also STRAT Emergency Action Messages that are transmitted by Navy TACAMO aircraft. If a major command like the US Strategic Command can issue EAMs, who else also can originate and release their own EAM traffic into the various communications systems that DoD uses?

## ❖ So how do they disseminate EAMs?

This depends on which branch of the military you are talking about. Radio hobbyists usually hear EAM broadcasts on the Joint Chiefs of Staff/Air Force operated HF-GCS network. But that is only a small tip of the iceberg, and there is a lot more that we never hear nor see.

The following radiotelephone, radioteletype and land based systems/communications networks have been confirmed as carriers of DoD EAM broadcasts:

**Landline based systems:**

Autodin/Nova, Strategic Automated Command and Control System (SACCS), Digital Remotely Programmable Conference Arrange (DRPCA), Defense Switching Network (DSN), Chairman, Joint Chiefs of Staff Alerting Network (CJCSAN), Strategic Emergency Action Telephone System (SEATS), DDN, and the Strategic Operational Conference System (SOCCS).

**Other known communications networks:**

UHF-FDM Northstar GEP Network, CJCS HF Broadcast on CJCS HF network and its subnets, Survivable Mobile Command Center (SMCC) HF network, Worldwide TACAMO (WTAC), SMCC UHF LOS, CJCS VLF/LF, CJCS CINCNET, TACAMO Intranet, UHF ADIS, CJCS Data* (JCSDATA), CJCS Voice* (JCSVOICE), CJCS EAM Cross-banded Network* (JCSEAM-X), Missile Warning Teletype* (MWTTY), Mobile Ground System-Global Summary Message* (MGS-GSM), CTF-124 Voice, Strategic Force Management Network* (STRATFM), Strategic Report Back Submarine Network* (STRRBSUB), STRINTEL*, STRINTD-E*, STRRB-E, STRFD-E, National Command Authority Secure* (NCASEC), North Secure* (NORTHSEC), STRAT Secure* (STRATSEC), and Airborne Launch Control System (ALCS).

These networks can use VLF, HF and UHF frequency ranges, AFSATCOM transponders and Milstar EHF/AEHF satellite capability. In the list above, an asterisk * indicates a Military Strategic and Tactical Relay (MILSTAR) satellite network.

## ❖ Always Expect Change

Nothing in the nuclear mission world stays static, especially with the dissemination of EAM messages. Back in 2005, Rockwell Collins was selected by the U.S. Air Force as the prime contractor for Phase 2 of the Ground Element Minimum Essential Emergency Communications Network (MEECN) System (GEMS) program.

The GEMS program replaces Air Force and Navy fixed and deployable communications for bomber, tanker, reconnaissance and other alert communications facilities. When operational, this system will provide an upgraded networked infrastructure incorporating improved capabilities for aircrew alerting, message handling and the supporting communications links.

Improvements include updated Extremely High Frequency (EHF)/Advanced EHF (AEHF) satellite communications and redundant Very Low Frequency (VLF) communication paths for critical strategic message traffic. The improvements will eliminate obsolescence issues associated with the current aircrew alerting devices (pagers and klaxons), Ultra High Frequency (UHF) communications and Emergency Action Message (EAM) processing systems.

Rockwell Collins has been involved in the MEECN system since its inception and continues to provide key portions of the network for the U.S. military. As of this writing, we are still not sure if GEMS is up and running. There may be additional systems and networks that we still do not know about as we approach 2010.

## ❖ Where to Hear an EAM

So, if you want to hear an EAM broadcast, where do you park your receiver or scanner?

The best place to monitor these transmissions is on HF when they are transmitted by stations working within the previously mentioned USAF HF-GCS network. Tune your receiver to one of the following frequencies (low at night, high during the day), switch on the upper sideband (USB) mode, and wait. Frequencies: 4724.0 6739.0 8992.0 11175.0 13200.0 15016.0 kHz

If you are lucky to be within line of sight range of one of the airborne units that transmit EAMs, you might want to program 311.000 321.000 or 323.800 MHz (AM mode) into your scanner and wait for one to be transmitted.

Whether they are transmitted for exercise or contingency purposes, or an indication of something important happening in the real world, Emergency Action Messages are a fascinating aspect of the Milcom radio hobby to monitor and study.

**Milcom Resource Guide**

- Nuclear Matters: A Practical Guide, Chapter 5
  **www.acq.osd.mil/ncbdp/nm/nmbook/chapters/ch5.htm**
- What does an EAM sounds like? Check out this YouTube EAM Video:
  **www.youtube.com/watch?v=fTZuJQ4xtE0**
- What is an EAM?
  **www.monitoringtimes.com/html/eam.html**

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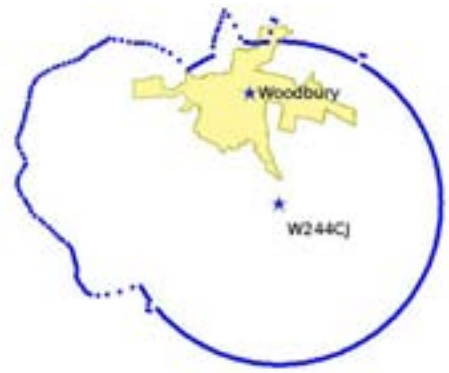
# Tough Times for "Community" Radio

Wayne Thomas read the August *American Bandscan*, on the gradual disappearance of small-town radio stations. Many of these stations are trying to find a way to move to the nearest large city. Others are finding it financially impossible to remain in business; they surrender their license and go permanently silent. Wayne found a webpage for a station – in my backyard – that's trying yet another method.

WBRY is the local station in Woodbury, Tennessee. They're a 500-watt daytime-only station in a town of about 2,400, about 60 miles southeast of Nashville. There's a FM station in Woodbury as well, but it's programmed from Nashville as a gospel-music station, serving the large city of Murfreesboro between Woodbury and Nashville.




Wayne noted the "Adopt-a-Watt Program" on WBRY's website (link below). The station says that revenues at commercial radio stations are very dependent on retail advertising – and retail business is scarce in Woodbury. WBRY's transmitter dates back to the station's foundation in 1963. The station is trying to raise $12,500 for a new solid-state transmitter, by asking listeners to "adopt" 500 watts for $25 apiece.

You probably also remember the October column, where we discussed the use of low-power FM translators to relay weak-signaled AM stations. WBRY has such a translator, W244CJ running ten watts on 96.7. Ten watts doesn't seem like much, but it's enough to cover almost all of the city of Woodbury – see the map.

I would imagine many of you have encountered similar programs on non-commercial stations. They're rare on commercial outlets, but WBRY is not the first station to try it. New York's "Pulse 87" (WNYZ-LP, the channel 6 TV station operating as a FM radio station) has also briefly tried raising money from its audience.

## ❖ Another Military AM Test

The FCC has issued an experimental authorization for the operation of three temporary AM stations in California. Hatfield & Dawson Consulting Engineers will operate station WD2XUM from Naval Air Facility El Centro in southern California. The frequencies to be used are 530, 890, and 1680 AM.

The last time we had an operation like this, the station only broadcast test tones. You probably won't be able to know for certain what you were hearing. But if you hear test signals some night on one of these frequencies, now you know something it could be...

The experimental authorization is under a contract with the military "...to modernize and transform psychological operation equipment." This seems to involve temporary broadcast stations to provide information to civilians in areas where the U.S. military is involved in conflicts.

## ❖ New *AM Radio Log*

The 30th Edition of the National Radio Club's *AM Radio Log* is out. It came in handy for identifying Bill WB4WTN's logging of a Korean-language station on 1040 in Atlanta! (And, indicates this station has apparently given up on its attempt to obtain permission to operate at night.) See **www.nrcdxas.org** for more information.

## ❖ Analog TV: Dead. But what about audio?

"Regular full-power analog TV did end as scheduled on June 12th." Well, pretty much. As expected, many stations did continue for another 2-4 weeks with "analog nightlight" programming – information on the digital conversion for viewers who hadn't converted yet. Regular programming was to end in June, and all full-power analog broadcasts in July. However, in the Albany, New York area, that didn't happen.

All analog channel 6 stations broadcast their audio signal on 87.75MHz. This frequency is just outside the FM radio band, and could be received on most FM radios. Many analog channel 6 stations promoted this fact. But, the compatibility with FM would end with the end of analog broadcasting. Most analog channel 6 stations moved their digital broadcasts to different channels – channel 33 in Milwaukee, channel 26 in Knoxville, channel 9 in Sacramento, channel 31 in Miami, etc...

Of the five analog channel 6 stations whose digital signals remained on channel 6, four used their entire channel bandwidth to broadcast their digital signal. No space was left for analog audio.

The fifth station was WRGB Schenectady, the CBS affiliate for the Albany area. Much to the surprise of most observers, WRGB's analog audio did not disappear on June 13th. And it didn't disappear on July 13th. It continued through late August.

The FCC has been bending over backwards to help TV stations maintain their audiences through the digital conversion. "Distributed Transmission Systems" allow a single station to use multiple transmitters on the same channel to reach audiences that can't be served with a single transmitter. Another service, "DTV Replacement Translators," works similarly but uses additional transmitters on different channels. Most of us figured the FCC had granted WRGB "Special Temporary Authority" to leave their analog audio signal on the air. There was no sign of such permission on their website, but that is not uncommon with temporary authorities.

By mid-August, not only was the analog audio still on the air, but according to reader Karl Zuk (among others) the analog broadcast had moved from the analog channel 6 audio frequency of 87.75MHz to 87.9 – further from the center of the digital TV channel (and thus less likely to interfere with the station's own digital television broadcast) and more likely to work with FM radios. We continued to believe the FCC had authorized these analog broadcasts.

Turns out we were wrong.

Around the end of the month, rumors began circulating that the analog FM simulcast was in fact unauthorized, and on the 24th the station's website admitted as much. Quoting the station's General Manager: "We do not have FCC authorization to transmit an analog signal. We only have authorization for a digital signal at this time." And indeed, the analog audio signal has vanished.

You may also remember from the October column that WRGB had applied to increase digital power, from about 4.6 kilowatts to about 30 kilowatts. This is roughly seven times the power that would normally be authorized for a station on that channel and with that antenna height. WRGB suggested the extra power was

justified due to difficulties viewers were having in receiving the digital signal.

Now, there *have* been serious problems with digital operation on channels 2-6. WPVI in Philadelphia, on the same channel, has obtained Special Temporary Authority to operate at almost four times the nominal power limit for just that reason. But one must wonder, did WRGB cause at least part of their own problem by operating a powerful analog transmitter *within their own digital channel*?

(There is no word yet on any sanctions for the unauthorized operation. It seems very strange that a licensed station would intentionally operate a powerful transmitter for two months completely unauthorized. I have to think WRGB had some kind of informal authority that they wrongly believed was valid.)

## ❖ Canadian Notes

FM relays of AM stations are a new concept in the US. They've been around for awhile (though somewhat rare) in Canada. *AM* relays of *FM* stations are rare in both countries! There will, however, be a new one soon in Gatineau, Quebec, across the river from the nation's capitol in Ottawa. The station will use 1350 kHz, abandoned a few years ago by CHVR a few miles (km) up the river in Pembroke, Ontario. (CHVR moved to 96.7 FM.) The new station will relay CIRA-FM, a Catholic religious station in Montreal. Yes, this is an AM station relaying an FM, not the other way around.

Canadian over-the-air TV stations have been asking the government to require cable systems to pay compensation for the use of their signals. They've suggested continued operation will be economically impossible without the additional source of revenue. As if to underline this, seven TV stations threatened to shut down at the end of August – and two actually did so.

CHCA-TV covered the major population centers of Alberta with three transmitters. The main transmitter, operating since 1957, served Red Deer in the center of the province; the other two, in Calgary and Edmonton, were barely a year old. CKX-TV was the only local station in Brandon, Manitoba. Brandon continues to be served by three transmitters relaying Winnipeg stations. CKX had been offered to the CBC for $1; the CBC refused, indicating they couldn't afford to convert the transmitter to digital. (Programming probably would have all come from the existing CBC facility in Winnipeg.)

CHCH-TV Hamilton, Ontario and CJNT-TV Montreal were rescued by a last-minute purchase for $12. (Plus assumption of liabilities, which I'm sure well exceed $12!) CHEK-TV Victoria was sold for two dollars. (While it doesn't say so, I would assume "...and assumption of liabilities..." as well.) CHWI-TV and CKNX-TV in southwestern Ontario agreed at the last minute to continue operating.

## ❖ Letters

Wayne Thomas and Karl Zuk aren't the only *Monitoring Times* readers we've heard from this month. Bill, N8UUP; Frank Szucs of Ohio; another Bill (WB4WTN), and Mike in Nevada all wrote.

Bill N8UUP logged two new FM stations. WOPR-102.3 is in Auburn, Indiana near Fort Wayne. The station recently switched from a Spanish-language format to English-language top-40. CJWF-FM is on 95.9 in Windsor, Ontario; this is a completely new station, with country music.

Most radio stations in the U.S. broadcast in either English or Spanish. However, other languages are also broadcast. Frank writes about WKTX-830 in Cortland, Ohio between Youngstown and Cleveland. WKTX broadcasts Hungarian-language programs on weekday afternoons.

The other Bill writes from the Atlanta area, where there are two stations broadcasting in Korean. WPBS operates on 1040; WPBC is on 1310.

Don't confuse WPBS with a station with a similar callsign, also in Georgia, and on the next lower frequency – on 1030, you'll find WEBS in Calhoun. WEBS, however, broadcasts an English-language oldies format. Both WPBS-1040 and WEBS-1030 have been widely heard across much of the East. Listen at sunrise, after the FCC has allowed these daytime-only stations to begin broadcasting, but before the sun has risen high enough to cut off the nighttime DX conditions.

Finally, Mike (who didn't give his last name) mentions one of the newer AM stations in Nevada. KHWG-750 is located at Fallon east of Reno. It carries classic country music, in parallel with their FM station on 100.1. Atlanta's WSB on the same frequency will make KHWG difficult to hear in the East. It may be worth a try in the Midwest, though.



## ❖ 'Til next month

Have any spots opened up in your radio and/or TV dials due to failed stations? Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to *dougsmith@monitoringtimes.com*. Good DX!

### URLS IN THIS MONTH'S COLUMN

My DX blog -
**http://americanbandscan.blogspot.com**
WBRY-1540 and their "Adopt-a-Watt Program" -
**www.wbry.com**
WRGB-6 and their post-DTV analog audio broadcasts -
**www.cbs6albany.com/news/radio-1265823-span-11pt.html**
Red Deer Advocate article on the demise of CHCA-TV -
**www.albertalocalnews.com/news/Signing_off_55727952.html**

### AM BANDSCAN STATION REPORT

**NEW:**

| | | | |
|---|---|---|---|
| Applications for new stations | | | |
| Wasilla, Alaska | 880 | 210/210 ND | (near Anchorage) |
| New station permits granted | | | |
| Helendale, Calif. | 1450 | 250/250 ND | (between Victorville and Barstow) |
| Vidalia, La. | 1340 | 1,000/810 ND | |
| Gatineau, Que. | 1350 | 1,000/180 | (across the river from Ottawa, Ontario) |
| Vernal, Utah | 1400 | 1,000/1,000 ND | |
| New station applications dismissed | | | |
| Reno, Nevada | 1180 | | |
| New stations on the air | | | |
| Agana, Guam | 1530 | KVOG | 250/250 ND |

**GONE:**

| | | | |
|---|---|---|---|
| Stations off the air | | | |
| Peterborough,Ont | 980 | CKRU | (gone to 100.5 FM) |
| Sudbury, Ont. | 790 | CIGM | (gone to 93.5 FM) |

**CHANGES:**

| | | | |
|---|---|---|---|
| Stations requesting moves to new frequencies and/or locations | | | |
| Deerfield, Ill. | 1430 | WEEF | from Highland Park (already granted) |
| Northbrook, Ill. | 1550 | WZRK | from Lake Geneva, Wis. |
| Kearns, Utah | 630 | KTKK | from Sandy |
| Callsign changes | | | |
| Cortaro, Arizona | 1030 | KVOI | from KCEE |
| Tucson, Arizona | 690 | KCEE | from KVOI |
| Garden City, Kan | 1340 | KGGS | for new station |
| Florence, Ky. | 1160 | WQRT | from WDJO |
| Silver Spring, Md. | 1050 | WZQQ | from WTOP |
| Florence, Oregon | 1250 | KCFM | from KCST |
| Charleston, S.Car | 1390 | WSPO | from WXTC |
| Gaffney, S. Car. | 1500 | WZZQ | from WEAC |
| Quanah, Texas | 1150 | KOLJ | from KREL |

ND: non-directional
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

Ernest Robl
*ernestrobl@monitoringtimes.com*

# Narrowband Railroad Channels

In one of my earliest columns, I briefly mentioned that railroad "narrowbanding" was in the future, but that, because details remained to be worked out, I would get back to that topic in the future. Well, the picture is now sufficiently clear to at least look at what is likely to happen in the next three to five years.

The U.S. Federal Communications Commission (FCC) responded to the need for additional railroad frequencies, particularly in congested urban areas, with a mandate to railroads for "narrowbanding."

Improvements in communications equipment have made it possible to provide a narrower frequency range for each channel (without loss of signal quality) – and therefore to space channels closer together. This means that you can now get at least twice as many channels into the same total frequency range.

This proposal is to be implemented by 2013, meaning that by that date most locomotive and hand-held railroad radios will have to be able to operate on the narrower channels and to be able to handle the additional channels.

Much of the new equipment being delivered now is already capable of these features, though it may require some reprogramming to accommodate them. Most currently available scanners also have enough discrimination to be able to handle the additional channels.

It is very possible that some of the new channels may be heard in major urban areas before 2013. Any new railroad operation in a congested radio traffic environment would likely be assigned channels out of the new frequency pool.

## ❖ Channel Numbering

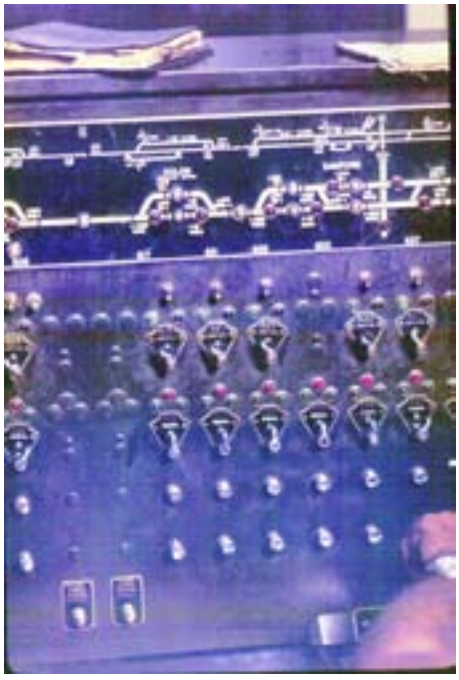
The Association of American Railroads (AAR), headquartered in Washington, D.C., is the frequency coordinating body for railroad channels, meaning that this trade group allocates channels, not just to its members (the largest railroads in the country) but also to all U.S. railroads.

A big question for the AAR was how to handle the new channel designations, without having to renumber all of the existing channels. Remember, there are many thousands of pages of existing railroad documentation that reference the use of particular railroad channels at particular locations or on particular routes.

The solution was to only provide new numbers for the new intermediate channels. Previously, channels were 15 kHz apart; the new spacing is half that much – 7.5 kHz.

Though railroad radios have often been referred as "99 channel" radios, the uppermost and lowermost of these channels have long been given over to other applications. In reality, in the U.S., the channel numbering starts with 7 and ends with 97.

So, between channel 7 and channel 8, you will now have channel 107. Channel 8 is then followed by channel 108, and so on.



Detail of a 1940s era CTC console of the Seaboard Coast Line (SCL) in Raleigh, NC. This section of the console shows tracks near Sanford and was still in use in 1975 when this photo was made. There are two track diagrams: the one in heavy lines with the track occupancy lights and a second diagram with lighter lines. The first diagram shows the tracks with turnouts (switches) that are remotely controlled by the dispatcher; the second shows additional tracks with manually operated turnouts that are operated by crews in the field (and for which track occupancy status is not automatically reported to the dispatcher).

Below that are two rows of toggle switches. The first controls signals and sets them for movement to either the left or right (L or R as shown on the console). These controls also have a neutral center position, when no movement is authorized in either direction. The second row of switches controls the turnouts in the field, with settings of either normal or reverse (N or R). Normal is the straight (mainline) route through a turnout; reversed is the curved route into or out of a siding or onto a diverging route.

Though final implementation is still a few years out, and changes could be made, these are generally considered unlikely.

Much of the new radio equipment being purchased by railroads is also capable of digital voice and data communications, though implementation of digital voice communication may be some time off, because of interoperability issues. Remember, railroads have to be able to talk to each other and any equipment (locomotive) that moves from one line to another has to be able to communicate anywhere in the country with other equipment and personnel at those locations.

If you live outside of major metropolitan areas, you may not even hear the use of the new intermediate channels for many years to come, as there is still plenty of available radio spectrum. And, for the same reasons that railroads wanted to retain the numbering of existing channels, to keep from having to change information that did not need to be changed – railroads are unlikely to change channel assignments in these areas.

Railroads will need to replace or upgrade remote base stations (and talking defect detectors) to ensure that they now broadcast on the narrower channels and that their broadcasts do not spill over into the new intermediate channels.

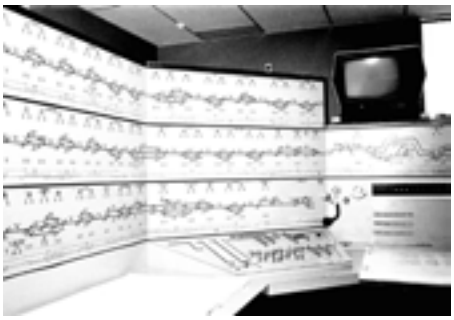
## ❖ Canada and Mexico

Narrowbanding is a mandate of the Federal Communication Commission (FCC), a U.S. government agency. The FCC cannot impose its will on neighboring countries, although, obviously, in border areas there needs to be coordination between countries so that both countries do not assign the same frequency to entities that will interfere with each other.

For all practical purposes, Canada will end up having to go along with the U.S. narrowbanding plan. Canadian railroads have long been interconnected and intertwined with U.S. railroads. Canada's two largest railroads, Canadian National (CN) and Canadian Pacific (CP) both have many miles of tracks within the U.S., and their motive power often operates through on lines of U.S. railroads.

CN and CP are both members of the AAR.

So, motive power of the major Canadian railroads will have to be equipped with radios capable of operating on the new channels. As smaller Canadian railroads interconnect with the larger railroads – and in some cases operate on sections of their lines – their locomotives,



The 1940s era console at the Raleigh dispatching center was replaced with this newer version in 1976 when the Raleigh dispatching center moved to a new building. Again, there are two track diagrams with the same purpose as on the earlier console. This time the controls for setting up routes and controlling signals are at the center of the console where the dispatcher selects a location and then issues commands. (This console had just been installed and was not officially in use when the photos were made.) Note the rotary dial for making phone calls!

too, will likely need to have updated radio equipment.

And, with all the equipment having the capability to use the new channels, more than likely, some of them will find use in Canada, particularly in larger urban areas.

Railroad enthusiast groups and railroad museums that have operable equipment, particularly those in or near large urban areas, may also find themselves using some of the new channels.

The picture for Mexico is less clear. There's only a limited amount of Mexican motive power that crosses over into the U.S., which, will, of course, need to have radios capable of operating on all the new channels. However, through much of this large country, railroad traffic is substantially below the levels of the busiest U.S. main lines. So, there's hardly an urgent need for additional railroad channels.

On the other hand, Mexican railroads largely use equipment – both locomotives and radios – manufactured in the U.S. and Canada, so over time compliant equipment will find its way into Mexico, too, particularly as the smaller Mexican railroads purchase used equipment from major U.S. railroads.

## ❖ Dispatcher Districts

When a Norfolk Southern or Amtrak train in my hometown of Durham, N.C., tones a dispatcher to initiate a radio conversation, the dispatcher may answer with any of the following:

"NS Dispatcher, Greenville."

"NS Raleigh Dispatcher"

"NS Danville [Va.] Dispatcher"

All three are technically correct. The dispatchers are physically located at a Norfolk Southern dispatching center in Greenville, S.C.

On less busy days and at less busy times, the dispatcher for the Danville district also handles the NS "H" line through central North Carolina. But, during busier times, a separate Raleigh district dispatcher takes over the H line and branches radiating from it.

This illustrates some of the flexibility of modern centralized traffic control (CTC) dispatching, where a busy dispatch station watches data displayed on computer screens.

In the earliest versions of CTC, dispatchers sat at hard-wired panels with illuminated status lights with toggle and rotary switches that controlled signals and turnouts in the field. (A few of these old dispatching consoles are still in use, and others are on display in railroad museums.)

The dispatchers at those consoles could only see and control specific segments of track, though there was usually some overlap between consoles, so that dispatchers could see traffic entering and leaving their districts.

Today, any computer-based dispatching console, can, with a few keystrokes and clicks of a mouse, pull up any district within a railroad that's assigned to that particular dispatching center. In some cases, where two railroads share track in a given district, one railroad actually dispatches the line, while dispatchers of the other railroad, which feeds traffic into and out of that line, can see the same track activity diagrams that the other railroad's dispatcher uses, though they cannot issue any commands that affect traffic on that line.

Dispatchers at the same dispatching center that are working adjoining districts can also pull up displays of the adjoining district to see what is headed their way – in addition to verbally coordinating traffic that they hand off to each other. In the past, if a chief dispatcher or other railroad official wanted to see what was going on with a particular line segment, he had to physically walk to that dispatching console.

*Trains* magazine reported recently that the CEO of a major railroad, frustrated with what he perceived as inefficiencies in train movements, logged onto the railroad's dispatching system from home, pulling up the display for a particular line segment. He then got on the phone with the dispatcher responsible for that line segment and asked him to try his ideas for managing trains on that segment.

Computer-based dispatching also integrates both signaled and non-signaled lines by recording authorities given to trains or work crews and by blocking the release of conflicting authorities until the first authorization has been formally cleared.

## ❖ Shared Views

Look at historic photos of any major rail lines and you will find them bordered by long "telephone" poles with dozens of wires. Some of these wires were actually devoted to voice circuits between manned locations and phone boxes from which crews could call in. Most were actually "code lines" for circuits that activated signals and turnouts and that reported back the status of equipment in the field, and most importantly, the occupancy status of tracks. (This was in the days before multiplexing, where multiple signals or voice circuits could be put on the same physical wire.)

Today, almost all of these wires are gone. Communication between dispatchers and field equipment is done with digital radio packets.

Somewhere near most major control points

Union Pacific dispatching station in "the Bunker" at the Harriman Dispatching Center at UP's headquarters in Omaha, Neb., in 1990. The dispatching station now uses computer monitors, a keyboard, and mouse to control equipment in the field. Note the small monitors, which were then state of the art: I'm sure the dispatching stations now use larger flat-panel displays. On the wall behind the dispatching stations, video projectors show an overview of larger route segments.

The dispatcher at this station is using a touch-screen monitor to select a remote radio base station to talk to railroad personnel in the field. With this setup, any dispatching station can work any dispatching district – and the same data about track occupancy, signal indications, and turnout settings in the field can be viewed at multiple locations. UP's dispatching center is called "the Bunker" because it is located below ground level, covered by heavily reinforced concrete, to make it essentially immune from most natural and man-made disasters.

(locations where signals control the ends of sidings or junctions), you will find a metal shed, often called a bungalow by railroad crews, equipped with a small antenna mast. The equipment in these bungalows not only receives and sends data for its own location, but also relays data up and down the line to master locations, which communicate directly with the dispatching center.

Just as you can listen in on railroad radio conversations, you can also "listen" in to these data packets, if you are within range of these stations. Of course, the data packets don't mean anything unless you have software to decode them and translate them into meaningful information about the line.

However, since the signal systems in much of the U.S. follow a common digital standard, it's now possible for radio enthusiasts and railfans to use some of this data – including producing displays similar to what a dispatchers sees. Master software handles the processing of the packets – but, of course, you also need a "map" of the route in question, that describes the track layout and radio addresses of the various control points along the way.

This is somewhat analogous to some of the train simulator programs available for home computers and gaming consoles. The master software still requires additional input for specific routes before the program will run.

In case you wondered, no, the software for processing the signal data does not allow for the issuing of commands.

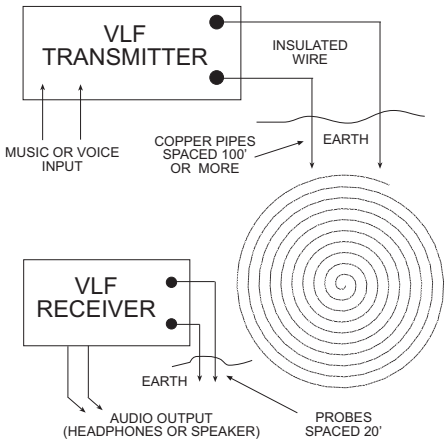
In the next column, we'll look at how it's possible to view this signal data on your own computer, either at home or out in the field.

# BELOW 500 kHz

**DXING THE BASEMENT BAND**

*Kevin Carey, WB2QMY*
*kevincarey@monitoringtimes.com*

# Through-Ground Radio




The title of this month's column was chosen carefully, in the hopes of not confusing it with "underground radio" which we covered back in October. Underground radio typically refers to communication in caves with portable equipment carried about by spelunkers (cave explorers).

It is an interesting topic as well, but we are going to discuss a variation on the theme, where point-to-point *surface* communication is accomplished using the Earth as a *transmission medium*. Most of this activity is carried out on frequencies below 20 kHz.

Is this radio or audio? Well, the signals consist of electromagnetic energy as is the case with radio, but the frequencies used are normally associated with audio and sound waves. We are thus entering a "twilight" area between radio and audio with this technology. For the sake of simplicity, we'll refer to it here as "radio," but with the understanding that some may take exception to the terminology.

You may be interested to know that at least one *MT* reader has been experimenting with through-ground radio for several years, and claims surprisingly long distances (up to a half-mile), using little more than an audio amplifier and conductive stakes placed in the ground at the transmitting and receiving sites.

This experimenter is James "J.B." Young, KJ4JAE, who hails from Gravel Switch, Kentucky. Prior to corresponding with J.B., I'd only heard of ranges up to a few feet through the earth, but as he points out, experiments in this area go back to at least the early 1900s, and greater distances are being achieved all the time. Today, some experimenters using high powered (1 kW) audio amplifiers have claimed ranges of up to 10 km (6.2 miles)!

At the outset, I would like to say I have not personally conducted any of these experiments, and offer them only as a "report from the field" from a reader involved in this activity. There are many other sources for information on through-ground available via the Internet, which we will list later.

### First Steps & Refinements

I first heard from J.B. back in the early 2000s, and at this time he was experimenting with a fairly basic setup, injecting audio into the ground with an audio amplifier and two metallic poles separated by some distance.

He soon discovered that sending anything other than a single pitch tone would produce garbling at the receiving end, because the higher audio frequencies travel through the ground faster than the lower ones. While it was encouraging, and perhaps useful for on/off CW signaling, such a system clearly had its limitations.

J.B. then began experimenting with modulating a very low frequency carrier (17 kHz) with audio modulation, resulting in crystal-clear transmission through the ground. To generate the carrier, he built a homebrew transmitter based on the XR2206 AM Modulator chip.

Antennas are another story. "Simply burying a regular antenna in the ground won't cut it," he says. He uses what some call an "Earth Dipole" to transmit his signals. This consists of two copper pipes buried in the ground, spaced 100 feet or more apart (the farther the better) and fed with insulated wires. One of his latest systems uses two copper pipes hammered into the ground at a spacing of about 600 feet. Obviously, one must have a fair amount of space to do this kind of work.

A fancy receiver is not required to receive through-ground signals, J.B. says. He reports that a high-gain audio amplifier can do the job quite well. He uses a homebrew design based on a TL082 op-amp chip followed by a LM386 audio amplifier. By connecting the receiver's input to two stakes in the ground, signals can be received at surprisingly long distances. Connection to the stakes is made with small-gauge, insulated wire (he uses 22-gauge) and his stakes are fashioned from car antenna "whips" that are pushed into moist ground at a depth of about 12 inches, and spaced roughly 20 feet apart.

When testing the system, J.B. typically plays music from a CD player, and connects this audio to his transmitter. He then walks about the fields near his home and "plugs in" the receiver at various locations, looking for the transmitted signal. He has achieved a range of about a half-mile using this system.

One key observation he has made is that *the farther the transmitting poles are apart from each other, the greater the range that will be achieved.* The signal will go outward about twice the distance that the poles are apart, he says. He states that if you placed the poles a mile apart, a distance of roughly two miles could be expected.

### Latest Results

J.B. sent me an update this past September and he felt that now was the time to release some of the information about his work. He also reports that he has achieved even better results using a new pulse wave modulated (PWM) DC signal, rather than the AM carrier traditionally used. Work continues on the PWM system. He got the idea from a Nikola Tesla theory that he has been researching in detail.

J.B. reports that the new technique shows promise for communication over *several miles* using ground poles with only a few hundred feet of separation and a relatively low applied voltage. With this system, he has achieved a range of one-half mile with only 50 volts applied to poles that are spaced by 100 feet.

Ultimately, J.B. would like to publish a book on this subject, and he is nearly finished with the manuscript. For now, he'd like to hear from other experimenters who have an interest in this area, or have worked with it themselves, to discuss possible future applications.

If you have questions or comments for J.B. regarding his systems, feel free to contact him at *empireco@windstream.net*. When you write, please also share your comments and observations with the *Below 500 kHz* desk. Perhaps we can encourage even more exploration of this very interesting subject!

## SAQ Broadcast, Dec. 24th

Mark your calendar for a CW transmission on 17.2 kHz from the last working Alexanderson Alternator (SAQ) located in Grimeton, Sweden. It will take place on Christmas Eve, **December 24th at 08:00 UTC**. Special thanks to Station Manager Lars Kålland, SM6NM, for this information. (Note: this will be a conventional radio transmission, and not a through-ground signal!)

*Merry Christmas and best holiday wishes to all readers.*

### LEARNING MORE

The websites below provide additional resources for learning more about through-ground radio and related VLF subjects.

**http://homepage.ntlworld.com/lapthorn/earthmode.htm**
**www.borderlands.com/newstuff/research/ground-myst.htm**
**www.qru.de/vlf.html**
**www.vlf.it/**

Website addresses often change without notice, so some key terms have also been provided, which may be entered into your search engine for further exploration:

Earth Telegraphy, Earth Mode Communication, Heinrich Barkhausen, Gustave-Auguste Ferrié, Ground Radio, Earth Dipole, Ground Conduction

# OUTER LIMITS

THE CLANDESTINE, THE UNUSUAL, THE UNLICENSED

*George Zeller*
*georgez@nacs.net*

# Taliban, Commander Bunny and QSLing Pirates

## Taliban Heard on Phones, Not Radios!

According to the Mobile Active.org blog and a recent report by the Asian think tank LIRNEasia, in Pakistan only 24% of the population owns a radio. However, the same report finds that 58% of the population in Pakistan has a mobile phone. In south Asia, most mobile phones come equipped with a radio.

Meanwhile, it finds that the Taliban operate roughly 150 FM pirate and/or clandestine stations in Pakistan and Afghanistan. More of their listeners use their phone than their radio to listen to the broadcasts. Further, licensed radio stations are often forbidden to broadcast about the Taliban. Therefore, they circumvent this censorship by including reports on Taliban concentrations by mentioning them in traffic reports, citing unsafe travel conditions in local regions.

This important LIRNEasia report, which has generated almost no interest in the United States, can be found on the internet in English at **http://lirneasia.net/projects/2008-2010/bop-teleuse-3/**

## Commander Bunny Award

Commander Bunny at WBNY has announced that the Rodent Revolution has named *MT* columnist George Zeller as the "Smartest Monkey on Planet Earth." It isn't the Nobel Peace Prize, but *MT* thanks the station for this honor. It's up at **http://shortwavepirate.info/WBNY/?p=63** on the WBNY web site. Commander Bunny used the photo that we see this month for his award. It shows Allan Weiner of WBCQ interviewing your *MT Outer Limits* columnist George Zeller live on the air.

## Few Cite Holiday

The annual *Talk Like a Pirate* day on September 19 took place with numerous pirate broadcasts near the holiday, but with almost no commemorative broadcasts for the holiday itself. The holiday has caught on with the general population, but it is not yet a big pirate broadcasting holiday.

## Gigantic Pirate Activity

As we see this month, an enormous level of shortwave pirate activity emerged once the DX season started this fall. Pirate radio is perhaps the single growth area in shortwave broadcasting today. Thanksgiving, Christmas, and New Year's Eve are long known for increased levels of pirate broadcasting. Why not dust off your new receiver from under the Christmas tree and tune around the pirate band?

## Thanks to Our Pirate Listeners from Monitoring Times

Coverage of pirate and clandestine stations has always been a somewhat controversial niche in the radio listening hobby, but it has had a small, loyal following throughout the years in *MT*. However, a lot has changed since the days of Havana Moon, and *MT* has finally decided to turn this page over to other topics in 2010. We thank George Zeller for faithfully covering the pirate scene in *MT* since 1992.

But most of all, we thank our readers who kept George supplied with a never-ending list of unlicensed stations to seek out and log. This month those valuable contributors were: Brian Alexander, Mechanicsburg, PA; Kirk Allen, Pasadena, TX; Skip Arey, Beverly, NJ; Kirk Baxter, North Canton, OH; Jerry Berg, Lexington, MA; Artie Bigley, Columbus, OH; Commander Bunny, Belfast, NY; Wendel Craighead, Prairie Village, KS; Richard Cuff, Allentown, PA; Rich D'Angelo, Wyomissing, PA; Ragnar Daneskjold, North America; Gerry Dexter, Lake Geneva, WI; Gregory L. Dome, Onalaska, TX; Bill Finn, Philadelphia, PA; Harold Frodge, Midland, MI; William T. Hassig, Mt. Prospect, IL; Avery W. Hill, Goose Creek, SC; R. M. Hinton, Boulder, CO; Ed Insinger, Summit, NJ; Terry L. Kreuger, Clearwater, FL; Ed Kusalik, Camrose, Alberta; Larry Magne, Penn's Park, PA; Greg Majewski, Oakdale, CT; A. J. Michaels, Blue Ridge Summit, PA; Gene Patterson, Gibsonia, PA; John Poet, Belfast, NY; Mike Rhode, Columbus, OH; Robert Ross, London, Ontario; Armando Slaen, Argentina; John Wilkins, Wheat Ridge, CO; Joe Wood, Greenback, TN; and Dave Zantow, Janesville, WI.

## QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or $2 US to foreign locations. The cash defrays postage for mail forwarding and a souvenir QSL to your mailbox. Letters go to these addresses, identified above in parentheses:

- PO Box 1, Belfast, NY 14711
- PO Box 109, Blue Ridge Summit, PA 17214
- PO Box 146, Stoneham, MA 02180
- PO Box 293, Merlin, Ontario N0P 1W0
- PO Box 9, 8096 ZG, Oldebroek. Netherlands

Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. The best bulletin for submitting pirate loggings is the e-mailed *Free Radio Weekly* newsletter, free to contributors via *freeradioweekly@gmail.com*. A few pirates will sometimes QSL reports left on the outstanding Free Radio Network web site, at **www.frn.net**. *The ACE,* a formerly widely read print bulletin, now has a good loggings section and a valuable archive of *Free Radio Weekly* issues at **www.theaceonline.com/**

## What We Are Hearing

*Monitoring Times* readers heard more than three dozen different pirate radio stations this month. Thanks for the huge turnout this month! You can hear them, too, if you use some simple techniques. Pirate radio stations never use regularly announced schedules, but shortwave pirate broadcasting increases noticeably on weekends and major holidays. You sometimes have to tune your dial up and down through typically used pirate radio frequencies to find the stations, but more than 95% of all North American shortwave pirate broadcasts are heard on **6925 kHz**, plus or minus 30 or 40 kHz.

**Barnyard Radio-** Chuck Manson's classic rock music mixed with noises from farm animals. (***barnyardradio@gmail.com***)

**Big Dog Radio-** Barking dogs announce their rock music shows. (report to FRW and FRN)

**Captain Morgan-** Rock music and audio from the old Twilight Zone TV (***captainmorganshortwave@gmail.com***)

**Channel Z Radio-** One of the best produced rock music pirates on the air. On occasion they relay other pirates. (Belfast and ***channelzradio@gmail.com***)

**Cupid Radio-** When they use 15070 kHz, this Europirate is widely heard in North America. (***cupidradio@hotmail.com***)

**Iron Man Radio-** Oddly, Scruffy Swab is broadcasting folk music lately. (Belfast and ***ironmanradio@hotmail.com***)

**Jay Channel-** Another pirate has been publicizing DXer Jay Smilkstein, who recently underwent successful open heart surgery. (None)

**KIPM-** Alan Maxwell's Illuminati station has returned, but unclear if he has new shows or if it is relays. (Current address unknown)

**KUSA-** Less Whitehouse's rock music podcast now more widely heard on the pirate bands (***contact@kusaradio.com***)

**La Voz de Mataderos-** Armando Slaen heard this pirate operating on 27615 kHz in Argentina. Here's another frequency range to check for pirates. (Unknown)

**Liquid Radio-** Like WMPR, they program techno

***Continued on page 61***

T.J. "Skip" Arey, N2EI
tjarey@monitoringtimes.com

# Tinsel and Toys

Well, once again we come to the last month of the year: A time of joy and peace toward all people of good will. But also a time when some folks expect a visit from the big, red coated elf from North of KL7-land.

Have you been a good little ham? Have you always checked the frequency before sending CQ? Have you sent out QSL cards to all your contacts? Have you helped introduce somebody to our great hobby?

In December, I usually take the liberty of making some suggestions that might make a good gift for any ham (often including me). You can leave your copy of *MT* open to this article so your OM, YL, XYL or harmonics can get an idea about what to wrap this year.

Let's take a look at what's new for under the tree this year.

**THE ICOM 7200 HF/50 MHz TRANSCEIVER**
$1099.95
Icom America Inc.
2380 116th Ave NE
Bellevue, WA 98004
www.icomamerica.com

What is it about this rig that makes me want to go out and buy one of those All Terrain Trucks with those great big wheels on it? Put simply, this is one tough monkey of a radio. This transceiver has been out for a couple of year now and has proven to be a good performer in the compact HF rig class.

It has IF DSP, AGC Loop Management, Digital Dual Passband Tuning, manual Notch Filtering, Digital Noise Blanking and Digital Noise reduction. The 7200 can be run from 2 watts up to 100 Watts in SSB, CW and RTTY Modes. It can also go to 40 Watts in the AM Mode – a feature missed on many newer transceivers.

It has protection and bumper padding similar to what Icom uses on their marine radios. While not completely waterproof, I wouldn't worry about riding with the top down in my 4 Wheeler. Folks like me will appreciate the full break in CW and adjustable CW pitch control. Its front facing speaker makes it great for mobile and field operation. Good enough for a primary rig; way over the bar for a secondary or mobile rig.

**DV DONGLE**
$199.00
(see FAQ at internet address below for suggested retailers)
www.dvdongle.com

As you have probably noticed, D-Star is coming on strong around the country. Lots of folks are setting up repeaters and experimenting with this digital voice and data system. While the prices are coming down, the cost of D-Star radios are still a bit high for somebody still trying to make up their mind about this new mode of operation. Not to worry! Enter the DV Dongle.


The DV Dongle allows the user to connect a personal computer (Mac or PC) to the International D-Star Gateway Network, allowing the ham to participate in the system as if they were using a D-Star transceiver to do the heavy lifting.

The unit connects to the PC by way of a standard USB 2.0 port found on most modern personal computers. The user needs to register on the D-Star Network just like using a radio. This is easily done at **https://dstargateway.dcara.net/Dstar.do** if you are not already part of the network.

You will need to scare up your own microphone and speakers (or headset if you prefer) and, of course, your computer will need a high speed internet connection. Dial-ups need not apply for this tool. With a price tag under $200, it is a reasonably priced way to dip your toe into the D-Star waters. (By the way, it is small enough to fit into the stocking hanging on the mantle piece.)

**YAESU FT-2900R**
$215
Vertex Standard USA
10900 Walker Street
Cypress, CA 90630
www.yaesu.com

75 Watts output, 3 Watts audio, all in a diminutive package that should fit under any dashboard. What's not to like? Folks looking for a dependable 2 meter mobile rig for ARES, RACES and SkyWarn activities should find everything they need here. The unit has built in weather channel coverage by way of a separate 10 channel weather frequency memory bank, with severe weather alert. It also features extended receiver coverage over the 136-174 MHz portion of the spectrum.

The 2900 has 221memories and WIRES™ (Wide-Coverage Internet Repeater Enhancement System) capability. The 2900 comes with a keypad enhanced microphone designed to make mobile operation as safe as possible. It has a large 6 digit LCD frequency display that is easily viewed in any level of light.

But, let's cut to the chase… This radio offers 10 watts more output than most other units currently available. When you are covering an emergency checkpoint out in the middle of nowhere, that extra 10 watts of RF grunt is going to help you get into the net control repeater with no worries.

**ALINCO DJ-G7T TRI-BAND TRANSCEIVER**
$389.95
(Check this site for a retailer near you)
www.alinco.com/usa.html

The ham radio world is becoming well populated with diminutive handhelds that add wide band receiver capability. The Alinco G7T is a stand out tribander that allows for full duplex operation between and two of its three bands, making it highly versatile for field and emergency use.

The rig puts out 5 watts on 144 MHz, 4.5 watts on 440 MHz and 1 watt on 1.2 GHz. The receiver can hear from 530 kHz to 1299.995 MHz (less cellular) in the AM/FM/WFM modes. It has a spectrum display capability to help you hunt for useful signals throughout the covered frequency range.

The radio has a 1000 frequency memory bank, user programmable controls and internal VOX circuit. All in a package that would probably get lost on my normally messy desktop.

**MAHA MH-C808M CHARGER**
$109.95
MaHa Energy Corporation
18567 E. Gale Ave.
City of Industry, CA 91748
800-376-9992
www.mahaenergy.com

Okay, I have a confession to make. I wasn't willing to wait until December 25th for this unit to show up under my tree. As soon as I saw it, I ordered it. Like many hams, I go through a lot of rechargeable cells and finding

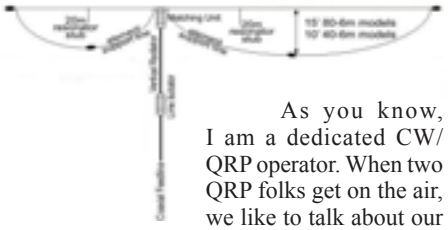
a single charging station that would take all the popular sizes and types of rechargable cells was something I needed NOW!

The MH-C808M can recharge and condition from one to eight AA, AAA, C or D NiMH or NiCD batteries in any combination.

This charger has solid contacts for all standard cell sizes, an easy to read LCD display that shows cell charging and conditioning activity and switch selectable soft and rapid charging modes.

Charging is good, but battery conditioning is what keeps those dollars in your wallet. The 808's battery conditioning system assures that you will get maximum life out of your cells. It should also be able to breathe a little extra life into some of those cell you have left neglected around the shack. This is about as close to a must-have shack accessory as I have come across. When you sit on Santa's lap, you'll want to ask for this charger, if you can wait that long!

**CAROLINA WINDOM (COMPACT)**
80 Meter Version $150
40 Meter Version $140
800-280-8327
www.radioworks.com/



As you know, I am a dedicated CW/QRP operator. When two QRP folks get on the air, we like to talk about our power level, but we also like to talk about the type of antenna we are using to get those 5 watts (or less) out into the ether. One commercial wire antenna that is often mentioned is the Carolina Windom.

This antenna design has been used to set low power records for years. Jim Thompson W4THU has been tweaking this design to perfection. I am always amazed when he comes up with a new twist to make this versatile antenna even more useful to the ham radio community. The new compact version of Jim's Carolina Windom design is sure to be a hit with folks who do not have the ability to put up a lot of wire in their particular sky. With the 80 meter version taking up only 69 feet of distance and the 40 meter version using just 34 feet, you get coverage of all lower bands with the aid of just about any tuner you have in the shack.

It might be hard for some folks to get on their roof in the dead of winter, but this antenna will having you wishing for a clear day with no snow and ice on the eaves.

**MFJ-813 QRP HF WATTMETER AND SWR** BRIDGE
$39.95
MFJ Enterprises, Inc.
P.O. Box 494
Mississippi State, MS 39762
800-647-1800
www.mfjenterprises.com

As I mentioned above, QRP ops love to talk about their power. They are also real sticklers when it comes to getting that power level accurately monitored, especially when taking things down into the QRPp milliwatt world.

QRPers are also concerned about SWR as part of seeking overall antenna and feedline efficiency, key to getting every bit of those 5 watts out to where it can do some good. All too many wattmeters lose their ability to do the job when looking at low power, so QRP hams are always excited to find a device designed to work at teeny power levels.

The MFJ-813 hits all the marks for QRP operation. Forward and reverse power reading from 0 to 5 watts on a calibrated analog meter. The 813 will also read SWR and relative power at any level from 100milliwatts to 50 watts. The 813 uses Bruene bridge circuit to detect RF current and RF voltage. This allows for its high degree of accuracy within the power range of its design.

The 813 will support radios transmitting from 1.8 to 50 MHz and the case has SO-239 UHF connectors. Its 4.5" W x 2.35" H x 3" D case makes it great for portable operation as well.

**VIBROPLEX KNOW CODE RED STRAIGHT KEY**
$189.95
The Vibroplex Company, Inc.
11 Midtown Park East
Mobile, AL 36606-4141
800-840-8873
http://vibroplex.com

Okay, I've save the best for last. Santa, are you paying attention? I have been a very, very, very good little ham.

I have mentioned in past columns that there is a resurgence of interest in straight key operation on the CW bands. Organizations such as FISTS and The Straight Key Century Club (SKCC) have been getting folks to step back from their electronic keyers and iambic paddles to rediscover the simple pleasures of good old fashioned brass pounding.

The Know Code straight key was put into production by Mitch Mitchell W4OA and the rest of the folks at Vibroplex to encourage new hams to take up the CW way of life. That is all good, and I certainly hope more than a few folks whose ink is not yet dry on their licenses get one of these keys for their holiday joy. But I can tell you for certain, I know of at least one long time CW Op who wants one of these keys…ME!

The Know Code key is a model of the simple elegance and straightforward design that has been the hallmark of the Vibroplex name since the days of Horace Martin over 100 years ago. With its unique serial number and beautiful red and chrome color. I WANT THIS KEY!! SANTA… ARE YOU LISTENING??

May you all have a joyous and safe holiday season leading into a prosperous New Year (hopefully full of new sunspots). I'll see you on the bottom end of 40 meters.

***Outer Limits continued from page 59***

rock dance music, so you have to listen for the ID. (*wwrbfm@gmail.com*)

**MAC Shortwave-** Paul Star and Ultra Man's rock oldies wirh the old Radio Prague interval signal and the US national anthem at the beginning and end (*macshortwave@yahoo.com*)

**Mystery Radio-** Some North American DXers are hearing this Europirate on weekends using 6220 kHz. (*radio6220@hotmail.com*)

**Northwoods Radio-** Jack Pine Savage is QSLing his rock music shows "from the Great Lakes." (*northwoodsradio@yahoo.com*)

**Outhouse Radio-** Novelty tunes and rock music (report to the FRN web site)

**Pirates Week Relay-** Ragnar Daneskjold's entertaining weekly pirate news podcast is still relayed occasionally or you can hear the show at **www.piratesweek.info/** (None)

**Radio Casablanca-** QSLs have arrived from this 1940s big band music station. (*radiocasablanca@gmail.com*)

**Radio Ga Ga-** Uncle Bob's rock music productions and SSTV digital pictures. (*popeonthepoint@gmail.com*)

**Radio Casablanca-** Joe Wood and others have received their new QSL. (*radiocasablanca1@gmail.com*)

**Radio Marlene-** She broadcasts classic rock music "from the Jersey Shore." (*radiomarlene@gmail.com*)

**Radio Mushroom-** Classic rock music "from a nuclear transmitter." (*radiomushroom@gmail.com*)

**Radio Playback International-** This new Europirate has been logged by a few in North America, perhaps from Italy on 6880 kHz. (*playbackinternational@googlemail.com*)

**Radio Station XXP-** Classic rock music and pirate talk dominates on this relatively new one. (*radiostationxxp@gmail.com*)

**Scott Joplin Radio-** Their piano music is dominated by the composer in the station name. (Unknown)

**The Crooked Man-** This stream of consciousness pirate from the 1980s has returned, perhaps by relays. The announcer says that he got brain damage when he fell out of the Hindenburg. (None)

**The Crystal Ship-** The Poet features leftist political commentary and classic rock music on unusual frequencies such as 6876 kHz. (Belfast)

**Undercover Radio-** Dr. Benway's rock music and adventure stories. (Merlin and *undercoverradio@gmail.com*)

**Voice of Honor-** Their nonpartisan patriotic format is a breath of fresh air around holidays when they often are active. (*voiceofhonor@gmail.com*)

**Voice of KAOS-** Their political stance opposes chaos in the world; the format is normally rock music. (*voiceofkoas@gmail.com*)

**Voice of the Robots-** Their rock music uses robots as announcers. (*voiceoftherobots@gmail.com*)

**Voodoo Radio-** Recent shows featured Rev. Voodoo urging support for troops, but they also relay old time radio shows. (None, but QSLs FRN postings)

**WBNY-** Commander Bunny's Rodent Revolution parody of clandestine broadcasting. (Belfast and *rodentrevolutionhq@yahoo.com*)

**WEAK Radio-** Rock music and comedy in eclectic format (*weakradio@gmail.com*)

**WMPR-** Their "dance party" techno rock music has been active for years. (None; known to QSL occasionally only at the Kulpsville Winter SWL Festival)

**WOLF-** This new one has been playing Motown music. (unknown)

**WTCR-** Their slogan of "20th Century Radio" is meant to be taken literally. Their programming is music from all decades of that century (Belfast)

**WSTH-** This new one concentrates on dozens of different versions of Led Zeppelin's "Stairway to Heaven," including rock, country, opera, Elvis, and a Gilligan's Island version. (None known)

**Wolverine Radio-** Don't confuse the announcer's diction on this rock music pirate with "Long Range Radio." (None)

**9/12 Radio-** Both the station name and their programming are parodies. (unknown)

*Clem Small, KR6A*
*clemsmall@monitoringtimes.com*

# Tree Antennas for Christmas and an All-Band HF Antenna

I have read of several instances in which live, evergreen, Christmas-type trees have been successfully used as antennas. I once used a tall, maple tree as an all-band (500 kHz to 30 MHz) receiving antenna. It worked quite well.

Maybe you have a tall tree separated from other trees in your yard. It should work if you don't mind tapping into its trunk with 5 or 6 small nails. Separate the nails about 2 inches (5 cm) in a vertical line from ground level on up. Connect the coax feed line's shield to the nail driven into the tree at ground level, and try connecting the center conductor to the other nails, one at a time, to find the one that gives the best operation. I wouldn't recommend transmitting with this antenna as the RF current flowing might damage the tree.

For a different perspective on tree antennas, there is an old-timer's antenna known as the "tannenbaum" (evergreen tree) antenna. The tannenbaum is an actual antenna, but one could imagine the outline of this antenna looking a bit like the outline of a Christmas tree. The outline of the Yagi-Uda beam antenna and – even more so – the outline of the LPDA antenna also have that same general resemblance to a Christmas tree.

In addition, there are vertical antenna arrays where a smaller antenna is positioned on the mast above a larger antenna: the overall outline of this combination is roughly triangular, and so a bit like a Christmas tree in outline. And, yes, because of their shape, all of these antennas are occasionally referred to as "Christmas Tree Antennas."

Possibly you've seen some of the fake-tree antenna towers used these days as cell-phone towers. These come in styles from Christmas-tree-type evergreens to palm trees. If you give them more than a casual glance, most of these antenna towers are obviously fakes. But in areas where ordinary cell-phone towers are thought to be a visual nuisance, some folks apparently think these fakes fit in with the environment better than an ordinary tower.

Actually you could easily use the information from **http://vk2zoi.com/flowerpots/** to construct your own VHF Christmas-tree antenna.

## ❖ Let's Make a Random-Length Antenna

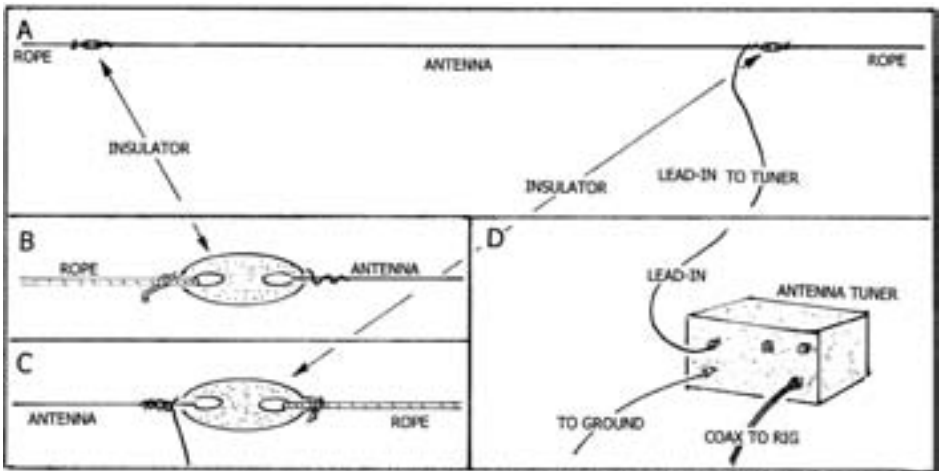
Here's an HF antenna (fig. 1A) that utilizes an antenna tuner to give it all-band (all HF bands) capability. If you're going to use it for reception only, you might find that you don't really need the antenna tuner!

The length of this antenna is determined by how much wire you have and how much space you have to string it up. Usually the longer, higher, and more in the clear it is, the better it will function. For the insulator at each end, scrape the wire clean where it wraps around itself, and then solder it to itself (fig. 1B). Then scrape clean, wrap, and solder the end of the lead-in wire to the end of the antenna nearest your operating position (fig. 1C).

A ground is needed for this antenna, connected to the antenna tuner's ground connection as shown in fig. 1D. A copper-coated ground rod from your local hardware store will do, as we're trying to keep it simple.

If you must run your ground wire to an upper story, it may not be effective. In this case you may get RF stings from your equipment during transmitting. Using quarter wavelength radials attached as substitute grounds can help with this. Lay them under the rug or around the room on the floor. To find a quarter wavelength in wire, use the formula, length (ft) = 234/frequency in MHz, or length (m) = 71.3/frequency in MHz.

As with any outdoor antenna use lightning protection. The minimum is to disconnect and ground your antenna when it is not in use, and never use the antenna when lightning is likely.




**(A) THE RANDOM-LENGTH ANTENNA (A), DETAIL OF FAR END OF ANTENNA (B), DETAIL OF LEAD-IN END OF ANTENNA (C), CONNECTIONS TO ANTENNA TUNER (D)**

**This Month's Interesting Antenna-Related Web sites:**

Unfortunately it's tedious to copy web addresses from the hard copy (paper copy) of *Monitoring Times*. However, if you subscribe to *Monitoring Times* as *MT Express* (both versions have the same content) it's delivered digitally via the internet, and you can copy the entire address with a couple of keystrokes or simply click on the link! Add to that the fact that *MT Express* is delivered to you earlier, costs much less than a paper subscription, and reduces our carbon footprint, and it's a win, win, win way to go!

- An antenna called the worlds' largest Christmas Tree antenna:
  **http://nepa.railfan.net/insul/banten.htm**
- A chat room discussion of artificial tree antennas:
  **www.eham.net/forums/AntennaRestrictions/3208**
- Picture of an artificial tree antenna tower:
  **http://i122.photobucket.com/albums/o258/platinum_fire/Picture054.jpg**
- An example of why some arrays are called "Christmas Tree Antennas:
  **www.qrz.com/callsign.html?callsign=VA3MJ&bs=+Sailing**
- Simple tutorials on radio-electronics technology, including antennas:
  **www.radio-electronics.com/info/electronics-tutorials.php**
- A free electronic technician course covering antennas and related topics:
  **www.tpub.com/content/et/14092/**
- Wearable vest-contained antennas!
  **http://wearableantenna.com/tactical_vest_antenna_system/?gclid=CKWyjuLl0pcCFQolgwodhQc9Dg**

## ❖ My Collection of Antenna Jokes

At age 77, after a lifetime spent involved in radio and over twenty five years writing about antennas, the only jokes I have to offer about antennas are those below. The first one I heard from a friend, the second I devised from a different joke, and the rest I made up myself.

Two antennas got married the other day,

the wedding wasn't much, but the reception was great.

A woman went to see a psychiatrist to discuss the problem of her husband thinking that he was a TV antenna. The psychiatrist thought a while, and then said that he could, with lengthy treatment, cure her husband. But the cost for all those treatments would be about $50,000 dollars. The woman thought a while, and then replied "I can't afford that much expense, so how much would it cost just to treat my husband so he could give us better TV reception?"

Why did the antenna decide that it would only function on transmitting? Because it heard it is more blessed to give than to receive.

A certain streetcar conductor was always rude and unpleasant to the riders in his streetcar. He really did a poor job of being a streetcar conductor. One day he even started a fight with a passenger, and this caused the streetcar to have a wreck. It ran into a high-powered radio station's antenna tower. The wreck threw the streetcar passengers and the conductor onto the station's antenna which was transmitting at very-high level of power. People were screaming in pain from the shocks and burns they were getting, and sparks were flying all around. But the radio-frequency voltage from the antenna tower didn't harm the streetcar conductor in the slightest. After all, he was a very poor conductor.

Why was the antenna picked to lead an orchestra? Because it was made of copper, it was a very good conductor.

Why do antenna installers usually age prematurely? Because they're exposed to the elements so much of the time. (Antennas have elements you know.)

Knock, knock.
Who's there?
Antenna.
Antenna who?
Antenna of your business.

If you've got other antenna jokes I'd appreciate your sending them to me.

## RADIO RIDDLES

**Last Month:**

I asked: "Many beam antennas, such as the Yagi-Uda Beam mentioned above, obtain their gain and directivity from the use of reflectors, and directors. Name some beam antennas that do not have reflectors or directors in their design."

Well, the legendary rhombic beam, as well as its relatives, the V beam and the long wire beam, have no reflectors in their design. They all depend on wave interaction from different sections of their length to produce their gain and directivity.

The also-legendary Beverage beam antenna has no reflector. It functions like a leaky transmission line, gathering wave energy from waves which sweep along its length. This gives the antenna considerable directivity, but its gain is very low. Nevertheless, it is this sharp directivity which eliminates so much noise and interference in off-beam directions and enables it to be very useful for some situations.

**This Month:**

Well, this month we've discussed living trees substituting as antennas. What about using some other living plants to substitute for a ground connection?

**And Now the Answer:**

Because this is my last *Antenna Topics* column, I'll answer this riddle now.

Actually, Lee DeForest writes in his memoirs about successfully using a connection to a small, growing plant as a ground for a receiver. In a more humorous vein, once DeForest was experimenting with using radio from a balloon. His assistant, fearing the radio system would not function without an earth ground, rushed out at the last minute, returned with a potted plant, and stuck his ground wire into the earth in the flower pot! This may have been written as a joke, but I actually found it in some old radio literature.

## ❖ It's Time for Goodbye:

In case you missed my announcement last month, let me say that it has been a genuine pleasure for me to write the *Antenna Topics* monthly column over the many years I've been with *Monitoring Times*. I've enjoyed writing about antennas and related topics with you readers in mind. Now it is time for me to retire from writing this column.

I sincerely wish you all, as I have each month for some 25 years now, Peace, DX, and 73

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# Digging into the BC314/BC-344 Project

## ❖ Tips from the Readers

Reader John Stoll, recalling some of the difficulties I had removing knob setscrews and control panel nuts, suggested a couple of helpful products.

As for the setscrews, some of you may remember the suggestion for removing frozen screws received from reader "Ted." Published last October, it involved using a "screw extractor" tool. First a pilot hole is drilled down through the head of the stubborn screw, then the extractor is tapped into the hole and backed off with a wrench or a drill on slow speed. Ridges in the extractor shaft bite into the surrounding metal and provide a good grip.

I'm not sure that there is a screw extractor and matching drill bit fine enough to be practical for the small set screws used on radio knobs. The "left handed bit" tool suggested by John might have a better chance. It cuts when turned in a counterclockwise direction (put your drill in reverse) – thus applying torque in the correct direction to back out the screw. No pilot hole is necessary. See the CVF Supply catalogue, at **www.cvfsupply.com/Drill_bits/15pc_left_handed_drill_bits.html** for a set with sizes from 1/16" to 1/2".

A nifty little tool from musical instrument supply company Stewart-MacDonald is great for removing or tightening the panel nuts that hold controls such as switches and potentiometers in place. It's not for the decorative ring nuts that gave me such grief in a couple of past restorations. Rather it's for the plain vanilla hex nut style.

***The useful little panel nut removal tool as shown in the Stewart MacDonald catalogue.***

I'm including a small picture of the tool from the Stewart-Macdonald catalogue. The double-ended tool has "V-slots" that will engage any size nut. Though not really visible in the little picture, the slot at one end is smooth for tightening nuts; the slot at the other is toothed for loosening them. The great thing about this tool is that it is made of such thin stock (.075") that it can be slipped under a control knob to engage the nut beneath.

Another thoughtful feature is that the tool is angled upwards from the business end, thus minimizing the chances of scratching a panel. View the Stewart-Macdonald catalogue description of this item at **www.stewmac.com/shop/Tools/Wrenches/ESP_Multi_Spanner.html**

## ❖ The BC-344: A Recap

As announced in the last issue, our new restoration project is a World-War-II-era low-frequency military receiver, the BC-344. This is an a.c.-operated set otherwise identical to its dynamotor-powered sister, the BC-314. These sets cover the frequency range 150-1500 kHz in four bands.

***The BC-344-D looks a mite dusty on removal from long-term storage.***

Last time, we reviewed the circuit of the BC-344 and discussed all of the controls on the front panel, using information and photos from the technical manual. This time, we'll begin the restoration, starting with an examination of the actual project radio. But one of the first things one must address when beginning a restoration project of this kind is finding a source for the necessary manuals.

The military technical manual TM-11-850 covers the BC-314/344 as well as the HF versions mentioned in the last issue, designated BC-312/BC-342. This is essentially a field manual, but does provide useful circuit information as well as realignment procedures. More detailed physical and trouble-shooting information is found in technical manual TM-11-4002, which covers the BC-314/BC-344 models. The BC-312/344 models are covered in a separate technical manual, TM-11-4001.

As this is written, decent scans of the TM-11-850 and TM-11-4001, which were contributed by NJ7P, are available for free downloading at **www.pestingers.net/military_manuals.htm** . I haven't yet been able to locate a free source for the TM-11-4002, and will look into finding a downloadable copy or a source for purchase. The 4001, however, covers many mechanical details, and quite a few electrical ones, that are common to both the HF and LF series of receivers.

## ❖ First Impressions

The first thing one notices about the BC-344 is its heft! Sliding it out from its low storage shelf and lifting it up to the bench top was a project in itself. According to my TM-11-850 this baby weighs in at 61.5 pounds, including the removable FT-162 shock mount. The BC-314 battery-powered version is a little lighter (56 or 58 pounds depending on the version). The difference obviously stems from the difference in weight between the a.c. and dynamotor power supplies.

This is about the heaviest radio I've ever had to deal with on the bench. The BC-348 HF receiver restored earlier, being an aircraft set, was a feather compared to our current subject. Obviously we will not be able to casually slide this unit around to various positions at will. However, it should lose more than a few pounds after removal from its heavy steel cabinet.

The ID plate identifies this receiver as a BC-344-D. The manual lists just two variants of the BC-344: the "D" model and a model with no letter suffix. The latter looks to have been the more sophisticated, sporting a variable selectivity control acting on the first i.f. stage. Another

***Even without its cabinet, this radio looks quite impregnable.***

***What is essentially the entire right side of the radio (as viewed from the rear) had to be removed to gain access to the r.f. oscillator compartment.***

feature not shared by the "D" is the presence of oscillator compartment heaters. These were very likely thermostatically controlled and intended to make the oscillator frequency more independent of temperature variations.

The "D" model may have been a later version – stripped of the selectivity control and oscillator compartment heater to conserve materials or facilitate production. The only special notes for the "D" in the manual's feature list are that all audio jacks are connected to the second audio stage and that the antenna disabling relay also disables the first audio stage. We'll deal with these features later on in the restoration process.

## ❖ Peeking Inside

To remove the BC-344 from its cabinet, one backs off five knurled thumb nuts located at the corners and bottom center of the panel. When resistance is met, one backs off a little further, thus moving a latching arm out from under a projecting lip that runs the length of the cabinet inside both the top and bottom. The receiver is then free to be pulled out of the cabinet – or as free as it can be considering its weight

It turned out that one of my latch assemblies was defective. Apparently a previous owner had forced it so far counterclockwise that it overran its stop and now would unscrew all the way off its shaft rather than moving the latch. Luckily, the latch happened to be in the "open" position, so I was able to pull out the receiver without difficulty. I'm not sure, what, if anything, I'll be able to do to correct this situation.

My first thought after getting a good look at the removed receiver was "Where did all this dust come from?" Except for a few screened ventilation openings, the cabinet is very well sealed. Perhaps the set spent a long time open on somebody's workbench. However, it is mostly loose dust and there is very little sign of corrosion. It looks like I could get the set presentable with a small brush and a vacuum cleaner

My second thought was, "My gosh, how do I get into this thing?" The radio looked virtually impregnable, with every square inch of space occupied by some heavy metal assembly.

The power supply blocks access to the i.f. and audio tube sockets. The r.f. and detector tubes are mounted on a shelf above the three r.f. and detector compartments with no possibility of access below the shelf other than, I supposed, removing its mounting screws and tipping it up. The bfo and r.f. oscillator tubes are buried in their radiation-proof enclosures.

I had done enough reading to find out that the power supply could be swung out of the way on a heavy built-in hinge. That was reassuring. As far as the other issues are concerned, we'll have to deal with them as they come up. It will be necessary to make wholesale replacements of the paper and electrolytic capacitors in the radio, since certain types originally installed some 65 years ago are known, by reputation, to be either bad or ready to fail at any time.

## ❖ Some Help from YouTube!

Right around this time, I came across a two-part video on YouTube covering, of all things, the removal of the bandswitch compartments for the first r.f., second r.f. and detector stages of the BC-342 (the procedure is the same for the BC-344)! These contain capacitors that must be replaced.

To find the two videos, plug "BC-342" into the YouTube search engine or go to the "Dhalgren440" channel. And by the way, the videos do confirm that the r.f. and detector tube shelf can be readily tipped up after removing its mounting screws.

## ❖ Tube Testing and Partial Disassembly

Our next step was to remove and test all tubes. Where there are two or more similar types, the TM-11-850 manual suggests marking them so that they can be put back into the same sockets from which they came. Otherwise the set's alignment might be compromised. I did observe this nicety, using self-adhesive labels, even though I do intend to completely realign the radio.

In order to remove the CW and RF oscillator tubes, it is necessary to access their shielded enclosures. In the case of the CW oscillator, the entire enclosure could be slid off after removing a few screws and loosening a few others. In the case of the RF oscillator, loosening a couple of screws freed up a little trapdoor that could be raised to reach the tube.

With one exception, all of the tubes tested well above the meter reading considered acceptable in the tester data book. The exception was the second diode in the 6R7 triode-duodiode detector/first audio tube. That tested out at only half the acceptable reading. I'm not going to worry about it, however. When testing similar tubes in the past, I've often noted that one diode would test weak without compromising the operation of the radio.

I could have saved myself the trouble of releasing the trapdoor to the RF Oscillator compartment. Before closing shop for this issue, I decided to begin the disassembly necessary to access certain of the capacitors I knew I would have to change. One of those was in the oscillator compartment. To reach that, I had to remove essentially the whole right side of the radio (looking at it from the back), including the trapdoor.

See you next month, when we'll continue this project.

# "Sky-Wires & Inhalers"
## *Part 3: A Random Antenna?*

By Walter Lindenbach

"Ah ha, here he is," Bill sang out, "How's Chuck tonight? Come on in, take a pew, and behave yourself while I get the coffee."

Bill went to the kitchen and Chuck sat thinking: Last time, Bill had just said that we could *make* transformers. Then I made some impolite remarks at the clock because it was time to go when I was just about to hear about that! But what did he think we needed transformers for?

Bill came back in with two cups of coffee.

"Last time, just before I had to go, you said we were going to make transformers, didn't you?"

"Yes I did."

"Why?"

"Well, you had just figured out that, to get the radio signals that the antenna collects to the receiver, we would have to connect the antenna to a transmission line, and then connect the transmission line to the radio receiver. Remember now?"

"Oh yes, and the characteristic impedance of the antenna, the transmission line, and the receiver antenna input may all be different, so they have to be matched with transformers, yes?"

Bill nodded.

"Good! Let's make them."

Bill raised a hand. "Hang on a sec, ol' son. First, we have to know what the transformers are supposed to do."

"Well, of course. That should be easy. *Then* we'll make the transformers, okay?"

"Oh Man, have I got news for you!" Bill looked sympathetic. "How's the coffee?"

Chuck made a growling noise. "Fine, fine! Now come on! We know the characteristic impedance of the transmission line, don't we? It is RG 58 and the characteristic impedance is 50 ohms, right?"

Bill nodded again.

"Good. Now the antenna."

"Oh yes, now the antenna! First, we have to know what kind of an antenna we're going to use. Then we have to know the frequency at which we're going to use it."

"Didn't you mention a thing called a random-wire antenna a while ago? Can we start with that?"

"Sure we can."

"Maybe first you could tell me what it is."

"That's a very good place to start." replied Bill. "It's called 'random' because its length is not related to a wavelength. It's just the length that will fit the place where you can put it. That's not ideal, but living in a condo unit with a small balcony as you do, there isn't any other choice. Can you put a piece of wire on the balcony?"

"Well, if I'm going to listen to any shortwave, I'm going to have to, won't I? Yes, some insulating supports can be attached to the balcony railing, and a wire can be attached to the supports. But the whole business will have to be nearly invisible or I'll get squawks from the condo board."

"That's going to be a challenge. Do you have pigeons around your place?"

"Did you say 'pigeons', Bill? Are you going to ask next about the characteristic impedance of a pigeon?"

"Well," said Bill slowly, "this is going to sound silly, but it worked in one place. You can tell the condo board that the antenna is to keep the pigeons off your balcony."

"Aha! Not bad. It might work. But, I'll worry about that. Let's get on with the antenna."

"Okay, what is the length of the piece of wire that you can mount?"

"About 12 feet. You figure that's any good?"

"Sure it is. Not ideal, but that can't be helped. Now the wire. Use solid wire, thicker is better than thinner – probably not thinner than No. 18 – insulated or not, but be sure it is well insulated from anything else."

"Say," Chuck asked, "somebody mentioned that stranded wire is good for radio frequency connections. He mentioned something called Litz wire. How about that?"

"No, no," replied Bill, "not for antennas. Stranded wire has its uses, but not here."

"Just out of curiosity, why not stranded wire? Apparently Litz wire has less resistance at radio frequencies than solid wire."

"Oh, that's a long subject, Chuck. But briefly, stranded wire has more radio frequency resistance because of the skin effect and the proximity effect. Both are a result of the anti-social tendencies of radio frequency currents. By the way, Litz wire is not just ordinary stranded wire; it is many individual strands insulated from each other, and it is useful at frequencies up to, at most, 3 MHz."

"'Anti-social tendencies?' Is that what you said? You must tell me about that sometime. But not now. Could we consider any other kinds of antennas? I've heard of dipoles, folded dipoles, windoms, yagis – any use in these?"

"Use? Yes. For you? No. That's because of the frequency range that you want to listen to – 2 MHz to 30 MHz – and because of your space limitations."

"Okay, what's next? The lead-in?"

"Almost. Random wire antennas have lead-ins connected at one end. Then their radiation pattern – which, for a receiving antenna, means the sensitivity pattern – is like a funnel – *if they're long enough*.

### ❖ Which Way Do They Listen?

"So, let's begin with a single wire that is two wavelengths long at some frequency where you want to listen. It can then be called a Long Wire. Think of a funnel with the antenna wire going through the hole. We'd better have a look at that." Bill pulled a book[1] from the shelf.

"Well, that's pretty. Did you say 'funnel'? Looks more like a cloverleaf to me. What's this got to do with antennas?"

"This diagram shows where an antenna is most sensitive and where it is least sensitive. First, to understand it, we must think of a 'figure of revolution'. That means that, to get the full picture, think of taking this diagram between your fingers with one end of the antenna wire at your thumb and the other against your index finger. Then give one of the leaves of the cloverleaf a flick with your other hand to make it spin. Now, while it's spinning, you are looking at a figure of revolution.


***Figure 1: Long Wire Sensitivity Pattern***

"The antenna in this diagram is shown as a line so that you can see where it is. In fact, the antenna is just a point where the leaves all come together. The distance from that point to any point on the outline of the cloverleaf represents the sensitivity of the antenna in that direction.

"So, where is the longest line? It's from the point representing the antenna to the farthest point on the curve of the line representing one of the two largest cloverleaves. That means that in that direction – perhaps 30° from the direction of the antenna wire – the antenna is most sensitive. And since this is a figure of revolution, this most-sensitive direction can be thought of as a circle formed by the outer edge of a funnel whose diameter is such that the angle between the antenna wire and the surface of the funnel is 30°.

"Our diagram shows that there are other directions where the antenna is also sensitive. These are the smaller 'leaves,' and the sensitivity in these directions is – according to the proportions of the diagram – about one half, then one third, and then, perhaps, one tenth of the sensitivity of the direction of the longest line on one of the biggest leaves.

"Now, look at the direction in which the antenna wire itself is pointing, and tell me what the sensitivity is in that direction."

"Well," said Chuck, looking thoughtful,

"there isn't even a wee spike of a leaf in the direction of the antenna wire, so I suppose the antenna is not sensitive in that direction at all."

"Good. Exactly right. And then notice, that's true in both directions. So if you are using this kind of an antenna, you would not point it in the direction of the signal that you want to receive."

"But I can't use a wire that is two wavelengths long, can I?"

"No, not unless you want to listen to something at around 164 MHz."

"Ah bother! That's no good! I want an antenna that works in the HF band. Now what'll we do?"

"Well, we make do with your little 12 foot long piece of wire. At 30 MHz, it is about 0.37 of a wavelength long. And at 2 MHz, it is about 0.024 of a wavelength."

"If I'm right in the notion that antennas should be a significant fraction of one wavelength," Chuck sighed, "I'm in trouble."

"Nah, stop worrying!" said Bill, reassuringly, "Your notion is right. Antennas should be a significant fraction of the wavelength that you want to receive. A very good fraction is one quarter, but your 12 foot antenna gets there only at 20.5 MHz"

"Let's see what a 12 foot antenna looks like in the HF band." Bill took another book[2] from the shelf, and opened it to a diagram.

"This diagram is in the same form as the last; that is, we assumed that the antenna is a point at the center of the donut, and the longer the line that can be drawn from the center to the outer surface of the donut, the greater is the antenna sensitivity in that direction. Again, notice that, in the directions that the antenna points, there is no response at all.

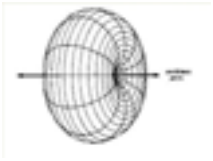

***Figure 2: Short Random Wire Sensitivity Pattern***

"Now, the response of an antenna such as you propose for your balcony with a lead-in at one end, has a response, even at the upper end of the HF band – 30 MHz – that is almost identical to the donut we just saw. Your condo unit balcony faces west, doesn't it?"

Chuck nodded.

"Then your random wire will be most sensitive toward the West – but also toward the East, and straight up and straight down, but not to the North or the South. That means that it will respond to all the noises that are generated in the building, by cars driving by on the road below, and by power lines overhead."

"Ah man, that's no good! Can we do anything about that?"

"We can't make the antenna directional. It's just too small for that. But, is there anything to be done with the short random wire antenna? Yes!"

## ❖ Leading in by Transforming

"The first thing to do is to arrange a connection to the lead-in such that it can be shielded. You will see antenna-and-lead-in arrangements described where a shielded cable is connected directly to an antenna. This arrangement may be okay for some kinds of antennas, but for the short random wire antenna – no."

Chuck wanted to know why not and how not to do that.

"We don't want to do that because the antenna is a high-impedance device and the shielded cable transmission line is a low-impedance device. How not to do that? With a transformer.

"Transformers are for three purposes. First, they isolate two circuits one from the other. It's clear that a circuit connected to the primary of a transformer has no direct connection to a circuit connected to the secondary.

"Second, it can correctly couple a balanced load to an unbalanced source. You know what that means?"

"Well," Chuck said dubiously, "…sort of. Let's suppose you tell me anyhow."

"Okay. An unbalanced circuit is one that is referenced to ground. That means that a signal voltage will become positive, return to zero voltage, become negative, and return to zero voltage *with respect to* ground, which is at zero voltage.

"Now a balanced circuit goes like this. When one conductor of a pair becomes positive, the other conductor becomes negative by exactly the same amount. Then the polarities change, the first conductor becomes negative and the second conductor becomes positive by the same amount. These voltages are all with respect to ground, which is at zero volts. That's the definition of ground: zero volts. Then we can say, with a balanced pair, that the sum of the voltages on the two conductors with respect to ground is zero. That's balance."

"Good, now what's the third purpose for a transformer?"

"Impedance matching. This may be the most important purpose of a transformer. To transfer power from one circuit to another efficiently, the impedances of the circuits should be equal. That means that, if you have a signal source with a characteristic impedance of 100 ohms, maximum power transfer will occur if it is connected to a 100-ohm load. If the impedances of the source and the load are different, efficiency of power transfer drops from a maximum of 50%. Some other things happen too, but that's a different subject."

Chuck had an "Aha" look. "So we put a transformer between the antenna and the lead-in cable so that the antenna impedance matches the 50-ohm transmission line to the receiver, yes?"

"Yes, but, as the donkey said when he surveyed his derrière, 'Thereon hangs a tail!'"

"Ooooh! That's awful!" groaned Chuck. "You're getting punchy. Maybe you could tell me the tail – er – tale next time, huh?"

"Yup, sure thing." Bill was smirking. "G'nite!"

"Thanks lots, Bill. G'nite!"

**REFERENCES:**


1: Fundamentals of Radio, Frederick Eamons Terman, page 377, McGraw-Hill Book Company Inc., First Edition, 1938.
2: The ARRL Antenna Book, The American Radio Relay League, page 2-17, 15th Edition, 1988.
3. Diagrams and graphs were prepared using National Instrument's program "Multisim," gratefully received from Analog Devices Inc.


4. Walter Lindenbach can be reached at *lindenbachw@shaw.ca*

# A Brief History of Amateur Radio Astronomy

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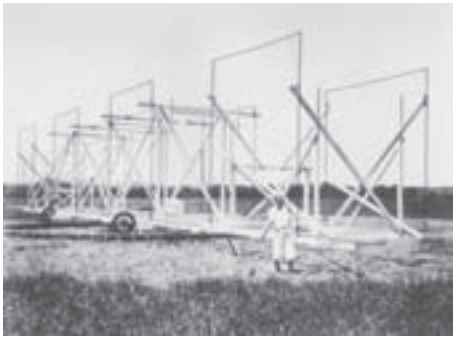
It wall began when Bell Labs wanted to investigate "short wave" (wavelengths of about 10-20 meters) sources of static that might interfere with radio voice transmissions for transatlantic radio telephone service. Karl Guthe Jansky was assigned the job of investigating.



He built an antenna, pictured here, designed to receive radio waves at a frequency of 20.5 MHz (wavelength about 14.5 meters). The antenna was mounted on a turntable which allowed it to rotate, thus earning the name "Jansky's merry-go-round." By rotating the antenna, one could find from which direction the RFI (Radio Frequency Interference) was emanating.

Over several months of recording signals from all directions, Jansky identified three types of static: nearby thunderstorms, distant thunderstorms, and a faint steady hiss of unknown origin.

Jansky spent over a year investigating the third type of static. It rose and fell once a day, leading Jansky to think at first that he was seeing radiation from the Sun. However, after a few months of following the signal, the brightest point moved away from the position of the Sun. The signal repeated not every 24 hours, but every 23 hours and 56 minutes. This is characteristic of the fixed stars and other objects far from our solar system.

He eventually figured out that the radiation was coming from the Milky Way and was strongest in the direction of the center of our Milky Way galaxy, in the constellation of Sagittarius.

## ❖ Grote Reber – A Continuing Fascination

Grote Reber was born in Chicago on December 22, 1911. He was a ham radio operator, studied radio engineering, and worked for various radio manufacturers in Chicago from 1933 to

***This picture of Reber is from "A Play Entitled the Beginning of Radio Astronomy," by Grote Reber, in The Journal of the Royal Astronomical Society of Canada, Vol.82, No.3, June 1988, page 93. This article is a delightful reminiscence about the author's early work in radio astronomy and that of Karl Jansky.***

1947 (www.nrao.edu/whatisra/hist_reber.shtml). Grote Reber learned about Karl Jansky's discovery (1932) of radio waves from the Milky Way galaxy and wanted to follow up on this discovery and learn more about cosmic radio waves. He wondered, were the waves coming only from the Milky Way, or from other celestial objects?

***The telescope (pictured above in Illinois and NRAO) was constructed by Grote Reber in 1937 in his back yard in Wheaton, Illinois (a suburb of Chicago). He built the telescope at his own expense while working full time for a radio company in Chicago. This shows the telescope as it was in Wheaton, Ill.***

What process produces the radio waves?

In the 1930s, Reber applied for several jobs with Karl Jansky at Bell Labs and with astronomical observatories to study cosmic radio waves, but none of them were hiring due to the fact it was the middle of the Great Depression. So, Reber decided to study radio astronomy on his own.

Reber built a parabolic dish reflector, because this shape focuses waves to the same focal point for all wavelengths. This principle had been used for a long time by astronomers for design of optical telescopes to avoid chromatic aberration.

The mirror, made of sheet metal 31.4 feet in diameter, focuses radio waves to a point 20 feet above the dish. The cylinder contains the radio receiver which amplifies the faint cosmic signals by a factor of millions, making them strong enough to be recorded on a chart. The wooden tower at the left is used for access to the receiver.

Reber knew that it would be important to observe a wide range of wavelengths of radiation from the sky in order to understand how the radiation was being produced. A parabolic reflector is usable over a wide wavelength range.

## ❖ Prediction of 21cm Line

During the years of WWII, the great Dutch astronomer Jan Oort learned of Grote Reber's discoveries in radio astronomy and realized that a radio spectral line would be an important tool for discovering the structure of our galaxy (**www.nrao.edu/index.php/learn/radioastronomy/radioastronomyhistory**).

Oort had spent many years studying the rotation and structure of the galaxy using optical means. He was frustrated by the extensive clouds of dust lying in the galactic plane, which block visible light. One can see only a few thousand light years towards the galactic center because the light of distant stars is absorbed. But radio waves will penetrate the dust and show us not only the galactic center but the opposite side of the galaxy. The importance of a spectral line is that the frequency of the line will be shifted by the Doppler Effect, which means that the velocity of the gas can be measured. One can then study the differential rotation of the galaxy and estimate distances to gas clouds, and thus map the distribution of matter in the galaxy.

Oort assigned his student, H.C. Van de Hulst, the job of figuring out what radio spectral

lines might exist and what their frequencies would be. Since hydrogen is the most abundant element in the universe, he started his studies with hydrogen. He found that a "hyperfine" transition in the ground state of neutral hydrogen would produce radiation in the radio range, at a frequency of 1420 MHz, or about 21 cm wavelength. In the ground state of hydrogen, the electron can have its magnetic moment either parallel to that of the proton, or anti-parallel. The parallel state has a little more energy, so a transition to the anti-parallel state results in emission of 21 cm radiation.

Van de Hulst's prediction was published in Dutch in *Ned.Tijd.Natuurkunde*, vol.11, p210, 1945. An English translation is published in "Classics in Radio Astronomy," by W.Sullivan, Reidel 1982.

Building a receiver to detect the predicted line proved to be a daunting task. Grote Reber began design of such a receiver in 1947, but set it aside because of changing jobs and moving to the east coast. Dutch engineers worked on the problem, but the first successful detection was by Ewen and Purcell at Harvard.

## ❖ Hydrogen Radio Emissions

In 1950, "Doc" Ewen was working 40 hours a week designing and building apparatus for the new cyclotron at Harvard. In addition, during nights and weekends, he was working on completing a doctorate in physics by building a receiver to detect the 21 cm line of neutral hydrogen, supervised by Purcell.

The original paper by Van de Hulst predicting the existence of the 21 cm line expressed doubt that the line would be detectable. A paper by Shklovski in 1948 was more optimistic. Ewen and Purcell assumed that the Dutch were probably not working on detecting the line and that the Russians might be soon. Ewen and Purcell could probably make the first sensitive detection attempt. It seemed likely that the experiment would yield a negative result, but they felt the experience would be worth the trouble and that a well defined upper limit to the 21 cm line emission strength would be important.

Ewen proceeded to design the horn antenna and the mixer and receiver, consulting with experts in these fields, including Sam Silver on antenna design and Bob Pound on mixers. The receiver used a frequency switching technique to cancel out background noise, a novel technique for astronomy at the time.

The whole project, from receipt of the $500 funding to detection of the line, took one year. Since the work was done on the weekends, the total time spent working on the project was 3.4 months (**www.nrao.edu/whatisra/hist_ewenpurcell.shtml**).

## ❖ The 3K Microwave Background

Working at Bell Labs in Holmdel, New Jersey, in 1964, Arno Penzias and Robert Wilson were experimenting with a supersensitive, 6 meter (20 ft) horn antenna originally

built to detect radio waves bounced off echo balloon satellites. To measure these faint radio waves, they had to eliminate all recognizable interference from their receiver. They removed the effects of radar and radio broadcasting and suppressed interference from the heat in the receiver itself by cooling it with liquid helium to −269 °C, only 4 °C above absolute zero.

## ❖ Bell Labs Horn

When Penzias and Wilson reduced their data, they found a low, steady, mysterious noise that persisted in their receiver. This residual noise was 100 times more intense than they had expected, was evenly spread over the sky, and was present day and night. They were certain that the radiation they detected on a wavelength of 7.35 centimeters did not come from the Earth, the Sun, or our galaxy.

After thoroughly checking their equipment, removing some pigeons nesting in the antenna and cleaning out the accumulated droppings, the noise remained. Both concluded that this noise was coming from outside our own galaxy – although they were not aware of any radio source that could account for it.

The cosmic microwave background hails from the earliest observable event in the history of the universe. Although the original temperature of the cosmic microwave background was much higher, the expansion of the universe has cooled it to its present value of 2.7 degrees Kelvin.

Though more than three decades have passed since Penzias and Wilson's discovery, the significance of their finding remains as great now as it was then. It provided a new tool for exploring the early universe.

A few years ago, NASA sent the Cosmic Microwave Background Explorer (COBE) satellite into orbit to investigate the cosmic microwave background in great detail. The principal scientist of the COBE mission, George Smoot, said, "There is no doubt that Penzias and Wilson's discovery of the cosmic background radiation marked a turning point in cosmology." (**www1.bell-labs.com/project/feature/archives/cosmology/**)

## ❖ Jumping Forward

On a personal note, my launch into Radio Astronomy (1964) came when I stumbled across a book called, "Radio Astronomy for Amateurs" by Frank W. Hyde, published in 1964. My basement became a depository of electronic receivers, old TV parts and boxes full of all sorts of electronic "stuff." I had big ideas, but did not have the full knowledge of how to put it all together.

Before 1970, I was not really aware of any amateur efforts except for Bill Maggio of Dix Hills, Long Island. Bill (my original mentor), was the only person I knew who was doing active Radio Astronomy, 365 days a year. In addition, Bill originally designed some of the receiving equipment for the Arecibo Radio Telescope in Puerto Rico.

It all came together for me after leaving the military and the training I received in electronics and missile systems at the Marshall Spaceflight Center, Huntsville, Alabama.

My first interest was observing solar radio bursts (1971-1974) which, in conjunction with visual observations, gave me more understanding of solar activity and processes. After relocating to South Florida (1974-1979) and teaming with Robert M. Sickels (my second mentor and good friend), I did much more research on galactic radio astronomy. During those years, Bob and I wrote the first US book on Amateur Radio Astronomy called *The Amateur Radio Astronomers Notebook*.

Early in 1981, I founded the Society of Amateur Radio Astronomers **www.qsl.net/SARA/** This was an attempt to unite all amateur radio astronomers into a viable group of US and International members, for the purpose of doing research and mentoring others wishing to learn more about Radio Astronomy. Over the years, this group has met once a year at NRAO (National Radio Astronomy Observatory), located in Green Bank, West Virginia.

At these three-day-long conferences, attendees are housed in modern rooms and are fed by a wonderful staff in the NRAO cafeteria. Also, there are social gatherings during the evenings in the lounge. I spent many hours deep into the early mornings, talking and enjoying the company of fellow Radio Astronomers. For those who want to study, the technical library offers a large selection of books on physics, radio astronomy and related subjects.

Amateurs meet in the new Science Center to report on their research programs. In addition, the members get to "rub elbows" with the staff at NRAO, gleaning professional guidance. Also, members tour the facility, gaining entrance to radio telescopes, such as, the GBT (Green Bank Telescope) and, training and actual hands on use of a 40 foot radio telescope. All this is combined in a friendly, constructive, non-intimidating atmosphere (**www.radio-astronomy.org/**).

In addition, the RAG (Radio Astronomy Group) of the BAA (British Astronomical Association) is very active, friendly and is engaged in great research (**www.britastro.org/info/radio.html).** Similar to SARA, this group is based in Great Britain and also has a world wide based membership. They have a high level of activity for teaching those new to the realm of Radio Astronomy.

**Acknowledgments:**
National Radio Astronomy Observatory Archives
The Journal of the Royal Astronomical Society of Canada, Vol.82, No.3, June 1988, page 93.
Wikipedia
Bell Labs

# Roberts Revival R250 AM/FM/LW Analog Radio

By Jay Allen

Although the name Roberts Radio might not be as familiar to Americans as some other brands, it is one of the longest lived, best known British radio companies of all time. It was founded in 1932 by Harry Roberts and is still operating today.

From the very beginning Roberts built its reputation on quality designs and workmanship and eventually earned three Royal Warrants, signifying that its products were provided to the British Royal Family. Imagine Robert's sense of pride when he received a letter from Harrods, a British Department Store, informing him that Her Majesty the Queen had purchased a Roberts M4D for her personal use and that she had previously bought another as a present for Princess Elizabeth!

Fifteen years later in 1955, Roberts Radio Co. Ltd was listed as "Radio Manufacturers to Her Majesty Queen Elizabeth II," and again in 1957, samples were requested in various color options for Buckingham Palace. The tradition of Roberts Radio in Great Britain is thus one of pride and honor.

Yet Harry Roberts was no conservative British businessman. He was, in fact, a master at devising clever ways to generate free publicity. One of his marketing strategies was to offer many so-called "specials" which were regular production radios offered in varied, sometimes outrageous coverings. Examples included a wildly expensive R200 in a solid-gold case. That one achieved worldwide newspaper coverage, but I have often wondered how the gold case affected reception.

Other specials included a mink-covered RT-1, as well as versions in pony skin, leopard skin, and suede with jewels. Many others were produced in a huge array of colored fabrics and sold as limited editions. Even today, Roberts offers the Revival Radio in the UK in *fourteen* color choices as well as real leather or vinyl.

Naturally, Roberts also made good use of celebrities, who were often photographed holding Roberts portable radios. However, as is stated on the company's UK website, the most valuable publicity came simply from demonstrating how good the product was. In may 1959, Roberts received a request from St John's College, Cambridge, for a compact, battery-powered short-wave set to be provided for the Cambridge Colombian Expedition. Roberts asked for a mention in the expedition's general report in lieu of payment, and an RT1 transistor set was hurriedly modified to include short waves. It won high praise by performing impeccably throughout the expedition, despite being buffeted about on a pack-mule and exposed to extremes of altitude, temperature and humidity.

Those who love vintage radios and their history will see a similarity between Zenith's founder Commander Eugene McDonald and Harry Roberts, both of whom were radio enthusiasts and salesmen who knew how to make their excellent products look good before the public.

From its beginnings in radio's infancy to the present day, Roberts has offered a huge range of radios, some of which are rebranded radios manufactured elsewhere and some of which are still manufactured exclusively by Roberts.

*Lighted Dial with European Markings*

*C.Crane Roberts Revival R250 in British Racing Green*

## ❖ Revival R250 Available in North America

The Revival R250 is a Roberts exclusive that is now being distributed here in North America by C. Crane Company under the Roberts name. It is a beautiful radio. With '50s retro styling and a classic wooden case covered in genuine leather, this is a fully analog set covering longwave, mediumwave (AM) and FM. C. Crane imports it in four colors as of this writing: Caramel Tan, British Racing Green, Blue and Yellow.

The Revival R250 is based on Roberts first transistorized portable from 1958, the aforementioned RT1. The C. Crane version features the expanded AM band up to 1710 kHz, which is not available on the European version. It has a Sangean-branded UL listed AC Adapter (120 volt AC to 6 volt DC 400 ma) for use in the U.S.

C. Crane points out, "someone accustomed to a (traditional analog) dial might really enjoy this." I count myself among them, and to the best of my knowledge the Roberts Revival is the only high quality fully analog portable radio currently being produced and it is for that reason I had to own one.

## ❖ Isn't Analog a Step Backward?

Yes it is, but sometimes taking a step backward is a good thing. Let me explain.

At one time, before digital tuning became commonplace, all radios were analog. I am referring here to digitally tuned radios which have been available since the 1980s, not today's digital broadcasting or HD radio, which is a completely new technology.

Analog radios generally employed variable capacitors and

*continued on page 72*

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tuned continuously, within specified bands, with a simple knob. Performance varied all the way from top notch or military grade receivers all the way down to the cheapest pocket radios. You twisted the tuning knob back and forth to home in on the best signal.

It was simple, mostly intuitive, but sometimes it left you guessing as to exactly what frequency you were tuned to. Thus, when digital radios with PLL (Phase Locked Loop) technology burst on the scene in the '80s, they pushed analog radios to the curb. Now you could punch in a specific frequency precisely, and even if you scanned the dial, you still had digital readout, so there was no more guessing about what frequency you were tuned to.

In addition, there was no more drifting of the tuned frequency. PLL technology guaranteed you were locked in. Many other features became possible, too, as digital radios evolved into mini-computers, using software to control everything from presets to clock and timer functions, and nowadays DSP (Digital Signal Processing) to achieve all sorts of signal manipulation. Preset memory tuning and scanning existed on earlier analog radios, but required complex mechanics to accomplish. Digital was a fantastic breakthrough and most of us would never want to do without our digital radios today.

But there was also a downside. Many early digitally-tuned radios did not perform as well as their analog forbearers. The very digital circuits and displays, which made all sorts of new features possible, also generated a hash-like noise which degraded reception. And even the act of manual tuning was often hindered by inter-station muting or spurious noises, as the circuitry jumped from one signal to the next.

Although most of these problems have since been resolved with more modern designs, many radio enthusiasts cling to vintage analog radios for their natural feel and simplicity. As a collector of vintage radios I can attest to the fact that they are lots of fun to use and there's just something that seems "right" about an analog radio to an old radio guy like me.

When I heard that C.Crane was offering the Roberts Revival Radio R250, I saw it as a unique chance to go back in time to own a beautiful *new*, old-style analog radio. Heck, I could skip a few lunches to help pay for it. Who needs those calories anyway?

## ❖ Opening the Box

I'll be honest: I was in love from the moment I opened the box. As advertised, the leather smell transported me right back to "the old days" when most portable radios came with leather carrying cases or were available in leather versions. I am lucky enough to own a few vintage leather radios, and they are beautiful to behold, but to be able to buy a *new* radio in genuine leather is a rare treat.

The Roberts Revival has instant eye appeal and it also has a very nice, solid feel. Another feature that struck me instantly was that, even on battery operation, the dial light is on whenever the radio is on. While this slightly shortens battery life, it is nevertheless specified as lasting 170 hours on a set of four alkaline D cells, which is not bad at all, and it is very appealing to have the dial always illuminated. That's a feature I have long wished for in other battery operated radios.

Although the dial scale does not give any indication of it, the C. Crane version does indeed tune to 1710 kHz on AM as specified. The radio sports the same dial scale used on the European version, which only tunes to 1620, but evidently for the U.S. they stretched the coverage with a circuit tweak. The C. Crane supplied owner's manual is a reprint of the Roberts original, incorrectly specifying the AM coverage out to only 1620 kHz. It also specifies an "AC Mains" voltage of 230 volts, but be assured the C. Crane version is supplied with a 120 volt power supply.

I must admit I love old analog radios with interesting dial scales and the Roberts Revival dial scale has lots of visual appeal. It is distinctly British with designations representing the 9 kHz AM channel spacing used in Europe. Thus it is marked for medium wave (AM) at 522, 603, 702, 801, 1008, 1206, 1404 and 1602 kHz. It also sports country and station markings such as Allouis (France), R. Scot, Eire (Ireland), and (BBC) World Service; designations which many European radios featured back in the late '50s and early '60s. Very cool indeed! And don't forget those Royal Insignias. It is intriguing to know this same radio is used in Buckingham Palace!

## ❖ But How Does It Perform?

In a word, very nicely indeed. Although not a boombox by any means, the sound is pleasant and well balanced – perhaps "polite" as the British might say. It also has good volume; not a surprise, given the solid wooden cabinet and 800 ma audio power output. The two-position tone switch is helpful as well.

There is an unusual internal duct about an inch in diameter running front to back. This is to vent the cabinet to augment bass response and eliminate cabinet rattles. Most radios have air vents on the back for this purpose, but with its solid leather-covered back, Roberts found an innovative way to vent the cabinet via the front grill with the use of this duct; very clever indeed!

Characteristic of vintage analog radios, only the essential controls are provided: rotary on/off volume and tuning knobs, three band selector buttons, and the tone control button. Rounding out the amenities are a 1/8" mini earphone jack, a DC input jack and the FM rod antenna.

The Roberts Revival is not designed to be the hottest DXing portable you can find, but it is definitely a radio for the listening enthusiast, especially if you love good old analog radios. Nevertheless I was pleasantly surprised that reception is very good on AM and FM, better than many radios I have.

LW is not used for broadcast here in the US, but enthusiasts occasionally catch navigational beacons or possibly transatlantic reception if they are in a good location for that. But for AM and FM, if you like to tune around to see what you can find, you will love this radio. As I tuned up and down the AM and FM bands, all of the weak signals I use for checking radio performance were there, somewhat to my surprise. To be sure, there are more sensitive radios that will pull in weak signals with a bit less background noise, but generally I found reception to be very good with all the usual signals I am accustomed to hearing in my area booming in loud and clear.

I also experimented with a small passive loop antenna. I used a Terk Advantage AM loop, but there are many small passive loops that work equally well. If you do want to improve very weak signal sensitivity, the Roberts responds very well to such a loop. Reception of very faint out of town signals became very listenable and impressive.

But down and dirty sensitivity is not what the Roberts Revival Radio is all about. What it *is* about is nostalgia from a time when analog radios reigned and were just plain fun. With its combination of solid feel, beautiful leather, an intriguing lighted dial, and striking retro European design, the Roberts Revival R250 is simply a fun radio to own. To a diehard analog man like me, it is a keeper!

## ❖ Where can I get one?

The Roberts Revival R250 is available for $199.95 from C. Crane Company, Inc., 1001 Main Street, Fortuna, CA. 95540, (800) 522-8863, or on the web at **www.ccrane.com**. You can read more about the history of Roberts Radio, as well as view their huge line of products on their UK webpage: **www.robertsradio.co.uk/index.htm.**

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# What's NEW

**Tell them you saw it in Monitoring Times**

## The NRC AM Radio Log 2009-2010, 30th Edition

We are now deep into the fall/winter DX season, and one of my favorite places to prowl is the AM medium wave broadcast band. It also means that one of my favorite annual radio publications is again available for purchase – *The NRC AM Radio Log*.

Formerly known as the *National Radio Club Domestic Log*, the first edition of this annual favorite was published by mimeograph and the stencils were hand-typed in Boston by the legendary AM radio hobbyist John Callarman. Since that first edition (which I still have, by the way), the *Log* has gone from its early, crude roots to today's sleek professional pub-


lication produced by Wayne and Joan Heinen.

This 2009-2010 30th annual edition of the National Radio Club's *AM Radio Log* contains approximately 290 pages in 8-1/2-inch by 11-inch size, 3-hole punched, loose leaf format, so you can put it neatly into a 1-inch three ring notebook.

AM band radio stations from the United States and Canada are listed by frequency, including the expanded (X-band) from 1610-1700 kHz. Each station listing consists of its operating frequency, callsign, location (city and state of license), time zone, antenna and transmission power, mailing address and daytime telephone number, hours of operation, broadcast format/networks, and much more.

There are also cross reference listings by city and callsign, as well as a list of stations conducting AM stereo operations.

Recent additions to the log lists call letters of FM simulcasts, listings of regional groups of stations in the groups section (separate section of the log book) and a cross reference of those stations that are licensed to use IBOC (In Band On Channel) digital audio. There are nearly 8,000 updates that are new to this edition since the 29th edition was released in the fall of 2009.

The *NRC AM Radio Log* is available from several radio dealers and directly from the club website at **www.nrcdxas.org/**. This publication lists for $25.95 (non-NRC members) and $19.95 (for members). New York residents will have to add sales tax. Canadian and overseas rates are as follows:

| | |
|---|---|
| Canada: Member | $24.00 |
| Canada Non-Member | $29.00 |
| Outside US/Canada Overseas [Member or Non Member] | $33.00 |

You can also get additional information or send orders via mail to: National Radio Club Publications, P.O. Box 473251, Aurora, CO 80047-3251

The *AM Radio Log* is the most accurate source on AM radio stations in the United States and Canada. If you tune the AM broadcast band, you need the *AM Radio Log*. Quite frankly, no self respecting AM DXer or listener should be without this superb publication on his or her radio room bookshelf.

## Klingenfuss 2010 Products Set for a December Release

Joerg Klingenfuss will be releasing his next round of radio hobby products for 2010 on December 10. The new products to be released include:

- 2010 Super Frequency List on CD
- 2010 Shortwave Frequency Guide
- 2010 Frequency Database for the Perseus LF-HF Software-Defined Receiver
- Supplement January 2010 to the 2009/2010 Guide to Utility Radio Stations

The printed Supplement will be attached free to all copies of the *2009/2010 Guide to Utility Radio Stations* sold after 1 January 2010. Those customers that acquired the *2009/2010 Guide to Utility Radio Stations* before that date may download the pertinent .PDF file free from the Klingenfuss website, after 1 January 2010.

The continuously updated product digital data decoder screenshots on CD is highly successful and now covers more than 7,000 (seven thousand!) screenshots from 1997 to today. Feed your PC with this CD and the "slide show" will keep you busy for a few days or maybe even weeks.


We will have more on these quality products here in *MT* after they are released later this month. In the meantime, you can get additional details on Joerg's website at **www.klingenfuss.org/**.

## My Marconi Shortwave Crystal Set Kit

The My Marconi Shortwave Crystal Set Kit is an offshoot of the popular "My Marconi 2106" AM Band Kit. This shortwave set is described in some detail in the September 2009 issue of the Xtal Set Society Newsletter. It features a single-tuned front end followed by a two-transistor audio amplifier, and accepts a dual-earphone assembly or high-Z headphones. The set is reasonably selective for having only one tuned circuit.

The set covers the 49 meter band, with selected tuning from 4.8 to 6.5 MHz and from 5.9 to 7.5 MHz. The LC "tank" circuit utilizes a 365 pf air variable capacitor and a fixed capacitance network with a 7 uH cylindrical coil wound on a 1.95-inch form as the tuner. A small secondary coil, wound on the same form, is used for antenna pickup.

A 10 mil thick Lexan plastic sheet, with screened black and white graphics and peel-off adhesive on the back dresses up the front panel.

The kit includes: chassis, front panel with lexan and graphics, side rails, metal and nylon hardware, power switch, 1/4-inch phone jack, large pointer knob, a 365 air variable capacitor, two earphones, necessary resistors, capacitors, and transistors, wire, audio amplifier printed circuit board, and 20 page manual (including step-by-step assembly instructions). Assembly time is less than 2 hours for the average builder.

If you wish to wrap a case around the set, a cabinet kit is also available. Simply screw it together, paint it, and slide the radio in! Case dimensions are: Top: 8.25 x 7 x 0.75 pine, Two Case Sides: 7 x 5.875 x 0.75 pine, and Beveled Case Bottom: 11 x 8.5 x 0.75 pine.

This kit is ideal for second-set builders and those interested in learning more about antenna matching, coils, tank circuits, diode detection of AM radio signals, and building a simple, fun and effective short wave set.

The My Marconi Shortwave Crystal Radio Kit (XS-MMSW) costs $69.95 plus shipping and handling. Orders may be placed by phone (405-517-7347) or via their website at **www.midnightscience.com**. For additional information on their ultrasonic offerings, visit **www.midnightscience/ultrasonics** or email them at *xtalset@sunflower.com*.

## MFJ Releases a Pair of Trunking Scanners

MFJ has released a new product, the MFJ-8322 analog handheld trunking scanner. It tunes the 800 MHz public service bands and "trunks" analog Motorola (type I, II and hybrid), EDACS Wide and LTR systems.


The MFJ-8322 has an alpha display, so you can program the name of the talk group ID you are receiving and know exactly what you are monitoring when it comes up in the display. This is not for scanning digital trunked systems.

The MFJ-8322 handheld also tunes all the VHF and UHF bands, and has all the important features just like the new MFJ-8310 desktop scanner (see below). This handheld stores up to 1,000 frequencies, maximum 10 trunked systems, and up to 1,500 total talk group IDs. Enter your county FIPS code and hear only NOAA "SAME" alerts for your county.

The Spectrum Sweeper mode in the MFJ-8322 rapidly searches for local transmitters of unknown frequency, finding, tuning and monitoring a nearby transmission in roughly 3/4 second. You can also lock out the undesired frequency and search again – this cannot be done by competitive scanners.

PC programming of the scanner is also available using third party software. Accessories for this scanner include a BNC antenna connector, flex antenna, and AC adapter/ charger. It requires four AA Alkaline or NiMH batteries; NiMH charge automatically to full charge in the scanner when the adapter/charger is attached. Other features include on/off/ volume control and squelch control, 3.5 mm headset jack.

The other scanner release from MFJ is a desktop scanner – the MFJ-8310. This analog-only, non-trunking scanner lets you monitor your favorite 2-meter, 70cm and even 10-meter and 6-meter repeaters, plus repeater inputs and local simplex frequencies, NOAA weather broadcasts, both VHF and UHF business bands, commercial aircraft, the marine band, FRS/GMRS frequencies and more. Like the '8322, the MFJ-8310 decodes digital "SAME" codes: enter your county FIPS code and the MFJ-8310 will only alert when severe weather is for your county.

This scanner has 200 memory channels and a 40 channel-per-second scanning rate. Lock-out and lock-out-review lets you temporarily lock out an undesired frequency. The scanner uses the patented "Zeromatic" tuning meters to adjust for best signal clarity.

Other features and accessories include a BNC antenna connection, generous backlit LCD, front panel on/off switch with separate volume and squelch controls, 3" speaker, and 3.5mm headset jack for private listening. Included are a pull-up BNC antenna and 120VAC to 9VDC adapter. The scanner measures a compact 8 1/4W x 6 7/8 x 2 3/8 inches and weighs just 24.3 ounces.

The MFJ-8322 handheld scanner sells for $199.95 and the MFJ-8310 desktop scanner sells for $99.95 plus shipping and handling. These scanners are available from the MFJ website at **www.mfjenterprises.com/**. Both of these scanners are made for MFJ by GRE.

## MFJ Purchases Cushcraft Amateur Radio Antennas

And finally, speaking of MFJ Enterprises, Inc., they have purchased Cushcraft Amateur Radio Antennas from Laird Technologies, St. Louis, Missouri.

"We are excited to have the Cushcraft Amateur Radio Antennas name alongside our other five companies," said Martin F. Jue, President and founder of MFJ Enterprises, Inc. "This product line increases our ability to offer our customers a wide range of antenna options at different prices. Customers will be able to choose from Cushcraft Amateur Radio Antennas, Hy-gain and MFJ antennas through one source."

Cushcraft Amateur Radio Antennas will bring over fifty new products to MFJ's impressive amateur radio product line. Cushcraft Amateur Radio Antenna products have long been a popular source for a wide range of HF/ VHF/UHF vertical, beam and Yagi antennas for the amateur radio community.

"We will add more new products to this antenna line and will continue the Cushcraft Amateur Radio Antennas name long into the future. Cushcraft Amateur Radio Antenna customers will appreciate the continued and expected top-quality manufacturing of this product in New Hampshire and the MFJ commitment to superb after-the-sale service and tech support in Mississippi," said Martin Jue.

## INDEX OF ADVERTISERS



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