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# Monitoring Times®

A Publication of Grove Enterprises

Volume 30, No. 8
August 2011
U.S. $6.95
Can. $6.95
Printed in the United States

# Monitoring Disaster Communications

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**In this issue:**

- Chasing FM-DX
- MT Looks at e-Readers
- World of Weird Antennas

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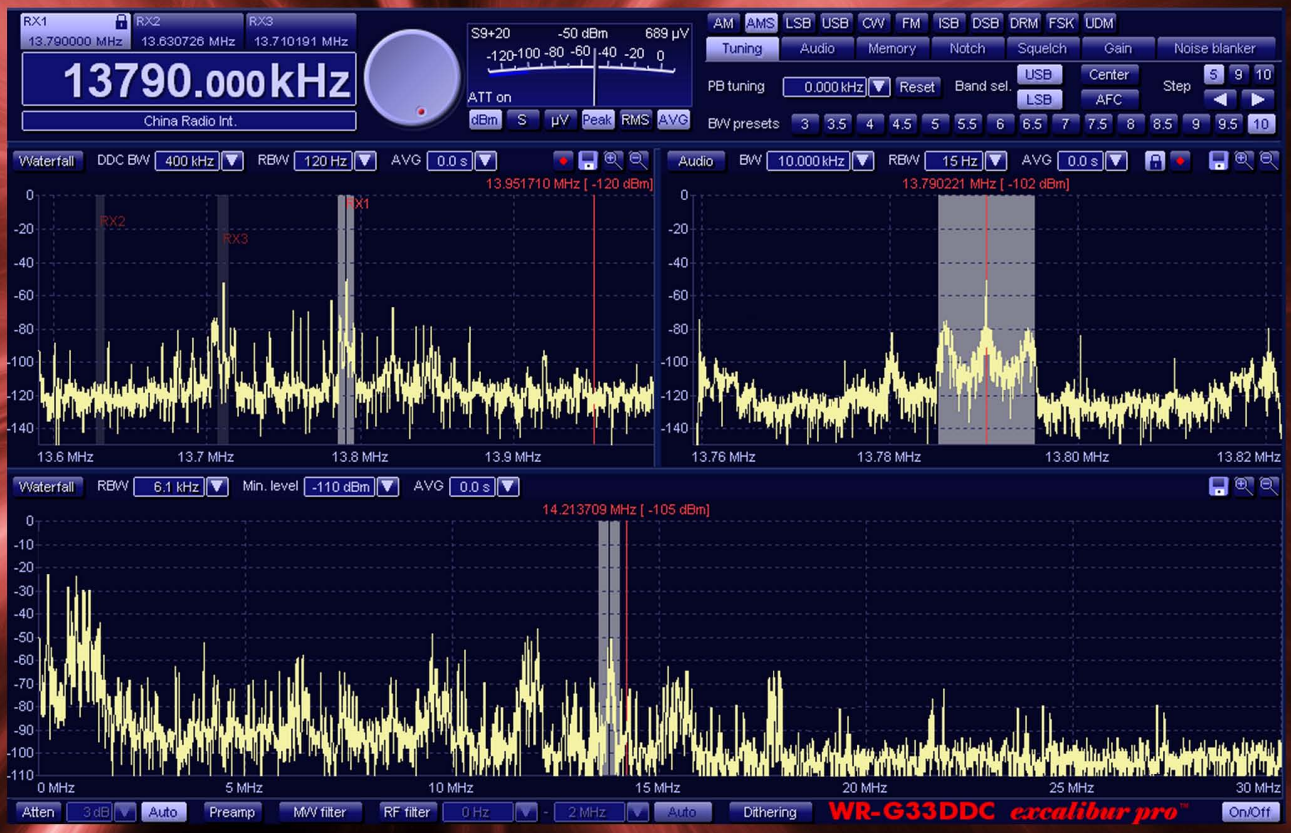


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Monitoring Times

Vol. 30 No. 8 August 2011

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## Monitoring Disaster Communications

**By Chris Parris**

The catastrophe that struck Japan's northeast coast this year came without warning. Between the damage inflicted by the earthquake and the unbelievable effects of the tsunami that followed, the area will be years, if not decades, in recovery. This year, in the U.S., we've seen crippling winter storms, horrific tornado damage and find ourselves now at the sixth anniversary of the formation of Hurricane Katrina, one of this country's greatest natural disasters.

MT's Fed Files columnist, Chris Parris, ponders the issues involved in trying to prepare for such emergencies; what happens to infrastructure, including radio communications, and what a person possibly at the center of such a scene might do to find out what's happening and where.

If you live in an area prone to earthquake, hurricanes, tornadoes, or severe winter storms, Chris has some advice on what to do before the worst happens.

*On Our Cover*

*In the aftermath of Hurricane Katrina the Federal Emergency Management Agency (FEMA) erected portable communications towers such as this 100 foot tower to replace the Jefferson Parish Sheriff's Department tower which was toppled by the storm. (Marvin Nauman/FEMA Photo)*

# C O N T E N T S

**World of Weird Antennas ..... 11**

**By Mark Haverstock K8MSH**

It's a wireless world and that means antennas everywhere. But, many Americans have a schizophrenic attitude about antennas. They want the convenience of the services antennas bring, but their eyesight is offended by the presence of those very antennas. Mark Haverstock K8MSH looks at the many ways antennas can be disguised and the strange shapes that specialty antennas require. From cartoon rabbit ears to a plywood buffalo, there's a world of weird antennas out there!

**DXing the FM Band in a Translator/booster World.... 15**

**By Ken Reitz KS4ZR**

The landscape of America's FM band has dramatically changed over the last 10 years and FM DX has been severely hampered. Thousands of new transmitters have cluttered up the once wide open, static-free, high fidelity band to which audiophiles once retreated to hear beautiful music. It's never been harder to pull in distant FM signals, but the good news is that it's still possible.

**Reading MT on an iPad ..... 17**

**By Gordon Bousman NW7D**

Longtime MT reader Gordon Bousman NW7D travels a lot (200,000 miles a year!). He explains how he takes MT, and many other books and magazines, with him on trips without adding any extra weight to his briefcase. And, on flights with Wifi, he can even explore the hot links in the articles and ads, just as he can at home.

**MT Looks at e-Readers ..... 18**

**By Bill Grove**

With the swarm of digital devices constantly inundating the market, it can be a daunting task to decide which ones are just a fad or which ones hold merit. E-book readers are one of those devices that seem to be gathering quite a following. But are they just a fad or are they something that you should consider adding to your repertoire of gadgets and gizmos? Bill has the answers.

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**Apple TV – Let it change your life ..... 68**

**By Loyd Van Horn, W4LVH**

If you want to combine streaming audio or video from your iOS device or computer with your home entertainment system, Loyd explains how much easier Apple TV makes everything. For $99 he can't think of a more practical and useful device to add to your home entertainment system.

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*MONITORING TIMES* (ISSN: 0889-5341; Publishers Mail Agreement #1253492) is published monthly by Grove Enterprises, Inc., Brasstown, North Carolina, USA.

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Subscription Rates: $32.95 in US; $42.95 Canada; and $58.95 foreign elsewhere, US funds. Label indicates number of issues left. Renewal notice is cover sheet 3 months before expiration. *See page 76 for subscription information.*

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# COMMUNICATIONS

by Ken Reitz

## SHORTWAVE/AMATEUR RADIO

### Commando Solo on HF over Libya

The USAF EC-130J aircraft, known as *Commando Solo*, is airborne and getting HF airtime over Libya during on-going NATO operations there. Frequencies reported by various monitors (*MT* Assistant Editor Larry Van Horn's **http://mt-milcom.blogspot.com** and French language **http://signal-monitoring.blogspot.com**) are updated on those websites as reported. Hugh Stegman NV6H, *MT's Utility World* columnist, reports there is little chance for stateside reception, but listeners on the East Coast around 6:00 a.m. would have the best shot.

***Commando Solo EC-130J is in the air and on the air in support of NATO operations in Libya. (Courtesy: USAF Special Operations Command Public Affairs Office)***

The aircraft, according to the public affairs office for the USAF Special Operations Command, is equipped to provide, "information operations, psychological operations and civil affairs broadcasts in AM, FM, HF, TV and military communications bands." The aircraft has an altitude ceiling of 28,000 feet, cruises at 335 mph, has an unrefueled range of 2,300 nautical miles and a crew of 11, including five electronic communications systems operators.

### BBG to "Sunset" Shortwave

In early June the government watchdog group **http://governmentattic.org** (actual motto: "Rummaging in the Government's Attic") forced the release, through a Freedom of Information Act request, of the Broadcasting Board of Governors' *2010-12 BBG Technology Strategic Plan*, a 174-page plan for the future of technology at the BBG which is in charge of operating the Voice of America, Radio Free Europe, and Radio Free Asia, as well as Radio and Television Martí. This document is not to

***Voice of America satellite TV feed. (Courtesy: Ken Reitz KS4ZR)***

be confused with the *BBG 2008-2013 Strategic Plan,* a 13 page document setting out a five-year plan previously available on the BBG web site.

As might be expected *The Plan* focused on changing the way State Department information is disseminated around the world and it's nothing new: Out with shortwave and in with IT. According to the document, we are currently in Year 2 (June 2011-June 2012) which calls for BBG to, "initiate the deployment of the SW sun-setting strategy developed during the first year of *The Plan*." This simply confirms the budget slashing moves away from shortwave and into brokered local AM/FM broadcasts, Internet streaming, pod-casting and social networking.

The report was authored by André Mendes, director of engineering and technical services for the International Broadcasting Bureau, who insisted, in a response published in *Radio World Online*, that "Shortwave will remain an important medium for the BBG where it is a viable one, but its use will be driven by audience habits and the relative costs of transmission." He reports that, with regard to shortwave broadcasts to China in Mandarin, the audience was estimated to be only one percent of the population (a scant 13 million listeners). No survey methodology in arriving at this number is referenced in the report.

Among the more interesting aspects of the report is the switch to "interactive" media from the traditional one-way broadcasting of shortwave. "Audiences today want to give their feedback and generate their own content," the report notes. Another aspect is the changing global demographics of media users. For instance, people aged 15-24 in Indonesia, China and Vietnam who were asked, "Which communications channel could you not live without?" Across the board only one percent said radio, according to the report. Again, no survey methodology is given.

*The Plan* includes sweeping technology changes in great detail, including adoption of cloud computing, MPEG4 HD technology for its satellite feeds; advice on proper cabling of routers and the use of "virtual sets," blue-screen backdrops that allow producers to customize news desks and studio backgrounds (including "virtual plants") at very little expense.

The report is highly critical of staff in all directions at one point citing "blurry lines of responsibility, finger pointing, morale issues and lower overall performance" under the sub-heading "Organizational misalignment, dysfunction, and behavioral issues." Heads will roll.

It's easy to see why this document was under wraps for so long. It doesn't paint a flattering picture of an important tool of U.S. statecraft, but it's difficult to see what the result of this plan will be. No doubt many entrenched supporters of shortwave will find sympathetic ears in Congress who will miraculously find the funding to continue many projects this report was designed to kill.

### RNW Budget Slashed (Again)

Andy Sennitt reports on his blog (**http://blogs.rnw.nl/medianetwork**) that government cuts to Radio Netherlands Worldwide (RNW) will leave the RNW International budget with one-quarter of its previous funding. "The new plans outlay a shift in focus towards providing news and information to regions where press freedom is limited. Dutch-language programming would be largely scrapped, keeping only RNW's function as an emergency broadcasting station in the event of disasters for Dutch nationals abroad."

## AM/FM/TV BROADCASTING

### Cord-Cutters Growing/ Shrinking?

Two surveys out this past spring tried to quantify the question of cord-cutting, the fanciful term given to cancelling cable and satellite-TV subscriptions: Is it happening or not? A Consumer Electronic Association (CEA) survey released at the end of June indicated that only 10 percent of those surveyed planned to "cut the cord" to their cable or satellite TV service and pegged the total number of U.S. households relying solely on Over-the-Air (OTA) TV at eight per cent, a declining trend, according to the CEA survey.

But, a competing survey from the Knowledge Network, cited in a March 15 article in *Ad*

*Age Mediaworks*, indicated that 17 percent said they had already cut back or eliminated cable or satellite TV service and further put the number of OTA households at 15 percent, a substantial discrepancy.

The CEA survey dismissed reported increases in OTA antenna sales as simply not happening, insisting instead that, "The cord that's being cut is the one to the antenna." The CEA is a supporter of the FCC push to ask OTA TV stations to vacate their assigned spectrum to allow a new wireless TV industry to take over.

Another bit of related information is also of interest. An article in the *New York Times* from May 3 reports that for the first time in 20 years, ownership of TV sets in the U.S. has declined. The article cites the never-ending recession and high-tech platform switching as possible reasons. Households barely holding on under current economic conditions are unlikely to replace broken TV sets and many young people are using high-tech alternatives such as iPads, smart-phones, and laptops to watch free online streaming instead of over-the-air, cable or satellite TV.

## States Gunning for Big Bird

With tax revenues down across the nation, state legislatures are cutting budgets across the board. A popular target is public broadcasting. Often forgetting the educational aspects of such enterprises, which few if any commercial broadcasters would want to undertake, state support for public broadcasting has never been lower.

Florida's governor cut all state funding for all public broadcasting (saving $4.8 million out of that state's $69 billion budget).

After Virginia's legislature approved less money for its public broadcasters, Virginia Governor McDonnell used his line item veto to slash additional funds for cuts of nearly $1 million over the previous budget.

Wisconsin's legislature applied a 10 percent cut to all state agencies including that state's public broadcasting, but then took an extra half-million dollars away from Wisconsin Public Broadcasting as if to emphasize the point.

South Dakota's legislature cut that state's agencies 10 percent across the board, but hacked more than 16 percent from South Dakota Public Broadcasting's budget.

After 43 years on the air, New Jersey Network, that state's public broadcaster, will essentially be closed. The state's governor announced June 6 that the network's 130 employees will be laid off and its headquarters in Trenton shut down. The state will sell the network's radio licenses to Philadelphia and New York public radio stations. New York's current state budget proposes a 10 percent cut to that state's public broadcasters.

Georgia Public Broadcasting took a 12.3 percent hit while the average state agency would see 7 percent reduction; Louisiana's legislature is cutting 20 percent of that state's public broadcasting budget. Texas, Kentucky, and California have also seen big cuts.

## PBS TV Stations Cashing Out

Reductions in state funding are not the end of PBS's woes. Major PBS-TV stations around the country are leaving the Public Broadcasting System and in some cases selling out, cashing in their licenses to religious broadcasters.

WMFE-TV "Public Media for Central Florida," the PBS affiliated TV station in Orlando, Florida for the last 45 years, sold its TV station to Texas-based religious broadcaster Daystar for a reported $3 million. According to the station's website, the funds would be put in a trust to continue "broadcasting news and information offerings on WMFE's NPR-affiliated radio station on 90.7 FM."

WMFE-TV cited a decline in "corporate and viewer support; uncertainty about state and federal funding; and expected increases in PBS dues and programming costs." Visitors to WMFE-TV's website are directed to WUCF-TV, at the University of Central Florida, also in Orlando.

Longtime PBS affiliate KCET-TV Los Angeles, California sold out to the Church of Scientology for undisclosed terms, according to an article in *Variety*, the entertainment industry trade journal. The station's prime real estate (4.5 acres on Sunset Boulevard, no less!) had ties to "showbiz dating back to 1912," according to *Variety*. In a statement, the Church said it would establish, "one of the most advanced centers used by religious broadcasters with the ability to harness 21st century broadcast technology and production power to deliver its message to the largest international audience possible." KCET plans to continue operations as a non-PBS independent, non-commercial TV station.

An article in the *New York Times* noted that WTTW-TV, Chicago's flagship PBS affiliate, has considered leaving PBS, citing increased dues and decreases in funding. The article quoted a station official as saying they paid $4.5 million per year in dues to PBS. The article mentioned that the Waco, Texas PBS affiliate closed last year for financial reasons and that there are a half-dozen other stations in a similar predicament.

## FCC ENFORCEMENT

## CB Shop Cited for Amps and Mods

On November of last year an undercover agent for the FCC paid a visit to the Spark Gap CB Shop in Lincoln, Illinois, shopping for linear amplifiers, and the agent was shown a display case with models from several manufacturers. The store employee helpfully advised the agent to also purchase a 10 meter amateur radio transceiver that had been modified to operate in the 11 meter Citizens Band.

That earned the shop a Citation with the warning that the FCC could impose a fine of up to $16,000 for each violation or each day of a continuing violation and up to $112,500 for any single act or failure to act, should the citation not be taken seriously.

## Beauty School Cited for Jamming

If you're running a school, it's hard to get students to set their phones down long enough to learn anything. To get around that problem, the operator of a beauty school in Yakima, Washington installed a cell phone jammer and all was apparently quiet until FCC agents showed up with direction finding devices and determined that signals jamming cell phone frequencies were coming from somewhere in the school. The proprietor admitted to operating a cell phone jammer and shut it off when confronted by FCC field agents.

*Communications is compiled by Ken Reitz KS4ZR (kenreitz@monitoringtimes.com) from clippings and links supplied by our readers. Many thanks to this month's fine reporters: Anonymous, David Alpert, Rachel Baughn, Bob Grove, Norman Hill, Steve Karnes, Brian Rogers, and Larry Van Horn.*

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*U.S. Coast Guard Search and Rescue demonstration off Los Angeles coast. (U.S. Coast Guard Photo by Coast Guard Petty Officer 1st Class Adam Eggers)*

# Monitoring Disaster Communications

By Chris Parris

It certainly seems as if barely a week goes by without some sort of weather or other disaster making news headlines. With all of the catastrophes, both man-made and natural, that have befallen different areas of the globe these days, have you ever wondered about monitoring the radio traffic in one of these stricken areas? What if you find yourself in a major storm or other disaster? I was pondering that very question while watching recent news coverage.

If you're deep in the center of a major catastrophe, communications monitoring may not be the first thing you need to worry about. But, if you are otherwise safe, monitoring what is going on around you can provide a wealth of information that you may not be able to get by any other means. While over-the-air broadcasters will have emergency power and some backup transmission systems, cable television, cell phone and Internet services are most likely going to be disrupted for some time after a major disaster.

## Listening for the Worst

It goes without saying that it's always a good idea to be prepared, even when it comes to monitoring a disaster. I won't attempt to advise you on how to prepare for your personal safety in emergencies, as there are plenty of experts that can help you with those. But, there are some items you might consider for your emergency communications set-up that will help you hear what's going on in case of a disaster.

Your emergency kits should include extra scanner batteries or a battery backup system for your monitoring equipment, spare antennas and portable AM/FM radios. Portable TV sets will no longer get you much, unless you have one of the new, small digital TV models. And don't forget a VHF weather radio. Even in a non-weather emergency, critical information can be broadcast by local government agencies over the VHF frequencies commonly used for weather forecasts.

So, what frequencies should you listen to in an emergency? Local police, fire and public safety radios should be the most active for immediate information; however, local communications infrastructure may be subject to failures, depending on the type and severity of the disaster that has occurred. Even with advanced planning and backup power sources, some public safety radio systems go down during emergencies due to unforeseen failures. When these radio systems do fail, particularly in the case of a trunked radio system, be sure and watch for instances of "fail-soft."

When a trunked radio system site has no data connection with the master site controller computer, the site can revert to a "site-trunking" mode, in which it can do limited trunking on the available channels at that site. Or it can go into a "fail-soft" mode, where it becomes one or more conventional repeaters using the same frequencies that the trunked radio site would use. If one were only listening to the system as a trunked system, you would miss any traffic that might be using the site in fail-soft.

If your local public safety trunked system fails, check the licensed frequencies for repeaters operating in the "fail soft" mode, as conventional repeaters. Also, keep an ear open for some trunked system frequencies being used in simplex mode as well.

## Interoperability Inability

One of the big catch phrases lately in public safety communications has been "Interoperability," the ability of many different agencies with different communications systems to talk to each other during major disasters. Reports from the recent tornados in Joplin, Missouri indicated that the regional public safety radio system operated continuously during the emergency, and users were well trained in interoperability communications. On the other hand, the destructive tornadoes that hit the Tuscaloosa, Alabama area destroyed not only the main communications towers for the area, but also their Emergency Management facility.

*Minnesota National Guard deployed this Remote Communications Platform to the Moorhead (Minnesota) area. It provided extended communications capabilities to emergency response personnel and was operated by Air National Guard members through a joint mission in support of this year's Red River flood response. (Courtesy: Minnesota National Guard)*

As documented in past articles in *Monitoring Times*, there can be a definite lack of training as to the use and availability of these interoperable systems. In emergencies, both large and small, different public safety responders sometimes don't know what channel other agencies or communities are using or how to talk to each other. Disaster training and communications drills attempt to solve that problem, but in an emergency or radio system failure, you may come across agencies using unusual or previously unheard frequencies in an attempt to establish contact with each other.

Amateur radio nets will be very important during disasters, but may also be subject to power or antenna system failures. However, amateur stations are often geared towards emergency operations. Amateur HF nets will operate as well as VHF/UHF local repeaters, so be sure to search for local "SKYWARN" and other emergency operations on the air.

Many municipalities operate an Office of Emergency Management (OEM) agency of some sort; so don't forget to check out your local government channels for their operations. Often the OEM will have local amateur radio operators based in their emergency operations centers. There are almost always some state-level Emergency Management agencies that will be in operation as well. Most states also operate an HF disaster communications network, and many of these agencies have drills or weekly communications tests that you should watch for.

## Listening for the Feds

Let's say the emergency happens: earthquake, floods, severe storms, tornados – take your pick. During the actual disaster your primary concern is staying safe. There may not be too much communications activity while officers and firefighters in the field hunker-down and try to survive whatever is going on. Once the immediate danger has subsided enough for first responders to go out in the field and assist victims, then the first wave of communications activity should start in the immediate wake of the disaster.

Many areas have volunteer search and rescue (SAR) operations that will be activated

during disaster operations. In an emergency, agencies will start handing out radios to staff members, volunteers, etc. There may be channels in these radios that have never been heard locally before.

After the initial activities by the first responding agencies, watch for a "second wave" of agencies arriving to provide assistance. News organizations, support and supply operations, emergency utility crews and federal agencies most likely will show up after the initial disaster has played out. Some of the federal agencies that will work in recovery efforts include Health and Human Services (HHS), the Environmental Protection Agency (EPA) and the Army Corps of Engineers.

The Civil Air Patrol and National Oceanographic and Atmospheric Administration (NOAA) aircraft may be present doing survey and photoreconnaissance work. The Federal Emergency Management Agency (FEMA), part of the Department of Homeland Security, will play a big role in major disaster recovery. Coast Guard assets will also be active, not only in coastal areas, but they have been known to respond to any areas needing assistance.

Along with the second wave, there will be temporary communications systems brought in to cover areas where the normal infrastructure has failed: portable cell sites, trunking sites, satellite terminals to provide phone and Internet service. Some agencies may be using mobile satellite terminals for vehicles, such as the SkyTerra system I described in the September 2010 edition of the *Fed Files*. These satellite systems are all proprietary digital and cannot be monitored.

If you do get a chance to monitor things after a major disaster, you may experience an interesting phenomenon that has been noted by scanner listeners. After a major destructive storm has passed, the airwaves can seem extremely quiet, that is, much less noise in the radio spectrum. Many RF noise-generating devices will be out of service due to power failures. Listeners have described instances of being able to hear clear radio signals from much further away, due to the uncluttered airwaves.

Look for the National Guard to show up on all sorts of frequencies. Listeners of the recent hurricane recovery efforts have noted army guard communications in the VHF lo-band (30 MHz-88 MHz), VHF hi-band (138 MHz -150 MHz), and even the military UHF land-mobile channels (380 MHz - 400 MHz). They may also be using state operated conventional or trunked radio systems if they are available.

Red Cross relief operations have been noted after many recent disasters. The Red Cross low band channel (47.420 MHz) is still active in many places, but be on the lookout for them on conventional UHF frequencies or even business trunked radio systems, if they are still in operation. Remember that privately owned radio systems often do not have the power backups that public safety radio systems do.

Air traffic will definitely be a monitoring target as part of this second-wave of response. Not only will there be all sorts of federal and military air operations, but media helicopters, air ambulance services and even FedEx and UPS special flights carrying supplies and medicines. FAA air traffic control may be operating with portable towers and temporary frequencies. Sometimes temporary helicopter landing areas will be established with their own dedicated operating frequencies. Careful monitoring of area FAA air traffic channels will often reveal new frequencies being assigned for disaster area operations.

Don't forget to search your local utility companies' radio channels *before* a disaster strikes. Keep those channels handy as you can gain a lot of information during cleanup efforts as to where outages are and where repair crews are operating. In many large disasters, utility crews from outside areas are brought in for recovery and cleanup work. They may operate on simplex channels that are provided by your local utility companies as well.

## Disaster at a Distance

What about monitoring events occurring at a distance? If the affected area that you are monitoring is less than 100 miles or so away, you should still keep an ear on VHF and UHF land-mobile channels. Mutual Aid response can come from areas all around the stricken region, so you may hear related communications even at some distances. Inbound aircraft will easily be heard talking with air traffic control and even call in to stations at their destinations prior to landing.

In addition to monitoring radio communications with your own receiving equipment, there are ways to monitor disaster communications over the Internet. Police and other public safety radio communications are increasingly being streamed over various Internet services that allow


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- 60 channels/sec. scanning rate and 75 steps/sec. searching rate.
- 2 second scan and search delay.
- Manual selection for channel.
- Scan mode. [Cleared channels (000.000 freq.) are not scan.]
- Deleting a frequency from a channel.
- 1 limit search bank.
- Key lock for safety.
- Key tone and alert tone.
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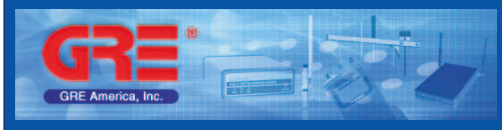
- 50 lock out frequencies per search bank, Public safety, Aircraft, Ham, R
- Frequency lock-out review and Channel lock-out review.
- PC Interface / Clone jack.

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you to listen to scanners located in many different cities around the country. In some cases these feeds are available via smart phone applications that can be downloaded and played on your cell phone. These feeds can also be accessed via your computer, even your iPad, through your Internet connection.

So what about a frequency list? This is something that you should put together ahead of time, as part of being prepared for a disaster. When the lights go out, looking up frequencies on line is not going to happen, so you should have a paper version of your disaster frequencies available for reference and know how to program these frequencies into your scanner if you haven't done so in a while.

Start with your local public safety channels, with which you are probably already familiar. Besides your police and fire departments, research frequencies for your local utilities and local government agencies. I have programmed the frequencies for various companies that provide power, water, gas and such to my area. I don't normally scan these frequencies daily, but they are handy to have in case something comes up. If you are fortunate enough to have more than one scanner available, keep the common, nationwide channels listed below in one scanner, and utilize the other to search out some of the listed frequency search ranges.

Here is a list of frequencies you should scan in case of any major incident or disaster in the area. In addition to these, search out previously unknown channels and stay safe!

### NATIONWIDE INTEROPERABILITY CHANNELS

| | |
|---|---|
| LLAW1 | 39.4600 / 45.8600 |
| LFIRE2 | 39.4800 / 45.8800 |
| LLAW3 | 45.8600 / 39.4600 |
| LFIRE4 | 45.8800 / 39.4800 |
| VCALL10 | 155.7525 |
| VTAC11 | 151.1375 |
| VTAC12 | 154.4525 |
| VTAC13 | 158.7375 |
| VTAC14 | 159.4725 |
| VTAC17 | 161.8500 / 157.2500 |
| VTAC33 | 159.4725 / 151.1375 |
| VTAC34 | 158.7375 / 154.4525 |
| VTAC35 | 159.4725 / 158.7375 |
| VTAC36 | 151.1375 / 159.4725 |
| VTAC37 | 154.4525 / 158.7375 |
| VTAC38 | 158.7375 / 159.4725 |
| UCALL40 | 453.2125 / 458.2125 |
| UTAC41 | 453.4625 / 458.4625 |
| UTAC42 | 453.7125 / 458.7125 |
| UTAC43 | 453.8625 / 458.8625 |

### 800 MHz National Mutual Aid

(after 800 MHz Rebanding)

| | |
|---|---|
| 8CALL90 | 851.0125 / 806.0125 |
| 8TAC91 | 851.5125 / 806.5125 |
| 8TAC92 | 852.0125 / 807.0125 |
| 8TAC93 | 852.5125 / 807.5125 |
| 8TAC94 | 853.0125 / 808.0125 |

### 800 MHz National Mutual Aid

(before 800 MHz Rebanding)

| | |
|---|---|
| 8CALL90 | 866.0125 / 821.0125 |
| 8TAC91 | 866.5125 / 821.5125 |
| 8TAC92 | 867.0125 / 822.0125 |
| 8TAC93 | 867.5125 / 822.5125 |
| 8TAC94 | 868.0125 / 823.0125 |

*Each state also has some individually assigned 800 MHz common channels.*

### FEDERAL INTEROPERABILITY CHANNELS

| | |
|---|---|
| NC 1 | 169.5375 / 164.7125 |
| IR 1 | 170.0125 / 165.2500 |
| IR 2 | 170.4125 / 165.9625 |
| IR 3 | 170.6875 / 166.5750 |
| IR 4 | 173.0375 / 167.3250 |
| IR 5 | 169.5375 |
| IR 6 | 170.0125 |
| IR 7 | 170.4125 |
| IR 8 | 170.6875 |
| IR 9 | 173.0375 |
| NC 2 | 410.2375 / 419.2375 |
| IR 10 | 410.4375 / 419.4375 |
| IR 11 | 410.6375 / 419.6375 |
| IR 12 | 410.8375 / 419.8375 |
| IR 13 | 413.1875 |
| IR 14 | 413.2125 |
| IR 15 | 410.2375 |
| IR 16 | 410.4375 |
| IR 17 | 410.6375 |
| IR 18 | 410.8375 |
| LE A | 167.0875 |
| LE 1 | 167.0875 / 162.0875 |
| LE 2 | 167.2500 / 162.2625 |
| LE 3 | 167.7500 / 162.8375 |
| LE 4 | 168.1125 / 163.2875 |
| LE 5 | 168.4625 / 163.4250 |
| LE 6 | 167.2500 |
| LE 7 | 167.7500 |
| LE 8 | 168.1125 |
| LE 9 | 168.4625 |
| LE B | 414.0375 |
| LE 10 | 409.9875 / 418.9875 |
| LE 11 | 410.1875 / 419.1875 |
| LE 12 | 410.6125 / 419.6125 |
| LE 13 | 414.0625 |
| LE 14 | 414.3125 |
| LE 15 | 414.3375 |
| LE 16 | 409.9875 |
| LE 17 | 410.1875 |
| LE 18 | 410.6125 |

### MISCELLANEOUS NATIONWIDE EMERGENCY FREQUENCIES

| | |
|---|---|
| 40.5000 | Military Joint Common "FM" |
| 47.4200 | Red Cross national assignment |
| 121.5000 | Aircraft emergency "VHF Guard" |
| 123.0250 | Helicopter common |
| 123.0750 | Helicopter common |
| 123.1000 | Aircraft Search & Rescue common |
| 148.1250 | Civil Air Patrol |
| 148.1500 | Civil Air Patrol |
| 155.1600 | Search & Rescue – common in many areas |
| 155.3400 | Medical Emergency – common in many areas |
| 155.4750 | National Law Enforcement Common |
| 156.8000 | Marine Channel 16 |
| 157.0500 | Marine Channel 21A |
| 157.0750 | Marine Channel 81A |
| 157.1000 | Marine Channel 22A |
| 157.1250 | Marine Channel 82A |
| 157.1500 | Marine Channel 23A |
| 157.1750 | Marine Channel 83A |
| 163.1000 | Federal Agencies |
| 164.4500 | EPA Common |
| 166.4625 | Federal Agencies |
| 168.3500 | Federal Agencies |
| 168.6250 | US Forest Service Aviation "Air Guard" |
| 168.6500 | US Forest Service Aviation "Flight Following" |
| 243.0000 | Aircraft emergency "UHF Guard" |
| 282.8000 | Joint military search & rescue common |
| 406.8625 | National Disaster Medical System (NDMS) |
| 407.1250 | Disaster Medical Assistance Teams (DMAT) |
| 407.2625 | National Disaster Medical System (NDMS) |
| 407.4625 | National Disaster Medical System (NDMS) |
| 409.0000 | Disaster Medical Assistance Teams (DMAT) |
| 409.0500 | Federal Agencies |
| 409.0750 | National Disaster Medical System (NDMS) |
| 409.3375 | Federal Agencies |
| 409.4625 | National Disaster Medical System (NDMS) |
| 412.8250 | Federal Agencies |
| 412.8375 | Federal Agencies |
| 412.8500 | Federal Agencies |
| 412.8625 | Federal Agencies |
| 412.8750 | National Disaster Medical System (NDMS) |
| 418.0500 | Federal Agencies |
| 418.3375 | Federal Agencies |

### NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION WEATHER BROADCASTS

| | |
|---|---|
| 162.375 | National Weather Service |
| 162.4 00 | National Weather Service |
| 162.425 | National Weather Service |
| 162.400 | National Weather Service |
| 162.475 | National Weather Service |
| 162.500 | National Weather Service |
| 162.525 | National Weather Service |
| 162.550 | National Weather Service |
| 162.575 | National Weather Service |

### SUGGESTED FREQUENCY SEARCH RANGES FOR DISASTER COMMUNICATIONS

30 to 88 MHz - National Guard and military FM
138 to 144 MHz - National Guard and military AM/FM
144 to 148 MHz - Amateur "2-Meter" band
148.0 to 150.75 - National Guard and military
150.8 to 161.59 MHz - Power, water, gas utilities and public safety VHF radio systems
161.640 to 161.760 MHz - News Media, both local and national
222 to 225 MHz - Amateur "1.25 Meter" band
380 to 400 MHz - National Guard and military
420 to 450 MHz - Amateur "70-Centimeter" band
450 to 451 & 455 to 456 MHz - News Media, both local and national
451 to 469 MHz - Power, water, gas utilities and public safety UHF radio systems
462.95 to 463.175 & 467.95 to 468.175 - UHF Medical Nets

## DISASTER FREQUENCY RESOURCES

Check these out BEFORE an emergency strikes.

The National Interoperability Field Operations Guide, a must have:
**www.ncdhhs.gov/dhsr/EMS/pdf/NIFOG.pdf**

Radio Reference on line frequency database, for your local frequency information:
**www.radioreference.com/apps/db/**

Radio Reference also has a page devoted to compiling monitored frequencies from various events and disasters:
**http://wiki.radioreference.com/index.php/Major_Events_and_Disasters**

Salvation Army Team Emergency Radio Network (SATERN) HF, VHF and UHF frequencies by operating region.
**http://www.satern.org/**

*Chris Parris writes the Fed Files column for MT and may be reached at chrisparris@monitoringtimes.com*

# Weird World of Antennas

By Mark Haverstock K8MSH

There has always been something magical about antennas with their ability to transmit and grab invisible signals out of thin air. Old school antennas used to be standard – the expected shapes and sizes, such as Yagis and corner reflectors populating the rooftops for TV reception. Portable FM radios always had a telescoping antenna built into the case.

Today, antennas are cropping up in all kinds of shapes, sizes and forms. The vertical whip on vehicles is giving way to in-glass antennas and sharkfin shaped roof fixtures. Giant antennas sprout all over the landscape in the form of cell towers. Others disappear into the background or are hidden among the electronics. Remember when cell phones actually had visible antennas?

Welcome to the weird new world of antennas, where antennas can look like or be just about anything.

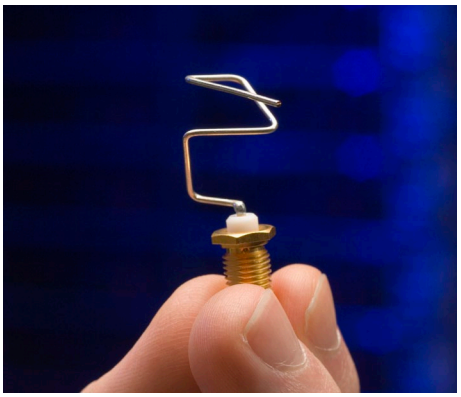
## Bent Paper Clips?

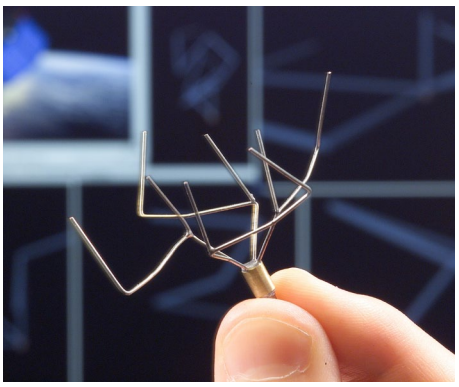
This strange looking antenna on the NASA ST5 micro satellite antenna doesn't require a matching network and provides 2-4 dB of gain with more uniform coverage. Able to fit into a one-inch space (2.5 by 2.5 centimeters), the antenna can receive commands and send data to Earth from the Space Technology 5 (ST5) satellites.

The three satellites, themselves no bigger than an average TV set, help scientists study magnetic fields in Earth's magnetosphere. NASA scientists spent two years developing the evolutionary artificial intelligence (AI) software that designed the antenna, based on a LOGO-like language (remember LOGO?).

"The AI software examined millions of potential antenna designs before settling on a final one," said project lead Jason Lohn, a scientist at NASA's Ames Research Center, located in California's Silicon Valley. "Through a process patterned after Darwin's 'survival of the fittest,' the strongest designs survive and the less capable do not."

The software started with random antenna designs and, through the evolutionary process, refined them. The computer system, composed of 120 personal computers working as a team, took about 10 hours to complete the initial antenna design process. "We told the computer program what performance the antenna should have, and the computer simulated evolution, keeping the best antenna designs that approached what we asked for. Eventually, it zeroed in on something that met the desired specifications for the mission," Lohn said, adding, "Not only can the software work fast, but it can adapt existing designs quickly to meet changing mission requirements."





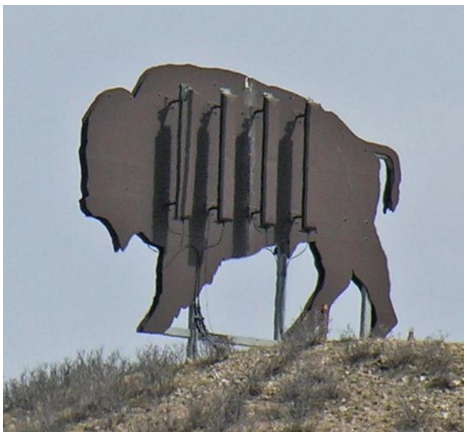
***ST5 Antenna from evolutionary AI software–only the strong survive. (Photo Credit: NASA Ames Research Center)***

## Where the Buffalo Roam

In some instances, cell phone companies have gone to great lengths to make their antennas blend in with the surroundings. This antenna on I-25, south of Cheyenne, Wyoming was constructed by the Mountain Wireless Construction Company of Aurora, Colorado.

The 12-foot long bison figure is made of marine plywood and was built in their shop. But, upon completion, they found it was too big to fit through the door. A few alterations and some brute strength eventually got the animal silhouette out the door and onto the hilltop.

The antennas belong to Verizon Wireless and the bison and the cell site are named "Pipeline," after an oil pipeline buried beneath.



***Cellular antennas hidden behind a plywood bison. (Photo Credit: MountainWireless.com)***

## A Higher Calling

Pastor Douglas Fountain of Epiphany Lutheran in Lake Worth, Florida, wasn't sure he wanted a cell phone tower on the church property. But when T-Mobile told him they

***It calls people to the church–and people can make calls as well. (Photo Credit: It 1224/ Wikipedia)***

could make the tower look like anything he wanted, he saw an opportunity. According to the church's executive director, John Sasson, T-Mobile hid antennas and equipment inside the 100-foot-high cross, which spans 30 feet, making it the largest freestanding cross in the Southeast.

Sasson says the cross provides "advertising we would not have been able to afford," as well as some additional income. T-Mobile is leasing some of the church's property for the antenna space.

## Who's Fooling Whom?

*Can you find the Antenna? (Photo credit: Gary Minnaert/Wikipedia)*

Putting palm leaves on this cell tower is like putting a bad toupee on a bald guy. Sure, they want the antenna to be aesthetically pleasing and blend in – but this has to be one of the homeliest and most unrealistic looking trees around. This example of almost antenna camouflage was found in Tucson, Arizona.

## The Tree is the Antenna

Pictured is a tree antenna. It's not a support, but actually an antenna for 600 meter VLF, thanks to the work of Ralph Hartwell W5JGV, a long-time broadcast engineer. There are two methods generally used to connect to a tree for using it as an antenna. The first is to drive a nail into the tree some distance up from the ground, and the second is to use a coupling coil around the trunk close to the ground. Hartwell preferred not to climb trees so he decided that the coupling coil would be the better approach.

Since little, if any, design data has been published on tree antenna coupling coils, he took a guess at what might work for the coil dimensions. "I guesstimated that using a coil with about half the diameter of the tree trunk would be about right for the coil diameter," he explains. "The length of the coil would be

the diameter of the tree trunk. The number of turns was an unknown, but I figured that if the inductance was too small the tuning would be very sharp, and changing environmental conditions, rain, temperature, etc., might cause tuning problems. A larger inductance would be less sensitive to such things."

Designing the coil was one thing, but holding it in place against the tree presented a problem. It had to be held away from the bark, or losses would increase when the tree got wet in the rain. "I finally hit on the idea of dropping each turn of the coil into a series of parallel slots cut into a length of plastic pipe," he says. Hartwell added a matching network (inside the gray box) and a ground system to complete the antenna. Detailed plans with photos can be found at:
**http://w5jgv.com/tree_antenna/index.htm**

Tree antennas aren't a new idea. These antennas were routinely utilized during the Vietnam War. And, General George O. Squier wrote about them in Scientific American in1919. Link: **http://w5jgv.com/tree_antenna/George%20O%20Squire%20Tree%20Antenna%20Patent.pdf**

Hartwell recommends several other links to help grow your interest in tree antennas. "Trees Performing as Radio Antennas" **http://w5jgv.com/tree_antenna/1975%20January%20Ikrath%20IEEE%20tree%20antennas.pdf** "Trees as Antennas" **http://w5jgv.com/tree_antenna/Robert%20Hand.pdf**; and "Signal Propagation at 400 kHz Using an Oak Tree with a HEMAC as an Antenna" **http://w5jgv.com/downloads/AD735330.pdf**

## Undercover Satellite

Once the novelty of a satellite dish has worn off, it's just a big, ugly hunk of metal or fiberglass on your house. The Sqish, a rectangular wall-mounted dish, has addressed this issue in an unusual way – when you order your dish, you send in a picture of your wall,

***Satellite dishes blend in like a chameleon. (Photo Credit: Squish.co.uk)***

and they send you a "sqishoflage" sticker to help it blend in with its surroundings. These UV-stable, matte finish stickers cost an extra £25, and they provide three color tone variations for a better match.

The 48cm by 26cm plastic Sqish antenna unit is just 7cm deep, and can receive Sky and Freesat in the UK, but aren't available in the U.S. at this time. It's mounted on a multipurpose bracket that allows 90 degree clearance.

OK, so it's not exactly invisible, but the Sqish is certainly useful for homes in areas where regulations restrict the choice of sat receivers. It may appeal to those who want access to decent television without the "dish stigma."

## Real Rabbit Ears

What's up, doc? Perhaps this vintage cartoon character antenna is up on a television ready to receive Over-the-Hare TV signals. This antenna, made by JFD Electronics, includes two telescoping whips and a loop, each fed with a short length of 300 ohm twin-lead, and of course, Bugs Bunny's toothy mug front and center. According to the box description, it improves performance on VHF channels; UHF channels; FM mono and stereo. We're not sure, but perhaps the carrot might be intended as some kind of matching stub. Digital converter not included. (Photo on following page)

## Real Beverage Antenna

A refreshing alternative to the standard two-meter vertical is the soda can vertical dipole.

Unlike the antenna developed by Harold Beverage in 1920, this soda can antenna is omnidirectional rather than unidirectional, and considerably shorter. In addition, it's eco-friendly and a great way to recycle those used soda or beer cans.

***Actual rabbit ears antenna (Photo Credit: Keith Schneider, Gasoline Alley Antiques.com)***

Eight soda cans are needed, and can be quickly prepared (emptied) at a club meeting, field day, or other social gathering. Four aluminum beverage cans stacked together is comfortably close to the value of a 1/4 wavelength element.

Each can is fastened to the can below it with three sheet metal screws to form the elements. Hex head self-drilling #6, 1/2-inch sheet metal screws are easiest to use, driven by a 1/4 inch magnetic tipped nut driver with a long shaft or shaft extension through the pop-top opening. Conventional sheet metal screws also work, but you may want to drill small pilot holes first. Each element consists of four attached cans.

***Yes, you can! (Photo Credit: Author)***

After the two elements are completed, the tops are removed using circular cutting metal shears. Old-fashioned manual can openers also work well if you don't apply too much pressure. Can assemblies are then joined together at the center of the antenna with a short piece of 1-1/2 inch, schedule 40 PVC pipe. Sand the connection points to the cans to remove outer coating and attach a good quality coaxial feed cable with sheet metal screws tapped into the PVC pipe. A vertical support can be fashioned from some 1 x 2 furring strip, PVC pipe, or other insulated material and attached using nylon wire ties.

## Monster Arrays - The Woodpecker

***Woodpecker Array – the real iron curtain. (Photo Credit: Necator/Wikipedia)***

Those of you who were active in shortwave listening and ham radio between 1976 and 1989 remember the Russian Woodpecker – the sharp 10Hz tapping noise that appeared in random frequency hops between 7 and 19 MHz. The interference caused by the Woodpecker resulted in thousands of complaints from legitimate broadcasters and hams worldwide.

Pictured is the massive antenna behind the interference, known as Duga-3 radar array, located outside Chernobyl, Ukraine. Transmit power was estimated to be as high as 10 MW (megawatts) equivalent isotropically radiated power. Pulses transmitted by the Woodpecker had a wide bandwidth, typically 40 kHz.

The purpose of the array wasn't radio jamming as many speculated. Instead, it was an over-the-horizon (OTH) radar system designed to provide early warning and track missile launches. When more reliable early warning satellite systems became available, the OTH system eventually was shut down.

Others have some more interesting ideas, particularly one about a sinister experiment in global mind control technology. The Woodpecker array was aimed at the west, transmitting on frequencies that supposedly matched the alpha brainwave frequencies.

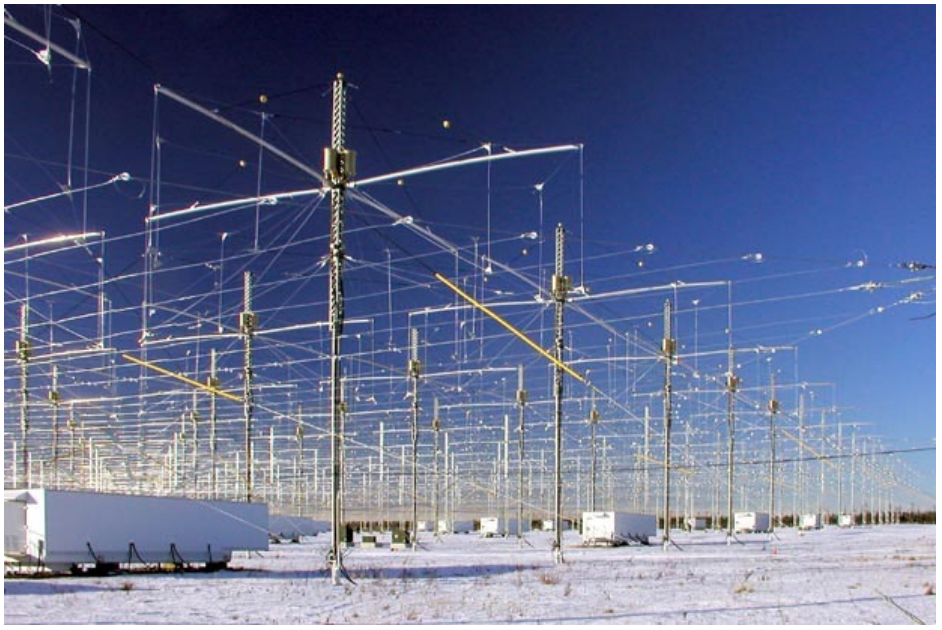
Control of the earth's electromagnetic field was another alleged use, along with setting off earthquakes and changing weather patterns by bombarding the ionosphere with high-powered radio waves. The same was said of Alaska's HAARP array.

## Playing the HAARP

Another monster antenna array is HAARP, an ionospheric research facility located in Gakona, Alaska, about 180 miles northeast of Anchorage. HAARP stands for The High Frequency Active Auroral Research Program. The goal of this program is to further advance knowledge of the physical and electrical properties of the Earth's ionosphere which can affect our military and civilian communication and navigation systems.

The HAARP antenna array consists of 180 antennas on a total land area of about 35 acres. The array, along with its integrated transmitters, has a total radiated power capability of about 3,600 kilowatts. HAARP transmitters direct signals in the 2.8 - 10 MHz region of the HF (High Frequency) band, into the ionosphere. The signal may be pulsed or continuous. ELF (extremely low frequency) signals are generated in the ionosphere at an altitude of around 100 km. Frequencies ranging from below one Hz to about 20 kHz can be generated through this ionospheric interaction process.

Like the Russian Woodpecker, it is alleged



*Visitors view the 180 antenna arrays at HAARP site in Gakona, Alaska. (U.S. Air Force Research Laboratory*

that HAARP also has hidden agendas and capabilities. The project has been blamed for triggering catastrophes such as floods, earthquakes, droughts, hurricanes, thunderstorms, and major power outages. Conspiracy theorists have also suggested links between HAARP and the work of Nikola Tesla (particularly potential combinations of HAARP energy with Tesla's work on pneumatic small-scale earthquake generation) and physicist Bernard Eastlund.

Their website FAQ section dismisses all these allegations and notes that there are no classified projects on site. Activities and environmental impact documents are a matter of public record. Further information on the site can be found at: **www.haarp.alaska.edu**

## Point and Shoot

For bow hunters who take their hobby seriously, Double Take Archery offers a really sharp accessory for your car or truck. Arrow Antenna pulls in AM and FM stations along with plenty of double takes. The attention-getting Arrow Antenna is a real fiberglass, camouflage-patterned arrow, but you don't want to put this one on your bow. The housing contains a universal antenna that directly swaps out with the stock antenna on your vehicle. It's designed to work just as well as the original, but with an outdoor flair you won't find anywhere else.

*Arrow is working replacement for AM/FM vehicle antennas. (Photo Credit: Double Take Archery, LLC)*

## That Sinking Feeling

You've heard the expression, everything but the kitchen sink. During the 2008 K0S Strange Antenna Challenge, Douglas Kohl, KI4YOB, started with the kitchen sink. His first attempt at making contacts using a stainless steel kitchen sink, resting atop a full size metal bedspring, resulted in marginal reception at best and no contacts made for 2 hours. Doug then elevated the setup about 4-1/2 feet off the ground. "Reception was a little better; I made one local contact," he explains, "Signal report from local station: 'barely out of the mud.'"

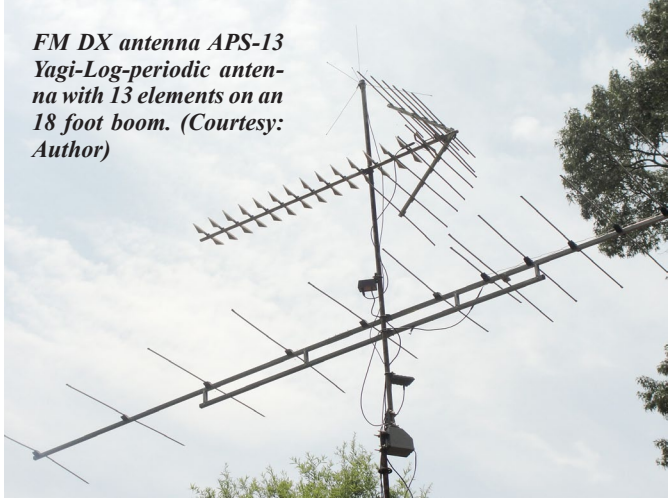
If you're interested in trying your hand at working stations with your own strange antenna, here are the basic rules: No wire! No pipe! (Unless it is currently part of something else.) If it is metal, you can tune it. Contest is held the last weekend in May, and further details can be found at: **www.n0ew.org/k0s/**

*Douglas Kohl, KI4YOB loads up the kitchen sink over bedspring radial. (Photo Credit: Douglas Kohl KI4YOB)*

*K0S Strange Antenna Challenge (Photo Credit: Erik Weaver N0EW)*

# DXing the FM Band in a Translator/Booster World

By Ken Reitz KS4ZR



*FM DX antenna APS-13 Yagi-Log-periodic antenna with 13 elements on an 18 foot boom. (Courtesy: Author)*

The landscape of America's FM band has dramatically changed over the last 10 years and FM DX has been severely hampered. Thousands of new transmitters have cluttered up the once wide open, static-free, high fidelity band to which audiophiles once retreated to hear beautiful music.

In their most recent tally the FCC reports that there are 10,000 commercial and noncommercial FM stations on the band. But, it's also licensed another 7,000 translators, boosters and low-powered FM transmitters, making a total of some 17,000 FM signals crammed into the same 300 channels that make up the 20 MHz wide band (87.9 to 107.9 MHz). On top of that there are several thousand unlicensed FM transmitters, mostly in and around big cities, some of which are pounding out hundreds of watts. It's never been harder to pull in distant FM signals, but the good news is that it's still possible.

## Chasing FM DX

The annual FM DX season, generally from April through August, offers many chances for excellent long distance reception via tropospheric and E-layer skip (Es). When the skip is in you don't need any fancy radios or expensive outdoor-mounted antennas, the skip just rolls through, pushing aside your local favorites and introducing you to stations from hundreds and even thousands of miles away. For most FM radio listeners it's a big nuisance, but for FM DXers it's the highlight of the year. This kind of DX you don't have to chase, it comes to you. Everything you could want to learn about Es propagation may be found in "Mid-Lattitude Sporadic-E A Review" by Michael Hawk, (http://www.wtfda.org/images/stories/pdf/sporade.pdf), found on the Worldwide TV-FM DX Association web site which has a treasure-trove of information and forums on the subject.

Tropospheric ducting is associated with wide-open spaces such as the Great Lakes, the Gulf of Mexico or the waters between the Hawaiian Islands and the U.S. West Coast. The combination of weather and E-layer skip essentially sets up "ducts" through which radio waves in the FM band (or TV, for that matter) may travel great distances. Chris Kadlec has written a 43 page study of Great Lakes Tropospheric ducting, also for the WTFDA site which you may read here: **http://www.wtfda.org/images/stories/pdf/dx_2006_log_report.pdf.**

You'll know if you're having Es or Tropo by just tuning your radio, but how can you tell if such skip is in the forecast? Luckily, there are a number of places to see just how favorable such conditions may be in your area. Again, turning to WTFDA you'll find VHF propagation maps that graphically show in real-time where such conditions are occurring and to what extent. The propagation map is found on the WFTDA home page, click on "APRS Map for Real-time Tropo Paths." You can also monitor their real-time FM DX Skip logs as avid FM DXers check in from all over the U.S. to report what they're hearing.

Another spectacularly useful site is www.dxfm.com, run by Girard Westerberg from Lexington, Kentucky. Girard also has a superb tutorial on TV-FM signal propagation, just click on the button labeled "signal propagation." Examples of digital and analog (back in the day) TV images are posted by DXers that show the date and the distance of the DX. TV images from distances in excess of 1,000 miles are not uncommon.

Girard also has many informative articles about analog and digital TV and FM DX. You can spend a lot of time just reading about what's been happening in this hobby for the last few years. While most American's only switched to digital TV two years ago, these guys have been logging DTV signals for ten years. Current FM DX logs are posted on the DXFM home page, just scroll down until you run into "DX Reports from You." One interesting aspect of the logs is that each reporter details his or her equipment including antenna type and model, height above ground, FM tuner and antenna preamp used as well as location. Reading reports as this is written in mid-June, Es FMDX of 1,000 to 2,000 miles is being reported daily.

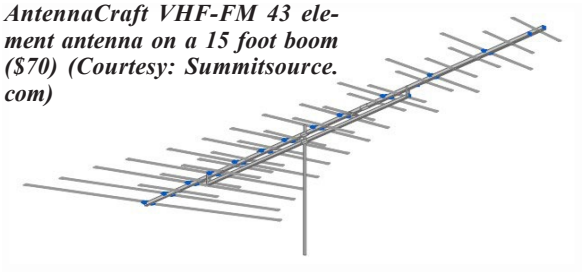
## FMDX Gear:

### Receivers:

Receivers for serious FMDXers fall into two camps: old school and new school. There are those in the hobby who swear by vintage, analog-tuned, FM receivers. The Tuner Information Center (**www.fmtunerinfo.com**) has the most authoritative information about vintage receivers that are also excellent DX machines. Of course, the only place you'll find these receivers today is through specialized forums and e-Bay. But, you might find a good looking vintage FM receiver at a junk shop that you'd like to know more about. If so, check out their member-written reviews by clicking on the brand list at the left on the home page. Exhaustive information from Accuphase to Yamaha, covering over 100 brands and hundreds of models, are examined by pros and hobbyists. Even though some of the information available on this site is dated, their informed opinion is worth noting.

New receivers also fall into two categories: with or without HD-Radio capability. The problem is that HD-Radio has been exceedingly slow to take off and some of the earlier models that FMDXers adopted, such as the Sony XDRF-1HD, are no longer made. Several new FM tuner/receivers have built-in HD-Radio capability and at least one, Onkyo, has an outboard, add-on

*Sangean HDT-1X component analog/HD-Radio AM and FM tuner. (Courtesy: Sangean U.S.A.)*



*AntennaCraft VHF-FM 43 element antenna on a 15 foot boom ($70) (Courtesy: Summitsource.com)*

HD-tuner. That leaves the Sangean HDT-1X, a component AM/FM/HD tuner (about $200) as the go-to DX machine. Even it has been discontinued by several national retailers including Crutchfield and CCrane, though a spokesperson for Sangean has assured me the unit is still very much in production. I've used one for several years and found it to be a very sensitive FM tuner, though the AM section is not nearly as good as the AM band on my Kenwood TS-140s transceiver. The Sangean HDT-1X features RDS display, external AM and FM antenna inputs and fiber optic as well as RCA stereo audio outputs.

**Antennas:**

Antenna manufacturers appear to be abandoning the FM band. Antenna Performance Specialties' APS-13, the premier DX FM antenna is no longer available; Winegard has discontinued their 10 element, 13 foot FM antenna, even Antennacraft is no longer making their DX FM antenna. But, you can still get excellent results by using a VHF-low band TV antenna (channels 2-6).

More adventurous FMDXers stack antennas for greater front-to-back gain and to help reduce side-lobe interference. If you stack two identical antennas, one on top of the other, you increase the gain and make it so you don't need a mast-mounted preamplifier. Just make sure the antennas are at least a half-wave length apart to avoid interaction between the two and that the two antennas are joined to an antenna coupler with cables of identical length, in order to avoid the signals from the antennas arriving out of phase.

If you really want to go for broke (literally) you can stack four identical antennas, increasing the gain further and reducing side-lobe interference more. "Quad-stacking," as it is known, is tricky. Typically, one stack will be two antennas one-over-the-other on the same mast (make sure they're lined up the same!), then a wooden boom (to reduce interaction with all the extra aluminum) is placed between the vertical stack and two other identical antennas are secured to each end of the wooden boom, making a diamond-shaped array as seen on-end. These must all be fed with coax cable cut as close to the same length as you can in order to avoid the signals getting out of phase.

If you're using four six-element antennas, which I have done, you end up with a 24 element super-array that brings in solid signals from 60-80 miles away, no skip or mast-mounted preamp necessary. But, there's a problem, as I discovered over the winter: You have to make the structure is as solid as you can make it because the first ice storm that comes your way will reduce your fabulous array to scrap.

By this time you've got quite a lot of metal and wood on the mast and you'll need to consider getting a heavy duty rotator. The average TV rotator is just not going to be up to the task. If you want to try a quad-stack with something bigger than four six-element antennas, you need to really map out your structure and rotator strategy as well as paying attention to how much space such an array needs to swing 360 degrees. Nearby tree branches can beat your array to scrap in a wind storm.

Top FMDXers use a combination of antennas (a large DX FM antenna and a smaller FM antenna on a separate but nearby rotatable mast) to null out signals from nearby FM stations to let distant FM stations come through. This set-up requires being able to deftly rotate both the DX antenna and the "noise antenna" so that the combined signal nulls out the interfering nearby FM station.

## Preamps, Rotators, and Cable

Mast-mounted antenna preamplifiers are a must for serious FMDX antennas. Make sure the one you get is intended for the VHF-TV band. Some preamps cover only the UHF-TV band. Use RG-6 coax cable from the antenna to your receiver. This is the same cable used for satellite TV and it is heavily shielded with a good copper conductor. Look for cable with a heavy copper ground wire attached that will help ground your antenna. Many Radio Shack stores no longer carry outdoor FM antenna equipment of any use to FMDXers, nor do many big discounters such as Walmart or Lowes. But, you can find the suitable gear still available at the two mail-order retail stores listed in the resources.

*Channel Master 7778 mast-mounted preamplifier ($51). (Courtesy: Summitsource.com)*

Depending on your DX antenna, consider shopping for a smaller amateur radio rotator instead of a generic TV rotator. But, whichever you chose, be sure to get the correct cable to go from your rotator-controller to the rotator. Some use three or five conductors, others send the voltage up through the coax, similar to the way LNBF voltage is fed in a satellite-TV installation.

**http://www.dxfm.com**
Girard Westerberg's highly informative FMDX site includes recent loggings from TV and FM DXers as well as current solar and geomagnetic activity and conditions.

**http://www.wtfda.org**
The premier site for everything having to do with FM DX has great archive of related articles; authoritative forums; maps of real-time E-skip and Tropospheric paths as well as current loggings from serious FMDXers.

**http://dxworld.com/tvfmlog.html**
Direct link to real-time TV and FM DX loggings.

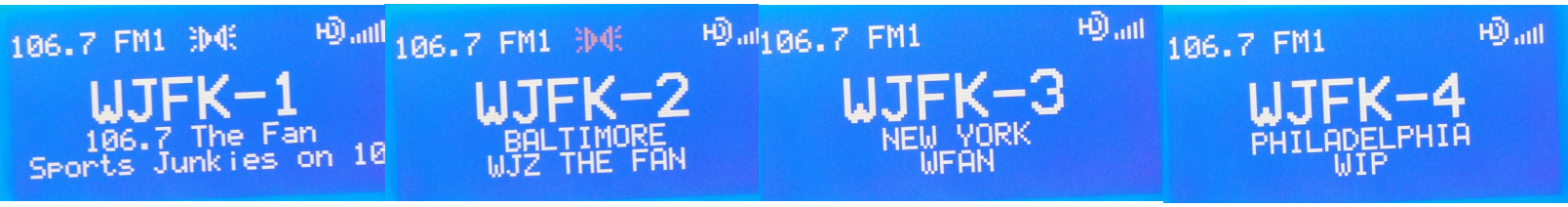
**http://transition.fcc.gov/mb/audio/fmq.html**
Official FCC records of every AM and FM station licensed in North America and the Caribbean lets you find out how much power they're running and the exact location of their antennas.

**http://fmdx.usclargo.com**
Mike Bugaj's TV and FM DX page is packed with technical resources for the FM-TV DXer including reviews of popular FM receivers and tuners.

**www.summitsource.com** (866-637-4965)
**http://www.starkelectronic.com** (508-756-7136)
Two great mail-order sources for brand name TV and FM DX gear. Both carry DX antennas, preamplifiers, rotators, cable and more.

**http://www.distancefromto.net** (measure the DX yourself)
Quickly learn the distance between your home and the DX station.

**www.fmfool.com**
Shows what stations are receivable under normal conditions at your location given your antenna height.




*RDS display from a Sangean HDT-1X shows reception of pioneering HD-Radio FM station WJFK (Manassas, Virginia). In addition to their own lineup of D.C.-related major league sports on WJFK-HD1, they also re-broadcast WFAN, (New York), WIP (Philadelphia) and WJZ (Baltimore). HD icon indicates full HD reception. (Courtesy: Author)*

# Reading MT on the iPad

By Gordon Bousman NW7D
(Photos courtesy Ken Reitz KS4ZR)

Having been a long-time, avid reader of *Monitoring Times*, I had always yearned for a better way to read one of my favorite magazines while traveling; I fly about 200,000 miles per year for my employer. Then, last Christmas, Santa Claus delivered both an iPhone™ and an iPad™ to me and, while the initial purpose was to enhance my productivity while working (email, document reading, etc.), I soon discovered that the iPad is also an excellent substitute for the more commonly known e-readers such as Nook™ and Kindle™ for reading books and magazines. Storage of books or magazines is the same on either platform; it's just smaller on the iPhone.

*The July issue of MT on an iPad*

In fact, the iPad does an excellent job of storing these books and magazines in memory, which eliminates the accumulation of piles of paper magazines and books, so it's very environmentally friendly in that respect. In years past, if I wanted to read *MT* or other magazines/books while traveling, it meant adding weight and bulk to my briefcase. Now, I only need to carry my 1.33 pound iPad plus my iPhone.

Bob Grove was one of the first publishers in the business of hobby radio to publish a magazine in electronic format and even today remains one of only a few to do so; most of the ham publications such as *QST* and *CQ* are still only available in printed editions. While I had been subscribing to *MTXpress* for several years, which I would read on my laptop computer, I now download it to my iPad and iPhone4 for convenient reading both at home and while burning up the skies traveling to such places as Mumbai, India, Tel Aviv, Israel, and Amsterdam, Netherlands.

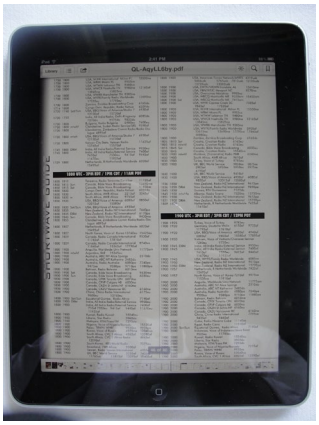
The readability of *MTXpress* on the iPad is simply awesome with vivid colors and resolution that actually exceeds that of the print version. The downloaded Adobe™ Acrobat™ PDF file for each month's *MTXpress* edition can be saved in iBooks (an electronic bookshelf application for the iPad and iPhone) from which you can retrieve the magazine at any time.

If you find the print too small to read, no problem: You can easily magnify any page or part of a page on the iPad or iPhone with the commonly known two-finger "pinch." This works especially well on photos and graphics, something you couldn't even dream of doing with the print version.

While you can read *MTXpress* on the iPad or iPhone without being connected to the Internet, its real strength becomes apparent when you instantly link to the Internet from a reference link given in an article or the web address of an advertiser via the iPad web browser Safari. This is something that is much more laborious when using the print version, as you need to hand type the Internet URL into a computer or at the very least, cut and paste.

## Not Just for Reading

I've been a ham since age 13 and, while I am active on the HF bands (mostly digital modes such as RTTY and PSK31), I also have a strong interest in utility monitoring (aviation and public safety). In my ham shack, I have two scanners which monitor local Seattle area aviation traffic – for which the enjoyment is enhanced by Boeing operating many newly built airliner test flights in the area. With the iPad, I can be anywhere in the world and still listen to Seattle area aviation traffic or any one of the 500+ global aviation monitor feeds using the LiveATC iPad and iPhone application ($2.99 for the iPad & iPhone).


*Reading MT's SW Guide on the iPad*

You can listen to thousands of global scanner feeds which include public safety, railroad, marine, and ham repeater scanner feeds on the iPad and iPhone using the 5-0 Radio Police Scanner application (lite version is free; $5.99 for Pro version with over 33,000 additional feeds and recording capabilities).

Of course, you can also listen to over 40,000 AM and FM radio stations around the globe that stream programming via the Internet, using the TuneIn Radio Pro application which is available for both the iPad and iPhone with two versions: free and Pro ($0.99). The Pro version adds the capability of being able to record and archive what you hear. There are quite a number of other iPad & iPhone Internet radio applications available as well.

I wish that I could tell you that it was also possible to listen to remote amateur radio Software Defined Radio (SDR) stations, but these remote receiver sites use Java™ code in their web sites to display the receiver spectrum graphic and, unfortunately, Apple does not support Java at this time.

## But wait, there's more!

Several other iPad and iPhone applications that might be of interest to readers (downloadable from the iPad and iPhone Apps Store) are:

**Ship Finder HD** – live tracking of ships (free version available; Pro version is $7.99).
**Plane Finder HD** – similar to Ship Finder with live tracking of flights (free version with Pro version available for $7.99).
**Quakes** – Earthquake notifications with maps (free for iPad and iPhone).
**HamSat HD** – graphic display of ham satellite tracks ($4.99 for iPad & iPhone). A related but more enhanced application, ProSatHD, graphically depicts virtually all commercial, weather, **International Space Station** (ISS), ham, and other types of satellites ($9.99 for iPad only).
**Exam Prep** – six different practice tests for various ham licenses (free for iPad & iPhone).
**Ham Tool VX-3R** – ITU region band plans, DXCC list, antenna calculator and some reference info for the Yaesu VX-3R ($1.99 for iPad & iPhone).
**Weather** – a number of really excellent free weather applications exist for the iPad & iPhone including Intellicast.com, The Weather Channel, and AccuWeather all of which can display real-time weather radar.
**73 HamLog** – great for portable and mobile operators who want to keep a log, also features WWV and solar propagation reports, DX Cluster, call sign lookup ($0.99 for the iPad).

I simply love my iPad and iPhone, and while I enjoy reading and storing *MTXpress* on my iPad, I can also enjoy some aspects of my radio hobby while I am traveling just about anywhere in the world. It's even possible to use most of the radio related applications featured above while flying on certain commercial flights that offer airborne Wi-Fi (such as Delta airlines). The iPad and iPhone are great tools for radio hobbyists, especially those who travel frequently.

*The author may be reached via email at nw7d.ham@gmail.com*

# *MT* Looks at e-Readers

By Bill Grove

With the swarm of digital devices constantly inundating the market, it can be a daunting task to decide which ones are just a fad or which ones hold merit. E-book readers are one of those devices that seem to be gathering quite a following. But are they just a fad or are they something that you should consider adding to your repertoire of gadgets and gizmos? Hopefully, with a little guidance, I can help you make the decision easier.

## Kindling a Revolution

By far the most well-known "true" e-book reader is the Amazon Kindle™. Released by Amazon in November of 2007, the Kindle has become the go-to standard for e-book readers. With its book-like screen and incredible battery life it's very easy to see why it has garnered such an auspicious reputation. What makes it so special? Let's talk a bit about the technologies at work inside this portable library.

Varying screen sizes and communications options are a few of the common choices on today's Amazon Kindle, but it's the screen that really makes this little beauty shine. Using the latest e-ink technology, the Kindle can display words and photos on a page very similar to that seen in a printed book.

E-ink turns each pixel (one single dot in a huge matrix of dots that form the display) either black or clear, but unlike computer displays, the pixel stays in that state until power is applied to it once again telling it to turn either black or clear. This means that while a picture is on the screen, if you remove the battery, the picture will remain! This allows unheard of battery life from these devices, often exceeding a month without the needing a charge.

Amazon has set up several deals with companies to add even more value to the Kindle. To start with, the Kindle store has a vast library of titles to choose from, many of which are free. You can store 3,500 books on all three current Kindle models, but your personal account on Amazon allows you to store an unlimited number of books, so you're not limited to the memory of the device itself. And, Kindle software, available for your computer and other devices (such as the iPad, iPhone and Android OS), allows you to read the books that have been purchased through downloads on any of your devices, so you're not limited to the Kindle e-reader alone.

Something else that makes the Kindle even more useful is the deal Amazon has struck with AT&T for the distribution of its books. If you purchase a Kindle with 3G connectivity (the device has a GSM -- Global System for Mobile Communications -- modem built-in), you can download your books from anywhere you can receive an AT&T signal and you can browse the Internet with the device. Cost of the monthly service? Free. Although the web browsing experience certainly isn't optimal, the ability to quickly check your email or hit the web for some timely research makes the Kindle even more valuable. Everything is in black and white, but when all that matters is the information, the appeal of color is quickly dimmed by the knowledge that you have a device that is always there at the ready to look something up when you need it.

## Barnes & Noble Nook

So, how could any other e-reader possibly compete with such an amazing device? With some interesting ideas of their own. Enter the Barnes & Noble Nook™. The Nook Color is the latest iteration of the Nook line and, as its name shows, is a full-color screen. Beyond that, Barnes & Noble have integrated a touch screen into the device so that you have a more natural interaction with the screen. Although the Kindle's built-in keypad (below the screen area) and side page-turn buttons which are functional, being able to flip pages as you would with a book by sliding your finger across the screen certainly gives the Nook a more natural feel.

But, all of this nifty technology comes at a cost, both figuratively and literally. The Nook Color costs a bit more than the Kindle ($249 versus $139 for the WiFi models), but worse is the battery life. The whole idea behind e-ink is the battery life and when you start throwing color and touch into the mix, the battery suffers. The Nook Color, with the WiFi turned off, only gets around 8 hours of battery life. When you're an "always on-the-go" kind of person, this can certainly affect your purchasing decision.

## Sony Reader

OK, so you're not convinced you need color, but that touch screen sure does sound nice. What's a person to do? Well, our friends at Sony believe they have the perfect solution! Enter the Sony Reader™. There are many different models of the Sony Reader, but the primary differences are the screen size, memory and included accessories. With prices ranging from $100-$300, there are a lot of choices, but the technology is solid and tested. They have chosen to use the same type of e-ink technology as the Amazon Kindle, but have thrown in a natural touch screen, so you still have that book "feel," but your battery life will allow you a good week or two between charges, far better than that of the Nook Color.

## Apple iPad

Alright, so you have decided that color is great, touch screen is great but you still want more! Back in April of 2010, Apple introduced the iPad. Their latest entry into the "i" line of products features a 9.7" capacitive, color, multi-touch screen, WiFi, 3G (if you wanted to pay for it) and a very powerful CPU (com-

puter processor, or "brain") as well as graphics processor. Not only did it have Apple's smooth "feel" but it also brought with it a massive repository of software from the iTunes app store. The iPad is much more than just an e-reader, it's a full-fledged computer with a versatile operating system and an absolute army of programmers and designers constantly working to add to it and improve on it.

So, what's the iPad's greatest shortcoming? Cost. The iPad starts at $499 and goes up to a whopping $829 and that's for just the unit. Start adding cases and gadgets and it can easily hop up over $1000. The other downfall as an e-reader is battery life. With great power comes great drainage (not sure that's how the original quote went, but I'm sticking with it). Expect to get about 8-10 hours of regular use out of your iPad's battery. That makes it quite comparable to the B&N Nook Color, but at over twice the price.

## Is there something else?

On the horizon are a plethora of choices. On the cheap side are the Android-based tablets from a dozen or more makers that are flooding the market. Android tablets are direct competitors to the Apple iPad but are far cheaper. They don't have Apple's massive programming team, but are quickly gaining a foothold due to their low prices (as low as $100 for a color, multi-touch device).

Another option will be the Microsoft Windows™-based tablets that will be quickly rolling off the manufacturing floors throughout this year and next. They will offer a "real" operating system (Microsoft Windows 7) as well as USB and Ethernet ports. The downfall will be with cost as well as battery life. Since it will be a full-blown operating system, you can expect to only get between 2-4 hours of active battery life from the Windows systems. But, most likely, the systems will have replaceable batteries, so you can swap them on-the-go to give your device new life, something the iPads and Androids don't offer.

There you have it! That's where we are today. Still confused? Don't worry, I can help. Need a good e-reader only and you're happy with black and white? Get the Kindle. Although the Sony is a great option, the Kindle is only going to grow in its support base and its quality is outstanding. With the best battery life on the market you can just throw it in a bag and tote it knowing it's always ready when you are.

If you really want the color and the touch, go for the iPad. These things are incredible. Yes, they are expensive, but you get what you pay for. Want to listen to your scanner but you don't have it with you? There's an app for that. Want to check what movies are playing? There's an app for that. Want to go on a diet and need some tracking and help? There's an app for that.

The "there's-an-app-for-that" commercials aren't kidding. If you can think of it, there's probably already an app for it. This market is always changing and expanding, so before you buy, research. Hit the Internet and start seeing what's out there and what deals you can find. I would like to be the first to welcome you to the world of digital print. It only gets bigger from here. MT


WiNRADiO Excalibur Pro

The WiNRADiO WR-G33DDC 'EXCALIBUR Pro' is a high-performance, low-cost, direct-sampling, software-defined, shortwave receiver with a frequency range from 9 kHz to 49.995 MHz. It includes a real-time 50 MHz-wide spectrum analyzer and 4 MHz-wide instantaneous bandwidth available for recording, demodulation and further digital processing.

* 4 MHz instantaneous processing bandwidth
* Low-noise preamplifier
* Configurable preselection filters
* Filter bandwidth adjustable down to 1 Hz
* 0.5 ppm frequency stability

Test and measurement functions

9 kHz to 49.995 MHz continuous frequency range
Direct sampling
Digital down-conversion
16-bit 100 MSPS A/D converter
50 MHz-wide, real-time spectrum analyzer
4 MHz recording and processing bandwidth
Continuously adjustable filter bandwidth down to 1 Hz
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# SCANNING REPORT

THE WORLD ABOVE 30MHZ

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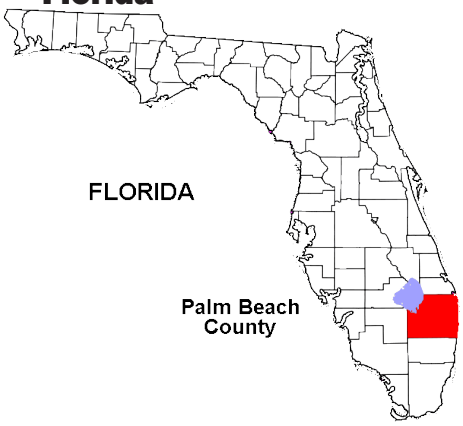
# The Open Sky Misnomer

In previous columns we've covered the difficulties public safety organizations have experienced attempting to install and operate a particular type of radio system called Open Sky. This fully digital, Internet Protocol-based radio network uses the same 800 MHz frequencies as the far more common Motorola analog and Project 25 digital public safety radio systems, but the specific technical details of how it works have been kept a secret by the manufacturer.

Such a closed, proprietary product has made Open Sky a particular sore spot for scanner listeners, because without those details it is very difficult to produce a device that can monitor the system. Although the design of Open Sky dates back more than 15 years, no scanner manufacturer has done the significant legal and technical work to incorporate an Open Sky capability into an affordable mass-market product, leaving listeners locked out.

In the meantime, Open Sky customers are finding it nearly as difficult to get a system up and running that meets their requirements.

## ❖ Palm Beach County, Florida




Palm Beach County is located in southeastern Florida between Lake Okeechobee and the Atlantic Ocean and is home to more than 1.3 million residents. It is the largest county by land area in the state, covering more than 2,000 square miles.

In 1993, 33 municipalities formed the Municipal Public Safety Communications Consortium (MPSCC) of Palm Beach County to investigate the possibility of purchasing and operating a shared public safety radio system that would improve interoperability between local agencies. After years of review, the Consortium selected an Open Sky radio system in 2003 and signed a contract with manufacturer M/A-COM in 2006.

During this time, Palm Beach County installed and began operating a Motorola trunked radio system in August 2000. Three large cities, Boca Raton, Boynton Beach and Delray Beach, left the MPSCC to join the county system. Today there are six municipalities that remain in the Consortium: Atlantis, Juno Beach, Jupiter, Palm Beach, Palm Beach Gardens and West Palm Beach.

Palm Beach Gardens has been using the Open Sky system since 2009 and Palm Beach since last year. Jupiter went live this year on May 5. Juno Beach and West Palm Beach continue to use older radio equipment while they prepare for transition to Open Sky. West Palm Beach Fire-Rescue is served by the Palm Beach County system, which is scheduled for upgrading to Project 25 over the next couple of years.

## ❖ West Palm Beach, Florida

The City of West Palm Beach had been planning to join the Open Sky system since 1999 and is tentatively set to finally join this September. They have spent $3.6 million for equipment and another $465,000 in maintenance and have yet to authorize the purchase of 400 Open Sky radios at a cost of $1.6 million. In addition, the City pays the MPSCC about $170,000 a year in fees.

Earlier this year a commissioner for the City of West Palm Beach, Florida claimed the City administration withheld a report critical of the Open Sky system. The 44-page report was written by the City's technical team in response to an April 2010 request, but was never provided to commissioners. It provides a detailed list of reported problems and objections to the MPSCC Open Sky system and recommends a number of alternatives that they claim will better serve the City and its taxpayers.

The report identifies a number of technical failings of the Open Sky system, including dead spots and poor coverage, poor building penetration, calls that don't go through, jury-rigged connections to provide connectivity and limited interoperability with nearby systems. Poor audio quality is also detailed, including garbled speech, excessive background noise and "computer generated" voices that make it impossible for dispatchers to identify officers by the sound of their voice.

According to this report and local news, the system failed in May 2011 during a chase when a Palm Beach Gardens officer was unable to communicate with a county helicopter while pursing a stabbing suspect.

## ❖ Testing Open Sky

West Palm Beach conducted a full-scale test of Open Sky in September 2009 and found numerous, severe problems. The Open Sky vendor at the time, M/A-COM, at their own cost replaced 130 radios valued at $450,000 and erected an $85,000 repeater site to provide greater coverage in the western communities.

Interestingly, during these tests the existing Motorola system operated from a single location at the city water treatment plant using 13-foot antennas. The Open Sky system operated from three sites within the city, including the water treatment plant, and used 20-foot antennas. Despite these advantages, the Open Sky system performed substantially worse than the Motorola system, including poor coverage. The City expects to add additional repeater sites to provide adequate coverage.

The MPSCC plans on using 16 towers to cover their six towns, while the county system uses 10 sites to serve the entire county. The City report estimates another $8 million in infrastructure costs and a doubling of operating expense would be necessary to bring Open Sky up to the level of performance and reliability currently provided by their Motorola system.

A February test in West Palm Beach identified 13 buildings into which radio signals did not penetrate with sufficient strength to communicate effectively. According to the MPSCC, building owners will be required to purchase amplifiers, which may end up costing as much as $50,000 per facility to install. The city already spent $50,000 to equip the police station and city hall with amplifiers, which previously suffered from poor in-building radio coverage.

Palm Beach fire trucks have been equipped with $8,000 repeaters in order to provide on-scene coverage and improve signal penetration into buildings during firefighting operations.

The report identifies differences in testing

methodologies that unfairly favor Open Sky. For example, to test coverage, the geographic service area of the radio system is divided into grid squares that are 1/2 mile by 1/2 mile. The City's current Motorola system was required to successfully communicate at 100 different locations within each grid square before being accepted. The Open Sky system was only required to communicate at one location in each square in order to be declared successful.

The report also identifies a curious problem known as "dynamic dead spots." In any radio system there will be a handful of locations where communication is not possible, due to interference, blockage, or other causes. System designers work to minimize such locations and public safety personnel learn not to use radios in those spots. As reported by West Palm Beach and other Open Sky users across the country, dead spots in an Open Sky system appear to move around. A user may be able to communicate effectively one minute, but the same user with the same radio at the same spot may not be able to communicate a few minutes later.

Perhaps the most telling admission made by the MPSCC, the proponent for Open Sky, appeared in a letter to the Federal Communications Commission (FCC) requesting an extension to a build-out requirement. The MPSCC letter provides the excuse that "system and subscriber software problems [that] prevent the system from being utilized for mission critical operations." As of June 2011, the MPSCC call sign, WQKC299, has a note indicating that "This call sign or a component(s) of this call sign is in termination pending status for failure to meet the buildout requirement."

The FCC Notice of Termination Letter lists 854.0375, 854.0625 and 854.4875 MHz as frequencies the MPSCC may lose due to their buildout delay. These frequencies were licensed to transmit from repeater sites in Atlantis, Lake Park, Palm Beach Gardens and West Palm Beach. The construction deadline was March 25, 2011.

## ❖ West Palm Beach Motorola System

The City of West Palm Beach currently operates a Motorola Type II SmartNet on the following licensed frequencies: 854.9625, 855.1375, 856.4375, 856.7125, 856.9625, 857.4375, 857.7125, 857.7875, 857.9625, 858.4375, 858.7125, 858.9625, 859.2125, 859.9625 and 860.7125 MHz. These frequencies are transmitted from two primary sites in West Palm Beach, one on the north edge of Clear Lake near the intersection of North Australian Avenue and 7th Street and the other at the East Central Regional Water Reclamation Facility adjacent to the turnpike.

| Decimal | Hex | Description |
|---|---|---|
| 16 | 001 | Police and Fire (Common) |
| 48 | 003 | School Burglary Alarms |
| 80 | 005 | Interagency |
| 112 | 007 | Police, Fire and Public Works (Common) |
| 1584 | 063 | Police Vehicle Maintenance |
| 1616 | 065 | Police (North Dispatch) |
| 1648 | 067 | Police (South Dispatch) |
| 1680 | 069 | Police (Information) |
| 1712 | 06B | Police Tactical 4 (North District) |
| 1744 | 06D | Police Tactical 5 (South District) |
| 1776 | 06F | Police Tactical 6 (Non-Patrol) |
| 1808 | 071 | Police |
| 1840 | 073 | Police Eyewatch (Citizens On Patrol) |
| 1904 | 077 | Police Supervisors |
| 1936 | 079 | Police Staff Services |
| 1968 | 07B | Police Special Events |
| 2000 | 07D | Police Dynamic Regroup 1 |
| 2032 | 07F | Police Dynamic Regroup 2 |
| 2064 | 081 | Police Citizen Observer Patrol (COP) 1 |
| 2096 | 083 | Police Citizen Observer Patrol (COP) 2 |
| 2128 | 085 | Police |
| 2160 | 087 | Police Tactical 4C (North District) |
| 2192 | 089 | Police Tactical 5C (South District) |
| 2224 | 08B | Police Tactical 6C (Special Operations) |
| 2256 | 08D | Police Training 1 |
| 2288 | 08F | Police Training 2 |
| 2320 | 091 | Police Training 3 |
| 2352 | 093 | Police Special Weapons and Tactics (SWAT) |
| 3120 | 0C3 | Police Criminal Investigative Division (CID) |
| 3216 | 0C9 | Fire (Dispatch) |
| 3248 | 0CB | Fire and Emergency Medical Services |
| 3280 | 0CD | Fireground 1 |
| 3312 | 0CF | Fireground 2 |
| 3344 | 0D1 | Fireground 3 |
| 3376 | 0D3 | Fire Prevention |
| 3408 | 0D5 | Fire Administration |
| 4816 | 12D | City Services |
| 4848 | 12F | Garbage Collection 1 |
| 4880 | 131 | Garbage Collection 2 |
| 4944 | 135 | Finance Department |
| 4976 | 137 | Building Department |
| 4992 | 138 | Traffic Engineering |
| 5008 | 139 | Traffic Operations |
| 5072 | 13D | Street and Traffic Maintenance |
| 5136 | 141 | Electrical Maintenance |
| 5168 | 143 | Emergency Operations Center (EOC) |
| 6416 | 191 | Water Department |
| 6448 | 193 | Public Works |
| 6480 | 195 | Public Works |

## ❖ Kanawha County, West Virginia

In many areas of the country, public safety agencies continue their migration to digital systems. Over the next year agencies in the capitol area of West Virginia will shift away from their old analog radios and join a statewide digital network. The State operates the West Virginia Interoperability Radio Project (WVIRP), a statewide Project 25 digital radio network

Charleston is the capitol of West Virginia, located in Kanawha County. While the City has a population of just over 51,000, the larger metropolitan area is home to more than 300,000 people.

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Several agencies in Charleston, including the Fire Department, have been using digital radios for more than a year.

Nitro is a town of about 7,000 people, located along the Kanawha River about 12 miles west of Charleston. St. Albans is an adjacent river town and home to nearly 11,000 people. These two towns are the first Kanawha County municipalities outside of Charleston to switch to digital operation on WVIRP, motivated by gaps in coverage and a lack of additional analog frequencies.

During the transition period and for some time to come, there will be many active VHF (Very High Frequency) radios in operation that can be monitored with nearly any scanner, since the transmissions are simple analog voice.

| Frequency | Description |
|---|---|
| 151.0250 | Nitro Fire (Dispatch) |
| 151.1000 | County Emergency Medical Services (Dispatch) |
| 151.1450 | County Schools |
| 151.2725 | County Schools |
| 151.3025 | County Fire (Operations) |
| 151.6850 | County Schools (Buses) |
| 153.8300 | County Fire (F4) |
| 153.9050 | West Virginia University |
| 154.0400 | Charleston Emergency Medical Services (Dispatch) |
| 154.0550 | Dunbar Police (Dispatch) |
| 154.1000 | Charleston Sanitation and Traffic Engineering |
| 154.1150 | South Charleston Maintenance |
| 154.1600 | Belle Fire |
| 154.2800 | County Fire (F3) |
| 154.2950 | County Emergency Medical Services |
| 154.3700 | South Charleston Fire (Dispatch) |
| 154.3850 | Charleston Fire (Dispatch) |
| 154.7325 | County Sheriff |
| 154.7550 | Charleston Police |
| 154.8900 | Charleston Drug Unit |
| 154.9650 | Dunbar Fire (Dispatch) |
| 154.9950 | Charleston Street Department |
| 155.0100 | St. Albans Police (Dispatch) |
| 155.0250 | St. Albans Fire (Dispatch) |
| 155.0400 | West Virginia Archives |
| 155.0550 | Town of Nitro |
| 155.1000 | Charleston Police |
| 155.1450 | County Fire (Dispatch) |
| 155.1600 | HealthNet (Dispatch) |
| 155.1900 | Charleston Police |
| 155.2650 | County Emergency Medical Services (Tactical) |
| 155.4750 | Police Interdepartmental |
| 155.5350 | Charleston Criminal Investigation Detectives |
| 155.6250 | County Sheriff (Dispatch) |
| 155.7450 | County Fire (F2) |
| 155.7750 | South Charleston Street Department |
| 155.8200 | County Schools (Buses) |
| 155.8650 | Nitro Police (Dispatch) |
| 156.1950 | County Municipal Police (Dispatch) |
| 156.2250 | County Office of Emergency Services (Bee Mountain) |
| 158.7300 | South Charleston Police |
| 158.7450 | West Virginia Archives |
| 158.7750 | County Regional Transport |
| 158.7900 | South Charleston Police (Dispatch) |
| 158.8350 | County Regional Transport |
| 159.1500 | Charleston Police (Dispatch) |
| 159.2100 | Charleston Police |

Frequencies in the UHF (Ultra High Frequency) band carry mostly fire and medical traffic, also in analog format.

| Frequency | Description |
|---|---|
| 453.1000 | County Fire (Bee Mountain patch to 155.145) |
| 453.1500 | County Fire (Cross Lanes patch to 155.145) |
| 453.4000 | County Fire (Clendenin patch to 155.145) |
| 453.5250 | State Capitol (Maintenance) |
| 453.7875 | County Fire (Glasgow patch to 155.145) |
| 453.9875 | County Fire (Edens Fork patch to 155.145) |
| 458.2875 | County Fire (Sumerco patch to 155.145) |
| 460.9000 | County Fire (Edens Fork Repeater) |
| 461.8500 | Life Ambulance Service (Dispatch) |
| 464.2500 | County Fire (Malden Mountain Repeater) |

In addition, some frequencies carry digital traffic. Radios on these frequencies use the Common Air Interface (CAI) defined by the APCO Project 25 standards. These frequencies are used conventionally, meaning they are not trunked, so any digital-capable scanner, including first generation models like the Bearcat BC250D and BC785D, can monitor them.

| Frequency | Description |
|---|---|
| 158.8950 | Charleston Drug Unit |
| 453.3625 | County Office of Emergency Services |
| 854.9625 | State Capitol (Security) |
| 855.2125 | State Capitol (Security) |
| 855.4625 | State Capitol (Security) |

## ❖ West Virginia Interoperability Radio Project (WVIRP)

Like some of the conventional frequencies in Kanawha County, the West Virginia Interoperability Radio Project uses Project 25 (P25) standards to carry voice traffic in digital format. However, WVIRP is also a P25 trunked system, meaning the voice channels are shared among a disparate set of users according to Project 25 trunking standards. What this means for scanner listeners is that not only is a digital-capable scanner necessary to hear activity on the system, but the scanner must also be capable of tracking a P25 control channel. Fortunately, there are a number of scanners on the market that are capable of doing so:

| Manufacturer | Model |
|---|---|
| GRE | PSR-500, PSR-600, PSR-800 |
| Radio Shack | Pro-18, Pro-106, Pro-197 |
| Uniden | BCD396T, BCD396XT, BCD996T, BCD996XT, HomePatrol |

There are five WVIRP sites within Kanawha County, transmitting on the following frequencies:

| Site | Frequencies |
|---|---|
| Malden | 453.1625, 453.6125, 453.8125, 460.0375, 460.2375, 460.4625 |
| Charleston | 453.3875, 453.6625, 453.6875, 460.0625, 460.1375, 460.2875, 460.3375 |
| State Capitol | 453.6500, 453.7375, 460.0875, 460.4125, 460.6375, 461.5375 |
| Clendenin | 453.1875, 453.4125, 453.5875, 453.8000, 460.0500, 460.3125 |
| St. Albans | 453.4375, 460.1500, 460.6125, 460.6750, 463.3750, 464.2750 |

The talkgroups listed below are monitored activity in Kanawha County. Nitro and St. Albans activity, along with other county municipalities as they transition, should also appear close to this range of talkgroup numbers.

| Decimal | Hex | Description |
|---|---|---|
| 6100 | 17D4 | Emergency Operations (Tactical 1) |
| 6104 | 17D8 | Carper Justice and Public Safety Complex (Maintenance) |
| 6105 | 17D9 | Yeager Airport (Operations) |
| 6110 | 17DE | Emergency Operations (Administration 1) |
| 6111 | 17DF | Emergency Operations (Administration 2) |
| 6120 | 17E8 | Sheriff (Dispatch) |
| 6121 | 17E9 | County Law Enforcement (East) |
| 6122 | 17EA | County Law Enforcement (West) |
| 6123 | 17EB | Judicial Annex |
| 6124 | 17EC | Special Operations 1 |
| 6125 | 17ED | Special Operations 2 |
| 6126 | 17EE | Special Operations 3 |
| 6130 | 17F2 | Municipal Fire (Dispatch) |
| 6131 | 17F3 | Municipal Fire (Operations) |
| 6132 | 17F4 | Municipal Fire (Operations) |
| 6133 | 17F5 | Municipal Fire (Operations) |
| 6134 | 17F6 | Municipal Fire Operations |
| 6135 | 17F7 | Municipal Fire (Operations) |
| 6140 | 17FC | Fire (Dispatch) |
| 6141 | 17FD | Volunteer Fire (Operations) |
| 6142 | 17FE | Volunteer Fire (Operations) |
| 6143 | 17FF | Volunteer Fire (Operations) |
| 6150 | 1806 | Emergency Medical Services Advanced Life Support (Dispatch) |
| 6151 | 1807 | Emergency Medical Services (Operations) |
| 6152 | 1808 | Emergency Medical Services Basic Life Support (Dispatch) |
| 6153 | 1809 | Emergency Medical Services (Operations) |
| 6154 | 180A | Emergency Medical Services (Operations) |
| 6155 | 180B | Emergency Medical Services (Operations) |
| 6170 | 181A | Mutual Aid 1 |
| 6171 | 181B | Mutual Aid 2 |
| 6172 | 181C | Mutual Aid 3 |
| 6173 | 181D | Charleston Police (Traffic Units) |
| 6181 | 1825 | Health Department Operations 1 |
| 6182 | 1826 | Health Department Operations 2 |
| 6183 | 1827 | Health Department Operations 3 |
| 6184 | 1828 | Health Department Operations 4 |
| 6210 | 1842 | Charleston Fire (Dispatch) (Simulcast on 154.385 MHz) |
| 6211 | 1843 | Charleston Fire 2 |
| 6212 | 1844 | Charleston Fire 3 |
| 6213 | 1845 | Charleston Fire 4 |
| 6214 | 1846 | Charleston Emergency Medical Services (Dispatch) |
| 6215 | 1847 | Charleston Emergency Medical Services 2 |
| 6220 | 184C | Charleston Police (Dispatch) |
| 6221 | 184D | Charleston Police (Operations) |
| 6222 | 184E | Charleston Police (Tactical) |
| 6223 | 184F | Charleston Police (Operations) |
| 6224 | 1850 | Charleston Police (Operations) |
| 6225 | 1851 | Charleston Police (Special Events) |
| 6226 | 1852 | Charleston Police (Operations) |
| 6227 | 1853 | Charleston Police (Operations) |
| 6228 | 1854 | Charleston Police (Operations) |
| 6277 | 1885 | County Humane Department |

That's all for this month. I welcome your comments and questions via electronic mail to `danveeneman@monitoringtimes.com`, and as always you can check my website at **www.signalharbor.com** for more frequencies and other radio-related information, including details on various Open Sky systems across the country. Until next month, happy scanning!

# ASK BOB

## GENERAL QUESTIONS RELATED TO RADIO

*Bob Grove, W8JHD*
*bobgrove@monitoringtimes.com*

***Q.*** *On a recent History Channel show it was stated that the penalty for Germans listening to BBC broadcasts was death, which appeared to be of little deterrent. Wasn't jamming practiced then? (Mark Burns, Terre Haute, IN)*

***A.*** Yes, it was. The Nazis attempted to jam BBC and other Allied stations, but more transmitters and more frequencies kept being added to overcome the jamming. In addition, Allied aircraft dropped leaflets into Nazi Germany with instruction on how to build a simple, directional, loop antenna to add to German radios to null out the jamming stations.

---

***Q.*** *With the virtual elimination of analog voice above 470 MHz, why are these upper frequency ranges still included in analog scanners? (J.J. Owens, NC)*

***A.*** There's really no reason not to include them; if there's nothing of interest to be heard in your area, don't listen to those ranges. The technology for total frequency coverage is well established and cheap to implement, and hobbyists don't want to be deprived of any listening possibilities. Some scanners are used as test-bench instruments. Manufacturers compete by producing wider and wider frequency ranges. Such receivers can be used to detect band occupancy, interference location, and other non-voice applications.

---

***Q.*** *While doing a little DXing on the normal AM band, I ran across a very weak signal on 950 kHz. It appears to be a time signal with just a tick every second and a quick Morse code ID. I only receive it at night. Any idea what it is? (Michael Brock, email)*

***A.*** These are time ticks from Cuba's Radio Reloj (Spanish for "clock"). They are heard on 570, 820, 860, 870, 930, 950, 960, and 1020 kHz.

---

***Q.*** *I am having trouble accessing a local two-meter repeater with my hand-held transceiver. I read a comparison of whip antennas that showed the Grove ANT-08 as being the best because of its adjustable length. I see that it has been discontinued. Will your current ANT-06 perform as well? (Dennis Hyde, KJ6MIW)*

***A.*** That review virtually paralleled one that I did a year or so ago in *MT*. A quarter-wave resonant antenna at 18"-19" in the 144-174 MHz range works better than the typically-shorter rubber duckies that don't have the capture area or impedance match at the proper frequencies. You will be pleased to learn that the replacement for the old ANT-08 is our ANT-06 shown at **www.grove-ent.com/ANT6.html**. Simply adjust it to 19" length and you will have the same superior results.

---

***Q.*** *I want a simple, hand-held scanner without all the bells and whistles. I simply want to turn it on, punch in frequencies between 28 and 1300 MHz, hit SCAN, and listen. Are these still made? (Eric Croft, Ceipachet, RI)*

***A.*** With the tremendous increase in sophisticated VHF/UHF communications, it's hard to find a basic scanner anymore. However, for the limited set of requirements you have requested, I would strongly recommend you consider the Uniden BC-95XLT.

Even though it does not include the 1300 MHz requirement, there's virtually nothing you would hear above 960 MHz except occasional point-to-point hams. It does cover up to 960 MHz, the upper limit of major UHF communications. None of these low-end, non-trunking, non-shortwave scanners, however, covers the 225-400 MHz military aircraft band.

If you must have that higher range, then you will have to pay considerably more and have a wide variety of other features as well like trunk-tracking. Or, you can select from a number of hand-held scanning receivers that includes shortwave. The bottom end of that category would be the BC346T (approximately $250).

Neither of these scanners covers the military aircraft band (225-400 MHz).

---

***Q.*** *I purchased the Austin Condor antenna and found no noticeable improvement over the factory supplied antenna. (John Fawcetti, Bartonville, IL)*

***A.*** Multiple tests have been made by independent technicians on comparative antennas over a wide range of frequencies. All tests that I have seen as well as those that I have personally made, place the Condor right up on top. That is why Grove carries them and why they are widely sold. Even so, there are many variables that can affect comparisons.

On any antenna, performance will be better on some frequencies than on others. Assuming resonance, a long antenna will always pick up stronger signals than a short antenna. To compare antennas, conditions must be precisely duplicated (location, position, elevation, received signal level, surrounding obstacles, feed-line if used, etc.). Tests must be made at the same time to avoid propagation changes. A signal-strength meter must be used to avoid intuition influencing actual measured performance.

---

***Q.*** *I understand the MFJ-1020C can be used to tune a longwire. Are we talking significant improvement on my Realistic DX320 and Hallicrafters 118 with a Heathkit 125 Q multiplier? (Bill Krupiczewicz)*

***A.*** When we speak of a "tuner" for shortwave reception, we generally mean a tunable preselector rather than an impedance-matching transmatch as used with transmitting antennas.

A preselector's tuning knob is adjusted to pass a specific, narrow swath of spectrum and present it to the receiver while also suppressing strong, out-of-band signals which can cause images (phantom signals produced by overloading the receiver's amplification stages), and general desensitization (reducing the receiver's weak-signal reception).

The MFJ-1020C also contains an optional preamplifier to boost incoming weak signals when using the short whip. Such amplification is unnecessary when using a large antenna because it increases the signal and the noise together, resulting in no signal improvement above the noise, only a higher reading of both on an S-meter.

If your receiver experiences overload symptoms as discussed above, then a preselector like the MFJ-1020C would be recommended.

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

# UTILITY WORLD

HF COMMUNICATIONS

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# More Changes at CFH

CFH, the Canadian Forces communication station in Halifax, Nova Scotia, continues to change things. One might remember earlier in 2011, when the weather broadcasts in radiofacsimile (fax) and radio teletype (RTTY) simply vanished without notice. Well, on June first, the other CFH RTTY transmission also went away.

In the second case, though, the only change is in the transmission mode used. Like most members of the North Atlantic Treaty Organization (NATO), Canada has switched its RTTY traffic to a newer mode called STANAG 4285. Message content remains the same.

This content is usually a channel availability marker fairly similar to those sent by other NATO members. A lucky few have heard the station actually work someone. It has always had a huge signal in the eastern US and Europe, though here in California it depends on band conditions.

While the mode has changed, the frequencies have not. They are still 5097, 10945, and 15920 kilohertz (kHz). However, listeners will probably notice "new" frequencies for the STANAG 4285, since its 1.8 kHz channel center and general signal parameters are different from RTTY. Radios tuned in USB will usually be centered correctly when the dial/window reads 1.8 kHz lower than the listed frequencies.

All this might seem like a lot of fuss over an arcane military transmission that few people would actually listen to for any length of time after adding it to the log. Mostly, the issue concerns the continuing disappearance of RTTY. Most of what's left outside the amateur bands in North America has strong signals, but it is heavily encrypted and uncopyable. Unencrypted Baudot RTTY is something of a vanishing species.

## ❖ Arcane Military Transmission?

Yes, unless the listener has had training in this area, or has knocked around this hobby long enough to understand some really old-school procedures. Let's look at what comes out of CFH.

Most of the time, what's heard is long periods of a STANAG 4285 idler padded to all one states. This is punctuated at a regular interval by a marker reading something like: NAWS DE CFH ZKR F1 2822 3394 4158 6242 8324 12371 AR.

Military procedures tend to get a lot of information into a few characters. "NAWS" is a really old military collective call sign which at least used to stand for, "Notice to Allied War Ships." It's basically a hello-all-friendly-vessels callup. "DE" is the traditional procedural signal for "from." It means the next characters copied will be a station identifier. CFH, of course, is the station's call.

ZKR is a military Z-signal meaning, "I am maintaining watch on [frequency list in kHz]." A lot of military stations use Z-signals, and it's worth having a list of them at hand. Finally, AR is the procedural signal for "end of message."

## ❖ Finding STANAG 4285

As noted, most of the old RTTY (aka RATT) communication by militaries has gone to STANAG 4285. It's a newer mode, though it's old by digital standards. The name refers to NATO's practice of agreeing on Standardization Agreements (STANAGs) for everything from ammo sizes to the color of vessels.

There are over a thousand of these. Number 4285 provides for a standard radio modem using single-tone modulation and user-selectable bit rates. The waveform is optimized for long-distance data broadcasting or point-to-point communication, mostly by navies, using the high frequency (HF) band.

STANAG 4285 is all over the bands. Everyone's heard it. It's that jet plane noise. Especially at night, frequencies around 8 megahertz (MHz) can really light up with the stuff. It's a steady, very purposeful sounding *whoosh*. Sometimes it starts and stops, but usually it runs continuously, even if idling.

The jet noise is a slow phase cancellation caused by cyclic selective fading in the ionosphere. Think of it as nature's version of the phase shifters used by musicians. The effect is strikingly visual on waterfall or spectrogram displays, where dark lines sweep across the fuzzy bandwidth of the signal.

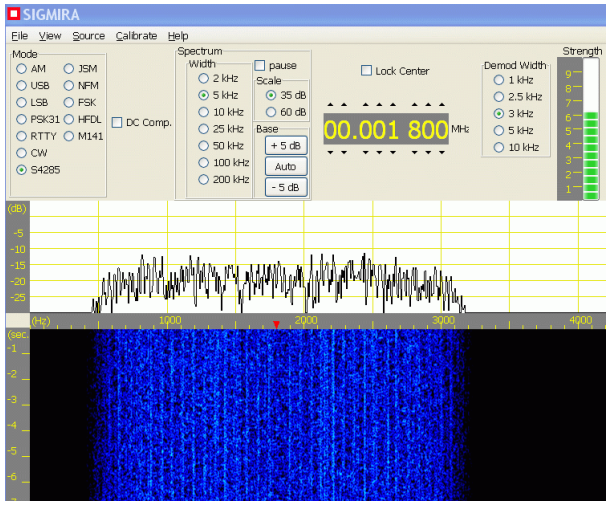
Since STANAG 4285 comes from militaries, finding unencrypted signals has always been something of a challenge, especially away from Europe. The French Navy has been the best bet for the Pacific coast.

Lately, FUM in Tahiti has been extremely strong into California at night. It's on 8625.0 kHz, channel center of 8626.8, with hours of clean decodes. It, too, runs markers, but these are identical in content to older RTTY test loops, right down to the "RYRY…" strings and "VOYEZ VOUS LE BRICK…" test phrases. The steady signal and unvarying content has allowed testing here of various sound card decoders available to hobbyists for less than several thousand dollars. The well regarded Sigmira (freeware) has provided the most consistent copy.

Now, though, we also have CFH to try our hand at attacking STANAG 4285. And attacking is just what one must do. It feels sometimes as if one is back in World War II Bletchley Park, trying to puzzle out something important with a few pieces missing.

## ❖ Decoding STANAG 4285

This mode has a well-deserved reputation for being maddeningly difficult to copy. It hides its signal parameters and makes high demands on hardware and software alike. There's no way to tell encrypted signals by ear. Weak signals are hard to distinguish from noise, even on waterfall displays. Tuning can be quite a challenge.




As always, the best way to catch something is to understand it first. STANAG 4285 is 8PSK, or phase-shift keying with eight states. It gives a distinctive 8-pointed star on phase constellation displays, or at least it should in the absence of noise and fading.

As noted, the center of information is at 1.8 kHz. The bandwidth is around 2.4 kHz, neatly fitting into a single-sideband voice channel. When properly tuned, a waterfall will show a fuzzy mass between approximately 600 and 3000 hertz.

The mode has a constant symbol speed of 2400 per second, but differences in modulation allow the user to select apparent data rates from 75 to 3600. This means that the decoder will sync when it's tuned right, but it's up to the

listener to pick the proper speed. The only way of knowing everything's correct comes when and if the copy changes from gibberish to something resembling military communication. CFH uses a 75 speed, same as their old RTTY, while the French prefer 300 or 600.

Like many digital modes, STANAG 4285 attempts to cope with channel noise and fading by interleaving the data stream. It's up to the user to select short or long interleave. Fortunately, every signal so far encountered uses long, so it's fine to just keep it there.

If everything's right, the sync light will come on, the confidence bar will go to a nice high reading, and when the interleaver/ deinterleaver does its work, out will come the data. Of course, now one needs to configure for the right kind of data. For plain text teleprinting, the choices are ASCII (American Standard Code for Information Interchange) or ITA2 (International Telegraph Alphabet number 2).

ITA2 is a 5-bit character set used by the older RTTY. It's been around a very long time. Fortunately for listeners, just about every copyable station has continued RTTY conventions. Not only is ITA2 used, but the bit framing is set to mimic the old RTTY frame of one start bit, 5 data bits, and one or two stop bits. This means that the only decision here is between "5N1" and "5N2" framing. The latter roughly imitates the old RTTY standard, with its long stop bit.

All of this sounds more formidable than it is. Mostly, experience allows one to evolve a systematic attack for the ominous whoosh. Even better, use the parameters shown in other people's loggings before tweaking things. Yes, it's challenging, but that's the attraction.

Until next month, happy *whooshing*.

## ABBREVIATIONS USED IN THIS COLUMN

AFB..... Air Force Base
ALE ..... Automatic Link Establishment
AM..... Amplitude Modulation
ARQ..... Automatic Repeat reQuest
CAMSLANT ..... USCG Communications Area Master Station, Atlantic
CAP ..... US Civil Air Patrol
CDC ..... US Centers for Disease Control
COTHEN..... US Customs Over-The-Horizon Enforcement Network
CW..... On-off keyed "Continuous Wave" Morse telegraphy
DHFCS..... UK Defence High-Frequency Communications Service
DSC..... Digital Selective Calling
FAX..... Radiofacsimile
FEMA..... US Federal Emergency Management Agency
FM..... Frequency Modulation
HFDL ..... High-Frequency Data Link
LDOC ..... Long-Distance Operational Control
LSB ..... Lower Sideband
M08a..... Cuban CW/MCW, 1-0 substitutes ANDUWRIGMT
MFA..... Ministry of Foreign Affairs
MX..... Generic for Russian single-letter beacons/markers
MARS..... US Military Auxiliary Radio System
MCW ..... Modulated CW, direct or in AM
NASA..... US National Aeronautics and Space Administration
NAT ..... North Atlantic oceanic air control, families A-F
NATO..... North Atlantic Treaty Organization
NCS..... US National Communications System
NTCN ..... US National Telecommunications Coordinating Network
PACTOR ..... Packet Teleprinting Over Radio, modes I-III
PSK..... Phase-Shift Keying
RTTY ..... Radio Teletype
Selcal..... Selective Calling
SESEF..... Shipboard Electronics Systems Evaluation Facility
SHARES..... SHAred RESources (US federal frequency pool).
SITOR..... Simplex Telex Over Radio, modes A & B
STANAG 4285.... NATO 8-ary PSK teleprinting
UK..... United Kingdom
Unid ..... Unidentified
US ..... United States
USAF..... US Air Force
USCG ..... US Coast Guard
VC01 ..... Chinese language voice chip robotic "female"
V13..... Taiwan "New Star," music and numbers
Volmet..... Formatted aviation weather broadcasts
X06..... Russian Intelligence "Mazielka" selcal

*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 ().*

277.0 CHT-Non-Directional Beacon (NDB), Chiltern, England, MCW identifier at 1741 (Mike-West Sussex, UK).
293.0 OB-NDB, Brussels National Airport, Belgium, MCW at 1801 (Mike-UK).
326.0 LM-NDB, Le Mans, France, MCW at 1835 (Mike-UK).
351.5 PLA-NDB, Pula, Croatia, MCW at 2027 (Mike-UK).
354.0 FE-NDB, Fiumicino, Italy, MCW at 2052 (Mike-UK).
360.0 OS-NDB, Goteborg, Sweden, MCW at 2106 (Mike-UK).
4150.0 "V"-Russian solitary beacon (MX), Khiva, CW at 1835 (Ary Boender-Netherlands).
4325.9 "R"-Russian solitary beacon (MX), Izhevsk, CW at 1835 (Boender-Netherlands).
4530.0 Unid-Chinese Robot (VC01), parallel 7684, LSB rapid-fire machine numbers at 1423 and 1829 (Boender-Hong Kong). [GlobalTuner Remote. -Hugh]
4742.0 Unid-UK Royal Air Force, working Tascomm at 1140 (Michel Lacroix-France).
4757.0 USDAHQ1-US Department of Agriculture, calling 010CDCNHQ and 011CDCNHQ, CDC, big FEMA exercise on National Public Health Radio Network (NPHRN); also on 5820, 8023. 9414.5, 10202, 11485, 12164, 13488, and 15658; all ALE, at 1642 (Jack Metcalfe-KY).
5153.7 "D"-MX cluster, Odessa, CW at 1939 (Lacroix-France).
5154.0 "C"-MX cluster, Moscow, CW at 1940 (Lacroix-France).
5206.0 Control-Possible UK cadet training, at 0652 (Lacroix-France).
5616.0 Gander-NAT-C, Newfoundland, position from American 152, at 0442 (Allan Stern-FL).
5723.0 Charlie Foxtrot-US military, calling Charlie in possible tracking net, also possibly 7591.6, at 0343 (PPA-Netherlands).
5745.0 Unid-US Navy Norfolk SESEF, VA, going to 10711 kHz with Mayport SESEF, FL, at 1427 (Metcalfe-KY).
5898.0 Unid-Cuban "cut number" station (M08a), MCW callup and numbers in substituted 5-letter groups, at 0505 (PPA-Netherlands).
6340.5 NMF-USCG, Boston, FAX satellite image and surface analysis, at 0402 (PPA-Netherlands).
6532.0 VP-BPY-Orenburg Airlines B737, flight R29945, HFDL position for Shannon at 2345 (MPJ-UK).
6550.0 Coast Guard 041-Netherlands Coast Guard mobile, coded position for Coast Guard Centre, at 1852 (PPA-Netherlands).
6586.0 New York-Caribbean air control, position and weather with FedEx 9302 (Federal Express freighter), at 0358 (Stern-FL).
6640.0 American 5FR-American Airlines B757 identifying with company fleet number, sent to 5547 by New York LDOC, at 0550 (Stern-FL).
6700.0 Unknown-Possibly French Air Force "Veilleur," at 1135 (Lacroix-France).
6806.0 AVS-CAP, calling 0011ARCAP in ALE, then voice as Avenging Spirit calling AR11, no joy on either, at 1919 (Metcalfe-KY).
6836.5 ONTVA-Possible Netherlands military, ALE sounding, followed immediately by 1000A, in ALE link checks with 308A and 302A, at 2058 (ALF-Germany).
6854.0 Unid-Probably M08a, Cuba, CW 5-letter groups at 2218 (Metcalfe-KY).
6876.5 "T-1-R"-TN-National Guard, discussing disaster medical evacuation with "T-3-R," at 2151 (Metcalfe-KY).
6902.6 WNG740-US Department of State, ALE sounding at 0247 (PPA-Netherlands).
6991.5 EA2SW-Spanish Civil Protection REMER (Red Radio de Emergencia), San Sebastian, calling large net with "Tango" callsigns, at 2135 (ALF-Germany).
7314.0 AAN4EKY-US Army MARS, net with AAN4TN, possible TN State Emergency Operations Center, at 1822 (Metcalfe-KY).
7348.0 FR5FEM006-FEMA Region 5, exchanging ALE text messages with FR-5FEM005, also FEMA, at 1958 (Metcalfe-KY).
7391.5 NNN0AHH-US Navy/ Marine Corps MARS training net, gave other frequencies as 4042.5, 7382.5, and 14385; at 1729 (Metcalfe-KY).
7527.0 TWVA2-Spanish Guardia Civil, Leon, calling TXX2, Madrid, ALE at 0423. OMNI-COTHEN remote transmitter, possibly Omaha, NE, ALE sounding at 0422. PCR-USCG Cutter Dallas (NPCR/ WHEC-716), ALE sounding at 0426 (PPA-Netherlands).
7535.0 Norfolk SESEF-US Navy, went "green" (secure voice) with unknown vessel, at 1845 (Metcalfe-KY).
7596.0 EK9-Greek military, working GEF, ALE at 2011 (PPA-Netherlands).
7615.0 Mockingbird 4-CAP, unsuccessfully receiving traffic from TN CAP 41, at 1533 (Metcalfe-KY).
7632.0 KOQ 900-US Immigration and Customs Enforcement, FL, SHARES net check in with AFA4YG, USAF MARS, at 1626 (Metcalfe-KY).
7697.0 RC4716, American Red Cross, calling WV mobile unit KNNP491WV, ALE at 2030 (Metcalfe-KY).
7704.0 0360FLCAP-Florida CAP, ALE sounding at 0019 (ALF-Germany).
7720.0 SCC43NG-SC National Guard Weapons of Mass Destruction Civil Support Team (WMD-CST), calling EN875TOC (875th Engineer Battalion Tactical Op Center, AR), also on 9145 and 12087, ALE at 2156 (Metcalfe-KY). [At last some real traffic on this net. -Hugh]
7744.0 VC01, LSB numbers at 0507, 0518, 0543, 0556, 0603, 0605, and 0617 (Boender-Hong Kong).
7822.0 XJN714-SailMail, Lunenberg, NS, Canada, message in PACTOR-III at 0444 (PPA-Netherlands).
7906.0 XVS-Ho Chi Minh Ville Radio, Viet Nam, storm warnings in English and Vietnamese, at 1706 (PPA-Netherlands).
7914.5 HNXW-Unknown station, working 47GW with RTTY test "RY" strings and operator chatter, at 0422 (PPA-Netherlands).

7963.0 ICI05-Italian Coast Guard, Reggio, working IGNT, at 1712 (PPA-Netherlands).
7980.0 Unid-Probably SailMail KZN508, SC, PACTOR-III message at 2023 (PPA-Netherlands).
8012.0 Wildwood 11-AR CAP, voice check with Redfire 114 (IN CAP); then 0114INCAP (Redfire) calling 0011ARCAP (Wildwood) in ALE; also on 9047, at 1518 (Metcalfe-KY).
8023.0 001CDC536-NY State Department of Health, Albany, voice call WNG 920, ALE text with 010CDCNHQ (WGY9030), at 1529. KTQ313A-US Environmental Protection Agency, NJ, ALE sounding on NPHRN, also on 9414.5, 11485, and 13488; at 1946 (Metcalfe-KY).
8045.0 RAP-Saudi Arabian Airfields Net, working JAP, ALE at 2059 (MPJ-UK).
8058.5 EN875TOC-AR National Guard, calling JOCAR, unknown AR Joint Operations Center, also on 9065, at 2220 (Metcalfe-KY).
8071.0 FAV22-French Morse code training station, Faviers/ Vernon, CW drill message in 5-letter groups, at 1833 (MPJ-UK).
8107.0 XJK-UK DHFCS mobile, calling XSS (control, Forest Moor), ALE at 1840 (PPA-Netherlands).
8122.0 Heimkehr-German sailing yacht Heimkehr, calling vessels Lotus, Kalandia, and Paulinchen, at 2315 (ALF-Germany).
8143.0 KHAIBAR-Pakistan Navy vessel Khaibar (F-184), working TARIQ, Frigate Tariq (F-181), ALE at 1851 (MPJ-UK).
8182.0 XJM-Unknown UK DHFCS, ALE followed by data transmission, at 2212. (MPJ-UK).
8200.0 MOBILE31-Libyan Great Man-Made River Authority, ALE link check with HQ1 (control, Tripoli) then voice operator chat, finally PSK exchange, at 2055 (ALF-Germany).
8258.5 Unid-North Korean diplomatic, ARQ traffic with unknown station, at 0611 (PPA-Netherlands).
8401.0 PWQO-Brazil Navy Hydrographic Vessel Sirius, SITOR-B third-party traffic via "WN" (PWN33, Natal Naval Radio), at 2050 (ALF-Germany).
8502.0 NMG-USCG, New Orleans, identifying after weather broadcast, at 0421. NMG, female voice (not "Iron Mike"), high seas forecast at 0517 (PPA-Netherlands).
8625.0 FUM-French Navy, Tahiti, very loud STANAG 4285 test loop, at 0550 (Hugh Stegman-CA).
8656.0 3061-Turkish Civil Defense, working 3561, ALE at 1957 (MPJ-UK).
8764.0. NMN-USCG CAMSLANT, VA, female voice with 24-hour forecast, at 0522 (PPA-Netherlands).
8891.0 Reykjavik Radio-NAT-D, warning Continental Airlines flight COA83 about ash from the latest Icelandic volcano, at 0213 (Ken Maltz-NY).
8918.0 New York-Caribbean air route control, working Reach 108, USAF C-17A, gave secondary frequency of 11330, at 0129 (Stern-FL).
8930.0 DSO 25LJ-Dassault Falcon Service, flight "over London," calling Stockholm LDOC at 1700 (ALF-Germany).
8942.0 SU0235-Aeroflot flight, HFDL position for Shannon, at 0741 (Lacroix-France).
8971.0 Fiddle-US Navy, FL, ops-normal from P-3C Wafer 514, at 1957 (Stern-FL).
9003.0 Unid-Royal Jordanian Airlines company LDOC, Amman, calling flight 702, at 1755 (PPA-Netherlands).
9025.0 523513-USAF Reserve KC-135R Stratotanker number 62-3513, ALE sounding at 1330 (ALF-Germany).
9031.0 Catch Fly-US military, setting up data comms with Befriend, at 1953 (Metcalfe-KY).
9035.0 190019-Unknown USAF, called ADW (Andrews AFB, MD) and AED (Elmendorf AFB, AK), then raised CRO (Croughton, UK), ALE at 1345 (ALF-Germany).
9067.7 Unid-Egyptian MFA, Cairo, SITOR-A selcal for OOVF (Pyongyang, North Korea), at 1956 (PPA-Netherlands).
9086.7 Unid-Egyptian MFA, Cairo, SITOR-A selcal for TVVC (Baghdad, Iraq), at 0344 (PPA-Netherlands).
9091.0 JFERNANDEZ-Chilean Emergency Management, Juan Fernandez Island, also on 9140 and 9150, ALE soundings at 2334 (ALF-Germany).
9106.0 KNY85-NTCN, TX, calling NCS311, NCS Auxiliary station, ALE at 1702 (Metcalfe-KY).
9164.9 HLL-Seoul Radio, Korea, FAX fishery weather chart at 1854 (PPA-Netherlands).
9200.0 2011-Moroccan Civil Defense, working 2416, ALE at 1736 (MPJ-UK).
9219.0 K27-Israeli Air Force C-130H number 427 (4X-FBS), ALE sounding at 2039 (ALF-Germany).
9725.0 New Star Radio Station-Chinese music and numbers (V13), Program #4, at 0500 and 0600 (Boender-Hong Kong).
9986.3 Unid-Czech Republic intelligence, Prague, encrypted SITOR-B traffic, at 1839 (PPA-Netherlands).
10063.0 N647AV-Avianca A319, flight 44, HFDL position for Panama, at 0407 (PPA-Netherlands).
10100.8 DDK9-Deutsche Wetterdienst (German weather office), Hamburg/ Pinneberg, forecasts for Baltic and Gulf of Riga in RTTY (50/450), at 0346 (Stegman-CA).
10162.0 3068ARCAP-Arkansas CAP, reporting airport runway conditions to Avenging Spirit (AVS), ALE and voice at 2003 (Metcalfe-KY).
10255.0 Unid-Vietnamese Numbers Station, male voice with usual "calling Lighthouse" and number groups in Vietnamese, at 1607(Boender-Hong Kong).
10366.4 WPUC469-SailMail, Daytona Beach, FL, CW identifier after PACTOR-III message, at 0422 (PPA-Netherlands).
10404.0 Unid-NATO or US aircraft, PSYOPS loop in English and Arabic telling Libyan government personnel to stand down, at 1202 (Lacroix-France). MOBILE31-Lybian Great Man-Made River Authority mobile, ALE with HQ1 (headquarters and frequency's normal user), at 1856 (PPA-Netherlands). [Also recently on 9376 and 10125. -Hugh]
10493.0 B03MECST-ME National Guard WMD-CST, calling T69ME1, ALE at 1516. 0T69ME1-National Guard, calling B01MECST (WMD-CST), ALE at 1804 (Metcalfe-KY).
10543.0 RCV-Russian Navy Sevastopol, Ukraine, CW navigation warnings in Russian, at 1526 (PPA-Netherlands).
10711.0 Mayport SESEF-US Navy, FL, came from 5745 for Norfolk SESEF, waiting for unknown US Navy vessel, at 1429 (Metcalfe-KY).
10780.0 Cape Radio-USAF, Cape Canaveral Air Force Station, FL, identifying, followed by BRD (Booster Recovery Director) working NASA Booster Recovery Vessel Freedom Star, at 1543 (Stern-FL). [Went to 9270. -Hugh]
10945.0 CFH-Canadian Forces, Halifax, NS, usual channel availability marker, but now in STANAG 4285, at 1230 (Terry Netzley-OH). [Also 5097 and 15920. Dial often reads 1.8 kHz lower. -Hugh]
10987.0 JDI4-Russian military, duplex CW comm checks with 3BJC, SC4H, OL5P, EDCT, YEZJ, YBMW and TOHT; at 2001 (MPJ-UK).
11010.0 GWPWZ33-Brazilian Navy, Rio de Janeiro, calling GWPWIN (vessel Independencia), ALE at 1924.
11033.0 99905-Egyptian MFA, Cairo, Codan data mode with unknown station, at 1845 (PPA-Netherlands).
11064.0 RIT-Russian Navy, Severomorsk, working RJP70, CW at 1825 (PPA-Netherlands).
11108.0 FC8FEM-FEMA Region 8, CO, ALE sounding at 0444 (PPA-Netherlands).
11155.0 RIT-Russian Navy, calling RGR35 for CW traffic, at 1943 (PPA-Netherlands).
11253.0 MVU-UK Royal Air Force Volmet, aviation weather for Middle East, at 0224 (Maltz-NY).
11342.0 New York-LDOC, Medlink patch for injured crew member on unknown company's flight 787, at 1415. New York-LDOC, working Air Transport 530 (Air Transport International, probable DC-8 freighter), went to 17925, at 1729 (Stern-FL).
11418.0 RMP-Russian Navy, Kaliningrad, calling RJP70 and RLA88, CW at 1831 (PPA-Netherlands).
11485.0 121CDCS27-Possibly MN Dept. of Health, St. Paul, NPHRN exercise ALE with WGY9441, FEMA Auxiliary Station, MI, and 441FEMAUX, same FEMA, at 1537. 010CDCNHQ, ALE text messages to 097CDCS18 and 109CDCC40, at 1608 (Metcalfe-KY).
12067.0 Roughneck 12-US military, net with Roughneck 07, 13, and 20; at 2314 (Metcalfe-KY).
12216.0 FC4FEM-FEMA Region 4, GA, ALE sounding at 1958 (PPA-Netherlands).
12230.0 XJM-UK DHFCS, working XSS, ALE at 2021. XBX-DHFCS, calling XSS, ALE at 2027 (PPA-Netherlands).
13089.0 NMN-USCG CAMSLANT, VA, offshore forecast at 2138 (PPA-Netherlands).
13092.0 XSV-Tianjin Radio, China, phone patch with unknown vessel on 12245, at 1536 (PPA-Netherlands).
13258.0 "C"-MX, Moscow, CW at 1958 (MPJ-UK).
13312.0 J40-USCG MH-60J helo number 6040, ALE sounding at 2147 (PPA-Netherlands).
13315.0 013-HFDL ground station, Santa Cruz, Bolivia, position from 2K0604 (Aerolineas Galapagos/ AeroGal flight 604), at 2155 (PPA-Netherlands).
13330.0 Nairobi-Kenya Airways company LDOC, working Kenya 112, at 2145 (PPA-Netherlands).
13485.0 AKALN1-Petroleos Mexicanos (PEMEX), Akal Oil Field platform N-1, Bay of Campeche, ALE sounding at 1806 (Metcalfe-KY).
13488.0 001CDCS36-CDC, working 010CDCNHQ and 011CDCNHQ with ALE text message regarding traffic for WGY9030, unknown FEMA Region 3 auxiliary, at 1531 (Metcalfe-KY).
13527.7 "D"-MX cluster, Odessa, CW at 1958 (MPJ-UK).
13528.1 "A"-MX cluster, Astrakhan/Baku, at 1958 (MPJ-UK).
13568.0 L6A-LA National Guard; call sign's middle number is for FEMA Region 6; calling N2Y, NY Guard in Region 2, ALE at 1532 (Metcalfe-KY).
13900.0 BMF-Taipei Radio, Taiwan, FAX prognostic chart at 2206 (PPA-Netherlands).
13927.0 Rama 82-USAF B-1B, attempting patches via USAF MARS AFA7HS (KS) and AFA5QW (IN), too weak for either, at 1430 (Stern-FL).
14422.0 Unid-Egyptian MFA, Cairo, working TVVQ, Khartoum, Sudan, 16-tone PSK at 1658 (PPA-Netherlands).
14435.0 Unid-Egyptian MFA, Cairo, SITOR-A selcal TVXX to San'A, Yemen, then 16-tone PSK, went to 17433, at 0756 (PPA-Netherlands).
14451.0 RJP70-Russian Navy, calling RIT, CW at 1733 (PPA-Netherlands).
14455.0 KHA925-NASA Johnson Space Center, TX, net with 5 other NASA stations, at 1628 (Metcalfe-KY).
14484.0 AAA9USA-US Army MARS, net with AAN6DFW, at 1629 (Metcalfe-KY).
14570.0 FUO01P-French Navy, Toulon, calling 05DGAP, ALE at 0720 (Eddy Waters-Australia).
14582.0 F33-USCG HU-25 Falcon Jet, ALE sounding at 2218 (PPA-Netherlands).
14812.0 Unid-Russian 6-tone selcal (X06) to 246531, repeated for 7 minutes after discovery, at 0917 (Mike-UK).
16804.5 256367000-Malta flag bulk carrier Sofie Bulker (9HSI8), DSC with USCG Miami at 1211 (Lacroix-France).
17425.0 RIT-Russian Navy, Severomorsk, calling vessel RGR35, CW at 1734 (PPA-Netherlands).
17435.0 2011-Moroccan Civil Defense, calling 2216 and 2212, also on 16240, ALE at 1320 (MPJ-UK).
17487.0 NCS311-Unknown NCS asset, ALE with NTCN/SHARES stations KNY95, KNY86, KNY85, and KNY63; at 0124 (Stegman-CA).
17925.0 New York-LDOC, working Air Transport 530 regarding departure from Patrick AFB, at 1730 (Stern-FL).
26955.0 13TH2207-German Citizen's Band station, FM voice with 13TH1001/p via unknown Internet gateway in Gottingen, Germany, at 1155 (ALF-Germany).

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# Russian Diplomatic Traffic

This month we take a look at the various digital guises used by the Russian Diplomatic and Intelligence Services to move traffic around their HF operations.

### CROWD36

Probably the most audibly familiar data mode used by the Russians is the MFSK system known as CROWD36, a copy of the famous British Piccolo modem. This mode uses 32 tones in a 10, 11, 11 tone group configuration and sends traffic at 40bd. This mode has a very rhythmic, flute-like quality when you hear it. The spacing between tones is 40Hz. The signal is usually sent at +2080 Hz above the carrier (USB or sometimes rarely LSB) point, but +2000 Hz is also used on some links.

Back in the day, when these modems were mainly human-operated, there used to be frequent operator chatter sent at 10bd where tone 17 (or 24) stood idle during the breaks in traffic. This is seldom heard these days, however, as the modems are usually remotely and automatically controlled. Along with this change also came the development of a more sophisticated error checking and ARQ (Automatic Repeat Request) mode, where the ISS (Information Sending Station) and IRS (Information Receiving Station) can operate full-duplex links.

Also disappearing with the evolution of the modem was the usual 5-letter or 5-figure group off-line encrypted traffic in favor of an on-line encrypted mode. However, the old header remains to this day and can be decoded by the relevant module of the Hoka and WaveCom decoders. These headers start with the group "11177" with the next 5 digit groups indicating the link (circuit) identifier, date/time, group count and other items. As we will see later, this style of message header has been used for a long time by the Russian networks and is common across a number of transmission systems.

Here are some recently active and regularly used channels on which to catch this interesting mode: 12218, 14470, 14655, 14934, 16045, 16342, 16343, 18332, 18738 and 19878 kHz USB

See the Resources section for some audio clips of this famous and instantly recognizable modem.

### Baudot

The Russians have also extensively employed 75bd and 50bd standard Baudot, usually with their trademark 500 Hz shift to move messages around their networks. The use of this mode has declined over the years, but can still be heard on a regular basis.

In fact, during the early and mid-'90s, there was a very active network of these stations using the "11177"-style message header and three-letter calls for the recipients. The network was covered in great detail by the WUN (now UDXF) listeners' forum and was christened variously as "The Brotherhood," SOUD, and later, FAPSI stations, as the Intelligence Service changed its name over the years. Sadly, these are rarely heard now, presumably CROWD36 having replaced them.

A few years ago, however, saw the emergence of a new 200bd Baudot 500 Hz version. Hoka owners might find a module somewhat curiously called "200-450" that formats the traffic nicely, even though the standard Baudot decoder will do fine. Here is a sample of this new style of traffic:

| | | | | |
|---|---|---|---|---|
| 823 21 | 25490 | 33543 | 38138 | 160 |
| 846 22 | 76708 | 17284 | 12331 | 117 |
| 757 23 | 42034 | 56091 | 64236 | 148 |
| 827 24 | 90013 | 07992 | 37526 | 85 |
| 818 25 | 73225 | 61986 | 92749 | 147 |

Messages end with this kind of line:

699 88 74261 00000 +++++ 250

A null message (no traffic available for the recipient – in this case recipient 576) is sent as 5 minutes of a line like this:

576 1 00000 +++++ +++++ 162

There also appears to be another style of traffic sent by the Baudot stations with lines containing ten 5-figure groups with a message break like "=100=" at each group of 100. These have been referred to as the "=x=" stations by some monitors.

Like the 288 bit stations outlined below, these stations also have a habit of repeating the same message 10 minutes later on a lower frequency.

### The 288 Bit System

Appearing in the late 1990s was a new, faster system sending synchronous data at a speed of 200 bd with 1000 Hz shift. The traffic has an ACF (Autocorrelation Function) of 288 bits, indicating the message frame size. To my knowledge, traffic has not been decoded by hobbyists, but I would not be at all surprised if the same underlying "11177" header, 5 figure group style traffic still emanates from the decoder at the receiving end of the link.

Another thing to note is that these stations behave very much like the family of Morse and voice numbers stations employed by the Russian Intelligence Service. The ENIGMA number station group has assigned the codes G06, E06 and S06 for the German, English and Russian voice versions and M12 and M14 for the Morse sister stations.

Messages usually start on the hour or any 10 minute interval thereafter with a 5 minute call-up phase. If there is no traffic for the receiver, a so-called "null message" is sent for the first 5 minutes, consisting of the recipient's 3 figure identifier and followed by "00000." You can hear the difference between the "I have messages for you" call-up and the "null message" very easily by ear when tuning into these stations.

Once the message is completed, null or otherwise, the station usually moves down by approximately 2 MHz and repeats the whole process at the next 10 minute point. See the Resources section for an example of this modem.

## ❖ SPO and Friends: Another Mystery

A long sounding burst by an ALE station on 16321.5 kHz USB caught my attention a few weeks ago. The ID was "SPO." This is the same frequency on which another as-yet unidentified ID "DKB" has also been heard. Propagation definitely suggests a US origin and the .5 kHz offset is another common sign of the Army. A few days after this initial hit, a large network of stations using IDs "STATION1" to "STATION12" could be heard, with network control being carried out by "STATIDIACMDNET."

There was much traffic using the MIL-188-110A high-speed modem, all of which was fully encrypted with no sign of any recognizable header or trailer. Best guess so far is that these may be Special Operations stations.

Other frequencies to check include 6911.5, 8050, 9325.5, 10765, 12078.5 and 17460 kHz USB.

That's all for this month. Next time we'll take a look at a new and unidentified PacTOR network. Until then, please keep the letters and emails coming.

### RESOURCES

CROWD36 Clip - **signals.taunus.de/WAV/CROWD36.HTML**
288bd Clip - **signals.taunus.de/WAV/RUS-INTEL_200Bd-1000Hz.WAV**
The Brotherhood - **www.cvni.net/radio/nsnl/nsnl000/nsnl0k.html**

# ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

Kirk A. Kleinschmidt, NT0Z
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# Six Meters: Stealth, QRP, and Newbie Friendly!

On the eve of the 2011 June VHF QSO Party, arguably the premier 6-meter activity day each year, I was helping Kevin, AC0TA, install and test his stack of home-brew Yagis (see Figure 2). Although I hadn't owned a 6-meter radio for several years, I knew in the back of my mind that if conditions were good during the contest, the June gathering would really showcase the band's fantastic and unusual characteristics.

Kevin, a relatively new ham in his mid-20s who got involved in the hobby as a result of TV DXing (and my prodding), had made a scant few QSOs in the year or so since he'd been licensed, but what he lacked in experience, he made up in a much rarer quality: AC0TA is a fearless "builder" who's not afraid to grab the drill, the soldering iron, and a handful of necessary components.

I'm sometimes amused by his trials and tribulations as a home-brewer. As a beginning ham I was also an avid builder, but I was always very concerned about frying delicate components, drilling holes in the wrong spots, etc. Kevin's not reckless by any means, but he has a definite "get 'er done" attitude about making projects happen!

His tower had been up for several months, serving only as a skyhook for his HF horizontal loop and a perch for his massive Gray-Hoverman TV collinear array, and Kevin wanted some VHF+ gain at the tippy-top. He started scouring the internet for design ideas and found several online Yagi design calculators, one of which provided the dimensions for a five-element, 6-meter beam made from the VHF-low elements salvaged from a pile of analog-era TV antennas he'd accumulated.

To ensure success on 144 and 432 MHz, I pointed him to *MT's* VHF antenna columnist Kent Britain, WA5VJB, whose "Cheap Yagi" designs are as foolproof as beam design can be. And they're ridiculously cheap, too, hence the name! See **www.wa5vjb.com/references.html** for more info.

## It's RotATors, Guys!

Kevin had been hassling with several ancient (and junky) TV rotators over the years, and I'd been bugging him to get at least one "real rotator" since the moment I saw his ragtag collection of scavenged, weather-beaten TV rotators, most of which were first installed in the 1970s.

The prices of modern antenna rotators haven't kept pace with those of transceivers and most other ham accessories. Towers and rotators are pricey, so it was important to choose wisely.

After a lot of searching and discussing, I seconded Kevin's choice of an older Alliance HD-73, expertly refurbished by the ill-named Norm's Rotor Service. The techs at Norm's have forgotten more stuff about rotators than most of us will ever know, but the company name has always tweaked my editorial DNA!

For the record, automobile disc brakes have rotors, as do helicopters, but antennas have rotators. Period. I'm sure NRS is aware of this, but the periodic rantings of smart alecks such as me are probably not enough to prompt a corporate name change.

If a creaky old Channel Master rotator is a rusty kid's tricycle, a good-as-new Alliance HD-73 is a diesel-powered locomotive.

Getting the antennas squared away took longer than expected, because we had to lower the beams and the mast to the ground after the initial install to fabricate a bearing plate for the top of the tower. Without it there was just too much lateral play, which would probably destroy the rotator and needlessly fatigue the top section of the freestanding tower.

After the final installation, by the time we cleaned up the yard and put the tools away it was 10p.m. local time. I had checked out the 50- and 144-MHz Yagis on the miniVNA (see Figure 3) prior to installing them, so I wasn't concerned about how well they'd work. The 432-MHz Yagi was beyond the miniVNA's frequency coverage, however, so we had to rely on WA5VJB's construction dimensions and the SWR meter in Kevin's FT-897 transceiver. No problem, either way.

***Just like the good old days! As shown by the band scope on the FLEX-1500 SDR, during the 2011 June VHF QSO Party, 6-meters was alive and well. Here in Minnesota, K0DU (left, Colorado) and W4TP (right, Alabama) were booming in for hours on end.*** *– NT0Z*

***Who says beginning hams don't build stuff these days? These home-brew Yagis for 50, 144 and 432 MHz were built by Kevin Adler, AC0TA, of Byron, Minnesota. The 6-meter Yagi was built from a pile of salvaged TV antennas, while the beams for 144 and 432 MHz are Kent Britain, WA5VJB, "Cheap Yagis" (made from hardwood, hot glue and 1/8-inch welding rod!). A refurbished Alliance HD-73 handles rotation chores. The arm near the top of the tower is a skyhook for Kevin's horizontal loop. The antennas, all fed with 75-ohm RG-6 or RG-11, work nicely. See text for more information. Good job, AC0TA!*** *– NT0Z*

## 6 Meter Ambush

As we fired up the rig, I figured that there'd be plenty of 6-meter ops around the country who'd be at their radios, testing, tweaking and working other locals in anticipation of the QSO Party, which would start early the next afternoon, but I didn't expect that there would be any active propagation for our test.

I was wrong!

Six meters was wide open, something I hadn't seen for several years (not having a 6-meter radio in the interim didn't help much)! As Kevin twirled the beams back and forth, the antenna showed plenty of directivity, and when there was a break in the action, AC0TA called Leo, WY7LL, in Wyoming, with 50 W of SSB from his brand-new, homemade antenna.

Leo came right back, giving Kevin a 59+ signal report. Leo, too, had a whopper signal, and being from the rare state of Wyoming, I imagined that he was running a kilowatt to a long-boom Yagi from a picturesque mountaintop retreat.

Not so! Thanks to the magic of six meters, Leo was running 50 W to his 80-meter dipole!

That fact *really* got my attention, and I immediately started to think that I might be able to work a few stations during the QSO Party with my "compromised," stealthy setup: 5 W and an attic-mounted 40-meter horizontal loop.

I stayed to help Kevin work a few more stations in Colorado, Montana and Utah, but I secretly wanted to race home to see whether I could get in on the action from my own shack. Although I hadn't spent a lot of time at 50 MHz, in several previous summers of working tropo and sporadic-E openings I had never worked Wyoming or Montana.

Lucky kid! With 50 W and a home-brew Death Ray Beam at 60 feet, AC0TA – greenhorn and fearless home-brewer – was working stuff in his first 30 seconds on 6 meters that I hadn't even heard in years of casual operating!

## ❖ A Friendly Competition

This fact, the great propagation – and my barely suppressed jealousy! – suggested an impromptu, friendly competition. Kevin, the inexperienced up-and-comer with a 100-W rig and a Killer Antenna, would slug it out with Yours Truly, a grizzled veteran with a Puny Power station and a Crappy Antenna.

Although I'm definitely not a world-class contester, I have been slogging through pileups since before Kevin was born. Plus, I could always whip out my secret weapon – Morse code. AC0TA isn't yet fluent with the dits and the dahs, which also convey a decent signal-to-noise ratio boost when compared with SSB.

Of course, it was a bit of false bravado on my part, sort of like bringing a pocket knife to a wood chipper fight...

Kevin had a 13 dB RF power advantage in addition to 5-10 dB of "aluminum gain," depending on where his antenna was pointed and the relative direction of my horizontal loop's many lobes on 6 meters. To offset what would probably be an insurmountable advantage, I had thousands of QSOs, 34 years of experience and a FLEX-1500 SDR receiver that totally crushes the FT-897 under the heel of its tiny, yet iron-soled, boot.

On the Big Day, Kevin and I had been chatting on 50.130 MHz for about 45 minutes before the QSO Party began at 1 PM local time. From 15 miles away I could hear him okay, but I initially thought conditions to be less than stellar. When he pointed the Death Ray in my direction, however, the full effect of staring into the Maw of the Beast was apparent. Wowser! This was going to be an uphill battle...

I had calibrated my station clock to within 0.2 seconds of UTC, and as the first seconds of the QSO Party ticked past like the crack of a starter's pistol, I switched from chat mode to contest mode, on the fly, like a crazed sportscaster.

"Okay, Kev," I said, having previously adjusted the FLEX-1500's TX equalizer, noise gate and speech compressor to squeeze out every last drop of QRP RF goodness, "in about 10 seconds, madness will ensue, so get ready...

"CQ contest, CQ contest, this is November, Tango, Zero, Zulu...contest."

I was expecting AC0TA to reply, as we had been chatting for almost an hour, but NY0V, apparently an old hand at this sort of thing, a few miles to the West of me, beat him to the punch! He had been reading the mail on our conversation and was poised at the key. Even with a massive 23-dB RF advantage, if you don't press the PTT switch at the right time, someone else will work your station!

Suppressing a chuckle, yet still feeling like a proud Elmer, I worked AC0TA for QSO number two.

First lesson in contesting, Grasshopper? Timing! When you can snatch the PTT from my hand, it's time for you to leave...

This tingle of self-satisfaction lasted for a few glorious seconds until I remembered my hideous 23-dB RF handicap. Score-wise, Kevin, of course, beat me up pretty badly. Six meters was wide open for most of the weekend contest period, and we both worked stations from coast to coast.

Thanks to youthful exuberance and the Death Ray Beam, on his first casual weekend on 6 meters, Kevin worked 150 QSOs, 80 grid squares, 26 states and two Canadian provinces! That's 80% of VUCC and more than half of Worked All States on Day One! AC0TA also made 28 QSOs on 2 meters in 7 grids, plus a few Qs on 432.

I'd call that an *awesome* introduction to the Magic Band.

As for me, the grizzled veteran running QRP to an indoor HF antenna, I worked 54 QSOs, 42 grids, 20 states and VE2. I couldn't best Kevin, but I was very happy with my results. Happy enough that I now monitor 6 meters regularly, listening for band openings, ready to pounce with my QRP 6-meter signal.

During a brief, but powerful pipeline to NY and CT, I managed to work Noted VHF Authority Emil Pocock, W3EP, near Newington, CT (a former coworker from my *QST* days in Newington), and I heard Bill Tynan, W3XO/5, from the Hill Country of Texas, although I wasn't able to work him. Yes, I'm a grizzled veteran when compared to AC0TA, but W3XO is a Real Deal Grizzled Veteran when compared to me! A past AMSAT President and prolific ham radio author, Bill was working 6 meters before I was born – and way before the modern era of compact, inexpensive dc-to-daylight transceivers.

So, what did we learn from our friendly competition?

We learned that six is beginner and QRP friendly; that almost anyone can build a suitable 6-meter antenna; that indoor antennas work, too; that simple, wire antennas cut for other bands can work on 6; that many inexpensive transceivers made during the past 15 years feature 6-meter coverage; that you, as beginning or experienced operator should at least test the waters; and that 6-meter operating – especially during contests, Field Day and times of enhanced activity – is a lot of fun, regardless of your gear and experience level.

Because I'm running out of space, I will have to cover the nuts and bolts of 6-meter operating, including portable operation and hilltopping, in a future column. In the meantime, get busy with your due diligence. Six-meter propagation tends to be best in the summer and fall, and there are VHF contests and operating events just around the corner.

See you on six!

## RESOURCES

6 Meters in General - **www.smirk.org www.qsl.net/n3db/Linkpage.html**
Worldwide Beacon List - **www.keele.ac.uk/depts/por/50.htm**
VHF Propagation - **www.anarc.org/wtfda/propagation.htm**
Tropo Forecast Maps (amazing!) - **www.dxinfocentre.com/tropo.html**
Grid Square Map of USA - **www.k0nr.com/Files/usgridsq.pdf**
Grid Finder from Google Maps - **http://f6fvy.free.fr/qthLocator/fullScreen.php**

## "TELE" ELMER

Veteran ham instructor and author Gordon West, WB6NOA, has just released his 2011-2015 General Class Study Manual. In addition to covering the entire Element 3 question pool in great detail, purchasers get a welcome and unexpected bonus – the author, affectionately known as Gordo – as a "telephone Elmer!"

"I receive five to ten phone calls a day," says West, "from students preparing for exams and from recent graduates who have passed their licensing tests." His personal phone number is mentioned many times throughout the book, so getting connected isn't difficult.

Says Gordon, "My free consultation service can lead students through tricky math formulas for Extra-Class and Commercial exams, as well as one-on-one discussions about simple antenna projects."

The book, priced at $24.95, includes Gordo's "On the Air!" audio CD that introduces readers to HF operations and General-Class privileges.

In today's era of overseas phone centers and online-only "self-help," it's nice to know that your license guide purchase is backed up by expert telephone support. You can check out the new General Class Study Manual and the rest of Gordon's training materials at **www.gordonwestradioschool.com**.

# GETTING STARTED

THE BEGINNER'S CORNER

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# Postscripts and Addenda

Throughout the course of the year I've written columns and articles on various aspects of radio in this magazine that led to response from some readers. In addition, I was struck by a number of things that have happened lately that relate to some of the topics from those writings. It sort of proves that nothing stands still, which is why it's harder to shoot fish in a barrel than many would suggest. So, here's an update.

## ❖ Sirius/XM Settles Lawsuit

For years I have ragged on the satellite radio monopoly Sirius/XM for a number of issues. I've been a subscriber since the beginning and feel the company could do a lot better for its listeners instead of always looking out for the shareholders and CEO Mel Karmazin's endless well-being. So, you can imagine how happy I was to see an email in my inbox addressed to me from someone called "Satellite Radio Class Action Administrator."

Of course, I opened it immediately and liked what I read: "If You Subscribed to Sirius, XM or Sirius/XM Radio You Could Get Benefits From a Class Action Settlement." Yes! Now they had my attention!

I was encouraged to go to a web site (**www.satelliteradiosuit.com**) and read on. "There is a class action lawsuit (*Blessing v. Sirius XM Radio Inc*.) against Sirius XM concerning the July 28, 2008 merger that created Sirius XM. The lawsuit claims this merger violated federal antitrust laws and that Sirius XM raised its prices as a result of the merger." I thought, "Now, we're getting somewhere!" It wasn't long before I was daydreaming of early retirement to a DX paradise with a 2012 Prius Plug-in Hybrid filled with exotic radio apparatus. But, the next sentence was ominous, "Sirius XM denies it did anything wrong." Huh?

The next couple of paragraphs go on to explain what the various things Sirius and/or XM or both didn't actually do, and which now, through the miracle of a court order, are suddenly available to me. The notice ends with, "The estimated value to the Class of the Settlement is approximately $180 million." I thought, "Hmmm. That really is big. That's nearly two years of Howard Stern's salary! Boy, this outfit is going to take a real hit." Then I read the next part which goes against the common prejudice that lawyers are without a sense of humor. It's what's known in comedy clubs as the punch line: "The Settlement does not provide for cash payments to Class members." Yes, very funny.

What exactly do Class members get? As part of the Settlement Sirius/XM states that they will not raise their subscription rates until the end of this year. That's a settlement? Rates will not go up for multi-radio subscriptions or for Internet streaming. And, subscribers can lock in their current rate if they renew by the end of the year and they may keep that rate for the duration of the term they choose.

While it sounds more like an ad campaign than a settlement, I guess that's the good news. The bad news is that 2012 will probably see a record rise in subscriber fees, extra-radio subscription fees, on-line listening and U.S. Music Royalty fees. Let me be the first to say, "Happy New Year!"

## ❖ TV/FM DXing

*MT* reader and professional broadcaster David Alpert wrote recently about a column I did on the return of the portable TV in the April issue. He notes: "Not sure you've ever referenced these websites dealing with digital TV in *MT*. One is **www.rabbitears.info**. Useful for what I've found to be an accurate, up-to-date list of all the channels and subchannels in a given market. There is also a "DX Tool," currently in public beta. The other is **www.tvfool.com**. That site provides an estimated idea of what you can receive OTA with an outdoor antenna at a given location. I can get almost everything it says I should on rabbit ears."

Thanks, David! Both are excellent sites especially for cross-referencing call signs with channel or frequency readouts. One interesting aspect is how the list does or does not change when the antenna height is changed, say from 30 feet to 60 feet. If you thought you were going to improve reception dramatically, the list shows you won't. The main reason is the nature of line of sight FM and TV transmissions. Now, if you had a really substantial increase, say at the top of a 1,500 foot mountain, things would be a lot different.

## ❖ Mobile Shortwave Listening

Last month I detailed all the possible ways to listen to shortwave stations in your car. Among the ways was via in-dash AM/FM/SW radios, of which only the Becker Mexico BE2340 was available. I mentioned that the supplier had only one in stock and before the issue hit the stands it was bought by an *MT* reader, Len WA2AMW, who works at the Princeton Plasma Physics Laboratory. He sent an email saying he was thrilled to get the radio and looking forward to putting in his car. Len could be the last person to buy a new-in-the-box, in-dash, shortwave radio in North America. Congratulations, Len!

## ❖ Attached to the Loop

Ronald Erickson K0IC wrote recently regarding the horizontal loop I described in this column in the June issue ("Loop Your Way to HF DX Success"). I mentioned the antenna was made of aluminum wire commonly used for electric fences and available quite cheaply at your local Tractor Supply Company store. Ronald wanted to know how I attached the aluminum wire without soldering.

***Unadilla 4:1 balun has pigtails to connect to your loop with standard wire nuts. (Courtesy: Universal Radio)***

Well, it's a great question! It seems that I forgot to mention in the text that I attached the two ends of the loop to the wire pigtails from the Unadilla W2AU 4:1 balun ($29 from Universal Radio) with normal house wiring nuts. You can do this with ladder line as well.

And, here's another tale from the world of the horizontal loop: The other day I was tuning around the 40 meter band and heard a ham asking for signal reports. He was a good 5-9 on the meter of my trusty Kenwood TS-140s at my location and he gave my report as 5-9 plus 10 to 20 dB over. He was over 300 miles away running 900 watts into a wire dipole. I was running one tenth the power into the loop.

Case closed! Loops not only put out great signals, but you can do so without the expense of a power-guzzling linear amplifier.

## ❖ Shortwave Pirate Monitoring

The HF bands are peppered with unauthorized transmissions. From spooky numbers stations to incomprehensible 11 meter outbanders; from big international operators such as China Radio International popping up on the ham bands, to wacky homegrown U.S. shortwave pirates. There are plenty of unidentified transmissions to keep HF band-hoppers happy.

But all has not been ho-ho-ho and a bottle of rum with HF pirates. This past winter there was an ongoing feud between various factions that saw on-air frequency-poaching that led to online blog-sniping that had many veteran HF pirate fans shaking their heads and wondering, "What next?"

*Radio Casablanca QSL (Courtesy: Author)*

Well, the next thing was the disappearance of WEAK Radio as described in this month's *Communications* column. Then there was the disaster of the outbreak of tornadoes in the Midwest which apparently leveled the server site for the Free Radio Network (**www.frn.net**), host of the most authoritative source of information about North American HF pirates. By the first of June the site was back up.

The good news for SWLers is that the HF bands are still active with the audio artistry of pirate radio, but how do you tell the players without a scorecard? Luckily, there's a new edition of Andrew Yoder's definitive book, the 2011 edition of the *Pirate Radio Annual*. The price is $16 plus $2.50 shipping (U.S.) from Cabinet Communications, P.O. Box 109, Blue Ridge Summit, Pennsylvania 17214.

The book details 161 North American and 13 European pirate stations, covers 184 pages, and includes black and white reproductions of many pirate radio QSL cards. The book comes with a CD featuring audio clips of 84 stations, most of which were from 2010 broadcasts.

Since many HF pirates QSL via email (the addresses of which are up to date and listed in the *Annual*), it's a must-have for all pirate radio fans.

## ❖ CRI Strikes Again

In the January issue of *MT*, I wrote a feature titled "China's Global Electronic Reach" which detailed the stealthy way China Radio International has insinuated itself into local radio

***CRI's Music Safari host Neal Jones rocks Washington, D.C. for CRI in afternoon drive time. (Courtesy: CRI)***

markets across the U.S. The brilliantly simple tactic is to buy struggling AM radio stations near major U.S. markets; upgrade the transmitter and antenna; change the call sign and introduce CRI's English service to the local population. At the time that piece was written, CRI had taken over the full-time programming of AM stations in Galveston, Texas, Honolulu, Hawaii and Tijuana, Mexico, with regularly scheduled broadcasts on stations in six other U.S. markets.

This year CRI struck gold when they were able to resurrect a locally much-loved but dormant AM station in Leesburg, Virginia: WAGE-AM 1200 kHz. Through a series of spectacular dance steps with FCC licensing that took more than two years to complete, the station changed its call sign to WCRW (as in, let's say, "China Radio Worldwide?"), upgraded the transmitter to 50,000 watts (maximum allowed in the AM band), changed the transmitter site to accommodate three towers, and moved to 1190 kHz. These moves were completed in mid-April of this year when the station hit the air with a signal big enough to cover all of the Metro Washington, D.C. market.

Among the instructive aspects of this particular case were the statements made by station officials in the lead-up to the station's return to the air, which indicated that a rising Asian population in the area called for more international programming. Possibly, but it's hard to imagine that such a population would be interested in listening to CRI's English service with its "Intro to Chinese Culture" programming. More likely the actual target audience members are among the millions of English speaking Americans in Virginia, Maryland, West Virginia, and the District of Columbia that the signal now covers.

According to an article in the Washington *Post*, WCWR President Alan Pendleton was quoted as saying, "We still want to do things that appeal to Loudoun County," he said. "We're not abandoning Loudoun by any stretch of the imagination."

I stumbled onto this station while cruising the AM band on a typical Friday afternoon. What initially caught my attention was the huge signal and Chinese language program. Listening to the station for several hours while writing this column I heard only CRI programming, interrupted briefly for "weather and traffic" and odd bits of local news. Programming was from CRI's *Beyond Beijing* line-up. **http://english.cri.cn/beyondbeijing/index.htm**


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*www.doghousecharlie.com/radio*

# Take Me Out to the Ballgame

This month we shine the *Programming Spotlight* on sports and the people who bring it to us on radio, and on some innovative comedy programming. When discussing the local sports teams, I sometimes wonder whether they fit under sports or comedy!?

I grew up hearing family stories about gathering around the radio to listen to hockey and baseball games; in fact I heard the stories so often I'm almost convinced that I was there. In the 1930s, my grandfather would listen to Toronto Maple Leafs games on the radio. He was a heavy smoker at the time. He also used to have to hold on to the antenna to get better reception. My mother loves to paint a word picture of the aftermath of a Toronto goal. My grandfather would jump up, shouting "Hooray!" My mother and her family would scramble to grab the radio and the ashtray before they both went flying!

My uncle also told me stories about listening to baseball games featuring Dizzy Dean, Babe Ruth and other immortals of the game. He recalled listening to the longest Stanley Cup game in NHL history, when Mud Bruneteau of the Detroit Red Wings scored in the 6th (!) overtime period to give them a 1-0 victory over the Montreal Maroons, sending Detroit to the first of its 11 championships.

Fast forward to the 1970s when as a lad I became a fan(atic) of the Toronto Maple Leafs. In those days only two games per week were shown on television, so I would tune in whenever possible (that is, when my mother let me stay up!) to listen to games on the radio.

I was slower to embrace baseball. When the major leagues came to Canada, I would watch the odd Montreal Expos game on television, and even when the Blue Jays arrived in Toronto, it was more of a novelty. Around 1979, I began to listen to a game or two each week on CING-FM 107.9 in Burlington, Ontario, a station I was absolutely addicted to – one of the only oldies stations on the dial at the time. These early games on the radio drew me to the game.

The Blue Jays finally climbed out of the cellar after several dismal seasons and started building a young core of players that would take them to the playoffs for the first time in 1985. For the next 10 years I would hang on every word of **Tom Cheek** and **Jerry Howarth** as they described pitch-by-pitch and play-by-play every Toronto Blue Jays baseball game, culminating in two World Series championships. While most people saw the final play of the 1993 World Series on television, **Tom Cheek's** radio call of Joe Carter's walk off home run in Game Six has been played over and over, ingrained in the local collective memory: "The Blue Jays have won it! The Blue Jays are World Series Champions! Touch 'em all Joe, You'll never hit a bigger home run." I still get chills hearing that, no less so since **Cheek's** tragic death from cancer a few years ago. **www.youtube.com/watch?v=U7i7efpX4HQ**

It was an exciting time to be a baseball fan in Canada. I'm sure any baseball (or sports) fan can relate. Whether you are a fan of the Yankees, Red Sox, Dodgers, Cubs or any of the other 25 major league teams, the radio play-by-play teams paint the pictures in our minds and put us in the parks. The really good ones can make you smell the grass, taste the hot dogs, feel the sunshine and see the outfielder gracefully glide across the field to snag a long lazy fly ball, or see the second baseman dive and snag the ball to start a double play.

Men like **Tom Cheek**, **Ernie Harwell** and **Harry Carey** brought games to life in the theatre of my mind for 30 years. There is nothing quite like listening to a ball game on the radio.

In the 1980s, I would often listen to the powerful shortwave transmitters of the **American Forces Radio and Television Service**. During baseball season, **AFRTS** would broadcast baseball games from all over the continent, often giving one the opportunity to hear local broadcasters from cities far away, cities that one could never hope to hear even with a good DX opening. **AFRTS** is still around but the tiny SSB transmissions are a tough catch. Still, you will find lots of sports programming and they still carry games (I listened to a Raptors basketball game on **AFRTS** a few years ago). Give it a shot on 12133.5, 7811.0 and 5446.5 kHz day and night.

One can also sign up for ***Major League Baseball Gameday Audio*** ($19.99 per year) and listen to any Major League baseball game, anywhere, and in some cases, in alternate languages such as French or Spanish. I'm not sure if it's still the case, but during Spring Training this service used to be free. For those who are both radio fans and baseball fans it is a great opportunity to hear different play-by-play voices from across the continent. Check it out at **http://mlb.mlb.com/mediacenter/** There are also hundreds of minor league teams across the continent. Often with a quick Google search, one can snag audio of their games, too.

While baseball, the NFL, the NBA and the NHL dominate the sports scene in North America, in the rest of the world, soccer or football is king. This would be the brand of football where the players actually touch the ball with their feet. In the coming months, sports coverage abroad will be focused on football in a big way. Countries are busy qualifying for the big European championship tournament (Euro 2012) which will be jointly hosted by Poland and Ukraine.

In addition, the London Olympics are not that far off and the hype is starting to build for that particular event, too.

**Polish Radio External Service** has added a program called ***Offside!*** As a host country for Euro 2012, stories are dominated by coverage of preparations for the tournament and FIFA news (FIFA is the world governing body for soccer) but other sports are featured, as varied as basketball, kite surfing (!) and rally driving.

One can listen to the programming on demand at **www.thenews.pl/1/3/Tematy/96955** One can also try listening on shortwave, on 11675 and 11980 kHz at the end of UTC Friday broadcast at 1200 UTC.

Another relatively new program is ***Russian Sports Daily*** from the **Voice of Russia**, Tuesday-Saturday at 0142 UTC (9800, 9665 kHz), Sunday at 0205 UTC (15425, 7440 kHz). On this program one will find coverage of a wide variety of sports from the obligatory football, to gymnastics, hockey and many more. One can also listen to past programs (and read the scripts) online at **http://english.ruvr.ru/radio_broadcast/36560725/**

**Voice of Russia** has had an increased focus on sports in the run-up to the 2014 Sochi Olympics in Russia. And like other nations in Europe, they are gearing up for Euro 2012 and London. The then **Radio Moscow** introduced the **Radio Moscow World Service**, and the ***Russian By Radio*** program in the lead-up to the 1980 Olympics hosted in Moscow.

Although it is called ***Sports Report***, **DW's** contribution to the genre is all football all the time, which makes sense as Germany is one of the dominant football powers of the world. Occasionally other sports such as Grand Prix racing sneak

in; perhaps in other seasons non-football stories dominate.

New episodes can be heard online every Sunday, at **www.dw-world.de/dw/0,,3133,00.html?id=3133** Once you get to the **DW Media Center**, past episodes can be heard as well, a useful feature if you miss a program. You might be able to hear the program on shortwave to Africa, during the 2100 UTC transmission. Try 9735, 11865, 15275 and or 15640 kHz.

While we are looking at Football coverage, **Radio Australia** brings you ***World Football Weekly***, wherein each week "The Four Diegos bring you the latest from the colourful and bizarre side of world football" You can snag the podcast at **www.abc.net.au/ra/podcast/worldfootballweekly/podcast.xml**

## CLASSIC COMEDY AND NEW LAUGHS

***The Goon Show* - BBC Radio 4 Extra**

2011 marks the 60th aniversary of the debut of ***The Goon Show*** on **BBC Radio**. This was the program that introduced the world to the talents of **Peter Sellers** and **Spike Milligan,** to name just two. To say ***The Goon Show*** was off the wall is an understatement. Nothing quite like it had ever been heard on radio in the United Kingdom, let alone the world. ***The Goons*** combined slapstick, word play and general insanity into one of the funniest productions to ever air on radio. ***The Goon Show*** laid the foundation for programs such as ***I`m Sorry I`ll Read That Again*** and ***Monty Python`s Flying Circus***.

In honor of the 60th anniversary of the show, **BBC Radio 4 Extra** (formerly **BBC Radio 7**) aired a number of special programs at the end of May. These included ***Eric Sykes – The Radio Years*** in which Sykes recounted his career in radio, including his role as a Goon Show writer, ***Goon Again***, a re-recording of the original script (done in 2001 for the 50th anniversary), ***The Last Goon Show of All***, a recording of the 1972 reunion of the ***Goon Show*** cast for the **BBC's** 50th anniversary that year. And of course they played their usual weekly ***Goon Show*** episode.

**BBC Radio 4 Extra** is a treasure trove of archival material. Very often programs such as the ***Goon Show*** specials get repeated several times per year. **BBC Radio 4 Extra** sends out a weekly e-mail newsletter, with highlights of that week's upcoming programs. There is a link to the newsletter at **www.bbc.co.uk/radio4extra/** along with the obligatory Facebook and Twitter links. Or as I do, you can poke through the daily schedules and make note of what's coming up. And, as everything is archived, you can go back up to 7 days in case you miss something.

***24/7 Comedy Overnight – CFRB/CFRX***

With apologies to ***Monty Python***, "and now for something completely different"... **CFRB-CFRX**, (1010 kHz/6070 kHz) in Toronto has been noted with programming from ***http://247comedy.com***. From local midnights (0400 UTC) Monday to Saturday, one can hear 5 hours of stand up comedy. As Toronto is relatively local for me, I`ve been listening off and on. So if you tune to 6070 kHz while meandering across the 49 meter band or chance upon 1010 kHz while medium wave DXing, and hear Jerry Seinfeld or some other comedian, you`ve probably found **CFRX/CFRB**.

If you are into stand up comedy it's a good listen, but it doesn't hurt to tune down the dial to **900 kHz (CHML** Hamilton, Ontario) and listen to the classic old radio shows like ***Burns and Allen***, ***The Great Gildersleeve,*** and of course, ***Jack Benny*** around 10 or 11 pm Eastern (depending on when the ball game ends). **www.900chml.com/**

Before leaving the topic of **CFRB/CFRX**, the station bills itself as «**Newstalk 1010**». It has been branding itself increasingly as "**In Depth Radio**," something to look for as you seek that elusive station ID in the wee hours. **CFRB** is one of Canada`s heritage stations, with a lineage going back to the 1930s. The talk programming through the day leans to the right, but not exclusively. I've heard them skewer politicians of both the right and the left – but only when they deserved skewering.

On a recent afternoon, talk centered on lewd tweets by a US congressman and efforts to talk Toronto's right wing mayor into walking in the local Pride Parade. It's an engaging lineup. **Mike Bullard** is/was a stand-up comic with rapid fire wit. **Jim Richards** should have been a stand-up comic, he may just be the wittiest man on Canadian radio. **John Tory** is a thoughtful ex-politician who brings a unique perspective to political discussions. Toronto's news and talk via medium wave, shortwave and the internet at **www.newstalk1010.com/**

***LOL – CBC Radio One***

Getting back to our discussion of stand-up comedy, ***Laugh Out Loud*** is **CBC Radio One's** weekly program featuring the best of Canadian comedy. The program can be heard weekly on Saturdays at 630 pm local, and Thursdays at 2pm local. Hosted by **Craig Norris**, one can hear stand-up from comedians with international acclaim (Andrea Martin) and those on their way up (or maybe down). Most programs have a theme, one near Valentines Day focused on relationships; others are from comedy festivals from across the country.

Most of the humour is G or PG rated; occasionally a word might get bleeped.

The program has a website, through which one can listen to episodes going back to February, subscribe to a podcast, access a comedy blog and of course contact the program. There is also a weekly comedy trivia contest, where the lucky winner gets a ***Laugh Out Loud*** coffee mug. Check out the website at **www.cbc.ca/laughoutloud/** Listen live on the **CBC Radio One** network in Canada and US border states, or online, by choosing the **CBC Radio** stream of your choice at **www.cbc.ca/radio**

## PIRATE RADIO SHIP NOSTALGIA

Thanks to a chance discovery on Facebook, I came across the website **http://nigelharris.net** It seems to be a work in progress with and potentially interesting content.

From the "About Me" page: "As both Nigel Harris and Stuart Russell [*two Radio Caroline personas-ed.]*I was with **Radio Caroline** as part of the late seventies team on the *Mi Amigo* and on the *Ross Revenge* in the eighties and nineties.

"I stayed with **Radio Caroline** for many years becoming the very last programme controller when the ship was still at sea. After a trip to Israel and the **Voice of Peace**, I joined **Invicta Radio** in Kent followed by **KMFM** and am still a regular presenter for **Radio Caroline** on land."

There are also some neat audio clips, video clips, photos and stories about the pirate radio ships off the coast of the UK, by someone who was there. Mr. Harris has also written a book about his experiences, called *Ships in Troubled Waters*, which he is selling through his website as well. It will be interesting to keep an eye on this one, if you have an interest in the British offshore pirate radio scene.

**NASB**

**National Association of Shortwave Broadcasters**

Representing the privately-owned shortwave stations in the USA

- Find links to all of our members at www.shortwave.org
- Take the NASB Shortwave Listener Survey and get a free subscription to the NASB Newsletter. www.surveymonkey.com/s/6LRVLJ7
- Listen to "The Voice of the NASB" on HCJB's DX Party Line on WRMI's 9955 kHz. Visit www.wrmi.net for schedule
- NASB is a member of the HFCC (High Frequency Coordination Conference) and the DRM (Digital Radio Mondiale) Consortium

# THE QSL REPORT

**VERIFICATIONS RECEIVED BY OUR READERS**

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## Palace and Lighthouse QSLing

Radio Romania International continues their popular *Romanian Castles* QSL card series throughout 2011. Two past favorites have included *The Cotroceni Palace* and *The Cantacuzino Palace*. Each month, RRI features a color painting reproduction to complement your collection. RRI's complete summer broadcast schedule is included in *MT*'s frequency guides. Station website **www.rri.ro.**

Each August, amateur radio operators follow the lure of operating from maritime lighthouses worldwide via the amateur radio bands. This year's International Lighthouse Lightship Weekend will be conducted from 0001 August 20 to 2359 August 21, 2011.

The annual ham radio event came into being from the Scottish Northern Lighthouses Award Weekend, first held in 1994. The Sunday date now coincides with International Lighthouse Day, when the International Association of Lighthouse Keepers arranges for as many world lighthouses as possible to be open to the public. For more information on this event, consult their website at **http://illw.net** Shortwave radio listeners can participate in this event and send reception reports to these stations to receive a QSL.

One of the U.S. amateur radio stations that has announced that they will be participating in this year's event is *International Lighthouse-Lightship Fire Island Lighthouse Station,* operating from the historic lighthouse on Fire Island, New York. Visitors are welcome to tune-in or visit the station to observe operators talking to other lighthouses around the globe.

Operations will begin on August 20, from 1100-1800 UTC, operated by W2GSB/LT, Ocean Beach, New York and the Great South Bay Amateur Radio Club. Activity on will be on 14.255, 14.070, 7.175, and 3.850 MHz. A Certificate QSL is being offered. Send your contact details to: W2GSB Lighthouse, PO Box 1356, West Babylon, NY 11704.

## MEDIUM WAVE

### COLOMBIA

HJUJ, 950 kHz AM. Armonías Boyacenses, Tunja, Colombia. Full data E-QSL from John Rubio, "El Kapitan Vallenato," Locutor. Received in one day for a Spanish e-report to: *jhonrubiovallenato@gmail.com* (Mauricio Molano, Spain/playdx/IRCA).

HJXZ, 1560 kHz AM. Santa María de la Paz Radio, Medellín. Colombia. Full data E-QSL from Equipo Humano Santamaría de la paz. Received in one day for a Spanish e-report to: *oventes@santamariadelapaz.org* (Molano).

### USA

KRLD, 1080 kHz AM. *News-Radio*. Partial data verification on station letterhead, signed by Jake Springer, Programming Assistant. Received in 13 days for an AM report and $1.00US (returned). Station address: 4131 N. Central Expressway, Ste. 1200, Dallas, TX 75204-2102 USA (Bill Wilkins, Springfield, MO). Streaming audio **http://dfw.cbslocal.com/**

KUDL 1660 kHz AM *Radio Bach*. Partial data verification letter, signed by John C., Morris, Assistant Chief Engineer. Station call sign KUDL was former call KXTR, effective March 31. Received in 12 days for an AM report, $1.00US and address label (used). Station address: 7000 Squibb Rd., Mission, KS 66202-3233 USA (Wilkins).

KWDP, 820 kHz AM, Waldport, Oregon. E-QSL from David Miller. Received in six hours for an AM e-report to *info@kytefm.com*. Also owns KBCH 1400 Lincoln City and KNPT 1310 New Port, plus three FM stations (Patrick Martin, Seaside, OR).

KWOS 950 kHz AM *News Radio*. Full data prepared card, signed by Warren Kretch, Program Director. Received in 10 days for an AM report. Station address: 3109 S. 10 Mile Dr., Jefferson City, MO 65109-1012 USA (Wilkins). Streaming audio **www.kwos.com/**

WBAL 1090 kHz AM. No-data letter signed by Edward Kiernan, VP/General Manager. Received in 16 days for an SAE and $1.00US. Station address: 3800 Hooper Avenue, Baltimore, MD 21211 USA (Frank Halaburak, Montreal, Canada). Streaming audio **www.wbal.com**

### PAPUA NEW GUINEA

Wantok Radio Light, 7325 kHz. Station slogan, *Proclaiming the name of Jesus Christ over the airwaves*. Date/frequency card of satellite dish/staff photo, signed by Rebecca Dango, Administrator. QSL address: P.O. Box 1273, Port Moresby, N.C.D. Papua Guinea (Dave Valko, PA/Cumbre DX). Email: *info@wantokradio.org* Website **www.wantokradio.org**

### PHILIPPINES

Radio Veritas Asia, 15350 kHz. 15350 kHz via Santa Maria di Galeria, Vatican City transmitter. Full data *15 Languages* card except for requested site notation. Received in 59 days for a CD Mp3 postal report with return postage. Station address: P.O. Box 2642, Quezon City, Manila 1166, Philippines (Kusalik). Streaming audio **www.rveritas-asia.org**

### UTILITY

600 Meter Experimental Beacon, WD2XSH/7 Natchitoches, Louisiana, 508.9 kHz, 200 watts. Full data professionally printed QSL card, signed by Ralph Hartwell W5JGV and three-page info letter. Received in 31 days for a utility report and SASE. QSL address: c/o Ralph Hartwell W5JGV, 641 Sission Road, Natchitoches, LA 71457-6743 (Jim Pogue, Memphis, TN).

Non-Directional Beacon, YGV Havre St. St. Pierre, QC, Canada, 344 kHz, 25 watts. Full data prepared card returned as verified, signed by Benoît Bannon. Received in 13 days for an English utility report, SAE and $2.00US. QSL address: Opérations Techniques, Aéroport Internationale Jean Lesage, 515 rue Principale, Sainte-Foy, Quebec G2G 2TB Canada (Pogue).

Non-Directional Beacon, SYS Stoystown, Somerset, PA, 209 kHz, 25 watts. Full data prepared QSL card returned as verified, signed by David Wright. Received in 27 days for an English utility report, SASE and $ 2.00US. QSL address: Somerset County Airport, 159 Airport Lane, Friendens, PA 15541 USA (Pogue).

Non-Directional Beacon, F8 Victorville, Quebec, 384 kHz, 17 watts. Full data prepared QSL card returned as verified, signed by Gerart. Received in 11 days for a French utility report, SAE and $2.00US. QSL address: Louis Provencher, Aéroport Andre-Fortin, 402, Rte de l'Aéroport, Victorville, Quebec G6T 0R5 Canada (Pogue).

## ADDITIONAL ACTIVITY REMINDERS

**Navajo Code Talkers Day**

August 12-14, 1400-0000 UTC. N7C, Window Rock, Navajo Nation, Arizona. Navajo Amateur Radio Club. 20/40 meters, 14.265, 7.265. QSL: Herbert Goodluck, N7HG, PO Box 3611, Window Rock, AZ 86515 **www.qrz.com/db/n7c**

**National Parks Service establishment on August 25, 1916**

Aug 27, 1500-2300 UTC. W7SVD, Coronado National Memorial, Arizona. Sierra Vista Contesting Group. SSB 7.225, 14.275, 21.285, 28.350 CW 7.050, 14.050, 21.050 PSK31 7.035, 14.070, 21.070 JT65 7.076, 14.076, 21.076. QSL: W7SVD, 1955 Santa Teresa Dr, Sierra Vista, AZ 85635. W7SVD/P operating from Montezuma Pass high in the Huachuca Mountains of southeast Arizona. W7SVD.net

**Hollenberg Pony Express Station Festival**

Aug 28, 1400-2100 UTC. K0ASA, Hanover, Kansas. Crown Amateur Radio Association. 18.085 14.245 14.045 7.045. Certificate QSL. Crown Amateur Radio Association, 11551 W 176th Terrace, Olathe, KS 66062. **www.arrlmidwest.org/ponyexpress.html**

# 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 Daylight Time) 4, 5, 6 or 7 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, 8:30 pm Eastern, 7:30 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 PROMISING FREQUENCIES

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

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

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

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

Target Areas

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

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

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

*Thank You to …*

BCL News, Cumbre DX; Hard-Core DX; DSWCI/DX Window; DBS 2011; DX Mix News WWDXC/BC-Top News.

Alokesh Gupta, India; Babcock; Evelyn Marcy, FL/WYFR; Nigel Holmes/R Australia; Ivo Ivanov, Bulgaria; Rachel Baughn/MT; Ron Norton/IRRS; Sean Gilbert, UK/WRTH; Wolfgang Büeschel, Germany.

## SHORTWAVE BROADCAST BANDS

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

**Notes**

| | |
|---|---|
| Note 1 | Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world. |
| Note 2 | Broadcasters can use this frequency range on a (NIB) non-interference basis only. |
| Note 3 | WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007 |
| Note 4 | WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide |

## "MISSING" LANGUAGES?

A **FREE** download to MTXpress subscribers, the online MTXtra Shortwave Guide is 115+ pages of combined language schedules, sorted by time. Print subscribers: add the MTXtra SW Guide to your subscription for only $11.95. Call **1-800-438-8155** or visit ***www.monitoringtimes.com*** to learn how.

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0000 | 0030 | | Egypt, Radio Cairo | 6270na | | |
| 0000 | 0030 | | USA, BBG/Voice of America | 7555as | | |
| 0000 | 0045 | | India, All India Radio/External Service | 6055as | | |
| | | | 7305as | 11645as | 13605as | |
| 0000 | 0057 | | Romania, Radio Romania International | 7385na | | |
| | | | 9580na | | | |
| 0000 | 0058 | | Germany, Deutsche Welle | 9885as | 13780as | |
| 0000 | 0100 | | Anguilla, University Network | 6090na | | |
| 0000 | 0100 | | Australia, ABC NT Alice Springs | 4835do | | |
| 0000 | 0100 | | Australia, ABC NT Katherine | 5025do | | |
| 0000 | 0100 | | Australia, ABC NT Tennant Creek | 4910do | | |
| 0000 | 0100 | | Australia, Radio Australia | 9660pa | 12080pa | |
| | | | 13690pa | 15240pa | 17715pa | 17795pa |
| 0000 | 0100 | | Bahrain, Radio Bahrain | 6010me | | |
| 0000 | 0100 | | Canada, CFRX Toronto ON | 6070na | | |
| 0000 | 0100 | | Canada, CFVP Calgary AB | 6030na | | |
| 0000 | 0100 | | Canada, CKZN St Johns NF | 6160na | | |
| 0000 | 0100 | | Canada, CKZU Vancouver BC | 6160na | | |
| 0000 | 0100 | | Canada, Radio Canada International | 11700as | | |
| 0000 | 0100 | | China, China Radio International | 6020eu | | |
| | | | 6075as | 6180as | 7350eu | 7415as |
| | | | 9570na | 11790as | 11885as | 13750as |
| | | | 15125as | | | |
| 0000 | 0100 | | Malaysia, RTM Kajang/Traxx FM | 7295do | | |
| 0000 | 0100 | | Micronesia, The Cross Radio/Pohnpei | 4755 as | | |
| 0000 | 0100 | | New Zealand, Radio NZ International | 15720pa | | |
| 0000 | 0100 | DRM | New Zealand, Radio NZ International | 17675pa | | |
| 0000 | 0100 | | Palau, T8WH/ WHRI | 15700as | | |
| 0000 | 0100 | | Russia, Voice of Russia | 9665na | 9800na | |
| 0000 | 0100 | | Spain, Radio Exterior de Espana | 6055na | | |
| 0000 | 0100 | | Thailand, Radio Thailand World Service | 15275na | | |
| 0000 | 0100 | | UK, BBC World Service | 5970as | 6195as | |
| | | | 9740as | 12095as | 15335as | 15360as |
| | | | 17685as | | | |
| 0000 | 0100 | | USA, American Forces Network/AFRTS | 4319usb | | |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 0000 | 0100 | | USA, EWTN/WEWN Irondale, AL | 11520af | | |
| 0000 | 0100 | | USA, FBN/WTJC Newport NC | 9370na | | |
| 0000 | 0100 | | USA, WBCQ Monticello ME | 5110usb | 7415usb | |
| | | | 9330usb | | | |
| 0000 | 0100 | | USA, WHRI Cypress Creek SC | 5920na | | |
| | | | 7315na | 9860na | | |
| 0000 | 0100 | | USA, WRMI Miami FL | 9955ca | | |
| 0000 | 0100 | | USA, WWCR Nashville TN | 3215eu | 4840na | |
| | | | 5935af | 7465eu | | |
| 0000 | 0100 | | USA, WWRB Manchester TN | 2390na | 3185na | |
| | | | 3215na | 5050na | | |
| 0000 | 0100 | | USA, WYFR/Family Radio Worldwide | 5950na | | |
| | | | 6985na | 7360sa | 7520sa | 9505na |
| | | | 15440ca | | | |
| 0000 | 0100 | | Zambia, CVC Radio Christian Voice | 4965af | | |
| 0030 | 0045 | twhfas | Albania, Radio Tirana | 9860na | | |
| 0030 | 0100 | | Australia, Radio Australia | 15415as | 17750as | |
| 0030 | 0100 | sfa | Canada, Bible Voice Broadcasting | 7405as | | |
| 0030 | 0100 | mtwhfa | Serbia, International Radio Serbia | 9685na | | |
| 0030 | 0100 | | Thailand, Radio Thailand World Service | 15275na | | |
| 0030 | 0100 | | USA, BBG/Voice of America | 7430as | 7555as | |
| 0030 | 0100 | | USA, BBG/Voice of America/Special English | | | |
| | | | 7430va | 9715va | 9780va | 11725va |
| | | | 12005va | 15205va | 15290va | 17820va |
| 0030 | 0100 | mtwhf | USA, WRMI/Radio Slovakia Intl | 9955ca | | |
| 0035 | 0045 | | India, All India Radio/Aizawl | 5050do | | |
| 0035 | 0045 | | India, All India Radio/Chennai | 4920do | | |
| 0035 | 0045 | | India, All India Radio/Guwahati | 4940do | | |
| 0035 | 0045 | | India, All India Radio/Hyderbad | 4800do | | |
| 0035 | 0045 | | India, All India Radio/Imphal | 4775do | | |
| 0035 | 0045 | | India, All India Radio/Port Blair | 4760do | | |
| 0035 | 0045 | | India, All India Radio/Shillong | 4970do | | |
| 0035 | 0045 | | India, All India Radio/Shimla | 4965do | | |
| 0035 | 0045 | | India, All India Radio/Thiruvananthapuram | | | |
| | | | 5010do | | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0100 | 0130 | | Vietnam, Voice of Vietnam/Overseas Service | | | |
| | | | 6175na | | | |
| 0100 | 0157 | | North Korea, Voice of Korea | 7220as | 9345as | |
| | | | 9730as | 11735ca | 15180sa | |
| 0100 | 0200 | | Anguilla, University Network | 6090na | | |
| 0100 | 0200 | | Australia, ABC NT Alice Springs | 4835do | | |
| 0100 | 0200 | | Australia, ABC NT Katherine | 5025do | | |
| 0100 | 0200 | | Australia, ABC NT Tennant Creek | 4910do | | |
| 0100 | 0200 | | Australia, Radio Australia | 9660pa | 12080pa | |
| | | | 13690pa | 15240pa | 15415as | 17715pa |
| | | | 17750as | 17795pa | | |
| 0100 | 0200 | | Bahrain, Radio Bahrain | 6010me | | |
| 0100 | 0200 | | Canada, CFRX Toronto ON | 6070na | | |
| 0100 | 0200 | | Canada, CFVP Calgary AB | 6030na | | |
| 0100 | 0200 | | Canada, CKZN St Johns NF | 6160na | | |
| 0100 | 0200 | | Canada, CKZU Vancouver BC | 6160na | | |
| 0100 | 0200 | | China, China Radio International | 6020eu | | |
| | | | 6175eu | 6180as | 9410eu | 9470eu |
| | | | 9535as | 9570na | 9580na | 9675eu |
| | | | 9790na | 11870as | 15215as | 15785as |
| 0100 | 0200 | | Cuba, Radio Havana Cuba | 6000na | 6050na | |
| 0100 | 0200 | | Malaysia, RTM Kajang/Traxx FM | 7295do | | |
| 0100 | 0200 | | Micronesia, The Cross Radio/Pohnpei | 4755 as | | |
| 0100 | 0200 | | Mongolia, Mongolian Radio 2/Ulaanbaatar | | | |
| | | | 7260do | | | |
| 0100 | 0200 | | New Zealand, Radio NZ International | 15720pa | | |
| 0100 | 0200 | DRM | New Zealand, Radio NZ International | 17675pa | | |
| 0100 | 0200 | | Palau, T8WH/ WHRI | 15700as | | |
| 0100 | 0200 | | Russia, Voice of Russia | 9665na | 9800na | |
| 0100 | 0200 | | Taiwan, Radio Taiwan International | 11875as | | |
| 0100 | 0200 | | UK, BBC World Service | 7395as | 9410as | |
| | | | 9740as | 11750as | 11955as | 12095as |
| | | | 15310as | 15335as | 15360as | 17685as |
| 0100 | 0200 | | USA, American Forces Network/AFRTS | 4319usb | | |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 0100 | 0200 | | USA, BBG/Voice of America | 7430va | 9780va | |
| | | | 11705va | | | |
| 0100 | 0200 | | USA, EWTN/WEWN Irondale, AL | 11520af | | |
| 0100 | 0200 | | USA, FBN/WTJC Newport NC | 9370na | | |
| 0100 | 0200 | | USA, KJES Vado NM | 7555na | | |
| 0100 | 0200 | | USA, WBCQ Monticello ME | 5110usb | 7415usb | |
| | | | 9330usb | | | |
| 0100 | 0200 | | USA, WHRI Cypress Creek SC | 9840na | | |
| | | | 9860na | | | |
| 0100 | 0200 | mtwhf | USA, WHRI Cypress Creek SC | 5920na | | |
| 0100 | 0200 | Sat/Sun | USA, WHRI Cypress Creek SC | 7315na | | |
| 0100 | 0200 | | USA, WRMI Miami FL | 9955ca | | |
| 0100 | 0200 | | USA, WWCR Nashville TN | 3215eu | 4840na | |
| | | | 5935af | | | |
| 0100 | 0200 | | USA, WWRB Manchester TN | 2390va | 3185na | |
| | | | 5050na | | | |
| 0100 | 0200 | | USA, WYFR/Family Radio Worldwide | 6985na | | |
| | | | 9505na | 15440ca | | |
| 0100 | 0200 | | Zambia, CVC Radio Christian Voice | 4965af | | |
| 0120 | 0200 | | Sri Lanka, SLBC | 6005as | 9770as | 15745as |
| 0130 | 0200 | twhfa | USA, BBG/Voice of America/Special English | | | |
| | | | 7465va | 9820va | | |
| 0145 | 0200 | twhfas | Albania, Radio Tirana | 7425na | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0200 | 0215 | | Croatia, Croatian Radio | 3985eu | 7375am | |
| 0200 | 0230 | | Thailand, Radio Thailand World Service | 15275na | | |
| 0200 | 0230 | | USA, KJES Vado NM | 7555na | | |
| 0200 | 0245 | | USA, WYFR/Family Radio Worldwide | 5985ca | | |
| | | | 11835ca | | | |
| 0200 | 0257 | | North Korea, Voice of Korea | 13650as | 15100as | |
| 0200 | 0300 | | Anguilla, University Network | 6090na | | |
| 0200 | 0300 | twhfa | Argentina, RAE | 11710am | | |
| 0200 | 0300 | | Australia, ABC NT Alice Springs | 4835do | | |
| 0200 | 0300 | | Australia, ABC NT Katherine | 5025do | | |
| 0200 | 0300 | | Australia, ABC NT Tennant Creek | 4910do | | |
| 0200 | 0300 | | Australia, Radio Australia | 9660pa | 12080pa | |
| | | | 13690pa | 15240as | 15415as | 15515pa |
| | | | 17750as | 21725pa | | |
| 0200 | 0300 | | Bahrain, Radio Bahrain | 6010me | | |
| 0200 | 0300 | | Bulgaria, Radio Bulgaria | 9700na | 11700na | |
| 0200 | 0300 | | Canada, CFRX Toronto ON | 6070na | | |
| 0200 | 0300 | | Canada, CFVP Calgary AB | 6030na | | |
| 0200 | 0300 | | Canada, CKZN St Johns NF | 6160na | | |
| 0200 | 0300 | | Canada, CKZU Vancouver BC | 6160na | | |
| 0200 | 0300 | | China, China Radio International | 11770as | | |
| | | | 13640as | | | |
| 0200 | 0300 | | Cuba, Radio Havana Cuba | 6000na | 6050na | |
| 0200 | 0300 | | Egypt, Radio Cairo | 9315na | | |
| 0200 | 0300 | | Indonesia, Voice of Indonesia | 9526va | | |
| 0200 | 0300 | | Malaysia, RTM Kajang/Traxx FM | 7295do | | |
| 0200 | 0300 | | Micronesia, The Cross Radio/Pohnpei | 4755 as | | |
| 0200 | 0300 | | New Zealand, Radio NZ International | 15720pa | | |
| 0200 | 0300 | DRM | New Zealand, Radio NZ International | 17675pa | | |
| 0200 | 0300 | | Palau, T8WH/ WHRI | 17800as | | |
| 0200 | 0300 | | Philippines, PBS/ Radyo Pilipinas | 11880me | | |
| | | | 15285me | 17700me | | |

0200 0300 Russia, Voice of Russia 7440na 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 9680ca
0200 0300 UK, BBC World Service 6005af 6195as 12095as 15310as 17790as
0200 0300 USA, American Forces Network/AFRTS 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0200 0300 USA, EWTN/WEWN Irondale, AL 11520af
0200 0300 USA, FBN/WTJC Newport NC 9370na
0200 0300 USA, WBCQ Monticello ME 5110usb 7415usb 9330usb
0200 0300 USA, WHRI Cypress Creek SC 5920na 9840na 9860na
0200 0300 USA, WRMI Miami FL 9955ca
0200 0300 USA, WRNO New Orleans LA 7505am
0200 0300 USA, WWCR Nashville TN 3215eu 4840na 5890af 5935af
0200 0300 USA, WWRB Manchester TN 2390va 3185na 5050na
0200 0300 USA, WYFR/Family Radio Worldwide 6100sa 6985na 9385ca 9505na
0200 0300 Zambia, CVC Radio Christian Voice 4965af
0215 0300 Nepal, Radio Nepal 5005as
0230 0255 China, Voice of the Strait (News Channel) Fuzhou 9505do
0230 0300 twhfas Albania, Radio Tirana 7425na
0230 0300 Myanmar, Myanma Radio/National Svc 5915do 5920al
0230 0300 Vietnam, Voice of Vietnam/Overseas Service 6175na
0245 0300 Australia, HCJB Global Australia 15400as
0245 0300 India, All India Radio/Bhopal 7430do
0245 0300 India, All India Radio/Delhi 4860do 6030do 7235do 11830do 15135do
0245 0300 India, All India Radio/Gorakhpur 3945do 6030do 7235do 11830do 15135 deo
0245 0300 India, All India Radio/Guwahati 4940do
0245 0300 India, All India Radio/Hyderbad 7420do
0245 0300 India, All India Radio/Imphal 7335do
0245 0300 India, All India Radio/Itanagar 4990do
0245 0300 India, All India Radio/Jaipur 4910do
0245 0300 India, All India Radio/Jeypore 5040do
0245 0300 India, All India Radio/Kolkata 7210do
0245 0300 India, All India Radio/Kurseong 4895do
0245 0300 India, All India Radio/Lucknow 4880do
0245 0300 India, All India Radio/Radio Kashmir 4760do
0245 0300 India, All India Radio/Shillong 4970do
0245 0300 India, All India Radio/Shimla 6020do
0245 0300 India, All India Radio/Thiruvananthapuram 7290do
0245 0300 Zambia, ZNBC/Radio Two 6165do
0250 0300 Vatican City State, Vatican Radio 6040am 7305am 9610am
0255 0300 Sat Swaziland, TWR Africa 3200af

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

0300 0315 India, All India Radio/Imphal 7335do
0300 0315 India, All India Radio/Itanagar 4990do
0300 0315 India, All India Radio/Shillong 4970do
0300 0325 Sun Swaziland, TWR Africa 3200af
0300 0327 Iran, IRIB/ VOIRI 11920na
0300 0330 Egypt, Radio Cairo 9315na
0300 0330 Myanmar, Myanma Radio/National Svc 9731do
0300 0330 Philippines, PBS/ Radyo Pilipinas 11880me 15285me 17700me
0300 0330 Vatican City State, Vatican Radio 7305af 7360af 9660af
0300 0355 mtwhf South Africa, Channel Africa 5980af
0300 0355 Turkey, Voice of Turkey 6165as 9515va
0300 0357 North Korea, Voice of Korea 7220as 9345as 9730as
0300 0357 Romania, Radio Romania International 7335na 9645na 11895as 15340as
0300 0358 Germany, Deutsche Welle 12005as 15595as
0300 0400 Anguilla, University Network 6090na
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 9660pa 12080pa 13690pa 15240as 15415as 15515pa 17750as 21725pa
0300 0400 Bahrain, Radio Bahrain 6010me
0300 0400 twhfas Canada, CBC Northern Quebec Service 9625na
0300 0400 Canada, CFRX Toronto ON 6070na
0300 0400 Canada, CFVP Calgary AB 6030na
0300 0400 Canada, CKZN St Johns NF 6160na
0300 0400 Canada, CKZU Vancouver BC 6160na
0300 0400 China, China Radio International 9690am 9790na 11770as 13750as 15110as 15120as 15785as
0300 0400 Cuba, Radio Havana Cuba 6000na 6050na
0300 0400 Germany, Deutsche Welle 15595as
0300 0400 Malaysia, RTM Kajang/Traxx FM 7295do
0300 0400 Micronesia, The Cross Radio/Pohnpei 4755 as
0300 0400 New Zealand, Radio NZ International 15720pa
0300 0400 DRM New Zealand, Radio NZ International 17675pa
0300 0400 Oman, Radio Sultanate of Oman 15355af
0300 0400 Palau, T8WH/ WHRI 17800as
0300 0400 DRM Russia, Voice of Russia 15735as
0300 0400 Russia, Voice of Russia 9665sa 15425na 15585as
0300 0400 mtwhf South Africa, Channel Africa 3345af
0300 0400 Sat Sri Lanka, SLBC 6005as 9770as 15745as
0300 0400 Taiwan, Radio Taiwan International 5950na 15320as
0300 0400 UK, BBC World Service 3255af 6005af 6145af 6190af 6195as 7255af 9410eu 9750af 12035af 12095as 15310as 15365as 17790as
0300 0400 USA, American Forces Network/AFRTS 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0300 0400 USA, BBG/Voice of America 4930af 6080af 9885af 15580af
0300 0400 USA, EWTN/WEWN Irondale, AL 11520af
0300 0400 USA, FBN/WTJC Newport NC 9370na
0300 0400 USA, WBCQ Monticello ME 7415usb 9330usb
0300 0400 USA, WHRI Cypress Creek SC 5920na 7385na 9840na
0300 0400 USA, WRMI Miami FL 9955ca
0300 0400 USA, WWCR Nashville TN 3215eu 4840na 5890af 5935af
0300 0400 USA, WWRB Manchester TN 2390na 3185na 5050na
0300 0400 USA, WYFR/Family Radio Worldwide 11740ca 15255sa
0300 0400 Zambia, CVC Radio Christian Voice 4965af
0300 0400 Zambia, ZNBC/Radio Two 6165do
0315 0400 Australia, Radio Australia 15240pa
0330 0400 twhfas Albania, Radio Tirana 7425na
0330 0400 Iran, IRIB/ VOIRI 9605na 11920na
0330 0400 Vietnam, Voice of Vietnam/Overseas Service 6175na
0335 0345 India, All India Radio/Aizawl 5050do
0335 0345 India, All India Radio/Delhi 7235do 11830do 15135do
0335 0345 India, All India Radio/Kolkata 7210do

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

0400 0427 Iran, IRIB/ VOIRI 9605na 11920na
0400 0430 USA, BBG/Voice of America 4930af 4960af 6080af 9855af 11670af 15580af
0400 0445 USA, WYFR/Family Radio Worldwide 6985na 9505na
0400 0457 Germany, Deutsche Welle 7240af
0400 0458 New Zealand, Radio NZ International 15720pa
0400 0458 DRM New Zealand, Radio NZ International 17675pa
0400 0459 Germany, Deutsche Welle 13840af
0400 0500 Anguilla, University Network 6090na
0400 0500 Australia, ABC NT Alice Springs 4835do
0400 0500 Australia, ABC NT Katherine 5025do
0400 0500 Australia, ABC NT Tennant Creek 4910do
0400 0500 Australia, Radio Australia 9660pa 12080pa 13690pa 15240as 15515pa 17750pa 21725pa
0400 0500 Bahrain, Radio Bahrain 6010me
0400 0500 twhfas Canada, CBC Northern Quebec Service 9625na
0400 0500 Canada, CFRX Toronto ON 6070na
0400 0500 Canada, CKZN St Johns NF 6160na
0400 0500 Canada, CKZU Vancouver BC 6160na
0400 0500 China, China Radio International 6020na 6080na 13750as 15120as 15785as 17730va 17855va
0400 0500 mtwhf France, Radio France Internationale 9805af 11995af

| | | | | | | |
|---|---|---|---|---|---|---|
| 0400 | 0500 | | Germany, Deutsche Welle | 6180af | | 15400af |
| 0400 | 0500 | | Malaysia, RTM Kajang/Traxx FM | | | 7295do |
| 0400 | 0500 | | Micronesia, The Cross Radio/Pohnpei | | | 4755 as |
| 0400 | 0500 | | Palau, T8WH/ WHRI | 17800as | | |
| 0400 | 0500 | DRM | Russia, Voice of Russia | 15735as | | |
| 0400 | 0500 | | Russia, Voice of Russia | 13775na | | 15735as |
| 0400 | 0500 | mtwhf | South Africa, Channel Africa | 3345af | | |
| 0400 | 0500 | Sat | Sri Lanka, SLBC 6005as | 9770as | | 15745as |
| 0400 | 0500 | | UK, BBC World Service | 3255af | | 3955eu |
| | | | 6005af | 6190af | 7255af | 7310af |
| | | | 11945af | 12035af | 12095as | 13840af |
| | | | 15310as | 15365as | 17790as | |
| 0400 | 0500 | | USA, American Forces Network/AFRTS | | | 4319usb |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 0400 | 0500 | | USA, EWTN/WEWN Irondale, AL | | | 11520af |
| 0400 | 0500 | | USA, FBN/WTJC Newport NC | | | 9370na |
| 0400 | 0500 | | USA, WHRI Cypress Creek SC | | | 5920na |
| | | | 7385na | 9825na | | |
| 0400 | 0500 | | USA, WRMI Miami FL | 9955ca | | |
| 0400 | 0500 | | USA, WWCR Nashville TN | 3215eu | | 4840na |
| | | | 5890af | 5935af | | |
| 0400 | 0500 | | USA, WWRB Manchester TN | 3185na | | |
| 0400 | 0500 | | USA, WYFR/Family Radio Worldwide | | | 5985na |
| | | | 9680na | 9715ca | | |
| 0400 | 0500 | | Zambia, CVC Radio Christian Voice | | | 4965af |
| 0400 | 0500 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 0430 | 0500 | mtwhf | Swaziland, TWR Africa | 3200af | | 4775af |
| 0430 | 0500 | | USA, BBG/Voice of America | 4930af | | 4960af |
| | | | 6080af | 11670af | 15580af | |
| 0435 | 0445 | | India, All India Radio/Delhi | 4860do | | |
| 0455 | 0500 | | Nigeria, Voice of Nigeria | 15120af | | |
| 0459 | 0500 | | New Zealand, Radio NZ International | | | 11725pa |
| 0459 | 0500 | DRM | New Zealand, Radio NZ International | | | 11675pa |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0500 | 0507 | twhfas | Canada, CBC Northern Quebec Service | | | |
| | | | 9625na | | | |
| 0500 | 0530 | | Germany, Deutsche Welle | 6180af | | 7430af |
| | | | 9480af | | | |
| 0500 | 0530 | | Japan, Radio Japan NHK World | | | 5975va |
| | | | 6110na | 11970va | | |
| 0500 | 0530 | | UK, BBC World Service | 5975eu | | |
| 0500 | 0530 | | Vatican City State, Vatican Radio | | | 5965va |
| | | | 7250eu | 9660af | 11625af | 13765af |
| 0500 | 0557 | | China, China Radio International | | | 6020na |
| | | | 6190na | 11710af | 11895as | 15350as |
| | | | 15465as | 17505va | 17540as | 17730va |
| | | | 17855va | | | |
| 0500 | 0600 | | Anguilla, University Network | 6090na | | |
| 0500 | 0600 | | Australia, ABC NT Alice Springs | | | 4835do |
| 0500 | 0600 | | Australia, ABC NT Katherine | 5025do | | |
| 0500 | 0600 | | Australia, ABC NT Tennant Creek | | | 4910do |
| 0500 | 0600 | | Australia, Radio Australia | 9660pa | | 12080pa |
| | | | 13630pa | 13690pa | 15160pa | 15240pa |
| | | | 17750as | | | |
| 0500 | 0600 | | Bahrain, Radio Bahrain | 6010me | | |
| 0500 | 0600 | | Bhutan, Bhutan Broadcasting Service | | | 6035do |
| 0500 | 0600 | | Canada, CFRX Toronto ON | 6070na | | |
| 0500 | 0600 | | Canada, CKZN St Johns NF | 6160na | | |
| 0500 | 0600 | | Canada, CKZU Vancouver BC | | | 6160na |
| 0500 | 0600 | | Cuba, Radio Havana Cuba | 6000na | | 6010na |
| | | | 6050na | 6060na | 6150sa | |
| 0500 | 0600 | mtwhf | Equatorial Guinea, Radio Africa 2 | | | 15190af |
| 0500 | 0600 | Sat/Sun | Equatorial Guinea, Radio East Africa | | | 15190af |
| 0500 | 0600 | mtwhf | France, Radio France Internationale | | | 11995af |
| | | | 13680af | | | |
| 0500 | 0600 | | Malaysia, RTM Kajang/Traxx FM | | | 7295do |
| 0500 | 0600 | | Micronesia, The Cross Radio/Pohnpei | | | 4755 as |
| 0500 | 0600 | | New Zealand, Radio NZ International | | | 11725pa |
| 0500 | 0600 | DRM | New Zealand, Radio NZ International | | | 11675pa |
| 0500 | 0600 | | Nigeria, Voice of Nigeria | 15120af | | |
| 0500 | 0600 | | Palau, T8WH/ WHRI | 17800as | | |
| 0500 | 0600 | | Russia, Voice of Russia | 13775na | | |
| 0500 | 0600 | mtwhf | South Africa, Channel Africa | 7230af | | |
| 0500 | 0600 | mtwhf | Swaziland, TWR Africa | 3200af | | 4775af |
| 0500 | 0600 | | Swaziland, TWR Africa | 9500af | | |
| 0500 | 0600 | Sat/Sun | Swaziland, TWR Africa | 4775af | | |
| 0500 | 0600 | | Taiwan, Radio Taiwan International | | | 6875na |
| 0500 | 0600 | | UK, BBC World Service | 3255af | | 3955eu |
| | | | 6005af | 6190af | 7255af | 9410af |
| | | | 11945af | 12095as | 15310as | 15365as |
| | | | 15420af | 17640as | 17790as | |
| 0500 | 0600 | | USA, American Forces Network/AFRTS | | | 4319usb |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 0500 | 0600 | | USA, BBG/Voice of America | 4930af | | 6080af |
| | | | 15580af | | | |
| 0500 | 0600 | | USA, EWTN/WEWN Irondale, AL | | | 11520af |
| 0500 | 0600 | | USA, FBN/WTJC Newport NC | | | 9370na |
| 0500 | 0600 | | USA, WHRI Cypress Creek SC | | | 7385va |
| | | | 9825va | 11565va | | |
| 0500 | 0600 | | USA, WRMI Miami FL | 9955ca | | |
| 0500 | 0600 | | USA, WTWW Lebanon TN | 5755va | | 12100al |
| 0500 | 0600 | | USA, WWCR Nashville TN | 3215eu | | 4840na |
| | | | 5890af | 5935af | | |
| 0500 | 0600 | | USA, WWRB Manchester TN | 3185na | | |
| 0500 | 0600 | | USA, WYFR/Family Radio Worldwide | | | 5985na |
| | | | 9680na | | | |
| 0500 | 0600 | | Zambia, CVC Radio Christian Voice | | | 4965af |
| 0500 | 0600 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 0515 | 0530 | Sat | Greece, Voice of Greece | 11645eu | | |
| 0530 | 0550 | Sun | Greece, Voice of Greece | 11645eu | | |
| 0530 | 0557 | DRM | Romania, Radio Romania International | | | 7305eu |
| 0530 | 0557 | | Romania, Radio Romania International | | | 9655eu |
| | | | 17760eu | 21500eu | | |
| 0530 | 0600 | Sat/Sun | Clandestine, Sudan Radio Service/SRS | | | 13720af |
| 0530 | 0600 | | Thailand, Radio Thailand World Service | | | 17655va |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0600 | 0615 | Sat/Sun | South Africa, TWR Africa | 11640af | | |
| 0600 | 0630 | | Germany, Deutsche Welle | 9545af | | 15275af |
| 0600 | 0645 | smtwhf | South Africa, TWR Africa | 11640af | | |
| 0600 | 0655 | mtwhf | South Africa, Channel Africa | 15255af | | |
| 0600 | 0658 | | New Zealand, Radio NZ International | | | 11725pa |
| 0600 | 0658 | DRM | New Zealand, Radio NZ International | | | 11675pa |
| 0600 | 0700 | | Anguilla, University Network | 6090na | | |
| 0600 | 0700 | | Australia, ABC NT Alice Springs | | | 4835do |
| 0600 | 0700 | | Australia, ABC NT Katherine | 5025do | | |
| 0600 | 0700 | | Australia, ABC NT Tennant Creek | | | 4910do |
| 0600 | 0700 | | Australia, Radio Australia | 9660pa | | 12080pa |
| | | | 13630pa | 13690pa | 15160pa | 15240pa |
| | | | 15415as | 17750as | | |
| 0600 | 0700 | | Bahrain, Radio Bahrain | 6010me | | |
| 0600 | 0700 | | Canada, CFRX Toronto ON | 6070na | | |
| 0600 | 0700 | | Canada, CFVP Calgary AB | 6030na | | |
| 0600 | 0700 | | Canada, CKZN St Johns NF | 6160na | | |
| 0600 | 0700 | | Canada, CKZU Vancouver BC | | | 6160na |
| 0600 | 0700 | | China, China Radio International | | | 11710af |
| | | | 11870me | 11895as | 13660as | 15140me |
| | | | 15350as | 15465as | 17505va | 17540as |
| | | | 17710as | | | |
| 0600 | 0700 | | Cuba, Radio Havana Cuba | 6000na | | 6010na |
| | | | 6050na | 6060na | 6150sa | |
| 0600 | 0700 | mtwhf | Equatorial Guinea, Radio Africa 2 | | | 15190af |
| 0600 | 0700 | Sat/Sun | Equatorial Guinea, Radio East Africa | | | 15190af |
| 0600 | 0700 | mtwhf | France, Radio France Internationale | | | 11615va |
| | | | 15160af | 17800af | | |
| 0600 | 0700 | | Malaysia, RTM Kajang/Traxx FM | | | 7295do |
| 0600 | 0700 | | Malaysia, RTM/Voice of Malaysia | | | 6175as |
| | | | 9750as | 15295as | | |
| 0600 | 0700 | | Micronesia, The Cross Radio/Pohnpei | | | 4755 as |
| 0600 | 0700 | | Nigeria, Voice of Nigeria | 15120af | | |
| 0600 | 0700 | | Palau, T8WH/ WHRI | 17800as | | |
| 0600 | 0700 | | Papua New Guinea, Radio Fly | | | 5960do |
| 0600 | 0700 | | Russia, Voice of Russia | 15405pa | | |
| 0600 | 0700 | mtwhf | South Africa, Channel Africa | 7230af | | |
| 0600 | 0700 | | South Africa, CVC 1 Africa Radio | | | 13590af |
| 0600 | 0700 | | Swaziland, TWR Africa | 9500af | | |
| 0600 | 0700 | | UK, BBC World Service | 5875eu | | 6005af |
| | | | 6190af | 7430eu | 9410af | 9860af |
| | | | 12015af | 12095as | 15105af | 15310as |
| | | | 15420af | 17640af | 17790as | |
| 0600 | 0700 | | USA, American Forces Network/AFRTS | | | 4319usb |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 0600 | 0700 | | USA, BBG/Voice of America | 6080af | | 11670af |
| | | | 15580af | | | |
| 0600 | 0700 | | USA, EWTN/WEWN Irondale, AL | | | 11520af |
| 0600 | 0700 | | USA, FBN/WTJC Newport NC | | | 9370na |
| 0600 | 0700 | | USA, WHRI Cypress Creek SC | | | 7385va |
| | | | 9825va | 11565va | | |
| 0600 | 0700 | | USA, WRMI Miami FL | 9955ca | | |
| 0600 | 0700 | | USA, WTWW Lebanon TN | 5755va | | 12100al |
| 0600 | 0700 | | USA, WWCR Nashville TN | 3215eu | | 4840na |
| | | | 5890af | 5935af | | |
| 0600 | 0700 | | USA, WWRB Manchester TN | 3185na | | |
| 0600 | 0700 | | USA, WYFR/Family Radio Worldwide | | | 5850ca |
| | | | 7520eu | 9680na | 11530af | 11580eu |
| 0600 | 0700 | | Zambia, CVC Radio Christian Voice | | | 13590af |
| 0600 | 0700 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 0602 | 0700 | | Swaziland, TWR Africa | 6120af | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0630 | 0645 | | India, All India Radio/Guwahati | | | 7280do |
| 0630 | 0645 | | India, All India Radio/Hyderbad | | | 7420do |
| 0630 | 0645 | | India, All India Radio/Kurseong | | | 7230do |
| 0630 | 0645 | | India, All India Radio/Mumbai | | | 7240do |
| 0630 | 0645 | | India, All India Radio/Thiruvananthapuram 7290do | | | |
| 0630 | 0700 | | Bulgaria, Radio Bulgaria | 9600na | | 11600na |
| 0630 | 0700 | | Vatican City State, Vatican Radio 13765af | 15570af | | 11625af |
| 0645 | 0700 | Sun | Germany, TWR Europe | 6105eu | | |
| 0645 | 0700 | Sun | Monaco, TWR Europe | 9800eu | | |
| 0659 | 0700 | | New Zealand, Radio NZ International | | | 6170pa |
| 0659 | 0700 | DRM | New Zealand, Radio NZ International | | | 7440pa |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0700 | 0730 | Sun | Canada, Bible Voice Broadcasting | | | 5945eu |
| 0700 | 0730 | | China, Xizang PBS/Lhasa | 4905do | | 4920do |
| | | | 6025do | 6110do | 6130do | 9490do |
| | | | 9580do | | | |
| 0700 | 0745 | Sat | Canada, Bible Voice Broadcasting | | | 5945eu |
| 0700 | 0745 | | USA, WYFR/Family Radio Worldwide | | | 7570eu |
| 0700 | 0750 | mtwhf | Germany, TWR Europe | 6105eu | | |
| 0700 | 0750 | smtwhf | Monaco, TWR Europe | 9800eu | | |
| 0700 | 0758 | | New Zealand, Radio NZ International | | | 6170pa |
| 0700 | 0758 | DRM | New Zealand, Radio NZ International | | | 7440pa |
| 0700 | 0800 | | Anguilla, University Network | 6090na | | |
| 0700 | 0800 | | Australia, ABC NT Alice Springs | | | 4835do |
| 0700 | 0800 | | Australia, ABC NT Katherine | 5025do | | |
| 0700 | 0800 | | Australia, ABC NT Tennant Creek | | | 4910do |
| 0700 | 0800 | | Australia, Radio Australia | 9475as | | 9660pa |
| | | | 9710pa | 11945as | 12080pa | 13630pa |
| | | | 15160pa | | | |
| 0700 | 0800 | | Bahrain, Radio Bahrain | 6010me | | |
| 0700 | 0800 | m/DRM | Belgium, TDP Radio | 6015eu | | |
| 0700 | 0800 | | Canada, CFRX Toronto ON | 6070na | | |
| 0700 | 0800 | | Canada, CFVP Calgary AB | 6030na | | |
| 0700 | 0800 | | Canada, CKZN St Johns NF | 6160na | | |
| 0700 | 0800 | | Canada, CKZU Vancouver BC | | | 6160na |
| 0700 | 0800 | | China, China Radio International | | | 11895as |
| | | | 13660as | 15125va | 13710eu | 15350as |
| | | | 15465as | 17490eu | 17540as | 17710as |
| 0700 | 0800 | mtwhf | Equatorial Guinea, Radio Africa 2 | | | 15190af |
| 0700 | 0800 | Sat/Sun | Equatorial Guinea, Radio East Africa | | | 15190af |
| 0700 | 0800 | mtwhf | France, Radio France Internationale 17605af | | | 15615af |
| 0700 | 0800 | | Malaysia, RTM Kajang/Traxx FM | | | 7295do |
| 0700 | 0800 | | Malaysia, RTM/Voice of Malaysia | | | 6175as |
| | | | 9750as | 15295as | | |
| 0700 | 0800 | | Micronesia, The Cross Radio/Pohnpei | | | 4755 as |
| 0700 | 0800 | | Palau, T8WH/ WHRI | 17800as | | |
| 0700 | 0800 | | Papua New Guinea, Radio Fly | | | 5960do |
| 0700 | 0800 | | Russia, Voice of Russia | 15405pa | | |
| 0700 | 0800 | mtwhf | South Africa, Channel Africa | 7230af | | |
| 0700 | 0800 | | South Africa, CVC 1 Africa Radio | | | 13590af |
| 0700 | 0800 | | Swaziland, TWR Africa | 6120af | | 9500af |
| 0700 | 0800 | | UK, BBC World Service | 5875eu | | 6190af |
| | | | 11760me | 11765af | 11830af | 12095af |
| | | | 15310as | 15400af | 15575as | 17640af |
| | | | 17790as | 17830af | | |
| 0700 | 0800 | | USA, American Forces Network/AFRTS | | | 4319usb |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 0700 | 0800 | | USA, EWTN/WEWN Irondale, AL | | | 11520af |
| 0700 | 0800 | | USA, FBN/WTJC Newport NC | | | 9370na |
| 0700 | 0800 | | USA, WHRI Cypress Creek SC | | | 7385va |
| | | | 9825va | 11565va | | |
| 0700 | 0800 | | USA, WRMI Miami FL | 9955ca | | |
| 0700 | 0800 | | USA, WTWW Lebanon TN | 5755va | | 12100al |
| 0700 | 0800 | | USA, WWCR Nashville TN | 3215eu | | 4840na |
| | | | 5890af | 5935af | | |
| 0700 | 0800 | | USA, WWRB Manchester TN | 3185na | | |
| 0700 | 0800 | | USA, WYFR/Family Radio Worldwide | | | 5950ca |
| | | | 5985na | 6875na | 9385af | 9505ca |
| 0700 | 0800 | | Zambia, CVC Radio Christian Voice | | | 13590af |
| 0700 | 0800 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 0715 | 0750 | Sun | Germany, TWR Europe | 6105eu | | |
| 0715 | 0750 | Sat | Monaco, TWR Europe | 9800eu | | |
| 0730 | 0745 | | India, All India Radio/Aizawl | 5050do | | |
| 0730 | 0745 | | India, All India Radio/Delhi | 6190do | | 11710do |
| | | | 15185do | 15260do | | |
| 0730 | 0745 | | India, All India Radio/Guwahati | | | 7280do |
| 0730 | 0745 | | India, All India Radio/Imphal | 7335do | | |
| 0730 | 0745 | | India, All India Radio/Jaipur | 7325do | | |
| 0730 | 0745 | | India, All India Radio/Kolkata | 7210do | | |
| 0730 | 0745 | | India, All India Radio/Kurseong | | | 7230do |
| 0730 | 0745 | | India, All India Radio/Shimla | 6020do | | |
| 0730 | 0800 | | Australia, HCJB Global Australia | | | 11750pa |
| 0730 | 0800 | | India, All India Radio/Chennai | | | 4920do |
| 0759 | 0800 | | New Zealand, Radio NZ International | | | 6170pa |
| 0759 | 0800 | DRM | New Zealand, Radio NZ International | | | 7440pa |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0800 | 0830 | | Australia, ABC NT Alice Springs | | | 4835do |
| 0800 | 0830 | | Australia, ABC NT Katherine | 5025do | | |
| 0800 | 0830 | | Australia, ABC NT Tennant Creek | | | 4910do |
| 0800 | 0830 | | Australia, HCJB Global Australia | | | 11750pa |
| 0800 | 0845 | | USA, WYFR/Family Radio Worldwide 9385af | | | 5950ca |
| 0800 | 0900 | | Anguilla, University Network | 6090na | | |
| 0800 | 0900 | | Australia, Radio Australia | 5995pa | | 9475as |
| | | | 9590pa | 9710pa | 9580pa | 11945as |
| | | | 12080pa | 13630pa | | |
| 0800 | 0900 | | Bahrain, Radio Bahrain | 6010me | | |
| 0800 | 0900 | t/DRM | Belgium, TDP Radio | 6015eu | | |
| 0800 | 0900 | | Bhutan, Bhutan Broadcasting Service | | | 6035do |
| 0800 | 0900 | | Canada, CFRX Toronto ON | 6070na | | |
| 0800 | 0900 | | Canada, CFVP Calgary AB | 6030na | | |
| 0800 | 0900 | | Canada, CKZN St Johns NF | 6160na | | |
| 0800 | 0900 | | Canada, CKZU Vancouver BC | | | 6160na |
| 0800 | 0900 | | China, China Radio International | | | 11620as |
| | | | 11895as | 13710eu | 15350as | 15465as |
| | | | 15625va | 17490eu | 17540as | |
| 0800 | 0900 | mtwhf | Equatorial Guinea, Radio Africa 2 | | | 15190af |
| 0800 | 0900 | Sat/Sun | Equatorial Guinea, Radio East Africa | | | 15190af |
| 0800 | 0900 | Sat | Italy, IRRS-Shortwave | 9510va | | |
| 0800 | 0900 | | Italy, IRRS-Shortwave/European Gospel Radio 7290va | | | |
| 0800 | 0900 | | Malaysia, RTM Kajang/Traxx FM | | | 7295do |
| 0800 | 0900 | | Malaysia, RTM/Voice of Malaysia | | | 6175as |
| | | | 9750as | 15295as | | |
| 0800 | 0900 | | Micronesia, The Cross Radio/Pohnpei | | | 4755 as |
| 0800 | 0900 | | New Zealand, Radio NZ International | | | 6170pa |
| 0800 | 0900 | DRM | New Zealand, Radio NZ International | | | 7440pa |
| 0800 | 0900 | | Palau, T8WH/ WHRI | 17800as | | |
| 0800 | 0900 | | Papua New Guinea, Radio Fly | | | 5960do |
| 0800 | 0900 | | Russia, Voice of Russia | 15405pa | | |
| 0800 | 0900 | mtwhf | South Africa, Channel Africa | 9625af | | |
| 0800 | 0900 | | South Africa, CVC 1 Africa Radio | | | 13590af |
| 0800 | 0900 | Sun | South Africa, SA Radio League 17570af | | | 7205af |
| 0800 | 0900 | | South Korea, KBS World Radio | | | 9570as |
| 0800 | 0900 | | UK, BBC World Service | 6190af | | 11760me |
| | | | 12095af | 15310as | 15400af | 15575as |
| | | | 17640af | 17790as | 17830af | 21470af |
| 0800 | 0900 | | USA, American Forces Network/AFRTS | | | 4319usb |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 0800 | 0900 | | USA, EWTN/WEWN Irondale, AL | | | 11520af |
| 0800 | 0900 | | USA, FBN/WTJC Newport NC | | | 9370na |
| 0800 | 0900 | | USA, WHRI Cypress Creek SC 11565va | | | 7385va |
| 0800 | 0900 | | USA, WRMI Miami FL | 9955ca | | |
| 0800 | 0900 | | USA, WTWW Lebanon TN | 5755va | | |
| 0800 | 0900 | | USA, WWCR Nashville TN | 3215eu | | 4840na |
| | | | 5890af | 5935af | | |
| 0800 | 0900 | | USA, WWRB Manchester TN | 3185na | | |
| 0800 | 0900 | | USA, WYFR/Family Radio Worldwide 6875na | | | 5985na |
| 0800 | 0900 | | Zambia, CVC Radio Christian Voice | | | 13590af |
| 0800 | 0900 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 0815 | 0900 | | Nepal, Radio Nepal | 5005as | | |
| 0820 | 0900 | mtwhfa | Guam, TWR Asia/KTWR | 15170as | | |
| 0830 | 0845 | | India, All India Radio/Aizawl | 5050do | | |
| 0830 | 0845 | | India, All India Radio/Chennai | | | 4920do |
| 0830 | 0845 | | India, All India Radio/Delhi | 6190do | | 11710do |
| | | | 15185do | 15260do | | |
| 0830 | 0845 | | India, All India Radio/Hyderbad | | | 7420do |
| 0830 | 0845 | | India, All India Radio/Imphal | 7335do | | |
| 0830 | 0845 | | India, All India Radio/Itanagar | | | 4990do |
| 0830 | 0845 | | India, All India Radio/Kolkata | 7210do | | |
| 0830 | 0845 | | India, All India Radio/Shillong | | | 7315do |
| 0830 | 0845 | | India, All India Radio/Thiruvananthapuram 7290do | | | |
| 0830 | 0900 | | Australia, ABC NT Alice Springs | | | 2310do |
| 0830 | 0900 | | Australia, ABC NT Katherine | 2485do | | |
| 0830 | 0900 | | Australia, ABC NT Tennant Creek | | | 2325do |
| 0830 | 0900 | | Guam, TWR Asia/KTWR | 11840as | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0900 | 0910 | | Guam, TWR Asia/KTWR | 11840as | | |

SHORTWAVE GUIDE

| | | | | | | |
|---|---|---|---|---|---|---|
| 0900 | 0959 | | Germany, Deutsche Welle | 15640as | 17820as | |
| 0900 | 1000 | | Anguilla, University Network | 6090na | | |
| 0900 | 1000 | | Australia, ABC NT Alice Springs | 2310do | | |
| 0900 | 1000 | | Australia, ABC NT Katherine | 2485do | | |
| 0900 | 1000 | | Australia, ABC NT Tennant Creek | 2325do | | |
| 0900 | 1000 | | Australia, Radio Australia | 9475as | 9580pa | |
| | | | 9590pa | 11945as | | |
| 0900 | 1000 | | Bahrain, Radio Bahrain | 6010me | | |
| 0900 | 1000 | w/DRM | Belgium, TDP Radio | 6015eu | | |
| 0900 | 1000 | | Canada, CFRX Toronto ON | 6070na | | |
| 0900 | 1000 | | Canada, CFVP Calgary AB | 6030na | | |
| 0900 | 1000 | | Canada, CKZN St Johns NF | 6160na | | |
| 0900 | 1000 | | Canada, CKZU Vancouver BC | 6160na | | |
| 0900 | 1000 | | China, China Radio International | 11620as | | |
| | | | 13790pa | 15210as | 15270eu | 15350as |
| | | | 17490eu | 17570eu | 17750as | |
| 0900 | 1000 | Sun | Greece, Voice of Greece | 9420va | 15630va | |
| 0900 | 1000 | | Italy, IRRS-Shortwave/European Gospel Radio | | | |
| | | | 7290va | | | |
| 0900 | 1000 | | Malaysia, RTM Kajang/Traxx FM | 7295do | | |
| 0900 | 1000 | | Malaysia, RTM/Voice of Malaysia | 6175as | | |
| | | | 9750as | 15295as | | |
| 0900 | 1000 | | Micronesia, The Cross Radio/Pohnpei | 4755 as | | |
| 0900 | 1000 | DRM | New Zealand, Radio NZ International | 7440pa | | |
| 0900 | 1000 | | New Zealand, Radio NZ International | 6170pa | | |
| 0900 | 1000 | | Nigeria, Voice of Nigeria | 9690af | | |
| 0900 | 1000 | | Papua New Guinea, Radio Fly | 5960do | | |
| 0900 | 1000 | | Russia, Voice of Russia | 15170as | | |
| 0900 | 1000 | mtwhf | South Africa, Channel Africa | 9625af | | |
| 0900 | 1000 | | South Africa, CVC 1 Africa Radio | 13590af | | |
| 0900 | 1000 | | UK, BBC World Service | 6190af | 6195as | |
| | | | 9740as | 11760me | 12095af | 15310as |
| | | | 15400af | 15575as | 17640af | 17760as |
| | | | 17790as | 17830af | 21470af | 21630as |
| 0900 | 1000 | | USA, American Forces Network/AFRTS | 4319usb | | |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 0900 | 1000 | | USA, EWTN/WEWN Irondale, AL | 11520af | | |
| 0900 | 1000 | | USA, FBN/WTJC Newport NC | 9370na | | |
| 0900 | 1000 | | USA, WHRI Cypress Creek SC | 7385va | | |
| | | | 9825va | 11565va | | |
| 0900 | 1000 | | USA, WRMI Miami FL | 9955ca | | |
| 0900 | 1000 | | USA, WTWW Lebanon TN | 5755va | | |
| 0900 | 1000 | | USA, WWCR Nashville TN | 4840na | 5890af | |
| | | | 5935af | 9985eu | | |
| 0900 | 1000 | | USA, WWRB Manchester TN | 3185na | | |
| 0900 | 1000 | | USA, WYFR/Family Radio Worldwide | 9465as | | |
| | | | 9755ca | | | |
| 0900 | 1000 | | Zambia, CVC Radio Christian Voice | 13590af | | |
| 0900 | 1000 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 0930 | 1000 | | China, Voice of the Strait/Fuzhou | 6115do | | |
| 0930 | 1000 | Sun | Italy, IRRS-Shortwave | 9510va | | |
| 0930 | 1000 | | Saudi Arabia, BSKSA/External Service | 15250af | | |
| 0959 | 1000 | | Netherlands, R Netherlands Worldwide | 12065as | | |
| | | | 15110as | | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1000 | 1025 | | China, Voice of the Strait (News Channel) Fuzhou | | | |
| | | | 9505do | | | |
| 1000 | 1030 | | Japan, Radio Japan NHK World | 9605as | | |
| | | | 9625pa | 9840pa | | |
| 1000 | 1030 | | Vietnam, Voice of Vietnam/Overseas Service | | | |
| | | | 9840as | 12020as | | |
| 1000 | 1057 | | Netherlands, R Netherlands Worldwide | 12065as | | |
| | | | 15110as | | | |
| 1000 | 1057 | | North Korea, Voice of Korea | 11710ca | 11735as | |
| | | | 13650as | 15180sa | | |
| 1000 | 1058 | DRM | New Zealand, Radio NZ International | 7440pa | | |
| 1000 | 1058 | | New Zealand, Radio NZ International | 6170pa | | |
| 1000 | 1100 | | Anguilla, University Network | 11775na | | |
| 1000 | 1100 | | Australia, ABC NT Alice Springs | 2310do | | |
| 1000 | 1100 | | Australia, ABC NT Katherine | 2485do | | |
| 1000 | 1100 | | Australia, ABC NT Tennant Creek | 2325do | | |
| 1000 | 1100 | | Australia, Radio Australia | 9475as | 9580pa | |
| | | | 9590pa | 11945as | | |
| 1000 | 1100 | | Bahrain, Radio Bahrain | 6010me | | |
| 1000 | 1100 | h/DRM | Belgium, TDP Radio | 6015eu | | |
| 1000 | 1100 | | Canada, CFRX Toronto ON | 6070na | | |
| 1000 | 1100 | | Canada, CFVP Calgary AB | 6030na | | |
| 1000 | 1100 | | Canada, CKZN St Johns NF | 6160na | | |
| 1000 | 1100 | | Canada, CKZU Vancouver BC | 6160na | | |
| 1000 | 1100 | | China, China Radio International | 6040na | | |
| | | | 11610as | 11635as | 13590as | 13620as |
| | | | 13790na | 15190as | 15210as | 15350as |
| | | | 17490as | | | |
| 1000 | 1100 | | India, All India Radio/External Service | 7270as | | |
| | | | 13695pa | 15260as | 15410as | 17510pa |
| | | | 17800as | 17895pa | | |
| 1000 | 1100 | | Indonesia, Voice of Indonesia | 9526va | | |
| 1000 | 1100 | Sun | Italy, IRRS-Shortwave | 9510va | | |
| 1000 | 1100 | | Italy, IRRS-Shortwave/European Gospel Radio | | | |
| | | | 7290va | | | |
| 1000 | 1100 | | Malaysia, RTM Kajang/Traxx FM | 7295do | | |
| 1000 | 1100 | | Micronesia, The Cross Radio/Pohnpei | 4755as | | |
| 1000 | 1100 | | Nigeria, Voice of Nigeria | 9690af | | |
| 1000 | 1100 | | Russia, Voice of Russia | 15170as | | |
| 1000 | 1100 | | Saudi Arabia, BSKSA/External Service | 15250af | | |
| 1000 | 1100 | mtwhf | South Africa, Channel Africa | 9625af | | |
| 1000 | 1100 | | South Africa, CVC 1 Africa Radio | 13590af | | |
| 1000 | 1100 | | UK, BBC World Service | 6190af | 6195as | |
| | | | 9740as | 11760me | 12095af | 15310as |
| | | | 15400af | 15575as | 17640af | 17760as |
| | | | 17790as | 21470af | 21660as | |
| 1000 | 1100 | Sat/Sun | UK, BBC World Service | 17830af | | |
| 1000 | 1100 | | USA, American Forces Network/AFRTS | 4319usb | | |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 1000 | 1100 | | USA, EWTN/WEWN Irondale, AL | 9390as | | |
| 1000 | 1100 | | USA, FBN/WTJC Newport NC | 9370na | | |
| 1000 | 1100 | | USA, KNLS Anchor Point AK | 11870as | | |
| 1000 | 1100 | | USA, WHRI Cypress Creek SC | 7385va | | |
| | | | 11565va | | | |
| 1000 | 1100 | | USA, WRMI Miami FL | 9955ca | | |
| 1000 | 1100 | | USA, WTWW Lebanon TN | 5755va | | |
| 1000 | 1100 | | USA, WWCR Nashville TN | 4840na | 5890af | |
| | | | 5935af | 9985eu | | |
| 1000 | 1100 | | USA, WWRB Manchester TN | 3185na | | |
| 1000 | 1100 | | USA, WYFR/Family Radio Worldwide | 5950na | | |
| | | | 5985na | 6875na | 9465as | |
| 1000 | 1100 | | Zambia, CVC Radio Christian Voice | 13590af | | |
| 1000 | 1100 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 1030 | 1100 | | Iran, IRIB/ VOIRI | 17710as | 21630as | |
| 1030 | 1100 | | Mongolia, Voice of Mongolia | 12085as | | |
| 1059 | 1100 | | New Zealand, Radio NZ International | 9655pa | | |
| 1059 | 1100 | DRM | New Zealand, Radio NZ International | 7440pa | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1100 | 1105 | | Pakistan, PBC/Radio Pakistan | 15725eu | 17720eu | |
| 1100 | 1120 | f/DRM | Japan, Radio Japan NHK World | 9760eu | | |
| 1100 | 1127 | | Iran, IRIB/ VOIRI | 17710as | 21630as | |
| 1100 | 1130 | Sat/DRM | South Korea, KBS World Radio | 9760eu | | |
| 1100 | 1130 | fa | UK, BBC World Service | 9760eu | | |
| 1100 | 1130 | | Vietnam, Voice of Vietnam/Overseas Service | | | |
| | | | 7285as | | | |
| 1100 | 1145 | | USA, WYFR/Family Radio Worldwide | 6875na | | |
| | | | 9550sa | 9755ca | | |
| 1100 | 1157 | | Romania, Radio Romania International | 15210eu | | |
| | | | 15430eu | 17510af | 17670af | |
| 1100 | 1158 | DRM | New Zealand, Radio NZ International | 7440pa | | |
| 1100 | 1200 | | Anguilla, University Network | 11775na | | |
| 1100 | 1200 | | Australia, ABC NT Alice Springs | 2310do | | |
| 1100 | 1200 | | Australia, ABC NT Katherine | 2485do | | |
| 1100 | 1200 | | Australia, ABC NT Tennant Creek | 2325do | | |
| 1100 | 1200 | | Australia, Radio Australia | 5995pa | 6020pa | |
| | | | 9475as | 9560pa | 9580pa | 9590pa |
| | | | 11945as | 12080pa | | |
| 1100 | 1200 | | Bahrain, Radio Bahrain | 6010me | | |
| 1100 | 1200 | f/DRM | Belgium, TDP Radio | 6015eu | | |
| 1100 | 1200 | Sat/Sun | Canada, CBC Northern Quebec Service | | | |
| | | | 9625na | | | |
| 1100 | 1200 | | Canada, CFRX Toronto ON | 6070na | | |
| 1100 | 1200 | | Canada, CFVP Calgary AB | 6030na | | |
| 1100 | 1200 | | Canada, CKZN St Johns NF | 6160na | | |
| 1100 | 1200 | | Canada, CKZU Vancouver BC | 6160na | | |
| 1100 | 1200 | | China, China Radio International | 5955as | | |
| | | | 6040as | 11650as | 11660as | 11750na |
| | | | 11795as | 13590as | 13645as | 13650eu |
| | | | 13720as | 17490eu | | |
| 1100 | 1200 | Sun | Italy, IRRS-Shortwave | 9510va | | |
| 1100 | 1200 | | Italy, IRRS-Shortwave/European Gospel Radio | | | |
| | | | 7290va | | | |
| 1100 | 1200 | | Malaysia, RTM Kajang/Traxx FM | 7295do | | |
| 1100 | 1200 | | New Zealand, Radio NZ International | 9655pa | | |
| 1100 | 1200 | | Nigeria, Voice of Nigeria | 9690af | | |
| 1100 | 1200 | | Russia, Voice of Russia | 12065as | | |
| 1100 | 1200 | | Saudi Arabia, BSKSA/External Service | 15250af | | |
| 1100 | 1200 | mtwhf | South Africa, Channel Africa | 9625af | | |
| 1100 | 1200 | | South Africa, CVC 1 Africa Radio | 13590af | | |
| 1100 | 1200 | | Taiwan, Radio Taiwan International | 7445as | | |
| | | | 11715as | | | |

1100 1200 UK, BBC World Service 6140as 6195as 9740as 11760me 12095af 15285as 15310as 15400af 15575as 17640as 17760as 17790as 17830af 21470af
1100 1200 USA, American Forces Network/AFRTS 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
1100 1200 USA, EWTN/WEWN Irondale, AL 9390as
1100 1200 USA, FBN/WTJC Newport NC 9370na
1100 1200 USA, WHRI Cypress Creek SC 7385va 9410va 11565va
1100 1200 USA, WRMI Miami FL 9955ca
1100 1200 USA, WWCR Nashville TN 4840na 5890af 5935af 15825eu
1100 1200 USA, WWRB Manchester TN 3185na
1100 1200 USA, WYFR/Family Radio Worldwide 5950na 7730sa 9625sa 15560as
1100 1200 Zambia, CVC Radio Christian Voice 13590af
1100 1200 Zambia, ZNBC/Radio Two 6165do
1130 1140 f Vatican City State, Vatican Radio 15595as 17765as
1130 1200 Vietnam, Voice of Vietnam/Overseas Service 9840as 12020as
1135 1145 India, All India Radio/Aizawl 5050do
1135 1145 India, All India Radio/Delhi 9595do 11710do 15185do
1135 1145 India, All India Radio/Shillong 4970do

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

1200 1215 Vatican City State, Vatican Radio 13730am
1200 1230 Germany, AWR Europe 17535as
1200 1230 Saudi Arabia, BSKSA/External Service 15250af
1200 1245 USA, WYFR/Family Radio Worldwide 5950na 5985na
1200 1258 New Zealand, Radio NZ International 9655pa
1200 1259 Poland, Polskie Radio Warsaw 11675eu 11980eu
1200 1300 Anguilla, University Network 11775na
1200 1300 Australia, ABC NT Alice Springs 2310do
1200 1300 Australia, ABC NT Katherine 2485do
1200 1300 Australia, ABC NT Tennant Creek 2325do
1200 1300 Australia, Radio Australia 5995pa 6020pa 9475as 9560pa 9580pa 9590pa 11945as
1200 1300 Bahrain, Radio Bahrain 6010me
1200 1300 Sat/ DRM Belgium, TDP Radio 6015eu
1200 1300 Sat/Sun Canada, CBC Northern Quebec Service 9625na
1200 1300 Canada, CFRX Toronto ON 6070na
1200 1300 Canada, CFVP Calgary AB 6030na
1200 1300 Canada, CKZN St Johns NF 6160na
1200 1300 Canada, CKZU Vancouver BC 6160na
1200 1300 China, China Radio International 5955as 9460as 9600as 9645as 9730as 9760pa 11650as 11660as 11690va 11760pa 11980as 13645as 13650as 13790eu 17490eu
1200 1300 Ethiopia, Radio Ethiopia/National Program 5990do 7110do 9705do
1200 1300 Italy, IRRS-Shortwave/European Gospel Radio 7290va
1200 1300 Japan, Radio Japan NHK World 6120na 9695as
1200 1300 Malaysia, RTM Kajang/Traxx FM 7295do
1200 1300 Nigeria, Voice of Nigeria 9690af
1200 1300 DRM Russia, Voice of Russia 9445as
1200 1300 Russia, Voice of Russia 11500as
1200 1300 South Africa, CVC 1 Africa Radio 13590af
1200 1300 South Korea, KBS World Radio 9650na
1200 1300 UK, BBC World Service 5875as 6140as 6190af 6195as 9740as 11750as 11760me 12095af 15310as 15575as 17640af 17790af 17830af 21470af
1200 1300 USA, American Forces Network/AFRTS 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
1200 1300 USA, BBG/Voice of America 7575va 9510va 12075va 12150va
1200 1300 USA, EWTN/WEWN Irondale, AL 13580va
1200 1300 USA, FBN/WTJC Newport NC 9370na
1200 1300 USA, KNLS Anchor Point AK 11870as
1200 1300 USA, WHRI Cypress Creek SC 7385va 9410va 11565va
1200 1300 USA, WRMI Miami FL 9955ca
1200 1300 USA, WWCR Nashville TN 7490af 9980af 13845na 15825eu
1200 1300 USA, WWRB Manchester TN 3185va
1200 1300 USA, WYFR/Family Radio Worldwide 17555sa 17795ca
1200 1300 Zambia, CVC Radio Christian Voice 13590af
1200 1300 Zambia, ZNBC/Radio Two 6165do
1215 1300 Egypt, Radio Cairo 17870as
1230 1245 India, All India Radio/Aizawl 5050do
1230 1245 India, All India Radio/Chennai 4920do
1230 1245 India, All India Radio/Delhi 4860do 6085do
1230 1245 India, All India Radio/Hyderbad 4800do
1230 1245 India, All India Radio/Jeypore 5040do
1230 1245 India, All India Radio/Kurseong 4895do
1230 1245 India, All India Radio/Port Blair 4760do
1230 1245 India, All India Radio/Radio Kashmir 4950do
1230 1245 India, All India Radio/Shillong 4970do
1230 1245 India, All India Radio/Thiruvananthapuram 5010do
1230 1300 Australia, HCJB Global Australia 15400as
1230 1300 Thailand, Radio Thailand World Service 9890va
1230 1300 Turkey, Voice of Turkey 15450va
1230 1300 Vietnam, Voice of Vietnam/Overseas Service 9840as 12020as
1259 1300 New Zealand, Radio NZ International 6170pa

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

1300 1325 Turkey, Voice of Turkey 15450va
1300 1330 Egypt, Radio Cairo 17870as
1300 1330 Japan, Radio Japan NHK World 15735as 15660al
1300 1357 North Korea, Voice of Korea 9335na 11710na 13760eu 15245eu
1300 1400 Anguilla, University Network 11775na
1300 1400 Australia, ABC NT Alice Springs 2310do
1300 1400 Australia, ABC NT Katherine 2485do
1300 1400 Australia, Radio Australia 5995pa 6020pa 9560pa 9580pa 9590pa
1300 1400 Bahrain, Radio Bahrain 6010me
1300 1400 Sun/DRM Belgium, TDP Radio 6015na
1300 1400 Sat/Sun Canada, CBC Northern Quebec Service 9625na
1300 1400 Canada, CFRX Toronto ON 6070na
1300 1400 Canada, CFVP Calgary AB 6030na
1300 1400 Canada, CKZN St Johns NF 6160na
1300 1400 Canada, CKZU Vancouver BC 6160na
1300 1400 China, China Radio International 5995as 9570na 9650na 9730as 9760pa 9765va 9870as 11660as 11760pa 11980as 13610eu 13755as 13760eu 13790eu 15260na
1300 1400 Sat Greece, Voice of Greece 15630va
1300 1400 Sun Greece, Voice of Greece 9420va
1300 1400 Indonesia, Voice of Indonesia 9526as
1300 1400 Italy, IRRS-Shortwave/European Gospel Radio 7290va
1300 1400 Malaysia, RTM Kajang/Traxx FM 7295do
1300 1400 New Zealand, Radio NZ International 6170pa
1300 1400 Nigeria, Voice of Nigeria 9690af
1300 1400 Russia, Voice of Russia 12065as
1300 1400 South Africa, CVC 1 Africa Radio 13590af
1300 1400 South Korea, KBS World Radio 9570as
1300 1400 Tajikistan, Voice of Tajik 7245va
1300 1400 UK, BBC World Service 5875as 6190af 6195as 9740as 11760me 12095af 15310as 15420af 15575as 17790as 17830af 21470af
1300 1400 USA, American Forces Network/AFRTS 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
1300 1400 Sat/Sun USA, BBG/Voice of America 9510va 9760va 12150va
1300 1400 USA, EWTN/WEWN Irondale, AL 13580va
1300 1400 USA, FBN/WTJC Newport NC 9370na
1300 1400 USA, KJES Vado NM 7555na
1300 1400 USA, WBCQ Monticello ME 9330usb
1300 1400 USA, WHRI Cypress Creek SC 7385va 11565va
1300 1400 Sat/Sun USA, WHRI Cypress Creek SC 9840af
1300 1400 USA, WRMI Miami FL 9955ca
1300 1400 USA, WWCR Nashville TN 7490af 9980af 13845na 15825eu
1300 1400 USA, WWRB Manchester TN 9385na
1300 1400 USA, WYFR/Family Radio Worldwide 11830na 11865na 11910na 17795ca 11520as 11560as 12160as
1300 1400 Zambia, CVC Radio Christian Voice 13590af
1300 1400 Zambia, ZNBC/Radio Two 6165do

| | | | | |
|---|---|---|---|---|
| 1330 | 1345 | | India, All India Radio/Delhi | 6085do |
| 1330 | 1400 | stw | Guam, AWR/KSDA | 11860as |
| 1330 | 1400 | | India, All India Radio/External Service | 9690as 11620as 13710as |
| 1330 | 1400 | | Vietnam, Voice of Vietnam/Overseas Service | 9840as 12020as |
| 1345 | 1400 | Sun | Canada, Bible Voice Broadcasting | 17945as |
| 1359 | 1400 | | Netherlands, R Netherlands Worldwide | 11835as |

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

| | | | | |
|---|---|---|---|---|
| 1400 | 1430 | Sun | Germany, Pan American Broadcasting | 15205as |
| 1400 | 1430 | | Japan, Radio Japan NHK World | 11705as 15735as 21560va 15660al |
| 1400 | 1430 | | Thailand, Radio Thailand World Service | 9575va |
| 1400 | 1430 | Sun | UK, FEBA Radio | 12025as |
| 1400 | 1457 | | Netherlands, R Netherlands Worldwide | 9800as 11835as |
| 1400 | 1500 | | Anguilla, University Network | 11775na |
| 1400 | 1500 | | Australia, ABC NT Alice Springs | 2310do |
| 1400 | 1500 | | Australia, ABC NT Katherine | 2485do |
| 1400 | 1500 | | Australia, ABC NT Tennant Creek | 2325do |
| 1400 | 1500 | | Australia, Radio Australia | 5995pa 6080as 7240pa 9590pa 11660as |
| 1400 | 1500 | | Bahrain, Radio Bahrain | 6010me |
| 1400 | 1500 | DRM | Belgium, TDP Radio/Disco Palace | 6015eu |
| 1400 | 1500 | Sat | Canada, Bible Voice Broadcasting | 17945as |
| 1400 | 1500 | Sat/Sun | Canada, CBC Northern Quebec Service | 9625na |
| 1400 | 1500 | | Canada, CFRX Toronto ON | 6070na |
| 1400 | 1500 | | Canada, CFVP Calgary AB | 6030na |
| 1400 | 1500 | | Canada, CKZN St Johns NF | 6160na |
| 1400 | 1500 | | Canada, CKZU Vancouver BC | 6160na |
| 1400 | 1500 | | China, China Radio International | 5955as 9765va 9870as 11665me 11765as 13710eu 13760eu 11740na 13790eu 17630af |
| 1400 | 1500 | Sat/Sun | Equatorial Guinea, Radio East Africa/Malabo | 15190af |
| 1400 | 1500 | | India, All India Radio/External Service | 9690as 11620as 13710as |
| 1400 | 1500 | | Italy, IRRS-Shortwave/European Gospel Radio | 7290va |
| 1400 | 1500 | | Libya, LJBC Voice of Africa | 17725af |
| 1400 | 1500 | | Malaysia, RTM Kajang/Traxx FM | 7295do |
| 1400 | 1500 | | New Zealand, Radio NZ International | 6170pa |
| 1400 | 1500 | | Nigeria, Voice of Nigeria | 9690af |
| 1400 | 1500 | | Oman, Radio Sultanate of Oman | 15140va |
| 1400 | 1500 | DRM | Russia, Voice of Russia | 7225eu 9750eu |
| 1400 | 1500 | | Russia, Voice of Russia | 4975va 11500as |
| 1400 | 1500 | | South Africa, CVC 1 Africa Radio | 13590af |
| 1400 | 1500 | | UK, BBC World Service | 5845as 5875as 6190af 6195as 7435af 9740as 12095as 13820as 15310as 17640af 17830af 21470af |
| 1400 | 1500 | | USA, American Forces Network/AFRTS | 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb |
| 1400 | 1500 | | USA, BBG/Voice of America | 6080af 12080af 15580af 17545af |
| 1400 | 1500 | mtwhf | USA, BBG/Voice of America | 7540va 7575va 12150va |
| 1400 | 1500 | | USA, EWTN/WEWN Irondale, AL | 15610va |
| 1400 | 1500 | | USA, FBN/WTJC Newport NC | 9370na |
| 1400 | 1500 | | USA, Overcomer Ministries | 9655eu 13810va |
| 1400 | 1500 | | USA, WBCQ Monticello ME | 9330usb |
| 1400 | 1500 | | USA, WHRI Cypress Creek SC | 7385va 9840va |
| 1400 | 1500 | Sat/Sun | USA, WHRI Cypress Creek SC | 9840af 17510af |
| 1400 | 1500 | | USA, WJHR International Milton FL | 15550na |
| 1400 | 1500 | | USA, WRMI Miami FL | 9955ca |
| 1400 | 1500 | | USA, WWCR Nashville TN | 7490af 9980af 13845na 15825eu |
| 1400 | 1500 | | USA, WWRB Manchester TN | 9385na |
| 1400 | 1500 | | USA, WYFR/Family Radio Worldwide | 9615as 11560as 11910na 13695na 17795ca |
| 1400 | 1500 | | Zambia, CVC Radio Christian Voice | 13590af |
| 1400 | 1500 | | Zambia, ZNBC/Radio Two | 6165do |
| 1405 | 1435 | Sat/Sun | Canada, Bible Voice Broadcasting | 9345as |
| 1415 | 1430 | mtwhfa | Germany, Pan American Broadcasting | 15205as |
| 1415 | 1500 | Sun | Canada, Bible Voice Broadcasting | 17945af |
| 1415 | 1500 | | Nepal, Radio Nepal | 5005as |
| 1420 | 1440 | | India, All India Radio/Itanagar | 4990do |
| 1425 | 1455 | | Swaziland, TWR Africa | 4760af |
| 1430 | 1445 | Sat | Germany, Pan American Broadcasting | 15205as |
| 1430 | 1445 | | India, All India Radio/Aizawl | 5050do |
| 1430 | 1445 | | India, All India Radio/Delhi | 6085do 9575do 9835do |
| 1430 | 1445 | | India, All India Radio/Jeypore | 5040do |
| 1430 | 1445 | | India, All India Radio/Mumbai | 4840do |
| 1430 | 1500 | mtwhfa | Albania, Radio Tirana | 13625na |
| 1430 | 1500 | | Guam, AWR/KSDA | 9560as |
| 1430 | 1500 | Sat | India, All India Radio/Gangtok | 4835do |
| 1445 | 1500 | smtwhf | Australia, HCJB Global Australia | 15340as |
| 1450 | 1500 | | India, All India Radio/Itanagar | 4990do |
| 1450 | 1500 | | India, All India Radio/Kurseong | 4895do |

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

| | | | | |
|---|---|---|---|---|
| 1500 | 1515 | Sun | Canada, Bible Voice Broadcasting | 12035as |
| 1500 | 1525 | tf | Guam, TWR Asia/KTWR | 12140as |
| 1500 | 1530 | Sun | Canada, Bible Voice Broadcasting | 17945as |
| 1500 | 1530 | | Guam, AWR/KSDA | 11720as |
| 1500 | 1530 | | India, All India Radio/Jeypore | 5040do |
| 1500 | 1530 | | Vietnam, Voice of Vietnam/Overseas Service | 7285as 9840as 12020as |
| 1500 | 1535 | mwhfa | Guam, TWR Asia/KTWR | 12140as |
| 1500 | 1545 | | USA, WYFR/Family Radio Worldwide | 15770sa |
| 1500 | 1550 | | New Zealand, Radio NZ International | 6170pa |
| 1500 | 1557 | | North Korea, Voice of Korea | 9335na 11710na 13760eu 15245eu |
| 1500 | 1558 | | Libya, LJBC Voice of Africa | 17725af |
| 1500 | 1600 | | Anguilla, University Network | 11775na |
| 1500 | 1600 | | Australia, ABC NT Alice Springs | 2310do |
| 1500 | 1600 | | Australia, ABC NT Katherine | 2485do |
| 1500 | 1600 | | Australia, Radio Australia | 5995pa 6080as 7240pa 9475as 9590pa 11660as |
| 1500 | 1600 | | Bahrain, Radio Bahrain | 6010me |
| 1500 | 1600 | | Bhutan, Bhutan Broadcasting Service | 6035do |
| 1500 | 1600 | Sat/Sun | Canada, CBC Northern Quebec Service | 9625na |
| 1500 | 1600 | | Canada, CFRX Toronto ON | 6070na |
| 1500 | 1600 | | Canada, CFVP Calgary AB | 6030na |
| 1500 | 1600 | | Canada, CKZN St Johns NF | 6160na |
| 1500 | 1600 | | Canada, CKZU Vancouver BC | 6160na |
| 1500 | 1600 | | Canada, Radio Canada International | 11675as 15125as |
| 1500 | 1600 | | China, China Radio International | 5955as 6095me 7325as 7395as 9720me 9765va 9800as 9870as 11965eu 13640eu 13730na 13760eu 17630af |
| 1500 | 1600 | Sat/Sun | Equatorial Guinea, Radio East Africa/Malabo | 15190af |
| 1500 | 1600 | | Italy, IRRS-Shortwave/European Gospel Radio | 7290va |
| 1500 | 1600 | | Malaysia, RTM Kajang/Traxx FM | 7295do |
| 1500 | 1600 | | Nigeria, Voice of Nigeria | 15120af |
| 1500 | 1600 | DRM | Russia, Voice of Russia | 7225eu |
| 1500 | 1600 | | Russia, Voice of Russia | 4975va 9660as 11985va 12040eu |
| 1500 | 1600 | mtwhf | South Africa, Channel Africa | 9625af |
| 1500 | 1600 | | South Africa, CVC 1 Africa Radio | 13590af |
| 1500 | 1600 | | Uganda, Dunamis Shortwave | 4750af |
| 1500 | 1600 | | UK, BBC World Service | 5845as 5875as 6190af 6195as 7435af 9540as 9740as 12095as 13820as 15310as 15400af 15420af 17640af 17830af 21470af |
| 1500 | 1600 | | USA, American Forces Network/AFRTS | 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb |
| 1500 | 1600 | | USA, BBG/Voice of America | 4930af 6080af 7540as 12080af 12150va 13750va 15530va 15580af 17895af |
| 1500 | 1600 | | USA, BBG/Voice of America/Special English | 6140af 7465va 9485va 9760va |
| 1500 | 1600 | | USA, EWTN/WEWN Irondale, AL | 15610va |
| 1500 | 1600 | | USA, FBN/WTJC Newport NC | 9370na |
| 1500 | 1600 | | USA, KNLS Anchor Point AK | 9920as |
| 1500 | 1600 | | USA, Overcomer Ministries | 9655eu 13810va 17485af |
| 1500 | 1600 | | USA, WBCQ Monticello ME | 9330usb |
| 1500 | 1600 | | USA, WHRI Cypress Creek SC | 7385af |
| 1500 | 1600 | Sat/Sun | USA, WHRI Cypress Creek SC | 9840af |
| 1500 | 1600 | Sat | USA, WHRI Cypress Creek SC | 17510af |
| 1500 | 1600 | Sun | USA, WHRI Cypress Creek SC | 15195va |
| 1500 | 1600 | | USA, WJHR International Milton FL | 15550na |
| 1500 | 1600 | | USA, WRMI Miami FL | 9955na |
| 1500 | 1600 | | USA, WWCR Nashville TN | 9980af 12160af 13845na 15825eu |
| 1500 | 1600 | | USA, WWRB Manchester TN | 9385na |

| | | | | |
|---|---|---|---|---|
| 1500 | 1600 | | USA, WYFR/Family Radio Worldwide | 11605as |
| | | | 11830na 11910na 17795ca | 17580af |
| 1500 | 1600 | | Zambia, CVC Radio Christian Voice | 13590af |
| 1500 | 1600 | | Zambia, ZNBC/Radio Two 6165do | |
| 1515 | 1530 | | Australia, HCJB Global Australia | 15340as |
| 1515 | 1545 | Sat | Canada, Bible Voice Broadcasting | 13670as |
| 1525 | 1555 | Sat/Sun | Swaziland, TWR Africa 4760af | |
| 1530 | 1540 | Sat | Vatican City State, Vatican Radio | 11850as |
| | | | 13765as 15235as | |
| 1530 | 1545 | | India, All India Radio/Aizawl 5050do | |
| 1530 | 1545 | | India, All India Radio/Bengaluru | 9425do |
| 1530 | 1545 | | India, All India Radio/Bhopal 4810do | |
| 1530 | 1545 | | India, All India Radio/Chennai | 4920do |
| 1530 | 1545 | | India, All India Radio/Delhi 5015do | |
| 1530 | 1545 | | India, All India Radio/External Service | 9910as |
| 1530 | 1545 | | India, All India Radio/Guwahati | 4940do |
| 1530 | 1545 | | India, All India Radio/Hyderbad | 4800do |
| 1530 | 1545 | | India, All India Radio/Itanagar | 4990do |
| 1530 | 1545 | | India, All India Radio/Jaipur 4910do | |
| 1530 | 1545 | | India, All India Radio/Kolkata 4820do | |
| 1530 | 1545 | | India, All India Radio/Kurseong | 4895do |
| 1530 | 1545 | | India, All India Radio/Lucknow | 4880do |
| 1530 | 1545 | | India, All India Radio/Panaji, Goa | 9820do |
| 1530 | 1545 | | India, All India Radio/Port Blair | 4760do |
| 1530 | 1545 | | India, All India Radio/Radio Kashmir | 4950do |
| 1530 | 1545 | | India, All India Radio/Shillong | 4970do |
| 1530 | 1545 | | India, All India Radio/Shimla 4965do | |
| 1530 | 1545 | | India, All India Radio/Thiruvananthapuram | |
| | | | 5010do | |
| 1530 | 1600 | DRM | Belgium, TDP Radio/Disco Palace | 15775as |
| 1530 | 1600 | Sun | Canada, Bible Voice Broadcasting | 13590me |
| 1530 | 1600 | h | Canada, Bible Voice Broadcasting | 13670as |
| 1530 | 1600 | | Germany, AWR Europe 15255as | |
| 1530 | 1600 | | Iran, IRIB/ VOIRI 9600as 11945as | |
| 1530 | 1600 | | Mongolia, Voice of Mongolia 12015as | |
| 1530 | 1600 | | Myanmar, Myanma Radio/National Svc | 5985do |
| 1545 | 1600 | mtwhfa | Canada, Bible Voice Broadcasting | 13590me |
| 1551 | 1600 | | New Zealand, Radio NZ International | 7440pa |
| 1551 | 1600 | DRM | New Zealand, Radio NZ International | 6170pa |

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

| | | | | |
|---|---|---|---|---|
| 1600 | 1605 | Sun | Croatia, Croatian Radio 6165eu | |
| 1600 | 1615 | tf | Canada, Bible Voice Broadcasting | 13590me |
| 1600 | 1615 | mtwhfa | Croatia, Croatian Radio 6165eu | |
| 1600 | 1627 | | Iran, IRIB/ VOIRI 9600as 11945as | |
| 1600 | 1630 | | Australia, Radio Australia 9965pa | |
| 1600 | 1630 | DRM | Belgium, TDP Radio/Disco Palace | 15775as |
| 1600 | 1630 | | Guam, AWR/KSDA 11805as 12035as | |
| 1600 | 1630 | | Myanmar, Myanma Radio/National Svc | 5985do |
| 1600 | 1630 | | Vietnam, Voice of Vietnam/Overseas Service | |
| | | | 7220me 7280eu 9550me | 9730eu |
| 1600 | 1645 | h | Canada, Bible Voice Broadcasting | 13590me |
| 1600 | 1645 | | USA, WYFR/Family Radio Worldwide | 11830na |
| | | | 11865na | |
| 1600 | 1657 | | North Korea, Voice of Korea 9990va | 11545va |
| 1600 | 1658 | | Germany, Deutsche Welle 6170as | |
| 1600 | 1659 | | Germany, Deutsche Welle 15410as | |
| 1600 | 1700 | | Anguilla, University Network 11775na | |
| 1600 | 1700 | | Australia, ABC NT Alice Springs | 2310do |
| 1600 | 1700 | | Australia, ABC NT Katherine 2485do | |
| 1600 | 1700 | | Australia, Radio Australia 5995pa | 6080as |
| | | | 7240pa 9475as 9710pa | 11660as |
| 1600 | 1700 | | Bahrain, Radio Bahrain 6010me | |
| 1600 | 1700 | | Bhutan, Bhutan Broadcasting Service | 6035do |
| 1600 | 1700 | Sat/Sun | Canada, Bible Voice Broadcasting | 13590me |
| 1600 | 1700 | Sat | Canada, CBC Northern Quebec Service | |
| | | | 9625na | |
| 1600 | 1700 | | Canada, CFRX Toronto ON 6070na | |
| 1600 | 1700 | | Canada, CFVP Calgary AB 6030na | |
| 1600 | 1700 | | Canada, CKZN St Johns NF 6160na | |
| 1600 | 1700 | | Canada, CKZU Vancouver BC | 6160na |
| 1600 | 1700 | | China, China Radio International | 6060as |
| | | | 7420af 7235as 9570af | 11900af |
| | | | 11940eu 11965eu 13760eu | |
| 1600 | 1700 | | Egypt, Radio Cairo 15345af | |
| 1600 | 1700 | Sat/Sun | Equatorial Guinea, Radio East Africa/Malabo | |
| | | | 15190af | |
| 1600 | 1700 | | Ethiopia, Radio Ethiopia 7235va | 9560va |
| 1600 | 1700 | | Italy, IRRS-Shortwave/European Gospel Radio | |
| | | | 7290va | |
| 1600 | 1700 | | Malaysia, RTM Kajang/Traxx FM | 7295do |
| 1600 | 1700 | DRM | New Zealand, Radio NZ International | 6170pa |
| 1600 | 1700 | | New Zealand, Radio NZ International | 7440pa |
| 1600 | 1700 | | Russia, Voice of Russia 4975va | 11985va |
| | | | 12040eu | |
| 1600 | 1700 | | South Africa, CVC 1 Africa Radio | 13590af |
| 1600 | 1700 | | South Korea, KBS World Radio | 9515eu |
| | | | 9640as | |
| 1600 | 1700 | | Taiwan, Radio Taiwan International | 9435as |
| | | | 15485as | |
| 1600 | 1700 | | Uganda, Dunamis Shortwave 4750af | |
| 1600 | 1700 | | UK, BBC World Service 3255af | 5845as |
| | | | 5975as 6190af 9495as | 12095as |
| | | | 13820as 15400af 15420af | 17640af |
| | | | 17795af 17830af 21470af | |
| 1600 | 1700 | | USA, American Forces Network/AFRTS | 4319usb |
| | | | 5446usb 5765usb 7812usb | 12133usb |
| | | | 12759usb 13362usb | |
| 1600 | 1700 | | USA, BBG/Voice of America 4930af | 6080af |
| | | | 15580af | |
| 1600 | 1700 | | USA, BBG/Voice of America/Special English | |
| | | | 11890va 12080va 13750va | |
| 1600 | 1700 | | USA, EWTN/WEWN Irondale, AL | 15610va |
| 1600 | 1700 | | USA, FBN/WTJC Newport NC | 9370na |
| 1600 | 1700 | | USA, WBCQ Monticello ME 9330usb | |
| 1600 | 1700 | | USA, WHRI Cypress Creek SC | 7385af |
| | | | 9840af 17520af | |
| 1600 | 1700 | | USA, WJHR International Milton FL | 15550na |
| 1600 | 1700 | | USA, WRMI Miami FL 9955na | |
| 1600 | 1700 | | USA, WWCR Nashville TN 9980af | 12160af |
| | | | 13845na 15825eu | |
| 1600 | 1700 | | USA, WWRB Manchester TN 9385na | |
| 1600 | 1700 | | USA, WYFR/Family Radio Worldwide | 6085ca |
| | | | 11850as 13695na 17545af | 17795ca |
| | | | 18980eu 21525af | |
| 1600 | 1700 | | Zambia, CVC Radio Christian Voice | 13590af |
| 1600 | 1700 | | Zambia, ZNBC/Radio Two 6165do | |
| 1630 | 1700 | | China, Xizang PBS/Lhasa 4905do | 4920do |
| | | | 6025do 6110do 6130do | 7255do |
| | | | 7385do | |
| 1630 | 1700 | | Guam, AWR/KSDA 11740as | |
| 1630 | 1700 | | Palau, T8WH/ WHRI 9930as | |
| 1630 | 1700 | m | South Africa, SA Radio League | 3230af |
| 1630 | 1700 | | Turkey, Voice of Turkey 15520as | |

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

| | | | | |
|---|---|---|---|---|
| 1700 | 1720 | t | Canada, Bible Voice Broadcasting | 13590me |
| 1700 | 1725 | | Turkey, Voice of Turkey 15520as | |
| 1700 | 1729 | DRM | Romania, Radio Romania International | 7350eu |
| 1700 | 1730 | Sat | Canada, Bible Voice Broadcasting | 13590me |
| 1700 | 1730 | m | South Africa, SA Radio League | 3230af |
| 1700 | 1730 | | Vietnam, Voice of Vietnam/Overseas Service | |
| | | | 9625eu | |
| 1700 | 1755 | mtwhf | South Africa, Channel Africa 9675af | |
| 1700 | 1757 | DRM | Romania, Radio Romania International | 9535eu |
| 1700 | 1757 | | Romania, Radio Romania International | 11735eu |
| 1700 | 1759 | DRM | Poland, Polskie Radio Warsaw | 7265eu |
| 1700 | 1759 | | Poland, Polskie Radio Warsaw | 7265eu |
| | | | 9770eu | |
| 1700 | 1800 | | Anguilla, University Network 11775na | |
| 1700 | 1800 | | Australia, ABC NT Alice Springs | 2310do |
| 1700 | 1800 | | Australia, ABC NT Katherine 2485do | |
| 1700 | 1800 | | Australia, Radio Australia 5995pa | 6080as |
| | | | 9475as 9580pa 9710pa | 11880pa |
| 1700 | 1800 | | Bahrain, Radio Bahrain 6010me | |
| 1700 | 1800 | Sat/Sun | Canada, Bible Voice Broadcasting | 11960me |
| 1700 | 1800 | Sat | Canada, CBC Northern Quebec Service | |
| | | | 9625na | |
| 1700 | 1800 | | Canada, CFRX Toronto ON 6070na | |
| 1700 | 1800 | | Canada, CFVP Calgary AB 6030na | |
| 1700 | 1800 | | Canada, CKZN St Johns NF 6160na | |
| 1700 | 1800 | | Canada, CKZU Vancouver BC | 6160na |
| 1700 | 1800 | | China, China Radio International | 6090as |
| | | | 6140as 6145eu 6165me | 7235as |
| | | | 7265as 7410as 7420as | 11900af |
| | | | 13760af | |
| 1700 | 1800 | | Egypt, Radio Cairo 15345af | |
| 1700 | 1800 | Sat/Sun | Equatorial Guinea, Radio Africa | 7190af |
| 1700 | 1800 | | Italy, IRRS-Shortwave/European Gospel Radio | |
| | | | 7290va | |
| 1700 | 1800 | | Malaysia, RTM Kajang/Traxx FM | 7295do |
| 1700 | 1800 | | New Zealand, Radio NZ International | 7440pa |
| 1700 | 1800 | DRM | New Zealand, Radio NZ International | 6170pa |
| 1700 | 1800 | | Palau, T8WH/ WHRI 9930as | |
| 1700 | 1800 | | Russia, Voice of Russia 4975as | 11985af |
| | | | 12040eu | |
| 1700 | 1800 | | South Africa, CVC 1 Africa Radio | 4965af |
| | | | 13590af | |
| 1700 | 1800 | | Swaziland, TWR Africa 3200af | |
| 1700 | 1800 | Sat | Swaziland, TWR Africa 3200af | |
| 1700 | 1800 | | Taiwan, Radio Taiwan International | 15690af |

SHORTWAVE GUIDE

| | | | | | | |
|---|---|---|---|---|---|---|
| 1700 | 1800 | | UK, BBC World Service | 3255af | 5845as | |
| | | | 5975as | 6190af | 7405af | 7565as |
| | | | 9410af | 9495as | 12095af | 15400af |
| | | | 17795af | 17830af | | |
| 1700 | 1800 | | USA, American Forces Network/AFRTS | | | 4319usb |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 1700 | 1800 | | USA, BBG/Voice of America | 6080af | | 12015af |
| | | | 15580af | 17895af | | |
| 1700 | 1800 | | USA, EWTN/WEWN Irondale, AL | | | 15610va |
| 1700 | 1800 | | USA, FBN/WTJC Newport NC | | | 9370na |
| 1700 | 1800 | | USA, WBCQ Monticello ME | 9330usb | | 15420usb |
| 1700 | 1800 | | USA, WHRI Cypress Creek SC | | | 7385af |
| | | | 9840af | 17520af | | |
| 1700 | 1800 | | USA, WJHR International Milton FL | | | 15550na |
| 1700 | 1800 | | USA, WRMI Miami FL | 9955ca | | |
| 1700 | 1800 | | USA, WWCR Nashville TN | 9980af | | 12160af |
| | | | 13845na | 15825eu | | |
| 1700 | 1800 | | USA, WWRB Manchester TN | 9385na | | |
| 1700 | 1800 | | USA, WYFR/Family Radio Worldwide | | | 7395af |
| | | | 13690na | 17555eu | 17795eu | |
| 1700 | 1800 | | Zambia, CVC Radio Christian Voice | | | 4965af |
| | | | 13590af | | | |
| 1700 | 1800 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 1720 | 1740 | Sat/Sun | USA, BBG/Voice of America/Studio 7 | | | 4930af |
| | | | 12130af | 15730af | | |
| 1730 | 1745 | | India, All India Radio/Bhopal | 4810do | | |
| 1730 | 1745 | | India, All India Radio/Delhi | 5015do | | 7370do |
| | | | 9575do | 9835do | | |
| 1730 | 1745 | | India, All India Radio/Guwahati | | | 4940do |
| 1730 | 1745 | | India, All India Radio/Hyderbad | | | 4800do |
| 1730 | 1745 | | India, All India Radio/Jaipur | 4910do | | |
| 1730 | 1745 | | India, All India Radio/Kolkata | 4820do | | |
| 1730 | 1745 | | India, All India Radio/Kurseong | | | 4895do |
| 1730 | 1745 | | India, All India Radio/Lucknow | | | 4880do |
| 1730 | 1745 | | India, All India Radio/Radio Kashmir | | | 4950do |
| 1730 | 1745 | | India, All India Radio/Shimla | 4965do | | |
| 1730 | 1745 | | India, All India Radio/Thiruvananthapuram | | | |
| | | | 5010do | | | |
| 1730 | 1800 | | Bulgaria, Radio Bulgaria | 5900eu | | 7400eu |
| 1730 | 1800 | mtwhf | Clandestine, Sudan Radio Service/SRS | | | 9590af |
| 1730 | 1800 | mtwh | USA, BBG/Voice of America/Studio 7 | | | 4930af |
| | | | 12130af | 15730af | | |
| 1730 | 1800 | | Vatican City State, Vatican Radio | | | 11625af |
| | | | 13765af | 15570af | | |
| 1740 | 1745 | | India, All India Radio/Chennai | | | 4920do |
| 1745 | 1800 | DRM | India, All India Radio/External Service | | | 9950eu |
| | | | 11580af | | | |
| 1745 | 1800 | | India, All India Radio/External Service | | | 7400af |
| | | | 7410af | 7550eu | 9415af | 9445af |
| | | | 11670eu | 11935af | | |
| 1759 | 1800 | | Netherlands, R Netherlands Worldwide | | | 6020af |
| | | | 15495af | | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1800 | 1815 | Sun | Canada, Bible Voice Broadcasting | | | 13590me |
| 1800 | 1815 | Sat | Canada, Bible Voice Broadcasting | | | 11855as |
| 1800 | 1830 | | South Africa, AWR Africa | 3215af | | 3345af |
| 1800 | 1830 | w | South Africa, AWR Africa | 9755af | | |
| 1800 | 1830 | | USA, BBG/Voice of America | 6080af | | 9850af |
| | | | 12015af | 15580af | | |
| 1800 | 1830 | Sat/Sun | USA, BBG/Voice of America | 4930af | | |
| 1800 | 1835 | | New Zealand, Radio NZ International | | | 7440pa |
| 1800 | 1835 | DRM | New Zealand, Radio NZ International | | | 6170pa |
| 1800 | 1845 | Sun | Canada, Bible Voice Broadcasting | | | 9430me |
| 1800 | 1857 | | Netherlands, R Netherlands Worldwide | | | 6020af |
| | | | 15495af | | | |
| 1800 | 1857 | | North Korea, Voice of Korea | 13760eu | | 15425eu |
| 1800 | 1900 | | Anguilla, University Network | 11775na | | |
| 1800 | 1900 | mtwhf | Argentina, RAE | 15345eu | | |
| 1800 | 1900 | | Australia, ABC NT Alice Springs | | | 2310do |
| 1800 | 1900 | | Australia, ABC NT Katherine | 2485do | | |
| 1800 | 1900 | | Australia, Radio Australia | 6080pa | | 7240pa |
| | | | 9475as | 9580pa | 9710pa | 11880pa |
| 1800 | 1900 | | Bahrain, Radio Bahrain | 6010me | | |
| 1800 | 1900 | Sat | Canada, Bible Voice Broadcasting | | | 9430me |
| 1800 | 1900 | Sun | Canada, Bible Voice Broadcasting | | | 6030eu |
| 1800 | 1900 | | Canada, CFRX Toronto ON | 6070na | | |
| 1800 | 1900 | | Canada, CFVP Calgary AB | 6030na | | |
| 1800 | 1900 | | Canada, CKZN St Johns NF | 6160na | | |
| 1800 | 1900 | | Canada, CKZU Vancouver BC | | | 6160na |
| 1800 | 1900 | | Canada, Radio Canada International | | | 9530af |
| | | | 11765af | 17810af | | |
| 1800 | 1900 | | China, China Radio International | | | 6175eu |
| | | | 9600eu | 13760eu | | |
| 1800 | 1900 | Sat/Sun | Equatorial Guinea, Radio Africa | | | 7190af |
| 1800 | 1900 | DRM | India, All India Radio/External Service | | | 9950eu |
| | | | 11580af | | | |
| 1800 | 1900 | | India, All India Radio/External Service | | | 7400af |
| | | | 7410af | 7550eu | 9415af | 9445af |
| | | | 11670eu | 11935af | | |
| 1800 | 1900 | | Italy, IRRS-Shortwave/European Gospel Radio | | | |
| | | | 7290va | | | |
| 1800 | 1900 | | Kuwait, Radio Kuwait | 15540eu | | |
| 1800 | 1900 | | Malaysia, RTM Kajang/Traxx FM | | | 7295do |
| 1800 | 1900 | | Nigeria, Voice of Nigeria | 15120af | | |
| 1800 | 1900 | | Palau, T8WH/ WHRI | 9930as | | 9955as |
| 1800 | 1900 | | Russia, Voice of Russia | 4975me | | 12040va |
| 1800 | 1900 | | South Africa, CVC 1 Africa Radio | | | 4965af |
| | | | 13590af | | | |
| 1800 | 1900 | | South Korea, KBS World Radio | | | 7275eu |
| 1800 | 1900 | | Swaziland, TWR Africa | 9500af | | |
| 1800 | 1900 | | Taiwan, Radio Taiwan International | | | 6155eu |
| 1800 | 1900 | | UK, BBC World Service | 3255af | | 7405af |
| | | | 11765va | 11810af | 12095af | 15400af |
| 1800 | 1900 | | USA, American Forces Network/AFRTS | | | 4319usb |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 1800 | 1900 | | USA, EWTN/WEWN Irondale, AL | | | 15610va |
| 1800 | 1900 | | USA, FBN/WTJC Newport NC | | | 9370na |
| 1800 | 1900 | | USA, KJES Vado NM | 15385na | | |
| 1800 | 1900 | | USA, WBCQ Monticello ME | 9330usb | | 15420usb |
| 1800 | 1900 | | USA, WHRI Cypress Creek SC | | | 7385af |
| | | | 9840af | 17520af | | |
| 1800 | 1900 | | USA, WJHR International Milton FL | | | 15550na |
| 1800 | 1900 | | USA, WRMI Miami FL | 9955ca | | |
| 1800 | 1900 | | USA, WWCR Nashville TN | 9980af | | 12160af |
| | | | 13845na | 15825eu | | |
| 1800 | 1900 | | USA, WWRB Manchester TN | 9385na | | |
| 1800 | 1900 | | USA, WYFR/Family Radio Worldwide | | | 5905af |
| | | | 7395af | 9770af | 9925af | 13615na |
| | | | 13750af | 13690na | 17795ca | 17845af |
| | | | 18980eu | | | |
| 1800 | 1900 | | Zambia, CVC Radio Christian Voice | | | 4965af |
| | | | 13590af | | | |
| 1800 | 1900 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 1805 | 1810 | Sat | Croatia, Croatian Radio | 6165eu | | |
| 1805 | 1815 | mtwhf | Croatia, Croatian Radio | 6165eu | | |
| 1815 | 1845 | Sat | Canada, Bible Voice Broadcasting | | | 6030eu |
| 1830 | 1845 | | Croatia, Croatian Radio | 15540na | | |
| 1830 | 1845 | | India, All India Radio/Delhi | 5015do | | |
| 1830 | 1900 | | Moldova, (Transnistria) Radio PMR | | | 6240eu |
| 1830 | 1900 | | South Africa, AWR Africa | 9610af | | |
| 1830 | 1900 | | Turkey, Voice of Turkey | 9785eu | | |
| 1830 | 1900 | | UK, BBC World Service | 9850as | 5875as | |
| | | | 5905af | 5950as | 5950as | 5975as |
| | | | 6190af | | | |
| 1830 | 1900 | | UK, BBC World Service | 9410af | | |
| 1830 | 1900 | | USA, BBG/Voice of America | 4930af | | 6080af |
| | | | 9850af | 12015af | 15580af | |
| 1836 | 1850 | | New Zealand, Radio NZ International | | | 9615pa |
| 1836 | 1850 | DRM | New Zealand, Radio NZ International | | | 9890pa |
| 1845 | 1900 | mtwhfa | Albania, Radio Tirana | 7520na | | 13735na |
| 1851 | 1900 | | New Zealand, Radio NZ International | | | 9615pa |
| 1851 | 1900 | DRM | New Zealand, Radio NZ International | | | 15720pa |
| 1859 | 1900 | | Netherlands, R Netherlands Worldwide | | | 7425af |
| | | | 11610af | | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1900 | 1925 | | Turkey, Voice of Turkey | 9785eu | | |
| 1900 | 1930 | | Germany, Deutsche Welle | 6150af | | 9735af |
| | | | 11795af | 17610af | | |
| 1900 | 1930 | | USA, BBG/Voice of America | 4930af | | 4940af |
| | | | 6080af | 9850af | 15580af | 17895af |
| 1900 | 1930 | | Vietnam, Voice of Vietnam/Overseas Service | | | |
| | | | 7280eu | 9730eu | | |
| 1900 | 1945 | DRM | India, All India Radio/External Service | | | 9950eu |
| | | | 11580af | | | |
| 1900 | 1945 | | India, All India Radio/External Service | | | 7400af |
| | | | 7410af | 7550eu | 9415af | 9445af |
| | | | 11670eu | 11935af | | |
| 1900 | 1945 | | USA, WYFR/Family Radio Worldwide | | | 6085ca |
| 1900 | 1950 | | New Zealand, Radio NZ International | | | 9615pa |
| 1900 | 1957 | | Netherlands, R Netherlands Worldwide | | | 7425af |
| | | | 11615af | 15195af | | |
| 1900 | 1957 | | North Korea, Voice of Korea | 7210af | | 9975va |
| | | | 11535va | 11910af | | |
| 1900 | 2000 | | Anguilla, University Network | 11775na | | |
| 1900 | 2000 | | Australia, ABC NT Alice Springs | | | 2310do |
| 1900 | 2000 | | Australia, ABC NT Katherine | 2485do | | |
| 1900 | 2000 | | Australia, Radio Australia | 6080pa | | 7240pa |
| | | | 9500as | 9580pa | 9710pa | 11880pa |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1900 | 2000 | | Bahrain, Radio Bahrain | 6010me | | |
| 1900 | 2000 | | Canada, CFRX Toronto ON | 6070na | | |
| 1900 | 2000 | | Canada, CFVP Calgary AB | 6030na | | |
| 1900 | 2000 | | Canada, CKZN St Johns NF | 6160na | | |
| 1900 | 2000 | | Canada, CKZU Vancouver BC | | | 6160na |
| 1900 | 2000 | | China, China Radio International | | | 7295va |
| | | | 9435af | 9440af | | |
| 1900 | 2000 | | Cuba, Radio Havana Cuba | 11760sa | | |
| 1900 | 2000 | | Egypt, Radio Cairo | 11510af | | |
| 1900 | 2000 | Sat/Sun | Equatorial Guinea, Radio Africa | | | 7190af |
| 1900 | 2000 | | Indonesia, Voice of Indonesia | 9526eu | | |
| 1900 | 2000 | | Italy, IRRS-Shortwave/European Gospel Radio | | | |
| | | | 7290va | | | |
| 1900 | 2000 | | Kuwait, Radio Kuwait | 15540eu | | |
| 1900 | 2000 | | Malaysia, RTM Kajang/Traxx FM | | | 7295do |
| 1900 | 2000 | | Micronesia, The Cross Radio/Pohnpei | | | 4755as |
| 1900 | 2000 | DRM | New Zealand, Radio NZ International | | | 15720pa |
| 1900 | 2000 | | Palau, T8WH/ WHRI | 9930as | | |
| 1900 | 2000 | | Russia, Voice of Russia | 12040va | | |
| 1900 | 2000 | | South Africa, CVC 1 Africa Radio | | | 4965af |
| | | | 13590af | | | |
| 1900 | 2000 | mtwhf | Spain, Radio Exterior de Espana | | | 9665eu |
| | | | 11610af | | | |
| 1900 | 2000 | | Swaziland, TWR Africa | 3200af | | |
| 1900 | 2000 | Sat | Swaziland, TWR Africa | 3200af | | |
| 1900 | 2000 | | Thailand, Radio Thailand World Service | | | 7205eu |
| 1900 | 2000 | | UK, BBC World Service | 3255af | | 5875as |
| | | | 5950as | 6005af | 6190af | 9410af |
| | | | 11810af | 12095af | 15400af | |
| 1900 | 2000 | | USA, American Forces Network/AFRTS | | | 4319usb |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 1900 | 2000 | | USA, BBG/Voice of America/Special English | | | |
| | | | 7485va | 9630va | | |
| 1900 | 2000 | | USA, EWTN/WEWN Irondale, AL | | | 15610va |
| 1900 | 2000 | | USA, FBN/WTJC Newport NC | | | 9370na |
| 1900 | 2000 | | USA, WBCQ Monticello ME | 7415usb | | 9330usb |
| | | | 15420usb | | | |
| 1900 | 2000 | | USA, WHRI Cypress Creek SC | | | 7385af |
| | | | 9840af | 17520na | | |
| 1900 | 2000 | | USA, WJHR International Milton FL | | | 15550na |
| 1900 | 2000 | | USA, WRMI Miami FL | 9955ca | | |
| 1900 | 2000 | | USA, WWCR Nashville TN | 9980af | | 12160af |
| | | | 13845na | 15825eu | | |
| 1900 | 2000 | | USA, WWRB Manchester TN | 9385na | | |
| 1900 | 2000 | | USA, WYFR/Family Radio Worldwide | | | 3230af |
| | | | 6020af | 7270af | 7395af | 9610af |
| | | | 9775af | 13615na | 13690na | 17795ca |
| | | | 17845af | 18930eu | 18980eu | |
| 1900 | 2000 | | Zambia, CVC Radio Christian Voice | | | 4965af |
| | | | 13590af | | | |
| 1900 | 2000 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 1905 | 1920 | Sat | Mali, ORTM/Radio Mali | 9635do | | |
| 1930 | 2000 | Sat/Sun | Germany, Pan American Broadcasting | | | 9515af |
| 1930 | 2000 | | Iran, IRIB/ VOIRI | 5940eu | 6205eu | 9780eu |
| | | | 9800af | | | |
| 1930 | 2000 | | South Africa, RTE Radio Worldwide | | | 5840af |
| 1930 | 2000 | | USA, BBG/Voice of America | 4930af | | 4940af |
| | | | 6080af | 15580af | | |
| 1945 | 2000 | DRM | Vatican City State, Vatican Radio | | | 9800am |
| 1950 | 2000 | | Vatican City State, Vatican Radio | | | 4005va |
| | | | 5885va | 7250va | 9645va | |
| 1951 | 2000 | | New Zealand, Radio NZ International | | | 11725pa |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 2000 | 2015 | Sat | Germany, Pan American Broadcasting | | | 9515af |
| 2000 | 2027 | | Iran, IRIB/ VOIRI | 5940eu | 6205eu | 9780eu |
| | | | 9800af | | | |
| 2000 | 2030 | mtwhfa | Albania, Radio Tirana | 7465eu | | 13735na |
| 2000 | 2030 | | Egypt, Radio Cairo | 11510af | | |
| 2000 | 2030 | | South Africa, RTE Radio Worldwide | | | 5840af |
| 2000 | 2030 | Sat | Swaziland, TWR Africa | 3200af | | |
| 2000 | 2030 | | USA, BBG/Voice of America | 4930af | | 4940af |
| | | | 6080af | 15580af | | |
| 2000 | 2030 | | Vatican City State, Vatican Radio | | | 7365af |
| | | | 9755af | 11625af | | |
| 2000 | 2045 | | USA, WYFR/Family Radio Worldwide | | | 17750eu |
| 2000 | 2050 | | New Zealand, Radio NZ International | | | 11725pa |
| 2000 | 2050 | DRM | New Zealand, Radio NZ International | | | 15720pa |
| 2000 | 2057 | | Germany, Deutsche Welle | 6150af | | 11795af |
| | | | 11865af | | | |
| 2000 | 2057 | | Netherlands, R Netherlands Worldwide | | | 7425af |
| | | | 11615af | | | |
| 2000 | 2100 | | Anguilla, University Network | 11775na | | |
| 2000 | 2100 | | Australia, ABC NT Alice Springs | | | 2310do |
| 2000 | 2100 | | Australia, ABC NT Katherine | 2485do | | |
| 2000 | 2100 | | Australia, ABC NT Tennant Creek | | | 2325do |
| 2000 | 2100 | | Australia, Radio Australia | 6080pa | | 7240pa |
| | | | 9500as | 11650pa | 11660pa | 11880pa |
| 2000 | 2100 | | Bahrain, Radio Bahrain | 6010me | | |
| 2000 | 2100 | | Belarus, Radio Station Belarus | | | 7255eu |
| | | | 7360eu | 7390eu | | |
| 2000 | 2100 | DRM | Belgium, TDP Radio/Disco Palace | | | 17755am |
| 2000 | 2100 | | Canada, CFRX Toronto ON | 6070na | | |
| 2000 | 2100 | | Canada, CFVP Calgary AB | 6030na | | |
| 2000 | 2100 | | Canada, CKZN St Johns NF | 6160na | | |
| 2000 | 2100 | | Canada, CKZU Vancouver BC | | | 6160na |
| 2000 | 2100 | | Canada, Radio Canada International | | | 15235af |
| | | | 15330af | 17735af | | |
| 2000 | 2100 | | China, China Radio International | | | 5960eu |
| | | | 5985af | 7285eu | 7415eu | 9440af |
| | | | 9600eu | | | |
| 2000 | 2100 | Sat/Sun | Equatorial Guinea, Radio Africa | | | 7190af |
| 2000 | 2100 | | Kuwait, Radio Kuwait | 15540eu | | |
| 2000 | 2100 | | Malaysia, RTM Kajang/Traxx FM | | | 7295do |
| 2000 | 2100 | | Micronesia, The Cross Radio/Pohnpei | | | 4755as |
| 2000 | 2100 | | Palau, T8WH/ WHRI | 9930as | | |
| 2000 | 2100 | | Russia, Voice of Russia | 12040va | | |
| 2000 | 2100 | | South Africa, CVC 1 Africa Radio | | | 4965af |
| | | | 9505af | | | |
| 2000 | 2100 | | UK, BBC World Service | 3255af | | 6005af |
| | | | 6190af | 9410af | 11810af | 12095af |
| | | | 13710af | | | |
| 2000 | 2100 | | USA, American Forces Network/AFRTS | | | 4319usb |
| | | | 5446usb | 5765usb | 7812usb | 12133usb |
| | | | 12759usb | 13362usb | | |
| 2000 | 2100 | mtwhf | USA, BBG/Voice of America | 5930va | | 9480va |
| 2000 | 2100 | | USA, EWTN/WEWN Irondale, AL | | | 15610af |
| 2000 | 2100 | | USA, FBN/WTJC Newport NC | | | 9370na |
| 2000 | 2100 | | USA, WBCQ Monticello ME | 7415usb | | 9330usb |
| | | | 15420usb | | | |
| 2000 | 2100 | | USA, WHRI Cypress Creek SC | | | 7385na |
| | | | 15665na | | | |
| 2000 | 2100 | | USA, WJHR International Milton FL | | | 15550na |
| 2000 | 2100 | | USA, WRMI Miami FL | 9955ca | | |
| 2000 | 2100 | | USA, WWCR Nashville TN | 9980af | | 12160af |
| | | | 13845na | 15825eu | | |
| 2000 | 2100 | | USA, WWRB Manchester TN | 9385na | | |
| 2000 | 2100 | | USA, WYFR/Family Radio Worldwide | | | 7540eu |
| | | | 11690af | 12060af | 15195af | 17725ca |
| | | | 17795ca | 17845af | 18980eu | |
| 2000 | 2100 | | Zambia, CVC Radio Christian Voice | | | 4965af |
| | | | 9505af | | | |
| 2000 | 2100 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 2030 | 2045 | | Thailand, Radio Thailand World Service | | | 9680eu |
| 2030 | 2057 | DRM | Romania, Radio Romania International | | | 9765eu |
| 2030 | 2057 | | Romania, Radio Romania International | | | 11880na |
| | | | 11940na | 13800na | | |
| 2030 | 2100 | | Moldova, (Transnistria) Radio PMR | | | 6240eu |
| 2030 | 2100 | | Turkey, Voice of Turkey | 7205va | | |
| 2030 | 2100 | | USA, BBG/Voice of America | 4930af | | 6080af |
| | | | 7555as | 15580af | | |
| 2030 | 2100 | Sat/Sun | USA, BBG/Voice of America | 4940af | | |
| 2030 | 2100 | | Vietnam, Voice of Vietnam/Overseas Service | | | |
| | | | 7220me | 7280eu | 9550me | 9730eu |
| 2045 | 2100 | | India, All India Radio/External Service | | | 7550eu |
| | | | 9445eu | 9910pa | 11620pa | 11670eu |
| | | | 11715pa | | | |
| 2045 | 2100 | DRM | India, All India Radio/External Service | | | 9950eu |
| 2051 | 2100 | DRM | New Zealand, Radio NZ International | | | 11675pa |
| 2051 | 2100 | | New Zealand, Radio NZ International | | | 11725pa |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 2100 | 2125 | | Turkey, Voice of Turkey | 7205va | | |
| 2100 | 2130 | | Australia, ABC NT Alice Springs | | | 2310do |
| 2100 | 2130 | | Australia, ABC NT Katherine | 2485do | | |
| 2100 | 2130 | | Australia, ABC NT Tennant Creek | | | 2325do |
| 2100 | 2130 | | Austria, AWR Europe | 11955af | | |
| 2100 | 2130 | Sat | Canada, CBC Northern Quebec Service | | | |
| | | | 9625na | | | |
| 2100 | 2130 | | South Korea, KBS World Radio | | | 3955eu |
| 2100 | 2145 | | USA, WYFR/Family Radio Worldwide | | | 13615na |
| | | | 13690na | 17795ca | 18980eu | |
| 2100 | 2150 | DRM | New Zealand, Radio NZ International | | | 11675pa |
| 2100 | 2150 | | New Zealand, Radio NZ International | | | 11725pa |
| 2100 | 2157 | | North Korea, Voice of Korea | 13760eu | | 15245eu |
| 2100 | 2200 | | Angola, Angolan National Radio | | | 7217af |
| 2100 | 2200 | | Anguilla, University Network | 11775na | | |
| 2100 | 2200 | | Australia, Radio Australia | 9500as | | 9660pa |
| | | | 11660pa | 11650pa | 11695as | 13630pa |
| | | | 15515pa | | | |

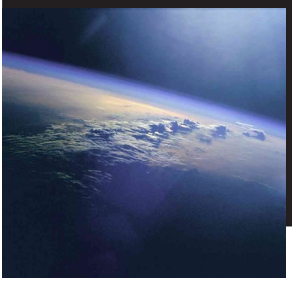
| | | | | | | |
|---|---|---|---|---|---|---|
| 2100 | 2200 | | Bahrain, Radio Bahrain | 6010me | | |
| 2100 | 2200 | | Belarus, Radio Station Belarus | 7255eu | 7360eu | 7390eu |
| 2100 | 2200 | DRM | Belgium, TDP Radio | 17555eu | | |
| 2100 | 2200 | | Bulgaria, Radio Bulgaria | 5900eu | 7400eu | |
| 2100 | 2200 | | Canada, CFRX Toronto ON | 6070na | | |
| 2100 | 2200 | | Canada, CFVP Calgary AB | 6030na | | |
| 2100 | 2200 | | Canada, CKZN St Johns NF | 6160na | | |
| 2100 | 2200 | | Canada, CKZU Vancouver BC | 6160na | | |
| 2100 | 2200 | DRM | Canada, Radio Canada International | 9800na | | |
| 2100 | 2200 | | China, China Radio International | 5960eu | 7205af | 7285eu 7325af 7415eu 9500eu |
| 2100 | 2200 | Sat/Sun | Equatorial Guinea, Radio Africa | 7190af | | |
| 2100 | 2200 | | India, All India Radio/External Service | 7550eu | 9445eu | 9910pa 11620pa 11715pa |
| 2100 | 2200 | DRM | India, All India Radio/External Service | 9950eu | | |
| 2100 | 2200 | | Malaysia, RTM Kajang/Traxx FM | 7295do | | |
| 2100 | 2200 | | Micronesia, The Cross Radio/Pohnpei | 4755 as | | |
| 2100 | 2200 | | Palau, T8WH/ WHRI | 9930as | | |
| 2100 | 2200 | | South Africa, CVC 1 Africa Radio | 4965af | 9505af | |
| 2100 | 2200 | Sat/Sun | Spain, Radio Exterior de Espana | 9650eu | | |
| 2100 | 2200 | | Syria, Radio Damascus | 9330va | 12085va | |
| 2100 | 2200 | | UK, BBC World Service | 3255af | 3915as | 5875as 5905as 6005af 6190af 6195as 9410af 9915af 12095af |
| 2100 | 2200 | | USA, American Forces Network/AFRTS | 4319usb | 5446usb | 5765usb 7812usb 12133usb 12759usb 13362usb |
| 2100 | 2200 | | USA, BBG/Voice of America | 6080af | 7555as | 15580af |
| 2100 | 2200 | | USA, EWTN/WEWN Irondale, AL | 15610af | | |
| 2100 | 2200 | | USA, FBN/WTJC Newport NC | 9370na | | |
| 2100 | 2200 | | USA, WBCQ Monticello ME | 7415usb | 9330usb | |
| 2100 | 2200 | | USA, WHRI Cypress Creek SC | 7385na | 13660na | |
| 2100 | 2200 | | USA, WJHR International Milton FL | 15550na | | |
| 2100 | 2200 | | USA, WRMI Miami FL | 9955ca | | |
| 2100 | 2200 | | USA, WWCR Nashville TN | 7465eu | 9350af | 9980af 13845na |
| 2100 | 2200 | | USA, WWRB Manchester TN | 3215na | | |
| 2100 | 2200 | | USA, WYFR/Family Radio Worldwide | 7425af | 12060af | 17845af |
| 2100 | 2200 | | Zambia, CVC Radio Christian Voice | 4965af | 9505af | |
| 2100 | 2200 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 2115 | 2200 | | Egypt, Radio Cairo | 6270eu | | |
| 2130 | 2200 | | Australia, ABC NT Alice Springs | 4835do | | |
| 2130 | 2200 | | Australia, ABC NT Katherine | 5025do | | |
| 2130 | 2200 | mtwhfa | Canada, CBC Northern Quebec Service | 9625na | | |
| 2151 | 2200 | DRM | New Zealand, Radio NZ International | 17675pa | | |
| 2151 | 2200 | | New Zealand, Radio NZ International | 15720pa | | |

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

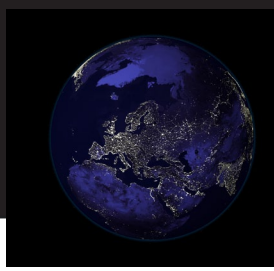
| | | | | | | |
|---|---|---|---|---|---|---|
| 2200 | 2205 | | Zambia, ZNBC/Radio Two | 6165do | | |
| 2200 | 2230 | | India, All India Radio/External Service | 7550eu | 9445eu | 9445eu 9910pa 11620pa 11670eu 11715pa |
| 2200 | 2230 | DRM | India, All India Radio/External Service | 9950eu | | |
| 2200 | 2245 | | Egypt, Radio Cairo | 6270eu | | |
| 2200 | 2245 | | USA, WYFR/Family Radio Worldwide | 15770af | | |
| 2200 | 2255 | | Turkey, Voice of Turkey | 9830va | | |
| 2200 | 2257 | | Romania, Radio Romania International | 5960eu | 7435eu | 9790eu 11940eu |
| 2200 | 2300 | | Anguilla, University Network | 6090na | | |
| 2200 | 2300 | | Australia, ABC NT Alice Springs | 4835do | | |
| 2200 | 2300 | | Australia, ABC NT Katherine | 5025do | | |
| 2200 | 2300 | | Australia, Radio Australia | 9660pa | 9855as | 13630pa 15230pa 15515pa 15560pa |
| 2200 | 2300 | | Bahrain, Radio Bahrain | 6010me | | |
| 2200 | 2300 | smtwhf | Canada, CBC Northern Quebec Service | 9625na | | |
| 2200 | 2300 | | Canada, CFRX Toronto ON | 6070na | | |
| 2200 | 2300 | | Canada, CFVP Calgary AB | 6030na | | |
| 2200 | 2300 | | Canada, CKZN St Johns NF | 6160na | | |
| 2200 | 2300 | | Canada, CKZU Vancouver BC | 6160na | | |
| 2200 | 2300 | | China, China Radio International | 9590as | | |
| 2200 | 2300 | Sat/Sun | Equatorial Guinea, Radio Africa | 7190af | | |
| 2200 | 2300 | | Malaysia, RTM Kajang/Traxx FM | 7295do | | |
| 2200 | 2300 | | Micronesia, The Cross Radio/Pohnpei | 4755 as | | |
| 2200 | 2300 | DRM | New Zealand, Radio NZ International | 17675pa | | |
| 2200 | 2300 | | New Zealand, Radio NZ International | 15720pa | | |
| 2200 | 2300 | | Palau, T8WH/ WHRI | 9930as | | |
| 2200 | 2300 | | Russia, Voice of Russia | 9800va | | |
| 2200 | 2300 | | UK, BBC World Service | 3915as | 5875as | 5905as 5935af 6195as 7490as 9580as 9915af 12095af |
| 2200 | 2300 | | USA, American Forces Network/AFRTS | 4319usb | 5446usb | 5765usb 7812usb 12133usb 12759usb 13362usb |
| 2200 | 2300 | smtwh | USA, BBG/Voice of America | 5915va | 7480va | 7575va 11955va |
| 2200 | 2300 | | USA, BBG/Voice of America | 7555as | | |
| 2200 | 2300 | | USA, EWTN/WEWN Irondale, AL | 15610me | | |
| 2200 | 2300 | | USA, FBN/WTJC Newport NC | 9370na | | |
| 2200 | 2300 | | USA, WBCQ Monticello ME | 7415usb | 9330usb | |
| 2200 | 2300 | | USA, WHRI Cypress Creek SC | 9850na | 9860na | 13620na |
| 2200 | 2300 | | USA, WRMI Miami FL | 9955ca | | |
| 2200 | 2300 | | USA, WWCR Nashville TN | 7465eu | 9350af | 9980af 13845na |
| 2200 | 2300 | | USA, WWRB Manchester TN | 3215na | 5050na | |
| 2200 | 2300 | | USA, WYFR/Family Radio Worldwide | 5950na | 15255sa | 15440ca |
| 2200 | 2300 | | Zambia, CVC Radio Christian Voice | 4965af | | |
| 2215 | 2230 | | Croatia, Croatian Radio | 3985eu | 7375sa | |
| 2230 | 2300 | | Moldova, (Transnistria) Radio PMR | 6240eu | | |
| 2230 | 2300 | | South Africa, AWR Africa | 15320as | | |
| 2230 | 2300 | | USA, BBG/Voice of America/Special English | 7460af | 9570va | 11840va 15340va |
| 2245 | 2300 | | India, All India Radio/External Service | 6055as | 7305as | 11645as 13605as |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 2300 | 0000 | | Anguilla, University Network | 6090na | | |
| 2300 | 0000 | | Australia, ABC NT Alice Springs | 4835do | | |
| 2300 | 0000 | | Australia, ABC NT Katherine | 5025do | | |
| 2300 | 0000 | | Australia, Radio Australia | 9660pa | 13690pa | 15230pa 15415as 17795pa |
| 2300 | 0000 | | Bahrain, Radio Bahrain | 6010me | | |
| 2300 | 0000 | | Bulgaria, Radio Bulgaria | 9700na | 11700na | |
| 2300 | 0000 | smtwhf | Canada, CBC Northern Quebec Service | 9625na | | |
| 2300 | 0000 | | Canada, CFRX Toronto ON | 6070na | | |
| 2300 | 0000 | | Canada, CFVP Calgary AB | 6030na | | |
| 2300 | 0000 | | Canada, CKZN St Johns NF | 6160na | | |
| 2300 | 0000 | | Canada, CKZU Vancouver BC | 6160na | | |
| 2300 | 0000 | | China, China Radio International | 5915as | 5990ca | 6145na 7350eu 7410as 9610as 11690as 11790as 11840na |
| 2300 | 0000 | | Cuba, Radio Havana Cuba | 5040ca | | |
| 2300 | 0000 | | Egypt, Radio Cairo | 6270na | | |
| 2300 | 0000 | | India, All India Radio/External Service | 6055as | 7305as | 11645as 13605as |
| 2300 | 0000 | | Malaysia, RTM Kajang/Traxx FM | 7295do | | |
| 2300 | 0000 | | Micronesia, The Cross Radio/Pohnpei | 4755 as | | |
| 2300 | 0000 | | New Zealand, Radio NZ International | 15720pa | | |
| 2300 | 0000 | DRM | New Zealand, Radio NZ International | 17675pa | | |
| 2300 | 0000 | | Palau, T8WH/ WHRI | 9930as | | |
| 2300 | 0000 | | Russia, Voice of Russia | 9665va | 9800va | |
| 2300 | 0000 | | UK, BBC World Service | 7490as | 9580as | 9740as 9890as 11850as 12010as |
| 2300 | 0000 | | USA, American Forces Network/AFRTS | 4319usb | 5446usb | 5765usb 7812usb 12133usb 12759usb 13362usb |
| 2300 | 0000 | | USA, BBG/Voice of America | 5895va | 7555as | 7575va 11955va |
| 2300 | 0000 | | USA, BBG/Voice of America/Special English | 7460af | 9570va | 11840va 15340va |
| 2300 | 0000 | | USA, EWTN/WEWN Irondale, AL | 15610me | | |
| 2300 | 0000 | | USA, FBN/WTJC Newport NC | 9370na | | |
| 2300 | 0000 | | USA, WBCQ Monticello ME | 7415usb | 9330usb | |
| 2300 | 0000 | mtwhfa | USA, WHRI Cypress Creek SC | 9850na | | |
| 2300 | 0000 | Sun | USA, WHRI Cypress Creek SC | 7315na | 17820va | |
| 2300 | 0000 | | USA, WRMI Miami FL | 9955ca | | |
| 2300 | 0000 | | USA, WWCR Nashville TN | 7465eu | 9350af | 9980af 13845na |
| 2300 | 0000 | | USA, WWRB Manchester TN | 3215na | 5050na | |
| 2300 | 0000 | | USA, WYFR/Family Radio Worldwide | 5950na | 11580sa | 15440ca |
| 2300 | 0000 | | Zambia, CVC Radio Christian Voice | 4965af | | |
| 2300 | 2330 | DRM | Vatican City State, Vatican Radio | 9755am | | |
| 2300 | 2345 | | USA, WYFR/Family Radio Worldwide | 11740na | | |
| 2330 | 0000 | | Australia, Radio Australia | 17750as | | |
| 2330 | 0000 | | Vietnam, Voice of Vietnam/Overseas Service | 9840as | 12020as | |
| 2330 | 2345 | | India, All India Radio/Aligarh | 9470do | | |



# MTXtra
## Shortwave Broadcast Guide



### SPANISH

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

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

| | | | | | |
|---|---|---|---|---|---|
| 0000 | 0045 | | USA, WYFR/Family Radio Worldwide | | 15190sa |
| 0000 | 0100 | mtwhf | Argentina, RAE | 11710am | |
| 0000 | 0100 | | Brazil, Educadora/Braganca | 4825do | |
| 0000 | 0100 | | Brazil, Radio 9 de Julho | 9820do | |
| 0000 | 0100 | | Brazil, Radio A Nossa Voz | 4974do | |
| 0000 | 0100 | | Brazil, Radio Alvorada/Londrina | | 4865do |
| 0000 | 0100 | | Brazil, Radio Alvorada/Parintins | | 4965do |
| 0000 | 0100 | | Brazil, Radio Aparecida | 5035do | 6135do |
| | | | 9630do | 11855do | |
| 0000 | 0100 | | Brazil, Radio Bandeirantes | 6090do | 9645do |
| | | | 11925do | | |
| 0000 | 0100 | | Brazil, Radio Boa Vontade | 6160do | 9550do |
| | | | 11895do | | |
| 0000 | 0100 | | Brazil, Radio Brasil 5000 | 4785do | |
| 0000 | 0100 | | Brazil, Radio Brasil Central | 4985do | 11815do |
| 0000 | 0100 | | Brazil, Radio Cancao Nova | 4825do | 6105do |
| | | | 9675do | | |
| 0000 | 0100 | | Brazil, Radio Capixaba | 4935do | |
| 0000 | 0100 | | Brazil, Radio Clube do Para | 4885do | |
| 0000 | 0100 | | Brazil, Radio Congonhas | 4775do | |
| 0000 | 0100 | | Brazil, Radio Cultura do Para | 5045do | |
| 0000 | 0100 | | Brazil, Radio Cultura Ondas Tropicais | | 4845do |
| 0000 | 0100 | | Brazil, Radio Cultura/Araquara | | 3365do |
| 0000 | 0100 | | Brazil, Radio Cultura/Sao Paulo | | 6170do |
| | | | 9615do | | |
| 0000 | 0100 | | Brazil, Radio Daqui | 4915do | 6080do |
| | | | 11830do | | |
| 0000 | 0100 | | Brazil, Radio Difusora Acerana | | 4885do |
| 0000 | 0100 | | Brazil, Radio Difusora Caceres | | 5055do |
| 0000 | 0100 | | Brazil, Radio Difusora de Macapa | | 4915do |
| 0000 | 0100 | | Brazil, Radio Difusora do Amazonas | | 4805do |
| 0000 | 0100 | | Brazil, Radio Difusora Roraima | | 4875do |
| 0000 | 0100 | | Brazil, Radio Difusora/Londrina | | 4815do |
| 0000 | 0100 | | Brazil, Radio Educacao Rural/Coari | | 5035do |
| 0000 | 0100 | | Brazil, Radio Educadora 6 de Agosto | | 3355do |
| 0000 | 0100 | | Brazil, Radio Educadora/Limeira | | 2380do |
| 0000 | 0100 | | Brazil, Radio Gaucha/Porto Alegre | | 6020do |
| 0000 | 0100 | | Brazil, Radio Gaucha/Rio de Janeiro | | 11915do |
| 0000 | 0100 | | Brazil, Radio Gazeta | 9684do | 15325do |
| 0000 | 0100 | | Brazil, Radio Gazeta Universitaria | | 5955do |
| 0000 | 0100 | | Brazil, Radio Globo | 11805do | |
| 0000 | 0100 | | Brazil, Radio Guaiba | 6000do | 11784do |
| 0000 | 0100 | | Brazil, Radio Guaruja Paulista | 5045do | |
| 0000 | 0100 | | Brazil, Radio Imaculada Conceicao | | 4754do |
| 0000 | 0100 | | Brazil, Radio Inconfidencia | 6010do | 15190do |
| 0000 | 0100 | | Brazil, Radio Jornal A Critica | 5055do | |
| 0000 | 0100 | | Brazil, Radio Maria | 4885do | |
| 0000 | 0100 | | Brazil, Radio Missoes da Amazonia | | 4865do |
| 0000 | 0100 | | Brazil, Radio Mundial | 3325do | |
| 0000 | 0100 | | Brazil, Radio Municipal | 3375do | |
| 0000 | 0100 | | Brazil, Radio Nacional da Amazonia | | 6180do |
| | | | 11780do | | |
| 0000 | 0100 | | Brazil, Radio Novas de Paz | 6080do | 9515do |
| 0000 | 0100 | | Brazil, Radio Novo Tempo | 4895do | |
| 0000 | 0100 | | Brazil, Radio Record | 6150do | |
| 0000 | 0100 | | Brazil, Radio Rural | 4765do | |
| 0000 | 0100 | | Brazil, Radio Transmundial | 9530do | |
| 0000 | 0100 | | Brazil, Radio Verdes Florestas | 4865do | |
| 0000 | 0100 | | Brazil, Radio Voz Misionaria/Camboriu | | 9665do |
| 0000 | 0100 | | Brazil, Radio Voz Misionaria/Florianopolis | | |
| | | | 11749do | | |
| 0000 | 0100 | | Brazil, Super Radio Deus e Amour/Curitiba | | |
| | | | 6060do | 11765do | |
| 0000 | 0100 | | Brazil, Super Radio Deus e Amour/Sao Paulo | | |
| | | | 6120do | 9585do | |
| 0000 | 0100 | | China, China Radio International | | 9560sa |
| | | | 9710eu | | |
| 0000 | 0100 | mtwhfa | Portugal, RDP Internacional | 9715na | |
| 0000 | 0100 | | USA, WYFR/Family Radio Worldwide | | 11580sa |
| | | | 17725sa | | |
| 0030 | 0100 | | Vatican City State, Vatican Radio | | 6040am |
| | | | 7305am | | |

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

| | | | | | |
|---|---|---|---|---|---|
| 0100 | 0145 | | USA, WYFR/Family Radio Worldwide | | 7520eu |
| 0100 | 0200 | | Brazil, Educadora/Braganca | 4825do | |
| 0100 | 0200 | | Brazil, Radio 9 de Julho | 9820do | |
| 0100 | 0200 | | Brazil, Radio A Nossa Voz | 4974do | |
| 0100 | 0200 | | Brazil, Radio Alvorada/Londrina | | 4865do |
| 0100 | 0200 | | Brazil, Radio Alvorada/Parintins | | 4965do |
| 0100 | 0200 | | Brazil, Radio Aparecida | 5035do | 6135do |
| | | | 11855do | | |
| 0100 | 0200 | | Brazil, Radio Bandeirantes | 6090do | 9645do |
| | | | 11925do | | |
| 0100 | 0200 | | Brazil, Radio Boa Vontade | 6160do | 9550do |
| | | | 11895do | | |
| 0100 | 0200 | | Brazil, Radio Brasil Central | 4985do | 11815do |
| 0100 | 0200 | | Brazil, Radio Cancao Nova | 4825do | 6105do |
| | | | 9675do | | |
| 0100 | 0200 | | Brazil, Radio Capixaba | 4935do | |
| 0100 | 0200 | | Brazil, Radio Clube do Para | 4885do | |
| 0100 | 0200 | | Brazil, Radio Congonhas | 4775do | |
| 0100 | 0200 | | Brazil, Radio Cultura do Para | 5045do | |
| 0100 | 0200 | | Brazil, Radio Cultura Ondas Tropicais | | 4845do |
| 0100 | 0200 | | Brazil, Radio Cultura/Sao Paulo | | 6170do |
| | | | 9615do | | |
| 0100 | 0200 | | Brazil, Radio Daqui | 6080do | 11830do |
| 0100 | 0200 | | Brazil, Radio Difusora Acerana | | 4885do |
| 0100 | 0200 | | Brazil, Radio Difusora Caceres | | 5055do |
| 0100 | 0200 | | Brazil, Radio Difusora de Macapa | | 4915do |
| 0100 | 0200 | | Brazil, Radio Difusora Roraima | | 4875do |
| 0100 | 0200 | | Brazil, Radio Difusora/Londrina | | 4815do |
| 0100 | 0200 | | Brazil, Radio Educadora/Limeira | | 2380do |
| 0100 | 0200 | | Brazil, Radio Gaucha/Porto Alegre | | 6020do |
| 0100 | 0200 | | Brazil, Radio Gaucha/Rio de Janeiro | | 11915do |
| 0100 | 0200 | | Brazil, Radio Gazeta | 9684do | 15325do |
| 0100 | 0200 | | Brazil, Radio Gazeta Universitaria | | 5955do |
| 0100 | 0200 | | Brazil, Radio Globo | 11805do | |
| 0100 | 0200 | | Brazil, Radio Guaiba | 6000do | 11784do |
| 0100 | 0200 | | Brazil, Radio Guaruja Paulista | 5045do | |
| 0100 | 0200 | | Brazil, Radio Imaculada Conceicao | | 4754do |
| 0100 | 0200 | | Brazil, Radio Inconfidencia | 6010do | 15190do |
| 0100 | 0200 | | Brazil, Radio Jornal A Critica | 5055do | |
| 0100 | 0200 | | Brazil, Radio Maria | 4885do | |
| 0100 | 0200 | | Brazil, Radio Missoes da Amazonia | | 4865do |
| 0100 | 0200 | | Brazil, Radio Mundial | 3325do | |
| 0100 | 0200 | | Brazil, Radio Nacional da Amazonia | | 6180do |
| 0100 | 0200 | | Brazil, Radio Novas de Paz | 6080do | 9515do |
| 0100 | 0200 | | Brazil, Radio Novo Tempo | 4895do | |
| 0100 | 0200 | | Brazil, Radio Record | 6150do | |
| 0100 | 0200 | | Brazil, Radio Rural | 4765do | |
| 0100 | 0200 | | Brazil, Radio Transmundial | 9530do | |
| 0100 | 0200 | | Brazil, Radio Verdes Florestas | 4865do | |
| 0100 | 0200 | | Brazil, Radio Voz Misionaria/Camboriu | | 9665do |
| 0100 | 0200 | | Brazil, Radio Voz Misionaria/Florianopolis | | |
| | | | 11749do | | |
| 0100 | 0200 | | Brazil, Super Radio Deus e Amour/Curitiba | | |
| | | | 6060do | 11765do | |
| 0100 | 0200 | | Brazil, Super Radio Deus e Amour/Sao Paulo | | |
| | | | 6120do | 9585do | |
| 0100 | 0200 | mtwhfa | Portugal, RDP Internacional | 9715na | |
| 0100 | 0200 | | USA, WYFR/Family Radio Worldwide | | 11530sa |
| | | | 11550sa | | |

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

| | | | | | |
|---|---|---|---|---|---|
| 0200 | 0230 | | Brazil, Educadora/Braganca | 4825do | |
| 0200 | 0300 | | Brazil, Radio 9 de Julho | 9820do | |
| 0200 | 0300 | | Brazil, Radio A Nossa Voz | 4974do | |

| | | | | | |
|---|---|---|---|---|---|
| 0200 | 0300 | | Brazil, Radio Alvorada/Londrina | | 4865do |
| 0200 | 0300 | | Brazil, Radio Aparecida | 5035do | |
| 0200 | 0300 | | Brazil, Radio Bandeirantes | 6090do | 9645do |
| | | | 11925do | | |
| 0200 | 0300 | | Brazil, Radio Boa Vontade | 6160do | 9550do |
| | | | 11895do | | |
| 0200 | 0300 | | Brazil, Radio Brasil Central | 4985do | 11815do |
| 0200 | 0300 | | Brazil, Radio Cancao Nova | 4825do | 6105do |
| | | | 9675do | | |
| 0200 | 0300 | | Brazil, Radio Capixaba | 4935do | |
| 0200 | 0300 | | Brazil, Radio Clube do Para | 4885do | |
| 0200 | 0300 | | Brazil, Radio Cultura do Para | 5045do | |
| 0200 | 0300 | | Brazil, Radio Cultura/Sao Paulo | | 6170do |
| | | | 9615do | | |
| 0200 | 0300 | | Brazil, Radio Difusora Acerana | | 4885do |
| 0200 | 0300 | | Brazil, Radio Difusora Caceres | | 5055do |
| 0200 | 0300 | | Brazil, Radio Difusora de Macapa | | 4915do |
| 0200 | 0300 | | Brazil, Radio Difusora Roraima | | 4875do |
| 0200 | 0300 | | Brazil, Radio Difusora/Londrina | | 4815do |
| 0200 | 0300 | | Brazil, Radio Educadora/Limeira | | 2380do |
| 0200 | 0300 | | Brazil, Radio Gaucha/Porto Alegre | | 6020do |
| 0200 | 0300 | | Brazil, Radio Gazeta | 9684do | 15325do |
| 0200 | 0300 | | Brazil, Radio Globo | 11805do | |
| 0200 | 0300 | | Brazil, Radio Guaiba | 6000do | 11784do |
| 0200 | 0300 | | Brazil, Radio Guaruja Paulista | 5045do | |
| 0200 | 0300 | | Brazil, Radio Imaculada Conceicao | | 4754do |
| 0200 | 0300 | | Brazil, Radio Inconfidencia | 6010do | 15190do |
| 0200 | 0300 | | Brazil, Radio Jornal A Critica | 5055do | |
| 0200 | 0300 | | Brazil, Radio Maria | 4885do | |
| 0200 | 0300 | | Brazil, Radio Mundial | 3325do | |
| 0200 | 0300 | | Brazil, Radio Nacional da Amazonia | | 6180do |
| 0200 | 0300 | | Brazil, Radio Novo Tempo | 4895do | |
| 0200 | 0300 | | Brazil, Radio Record | 6150do | |
| 0200 | 0300 | | Brazil, Radio Rural | 4765do | |
| 0200 | 0300 | | Brazil, Radio Voz Misionaria/Camboriu | | 9665do |
| 0200 | 0300 | | Brazil, Radio Voz Misionaria/Florianopolis | | |
| | | | 11749do | | |
| 0200 | 0300 | | Brazil, Super Radio Deus e Amour/Curitiba | | |
| | | | 6060do | | |
| 0200 | 0300 | | Brazil, Super Radio Deus e Amour/Sao Paulo | | |
| | | | 6120do | 9585do | |
| 0200 | 0300 | | USA, WYFR/Family Radio Worldwide | | 11550sa |

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

| | | | | | |
|---|---|---|---|---|---|
| 0300 | 0345 | | USA, WYFR/Family Radio Worldwide | | 11550sa |
| 0300 | 0400 | | Brazil, Radio 9 de Julho | 9820do | |
| 0300 | 0400 | | Brazil, Radio A Nossa Voz | 4974do | |
| 0300 | 0400 | | Brazil, Radio Alvorada/Londrina | | 4865do |
| 0300 | 0400 | | Brazil, Radio Bandeirantes | 6090do | 9645do |
| | | | 11925do | | |
| 0300 | 0400 | | Brazil, Radio Boa Vontade | 6160do | 9550do |
| | | | 11895do | | |
| 0300 | 0400 | Sat/Sun | Brazil, Radio Brasil Central | 4985do | 11815do |
| 0300 | 0400 | | Brazil, Radio Cancao Nova | 4825do | 6105do |
| | | | 9675do | | |
| 0300 | 0400 | | Brazil, Radio Capixaba | 4935do | |
| 0300 | 0400 | | Brazil, Radio Clube do Para | 4885do | |
| 0300 | 0400 | | Brazil, Radio Difusora Acerana | | 4885do |
| 0300 | 0400 | | Brazil, Radio Difusora de Macapa | | 4915do |
| 0300 | 0400 | | Brazil, Radio Difusora Roraima | | 4875do |
| 0300 | 0400 | | Brazil, Radio Educadora/Limeira | | 2380do |
| 0300 | 0400 | | Brazil, Radio Gaucha/Porto Alegre | | 6020do |
| 0300 | 0400 | | Brazil, Radio Globo | 11805do | |
| 0300 | 0400 | | Brazil, Radio Guaruja Paulista | 5045do | |
| 0300 | 0400 | | Brazil, Radio Imaculada Conceicao | | 4754do |
| 0300 | 0400 | | Brazil, Radio Inconfidencia | 6010do | 15190do |
| 0300 | 0400 | | Brazil, Radio Jornal A Critica | 5055do | |
| 0300 | 0400 | | Brazil, Radio Maria | 4885do | |
| 0300 | 0400 | | Brazil, Radio Mundial | 3325do | |
| 0300 | 0400 | | Brazil, Radio Nacional da Amazonia | | 6180do |
| 0300 | 0400 | | Brazil, Radio Novo Tempo | 4895do | |
| 0300 | 0400 | | Brazil, Radio Record | 6150do | 9505do |
| 0300 | 0400 | | Brazil, Radio Voz Misionaria/Camboriu | | 9665do |
| 0300 | 0400 | | Brazil, Radio Voz Misionaria/Florianopolis | | |
| | | | 11749do | | |
| 0300 | 0400 | | Brazil, Super Radio Deus e Amour/Curitiba | | |
| | | | 6060do | | |
| 0300 | 0400 | | Brazil, Super Radio Deus e Amour/Sao Paulo | | |
| | | | 6120do | 9585do | |
| 0300 | 0400 | | USA, WYFR/Family Radio Worldwide | | 7730sa |

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

| | | | | | |
|---|---|---|---|---|---|
| 0400 | 0445 | | USA, WYFR/Family Radio Worldwide | | 11530af |
| 0400 | 0500 | | Brazil, Radio 9 de Julho | 9820do | |
| 0400 | 0500 | | Brazil, Radio A Nossa Voz | 4974do | |
| 0400 | 0500 | | Brazil, Radio Alvorada/Londrina | | 4865do |
| 0400 | 0500 | | Brazil, Radio Bandeirantes | 6090do | 9645do |
| | | | 11925do | | |
| 0400 | 0500 | | Brazil, Radio Boa Vontade | 6160do | 9550do |
| | | | 11895do | | |
| 0400 | 0500 | | Brazil, Radio Cancao Nova | 4825do | 6105do |
| | | | 9675do | | |
| 0400 | 0500 | | Brazil, Radio Capixaba | 4935do | |
| 0400 | 0500 | | Brazil, Radio Clube do Para | 4885do | |
| 0400 | 0500 | | Brazil, Radio Difusora de Macapa | | 4915do |
| 0400 | 0500 | | Brazil, Radio Educadora/Limeira | | 2380do |
| 0400 | 0500 | | Brazil, Radio Globo | 11805do | |
| 0400 | 0500 | | Brazil, Radio Guaruja Paulista | 5045do | |
| 0400 | 0500 | | Brazil, Radio Imaculada Conceicao | | 4754do |
| 0400 | 0500 | | Brazil, Radio Inconfidencia | 6010do | 15190do |
| 0400 | 0500 | | Brazil, Radio Jornal A Critica | 5055do | |
| 0400 | 0500 | | Brazil, Radio Maria | 4885do | |
| 0400 | 0500 | | Brazil, Radio Mundial | 3325do | |
| 0400 | 0500 | | Brazil, Radio Nacional da Amazonia | | 6180do |
| 0400 | 0500 | | Brazil, Radio Novo Tempo | 4895do | |
| 0400 | 0500 | | Brazil, Radio Record | 6150do | |
| 0400 | 0500 | | Brazil, Radio Voz Misionaria/Camboriu | | 9665do |
| 0400 | 0500 | | Brazil, Radio Voz Misionaria/Florianopolis | | |
| | | | 11749do | | |
| 0400 | 0500 | | Brazil, Super Radio Deus e Amour/Curitiba | | |
| | | | 6060do | | |
| 0400 | 0500 | | Brazil, Super Radio Deus e Amour/Sao Paulo | | |
| | | | 6120do | 9585do | |

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

| | | | | | |
|---|---|---|---|---|---|
| 0500 | 0600 | | Brazil, Radio 9 de Julho | 9820do | |
| 0500 | 0600 | | Brazil, Radio A Nossa Voz | 4974do | |
| 0500 | 0600 | | Brazil, Radio Alvorada/Londrina | | 4865do |
| 0500 | 0600 | | Brazil, Radio Bandeirantes | 6090do | 9645do |
| | | | 11925do | | |
| 0500 | 0600 | | Brazil, Radio Boa Vontade | 6160do | 9550do |
| | | | 11895do | | |
| 0500 | 0600 | | Brazil, Radio Cancao Nova | 4825do | 6105do |
| | | | 9675do | | |
| 0500 | 0600 | | Brazil, Radio Capixaba | 4935do | |
| 0500 | 0600 | | Brazil, Radio Clube do Para | 4885do | |
| 0500 | 0600 | | Brazil, Radio Difusora de Macapa | | 4915do |
| 0500 | 0600 | | Brazil, Radio Educadora/Limeira | | 2380do |
| 0500 | 0600 | | Brazil, Radio Globo | 11805do | |
| 0500 | 0600 | | Brazil, Radio Guaruja Paulista | 5045do | |
| 0500 | 0600 | | Brazil, Radio Imaculada Conceicao | | 4754do |
| 0500 | 0600 | | Brazil, Radio Inconfidencia | 6010do | 15190do |
| 0500 | 0600 | | Brazil, Radio Jornal A Critica | 5055do | |
| 0500 | 0600 | | Brazil, Radio Maria | 4885do | |
| 0500 | 0600 | | Brazil, Radio Mundial | 3325do | |
| 0500 | 0600 | | Brazil, Radio Nacional da Amazonia | | 6180do |
| 0500 | 0600 | | Brazil, Radio Novo Tempo | 4895do | |
| 0500 | 0600 | | Brazil, Radio Record | 6150do | |
| 0500 | 0600 | | Brazil, Radio Voz Misionaria/Camboriu | | 9665do |
| 0500 | 0600 | | Brazil, Radio Voz Misionaria/Florianopolis | | |
| | | | 11749do | | |
| 0500 | 0600 | | Brazil, Super Radio Deus e Amour/Curitiba | | |
| | | | 6060do | | |
| 0500 | 0600 | | Brazil, Super Radio Deus e Amour/Sao Paulo | | |
| | | | 6120do | 9585do | |
| 0500 | 0600 | mtwhf | Portugal, RDP Internacional | 7240eu | 11840af |
| 0530 | 0559 | | Germany, Deutsche Welle | 17800af | |
| 0530 | 0600 | | Brazil, Radio Aparecida | 9630do | |
| 0530 | 0600 | | Germany, Deutsche Welle | 11830af | |
| 0530 | 0600 | | Vatican City State, Vatican Radio | | 11625af |
| | | | 13765af | 15570af | |
| 0545 | 0600 | | Brazil, Radio Itatiaia | 5970do | |

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

| | | | | | |
|---|---|---|---|---|---|
| 0600 | 0655 | mtwhf | Portugal, RDP Internacional | 7240eu | 11840af |
| 0600 | 0700 | | Brazil, Radio 9 de Julho | 9820do | |
| 0600 | 0700 | | Brazil, Radio A Nossa Voz | 4974do | |
| 0600 | 0700 | | Brazil, Radio Alvorada/Londrina | | 4865do |
| 0600 | 0700 | | Brazil, Radio Bandeirantes | 6090do | 9645do |
| | | | 11925do | | |
| 0600 | 0700 | | Brazil, Radio Boa Vontade | 6160do | 9550do |
| | | | 11895do | | |
| 0600 | 0700 | | Brazil, Radio Cancao Nova | 4825do | 6105do |
| | | | 9675do | | |
| 0600 | 0700 | | Brazil, Radio Capixaba | 4935do | |

0600 0700 Brazil, Radio Clube do Para 4885do
0600 0700 Brazil, Radio Difusora de Macapa 4915do
0600 0700 Brazil, Radio Difusora/Londrina 4815do
0600 0700 Brazil, Radio Educadora/Limeira 2380do
0600 0700 Brazil, Radio Globo 11805do
0600 0700 Brazil, Radio Guaiba 6000do
0600 0700 Brazil, Radio Guaruja Paulista 5045do
0600 0700 Brazil, Radio Imaculada Conceicao 4754do
0600 0700 Brazil, Radio Inconfidencia 6010do 15190do
0600 0700 Brazil, Radio Itatiaia 5970do
0600 0700 Brazil, Radio Jornal A Critica 5055do
0600 0700 Brazil, Radio Maria 4885do
0600 0700 Brazil, Radio Meteorologia Paulista 4845do
0600 0700 Brazil, Radio Mundial 3325do
0600 0700 Brazil, Radio Nacional da Amazonia 6180do
0600 0700 Brazil, Radio Novo Tempo 4895do
0600 0700 Brazil, Radio Record 6150do
0600 0700 Brazil, Radio Voz Misionaria/Camboriu 9665do
0600 0700 Brazil, Radio Voz Misionaria/Florianopolis 11749do
0600 0700 Brazil, Super Radio Deus e Amour/Curitiba 6060do
0600 0700 Brazil, Super Radio Deus e Amour/Sao Paulo 6120do 9585do
0600 0700 France, Radio France Internationale 11830sa
0645 0700 mtwhf Portugal, RDP Internacional 11850eu

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

0700 0745 USA, WYFR/Family Radio Worldwide 9985eu
0700 0800 Brazil, Radio 9 de Julho 9820do
0700 0800 Brazil, Radio A Nossa Voz 4974do
0700 0800 Brazil, Radio Alvorada/Londrina 4865do
0700 0800 Brazil, Radio Aparecida 5035do 6135do 9630do 11855do
0700 0800 Brazil, Radio Bandeirantes 6090do 9645do 11925do
0700 0800 Brazil, Radio Boa Vontade 6160do 9550do 11895do
0700 0800 Brazil, Radio Brasil 5000 4785do
0700 0800 Brazil, Radio Brasil Central 4985do 11815do
0700 0800 Brazil, Radio Cancao Nova 4825do 6105do 9675do
0700 0800 Brazil, Radio Capixaba 4935do
0700 0800 Brazil, Radio Clube do Para 4885do
0700 0800 Brazil, Radio Congonhas 4775do
0700 0800 Brazil, Radio Cultura/Sao Paulo 6170do 9615do
0700 0800 Brazil, Radio Difusora de Macapa 4915do
0700 0800 Brazil, Radio Difusora/Londrina 4815do
0700 0800 Brazil, Radio Educadora/Limeira 2380do
0700 0800 Brazil, Radio Globo 11805do
0700 0800 Brazil, Radio Guaiba 6000do 11784do
0700 0800 Brazil, Radio Guaruja Paulista 5045do
0700 0800 Brazil, Radio Imaculada Conceicao 4754do
0700 0800 Brazil, Radio Inconfidencia 6010do 15190do
0700 0800 Brazil, Radio Itatiaia 5970do
0700 0800 Brazil, Radio Jornal A Critica 5055do
0700 0800 Brazil, Radio Maria 4885do
0700 0800 Brazil, Radio Marumby 11724do
0700 0800 Brazil, Radio Meteorologia Paulista 4845do
0700 0800 Brazil, Radio Mundial 3325do
0700 0800 Brazil, Radio Nacional da Amazonia 6180do
0700 0800 Brazil, Radio Novas de Paz 6080do 9515do
0700 0800 Brazil, Radio Record 6150do
0700 0800 Brazil, Radio Voz Misionaria/Camboriu 9665do
0700 0800 Brazil, Radio Voz Misionaria/Florianopolis 11749do
0700 0800 Brazil, Super Radio Deus e Amour/Curitiba 6060do
0700 0800 Brazil, Super Radio Deus e Amour/Sao Paulo 6120do 9585do
0700 0800 mtwhf Portugal, RDP Internacional 7240eu 11850eu 15160af
0700 0800 Sat/Sun Portugal, RDP Internacional 12020eu 15160af

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

0800 0900 Brazil, Radio 9 de Julho 9820do
0800 0900 Brazil, Radio A Nossa Voz 4974do
0800 0900 Brazil, Radio Alvorada/Londrina 4865do
0800 0900 Brazil, Radio Aparecida 5035do 6135do 9630do 11855do
0800 0900 Brazil, Radio Bandeirantes 6090do 9645do 11925do
0800 0900 Brazil, Radio Boa Vontade 6160do 9550do 11895do
0800 0900 Brazil, Radio Brasil 5000 4785do
0800 0900 Brazil, Radio Brasil Central 4985do 11815do
0800 0900 Brazil, Radio Cancao Nova 4825do 6105do 9675do
0800 0900 Brazil, Radio Capixaba 4935do
0800 0900 Brazil, Radio Congonhas 4775do
0800 0900 Brazil, Radio Cultura do Para 5045do
0800 0900 Brazil, Radio Cultura/Sao Paulo 6170do 9615do
0800 0900 Brazil, Radio Daqui 4915do 11830do
0800 0900 Brazil, Radio Difusora Caceres 5055do
0800 0900 Brazil, Radio Difusora de Macapa 4915do
0800 0900 Brazil, Radio Difusora Roraima 4875do
0800 0900 Brazil, Radio Difusora/Londrina 4815do
0800 0900 Brazil, Radio Educadora/Limeira 2380do
0800 0900 Brazil, Radio Gaucha/Porto Alegre 6020do
0800 0900 Brazil, Radio Gaucha/Rio de Janeiro 11915do
0800 0900 Brazil, Radio Gazeta 9684do 15325do
0800 0900 Brazil, Radio Gazeta Universitaria 5955do
0800 0900 Brazil, Radio Globo 11805do
0800 0900 Brazil, Radio Guaiba 6000do 11784do
0800 0900 Brazil, Radio Guaruja Paulista 5045do
0800 0900 Brazil, Radio Imaculada Conceicao 4754do
0800 0900 Brazil, Radio Inconfidencia 6010do 15190do
0800 0900 Brazil, Radio Itatiaia 5970do
0800 0900 Brazil, Radio Jornal A Critica 5055do
0800 0900 Brazil, Radio Maria 4885do
0800 0900 Brazil, Radio Marumby 11724do
0800 0900 Brazil, Radio Meteorologia Paulista 4845do
0800 0900 Brazil, Radio Mundial 3325do
0800 0900 Brazil, Radio Nacional da Amazonia 6180do 11780do
0800 0900 Brazil, Radio Novas de Paz 6080do 9515do
0800 0900 Brazil, Radio Novo Tempo 4895do
0800 0900 Brazil, Radio Record 6150do 9505do
0800 0900 Brazil, Radio Rural 4765do
0800 0900 Brazil, Radio Transmundial 5965do
0800 0900 Brazil, Radio Voz Misionaria/Camboriu 9665do
0800 0900 Brazil, Radio Voz Misionaria/Florianopolis 11749do
0800 0900 Brazil, Super Radio Deus e Amour/Curitiba 6060do 11765do
0800 0900 Brazil, Super Radio Deus e Amour/Sao Paulo 6120do 9585do
0800 0900 Portugal, RDP Internacional 12020eu 15160af
0800 0900 USA, WYFR/Family Radio Worldwide 9605sa 9625sa 11770sa
0815 0900 Brazil, Radio Senado 5990do
0830 0900 Brazil, Educadora/Braganca 4825do
0830 0900 DRM Portugal, RDP Internacional 11995eu

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

0900 1000 Brazil, Educadora/Braganca 4825do
0900 1000 Brazil, Radio 9 de Julho 9820do
0900 1000 Brazil, Radio A Nossa Voz 4974do
0900 1000 Brazil, Radio Alvorada/Londrina 4865do
0900 1000 Brazil, Radio Aparecida 5035do 6135do 9630do 11855do
0900 1000 Brazil, Radio Bandeirantes 6090do 9645do 11925do
0900 1000 Brazil, Radio Boa Vontade 6160do 9550do 11895do
0900 1000 Brazil, Radio Brasil 5000 4785do
0900 1000 Brazil, Radio Brasil Central 4985do 11815do
0900 1000 Brazil, Radio Cancao Nova 4825do 6105do 9675do
0900 1000 Brazil, Radio Capixaba 4935do
0900 1000 Brazil, Radio Clube do Para 4885do
0900 1000 Brazil, Radio Congonhas 4775do
0900 1000 Brazil, Radio Cultura do Para 5045do
0900 1000 Brazil, Radio Cultura/Sao Paulo 6170do 9615do
0900 1000 Brazil, Radio Daqui 4915do 11830do
0900 1000 Brazil, Radio Difusora Acerana 4885do
0900 1000 Brazil, Radio Difusora Caceres 5055do
0900 1000 Brazil, Radio Difusora de Macapa 4915do
0900 1000 Brazil, Radio Difusora Roraima 4875do
0900 1000 Brazil, Radio Difusora/Londrina 4815do
0900 1000 Brazil, Radio Educadora/Guajara Mirim 3375do
0900 1000 Brazil, Radio Educadora/Limeira 2380do
0900 1000 Brazil, Radio Gaucha/Porto Alegre 6020do
0900 1000 Brazil, Radio Gaucha/Rio de Janeiro 11915do
0900 1000 Brazil, Radio Gazeta 9684do 15325do
0900 1000 Brazil, Radio Gazeta Universitaria 5955do
0900 1000 Brazil, Radio Globo 11805do

| | | | | |
|---|---|---|---|---|
| 0900 | 1000 | Brazil, Radio Guaiba | 6000do | 11784do |
| 0900 | 1000 | Brazil, Radio Guaruja Paulista | 5045do | |
| 0900 | 1000 | Brazil, Radio Imaculada Conceicao | | 4754do |
| 0900 | 1000 | Brazil, Radio Inconfidencia | 6010do | 15190do |
| 0900 | 1000 | Brazil, Radio Itatiaia | 5970do | |
| 0900 | 1000 | Brazil, Radio Jornal A Critica | 5055do | |
| 0900 | 1000 | Brazil, Radio Maria | 4885do | |
| 0900 | 1000 | Brazil, Radio Marumby | 11724do | |
| 0900 | 1000 | Brazil, Radio Meteorologia Paulista | | 4845do |
| 0900 | 1000 | Brazil, Radio Missoes da Amazonia | | 4865do |
| 0900 | 1000 | Brazil, Radio Mundial | 3325do | |
| 0900 | 1000 | Brazil, Radio Municipal | 3375do | |
| 0900 | 1000 | Brazil, Radio Nacional da Amazonia | | 6180do |
| | | 11780do | | |
| 0900 | 1000 | Brazil, Radio Novas de Paz | 6080do | 9515do |
| 0900 | 1000 | Brazil, Radio Novo Tempo | 4895do | |
| 0900 | 1000 | Brazil, Radio Record | 6150do | 9505do |
| 0900 | 1000 | Brazil, Radio Rural | 4765do | |
| 0900 | 1000 | Brazil, Radio Senado | 5990do | |
| 0900 | 1000 | Brazil, Radio Transmundial | 5965do | 11735do |
| 0900 | 1000 | Brazil, Radio Voz Misionaria/Camboriu | | 9665do |
| 0900 | 1000 | Brazil, Radio Voz Misionaria/Florianopolis | | |
| | | 11749do | | |
| 0900 | 1000 | Brazil, Super Radio Deus e Amour/Curitiba | | |
| | | 6060do | 11765do | |
| 0900 | 1000 | Brazil, Super Radio Deus e Amour/Sao Paulo | | |
| | | 6120do | 9585do | |
| 0900 | 1000 | Portugal, RDP Internacional | 12020eu | 15160af |

## MT SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana ..... **http://rtsh.sil.at/**
Angola, Angolan National Radio ..... **www.rna.ao/**
Anguilla, University Network ..... **www.worldwideuniversitynetwork.com/**
Argentina, RAE ..... **www.radionacional.gov.ar**
Australia, ABC NT Alice Springs ..... **www.abc.net.au/radio/**
Australia, ABC NT Katherine ..... **www.abc.net.au/radio/**
Australia, ABC NT Tennant Creek ..... **www.abc.net.au/radio/**
Australia, HCJB Global Australia ..... **www.hcjb.org/**
Australia, Radio Australia ..... **www.abc.net.au/ra/**
Austria, AWR Europe ..... **www.awr2.org/**
Bahrain, Radio Bahrain ..... **www.radiobahrain.fm/**
Belarus, Radio Station Belarus ..... **www.radiobelarus.tvr.by/eng/**
Belgium, TDP Radio ..... **www.airtime.be/schedule.html**
Belgium, TDP Radio/Disco Palace ..... **www.airtime.be/schedule.html**
Bhutan, Bhutan Broadcasting Service ..... **www.bbs.com.bt**
Bulgaria, Radio Bulgaria ..... **www.bnr.bg/**
Canada, Bible Voice Broadcasting ..... **www.biblevoice.org/**
Canada, CBC Northern Quebec Service ..... **www.cbc.ca/north/**
Canada, CFRX Toronto ON ..... **www.cfrb.com**
Canada, CFVP Calgary AB ..... **www.classiccountryam1060.com**
Canada, CKZN St Johns NF ..... **www.cbc.ca/listen/index.html**
Canada, CKZU Vancouver BC ..... **www.cbc.ca/bc**
Canada, Radio Canada International ..... **www.rcinet.ca/**
China, China Radio International ..... **www.cri.cn/**
China, Voice of the Strait (News Channel) Fuzhou **www.vos.com.cn**
China, Voice of the Strait/Fuzhou ..... **www.vos.com.cn**
Clandestine, Sudan Radio Service/SRS ..... **www.sudanradio.org**
Cuba, Radio Havana Cuba ..... **www.radiohc.cu/**
Egypt, Radio Cairo ..... **www.ertu.org**
Equatorial Guinea, Radio Africa ..... **www.radiopanam.com/**
Equatorial Guinea, Radio Africa 2 ..... **www.radiopanam.com/**
Equatorial Guinea, Radio East Africa ..... **www.radiopanam.com/**
Equatorial Guinea, Radio East Africa/Malabo **www.radiopanam.com/**
Ethiopia, Radio Ethiopia ..... **www.ertagov.com**
Ethiopia, Radio Ethiopia/National Program ..... **www.ertagov.com**
France, Radio France Internationale ..... **http://rfienglish.com**
Germany, AWR Europe ..... **www.awr2.org/**
Germany, Deutsche Welle ..... **www.dw-world.de/**
Germany, Pan American Broadcasting ..... **www.radiopanam.com/**
Germany, TWR Europe ..... **www.twr.org**
Greece, Voice of Greece ..... **www.voiceofgreece.gr/**
Guam, AWR/KSDA ..... **www.awr2.org/**
Guam, TWR Asia/KTWR ..... **http://nea.ktwr.net/**
India, All India Radio/Aizawl ..... **www.allindiaradio.org/**
India, All India Radio/Aligarh ..... **www.allindiaradio.org/**
India, All India Radio/Bengaluru ..... **www.allindiaradio.org/**
India, All India Radio/Bhopal ..... **www.allindiaradio.org/**
India, All India Radio/Chennai ..... **www.allindiaradio.org/**
India, All India Radio/Delhi ..... **www.allindiaradio.org/**
India, All India Radio/External Service ..... **www.allindiaradio.org/**
India, All India Radio/Gangtok ..... **www.allindiaradio.org/**
India, All India Radio/Gorakhpur ..... **www.allindiaradio.org/**
India, All India Radio/Guwahati ..... **www.allindiaradio.org/**
India, All India Radio/Hyderbad ..... **www.allindiaradio.org/**
India, All India Radio/Imphal ..... **www.allindiaradio.org/**
India, All India Radio/Itanagar ..... **www.allindiaradio.org/**
India, All India Radio/Jaipur ..... **www.allindiaradio.org/**
India, All India Radio/Jeypore ..... **www.allindiaradio.org/**
India, All India Radio/Kolkata ..... **www.allindiaradio.org/**
India, All India Radio/Kurseong ..... **www.allindiaradio.org/**
India, All India Radio/Lucknow ..... **www.allindiaradio.org/**
India, All India Radio/Mumbai ..... **www.allindiaradio.org/**
India, All India Radio/Panaji, Goa ..... **www.allindiaradio.org/**
India, All India Radio/Port Blair ..... **www.allindiaradio.org/**
India, All India Radio/Radio Kashmir ..... **www.allindiaradio.org/**
India, All India Radio/Shillong ..... **www.allindiaradio.org/**
India, All India Radio/Shimla ..... **www.allindiaradio.org/**
India, All India Radio/Thiruvananthapuram ..... **www.allindiaradio.org/**
Indonesia, Voice of Indonesia ..... **www.voi.co.id**
Iran, IRIB/ VOIRI ..... **www.irib.ir/English/**
Italy, IRRS-Shortwave ..... **www.nexus.org**
Italy, IRRS-Shortwave/European Gospel Radio **www.egradio.org/**
Japan, Radio Japan NHK World ..... **www.nhk.or.jp/english/**
Kuwait, Radio Kuwait ..... **www.media.gov.kw/**
Malaysia, RTM Kajang/Traxx FM ..... **www.traxxfm.net/index.php**
Malaysia, RTM/Voice of Malaysia ..... **www.rtm.gov.my**
Mali, ORTM/Radio Mali ..... **www.ortm.ml**
Micronesia, The Cross Radio/Pohnpei ..... **www.pmapacific.org/**
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 ..... **www.voiceofnigeria.org**
Oman, Radio Sultanate of Oman ..... **www.oman-tv.gov.om**
Pakistan, PBC/Radio Pakistan ..... **www.radio.gov.pk**
Palau, T8WH/ WHRI ..... **www.whr.org/**
Philippines, PBS/ Radyo Pilipinas ..... **www.pbs.gov.ph/**
Poland, Polskie Radio Warsaw ..... **www.polskieradio.pl**
Romania, Radio Romania International ..... **www.rri.ro/**
Russia, Voice of Russia ..... **http://english.ruvr.ru/**
Saudi Arabia, BSKSA/External Service ..... **www.saudiradio.net/**
Serbia, International Radio Serbia ..... **www.glassrbije.org**
South Africa, AWR Africa ..... **www.awr2.org/**
South Africa, Channel Africa ..... **www.channelafrica.org**
South Africa, CVC 1 Africa Radio ..... **www.1africa.tv**
South Africa, RTE Radio Worldwide ..... **www.rte.ie/radio1/**
South Africa, SA Radio League ..... **www.sarl.org.za**
South Africa, TWR Africa ..... **www.twr.org/**
South Korea, KBS World Radio ..... **www.worldkbs.co.kr**
Spain, Radio Exterior de Espana ..... **www.ree.rne.es/**
Sri Lanka, SLBC ..... **www.slbc.lk**
Swaziland, TWR Africa ..... **www.twrafrica.org**
Syria, Radio Damascus ..... **www.rtv.gov.sy/**
Taiwan, Radio Taiwan International ..... **http://english.rti.org.tw/**
Thailand, Radio Thailand World Service ..... **www.hsk9.org/**
Turkey, Voice of Turkey ..... **www.trt-world.com**
Uganda, Dunamis Shortwave ..... **www.biblevoice.org/stations/east-africa**
UK, BBC World Service ..... **www.bbc.co.uk/worldservice/**
UK, FEBA Radio ..... **www.febaradio.net**
USA, American Forces Network/AFRTS ..... **http://myafn.dodmedia.osd.mil/**
USA, BBG/Voice of America ..... **www.voanews.com/**
USA, BBG/Voice of America/Special English ..... **www.voanews.com/**
USA, BBG/Voice of America/Studio 7 ..... **www.voanews.com/**
USA, EWTN/WEWN Irondale, AL ..... **www.ewtn.com/**
USA, FBN/WTJC Newport NC ..... **www.fbnradio.com/**
USA, KNLS Anchor Point AK ..... **/www.knls.org/**
USA, Overcomer Ministries ..... **www.overcomerministry.org/**
USA, WBCQ Monticello ME ..... **www.wbcq.com/**
USA, WHRI Cypress Creek SC ..... **www.whr.org/**
USA, WRMI Miami FL ..... **www.wrmi.net/**
USA, WRMI/Radio Slovakia Intl ..... **www.wrmi.net/**
USA, WRNO New Orleans LA ..... **www.wrnoradio.com**
USA, WTWW Lebanon TN ..... **www.wtww.us/**
USA, WWCR Nashville TN ..... **www.wwcr.com**
USA, WWRB Manchester TN ..... **www.wwrb.org/**
USA, WYFR/Family Radio Worldwide ..... **www.familyradio.com/**
Vatican City State, Vatican Radio ..... **www.vaticanradio.org/**
Vietnam, Voice of Vietnam/Overseas Service ..... **www.vov.org.vn**
Zambia, CVC Radio Christian Voice ..... **www.voiceafrica.net**
Zambia, ZNBC/Radio Two ..... **www.znbc.co.zm**

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# MILCOM
## MONITORING MILITARY COMMUNICATIONS

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# Navy Training Wing Update

In our July 2010 *Milcom* column, we presented a profile for two of the U.S. Navy Aviation Training Air Wings – TAW-5 and TAW-6. Since that report we have uncovered some major changes to the frequencies used by Training Air Wing (TAW) Five.

Training Air Wing Five is located five miles north of Milton, Florida, on board Naval Air Station Whiting Field. The wing is comprised of three primary fixed-wing and three advanced helicopter squadrons and it trains aviators from the Navy, Marine Corps, Coast Guard, Air Force, and allied nations.

This wing is responsible for an estimated 43 percent of the Chief of Naval Air Training Command's total flight time and over 11 percent of Navy and Marine Corps' flight time world-wide. Over 1,200 personnel complete their essential flight training here annually.

Here is the latest information on callsigns and frequencies used by TAW-5.

### Squadron Call Signs

| Within Local Area | | Beyond Local Area | |
|---|---|---|---|
| Unit | Tactical Callsign | Phonetic ID | ICAO Callsign |
| VT 2 | Black Bird | BB | Navy 2 Echo ### |
| VT 3 | Red Knight | RN | Navy 3 Echo ### |
| VT 6 | Shooter | SH | Navy 6 Echo ### |
| FITU/TW5 | Spiral (T-34) | SP | Navy 5 Echo ### |
| T-6 | Texan (T-6) | TX | Navy 5 Echo ### |

All student solo aircraft use the word "solo" at the end of their call signs. T-6 aircraft are identified during the filing of their IFR flight plan by the prefix TEXNXXX on either military or civilian flight plans. Initial radio calls will include "Texan" and the aircraft side number.

As the TAW-5 squadrons complete their aircraft transition from T-34s to T-6s, the squadron call sign plus a unique flight identifier number will be assigned by the squadron and used in place of the normal side number.

*USN T-34 CONA Paint Scheme Aircraft Whiting Field*

### Training Wing 5 Common Use Frequencies

| Frequency | Facility (Airfield ID) |
|---|---|
| 118.800/251.100 | Mobile Downtown Tower (KBFM) |
| 119.550/317.750 | Andalusia-Opp (South Alabama Regional) Tower (79J) |
| 119.900/257.800 | Pensacola Regional Tower (KPNS) |
| 120.700/340.200 | NAS Pensacola Tower "Sherman Tower" (KNPA) |
| 121.250 | Pensacola Regional ATIS (KPNS) |
| 121.400/306.925 | NAS North Whiting Field Tower |
| 121.400/348.675 | NAS South Whiting Field Tower UHF Channel 19 |
| 121.700/336.400 | NAS Pensacola Ground Control (KNPA) |
| 121.900/273.450 | Andalusia-Opp (South Alabama Regional) Ground Control (79J) |
| 121.900/348.600 | Pensacola Regional Ground Control (KPNS) |
| 121.950 | TAW-5 Instructor Common |
| 122.800 | Atmore (Airfield is Emergency use only) CTAF/Unicom (0R1) and Bay Minette CTAF/Unicom (1R8) |
| 122.950 | Mobile Downtown Air Center (KBFM) and Pensacola Aviation Center (PNS) (KPNS) |
| 123.000 | Florala CTAF/Unicom (0J4) and Monroeville CTAF/Unicom (KMVC) |
| 123.725/256.875 | Pensacola Regional Clearance Delivery (KPNS) |
| 124.050/393.000 | Eglin Approach (Crestview RI Advisory Area) |
| 124.350/266.800 | NAS Pensacola ATIS (KNPA) |
| 126.500/351.675 | Hurlburt Field Tower (KHRT) |
| 133.200/290.425 | Duke Field Tower (KEGI) |
| 133.450 | Andalusia-Opp (South Alabama Regional) Approach Control (79J) |
| 134.100/268.700 | NAS Pensacola Clearance Delivery (KNPA) |
| 134.150/338.300 | Jacksonville Center PNS Sector UHF (handles North MOA) |
| 134.875 | Andalusia-Opp ASOS (79J) |
| 143.000 | Hurlburt Field Command Post (KHRT) |
| 225.750 | Duke Field 919th Command Post (KEGI) |
| 233.700 | NAS Whiting Base Operations/Operations Duty Officer (ODO) |
| 237.900 | Harold NOLF Crash |
| 250.000 | Pace NOLF Crash |
| 251.125 | Duke Field Ground Control (KEGI) |
| 251.150 | NAS North Whiting Field Ground Control |
| 251.250 | Hurlburt Field Command Post (KHRT) |
| 251.300 | Site 8 NOLF Crash |
| 253.100 | TAW-5 HITU |
| 254.350 | Evergreen Radio UHF Channel 14 |
| 254.900 | TAW-5 UHF Channel 12 |
| 255.100 | HT-18 Field Duty Officer (FDO) |
| 257.975 | Brewton Radio UHF Channel 13 |
| 266.800 | NAS Pensacola ATIS (KNPA) |
| 269.425 | Barin Field Radio UHF Channel 9 |
| 273.575 | NAS South Whiting Field ATIS |
| 273.750 | TAW-5 FITU – Spiral Base |
| 274.700 | Night Common/RI Common (Saufley, Monroeville, Whiting, Brooklyn, Gateswood) UHF Channel 18 |
| 275.800 | Hurlburt Field Ground Control (KHRT) |
| 299.500 | TAW-5 UHF Channel 16 |
| 303.150 | TAW-5 Area Common |
| 303.600 | HT-8 Field Duty Officer (FDO) |
| 307.375 | RI Common (Crestview) |
| 309.800 | Pensacola South MOA Common "Gator Common" (PNSS) |
| 312.100 | NAS Pensacola Operations Duty Officer (ODO) (KNPA) |
| 316.950 | Whiting Metro |
| 335.450 | Hurlburt Field Metro (KHRT) |
| 336.400 | NAS Pensacola Ground (KNPA) |
| 340.100 | Contract Maintenance (KNSE) |
| 341.850 | TAW-5 Formation Common (UHF Channel 15) |
| 342.200 | Duke Field/Eglin AF Aux Nr 3 (KEGI) – Eglin Metro Remote |
| 342.800 | VT-3 – Red Knight Base |
| 346.800 | NAS South Whiting Field Ground Control UHF Channel 20 |
| 350.150 | VT-2 – Blackbird Base |
| 355.550 | VT-6 – Shooter Base |
| 355.600 | NAS South Whiting Field Clearance Delivery |
| 358.800 | Spencer NOLF Crash |
| 359.600 | NAS Pensacola Metro (KNPA) |
| 360.675 | Hurlburt Field ATIS (KHRT) |
| 361.100 | Santa Rosa NOLF Crash |
| 361.900 | Santa Rosa NOLF Crash |
| 371.900 | Pensacola North MOA Common (monitored by Jacksonville Center) (PNSN) |
| 380.800 | Choctaw Radio/Tower UHF Channel 17 |

### Training Wing 5 Fixed-Wing Aircraft UHF Radio Presets

| Channel | UHF Freq | Facility |
|---|---|---|
| 1 | 290.325 | North Whiting ATIS |
| 2 | 257.775 | North Whiting Clearance |
| 3 | 251.150 | North Whiting Ground |
| 4 | 306.925 | North Whiting Tower |
| 5 | 278.800 | Pensacola Departure |
| 6 | 291.625 | Pensacola Approach (North) |
| 7 | 269.375 | Pensacola Approach (South) |
| 8 | 303.150 | Area 1 Common |
| 9 | 269.425 | Barin |
| 10 | 345.200 | Silverhill |
| 11 | 340.200 | Sherman Tower |
| 12 | 254.900 | Area 2T |
| 13 | 257.975 | Brewton |
| 14 | 254.350 | Evergreen |
| 15 | 341.850 | Area 2F |
| 16 | 299.500 | Area 3 |
| 17 | 380.800 | Choctaw |
| 18 | 274.700 | RI/Night Common |
| 19 | 348.675 | South Whiting Tower |
| 20 | 346.800 | South Whiting Ground |

## ❖ Milair Frequency Updates

Major changes to the 225-400 MHz military UHF aircraft band continue to be announced by the U.S. military and the federal government. Here are the latest official frequency additions, updates and changes directly from the Federal Aviation Administration (FAA).

| | |
|---|---|
| 118.250/269.450 | Harrisburg PA Approach/Departure Control |
| 118.625 | Michigan City Muni IN Clearance Delivery (KMGC) (ex-134.800) |
| | South Bend Regional IN Clearance Delivery (KSBN) |

| | |
|---|---|
| 119.050/269.500 | Los Angeles ARTCC – Low Altitude Discrete (Sector 15), San Luis Obispo CA RCAG (ZLA) |
| 119.300/307.100 | Honolulu ARTCC – Low/High Altitude Discrete (Sector 4), Waimanalo HI and Mount Haleakala RCAGs (ZHN) |
| 119.525/259.300 | Valdosta GA Approach/Departure Control |
| 119.650 | Allentown PA Approach/Departure Control (ex-118.200) |
| 119.700/269.000 | Anchorage ARTCC – Low/High Altitude, Kenai AK RCAG (ZAN) |
| 119.800 | Muskegon MI Approach/Departure Control |
| 119.900/306.900 | Honolulu ARTCC – Low/High Altitude Discrete (Sector 6), Kokee HI RCAG (ZHN) |
| 121.025 | Lambert St. Louis International MO – Approach Control (KSTL) |
| 123.750/256.800 | Fort Leonard Woods – Waynesville-St. Robert Regional (Forney Field) MO Ground Control (KTBN) |
| 123.800/353.800 | Oakland ARTCC – Low Altitude Discrete (Sector 16), Fresno CA RCAG (ZOA) |
| 124.100/273.525 | Harrisburg PA Approach/Departure Control |
| 124.100/317.500 | Honolulu ARTCC – Low/High Altitude Discrete (Sector 3), Mount Haleakala HI RCAG (ZHN) |
| 124.200/343.600 | Los Angeles ARTCC – Low Altitude Discrete, Cedar City UT RCAG (ZLA) |
| 124.400 | McCarren International NV Ramp Control (Gates A/B/C) (KLAS) |
| 124.450 | Allentown PA Approach/Departure Control |
| 124.625/377.100 | Los Angeles ARTCC – Low/High Altitude Discrete (Sector 16), Keeler CA, Mount Potosi NV and Tonopah NV RCAGs (ZLA) |
| 124.850/319.200 | Los Angeles ARTCC – Low Altitude Discrete, Seligman AZ RCAG (ZLA) |
| 125.275/351.700 | Los Angeles ARTCC – Low Altitude Discrete, Pleasants Peak CA RCAG (ZLA) |
| 125.375/254.325 | Jacksonville ARTCC – Low Altitude. Lake City FL RCAG (ZJX) |
| 125.800/351.800 | Los Angeles ARTCC – Low Altitude Discrete (Sector 13), Saddle Peak CA RCAG (ZLA) |
| 126.150 | Springfield IL Approach/Departure Control |
| 126.350/290.200 | Los Angeles ARTCC – Low Altitude Discrete (Sector 20), Riverside CA RCAG (ZLA) |
| 126.450/281.525 | Harrisburg PA Approach/Departure Control |
| 126.500/269.400 | Honolulu ARTCC – Low/High Altitude Discrete (Sector 2), Mauna Kapu HI and Mount Kaala RCAGs (ZHN) |
| 126.600/285.600 | Valdosta GA Approach/Departure Control |
| 126.600/284.600 | Honolulu ARTCC – Low/High Altitude Discrete (Sector 7), Hamakua HI RCAG (ZHN) |
| 126.850/322.500 | Oakland ARTCC – Low Altitude Discrete (Sector 23), Angels Camp CA RCAG (ZOA) |
| 127.100/317.700 | Los Angeles ARTCC – Low Altitude Discrete (Sector 3), Bakesfield CA RCAG (ZLA) |
| 127.300 | Fort Leonard Woods – Waynesville-St. Robert Regional (Forney Field) MO "Forney Ops" (KTBN) |
| 127.475/291.700 | Kansas City ARTCC – Low Altitude, Marion MO RCAG (ZKC) (ex-346.275) |
| 127.500/239.275 | Detroit MI Departure Control (Palace 5) |
| 127.800/353.500 | Oakland ARTCC – Low Altitude Discrete (Sector 40), Mount Tamalpais CA and Ukiah CA RCAGs (ZOA) |
| 127.900 | McCarren International NV Ramp Control (Gate D/Cargo Ramp) (KLAS) |
| 127.925 | Moody AFB GA Basic Radar – Approach/Departure Control Service (KVAD) |
| 128.600/291.700 | Los Angeles ARTCC – Low Altitude Discrete (Sector 9), Mount Laguna CA RCAG (ZLA) |
| 128.700/307.000 | Oakland ARTCC – Low Altitude Discrete (Sector 10), Priest CA RCAG (ZLA) |
| 128.800/285.500 | Oakland ARTCC – Low Altitude Discrete (Sector 45), Fallon NV RCAG (ZOA) |
| 132.500/284.700 | Los Angeles ARTCC – Low Altitude Discrete (Sector 17), Bastow CA RCAG (ZLA) |
| 132.575 | Springfield IL Approach/Departure Control (ex-118.600) |
| 132.850/323.125 | Potomac TRACON VA – Approach/Departure Control |
| 133.600/269.250 | Salt Lake City ARTCC – Low Altitude, Bryce Canyon UT RCAG (ZLC)<br>Salt Lake City ARTCC – Low Altitude, Hanksville UT RCAG (ZLC) |
| 133.825 | Muskegon MI Approach/Departure Control |
| 134.400/317.425 | Jacksonville ARTCC – Approach/Departure Service, Gainesville FL RCAG (ZJX) (ex-385.600) |
| 134.575/354.100 | Los Angeles ARTCC – Low Altitude Discrete (Sector 22), Santa Catalina CA RCAG (ZLA) |
| 134.650/360.650 | Los Angeles ARTCC – Low Altitude Discrete (Sector 7), Nelson NV RCAG (ZLA) |
| 135.500/327.100 | Los Angeles ARTCC – Low Altitude Discrete (Sector 14), Santa Barbara CA RCAG (ZLA) |
| 254.275 | Chicago ARTCC – Hampshire IL RCAG (ZAU) |
| 255.800 | Lincoln Muni NE – National Guard Operations (KLNK) |
| 257.725 | Altus AFB OK Approach/Departure Control |
| 257.800 | Palm Beach International Tower (KPBI) |
| 270.800 | Pensacola FL Approach/Departure Control (ex-376.800) |
| 273.600 | Sarasota/Bradenton International Tower/Ground Control (KSRQ) (ex-269.700) |
| 284.600 | Palm Beach International Ground Control (KPNI) (ex-257.800) |
| 291.775 | Decatur Airport IL Tower/Ground Control (KDEC) (ex-392.100) |
| 308.600 | Wichita Falls TX Approach/Departure Control |
| 316.075 | Wichita Falls TX Approach/Departure Control |
| 317.400 | Palm Beach FL Approach/Departure Control (ex-387.100) |
| 342.300 | R-5601 Falcon Range Control OK Secondary (ex-385.900) |
| 343.600 | Palm Beach FL Approach/Departure Control |
| 346.600 | Fort Richardson (Anchorage)/Bryant AAF Metro (KFRN) (ex-344.600) |
| 353.825 | Salt Lake City UT Departure Control (ex-387.000) |
| 363.700 | R-5601 Falcon Range Control OK Primary (ex-390.100) |
| 377.150 | Chicago O'Hare International IL Approach Control |
| 381.300 | Moody AFB GA AFSOC Command Post Alternate (KVAD) "Angel Ops" (ex-381.050) |

## ❖ New Pacific Metro Frequency

I have well documented in this column that the former nationwide DoD Metro frequency 344.600 MHz is being cleaned out to make way for a new wideband signal subband. It now appears that at least a few of the bases in the Pacific that used this former Metro frequency have moved to a new frequency – 346.600 MHz.

The following bases have now been documented using this new frequency: Eielson AFB AK; Elmendorf AFB AK; Fort Richardson/Bryant AHP AK; Andersen AFB Guam; Joint Base Pearl Harbor-Hickam, with remote briefing service to Bradshaw AAF and Wheeler AAF all in Hawaii.

The bases listed below are still being shown with 344.600 MHz assignments on various online sources. If you are near one of these bases and have recently observed their Metro frequency in use, we could use an update. Please contact us at the email address in the masthead.

McClellan Airfield CA (KMCC); Cape Canaveral AFS FL (KXMR); MacDill AFB FL (KMCF); NASA Shuttle Landing Facility FL (KTTS); Patrick AFB FL (KCOF); MCAS Kaneohe Bay HI (PHNG); Grissom ARB IN (KGUS); Andrews AFB MD (KADW); Whiteman AFB MO (KSZL); MCALF Bogue Field NC (KNJM); Pope AFB NC (KPOB); Wright Patterson AFB OH (KFFP); Willow Grove NAS/JRB PA (KNXX); Kingsville NAS TX (KNQI); and Orange Grove NALF TX (KNOG).

*U.S. Coast Guard HC-144 aircraft (photo courtesy of the US Coast Guard)*

## ❖ CanForce HF NAWS Mode Change

As of June 1 of this year, the Canadian Forces HF station CFH located at Halifax, Nova Scotia, is now using the STANAG 4285/75L/3300 + ITA2/5N1 framing mode instead of their former FSK baudot transmissions for Notice to Allied Warships (NAWS) broadcast transmissions. Shortly after the June 1 changeover, the following Stanag 4285 marker was observed on 5095.2 10493.2 15918.2 kHz (all former FSK frequencies):

NAWS DE CFH ZKR F1 2822 3394 4158 6242 8324 12371 AR

I have also observed CFH using Stanag 4285 sending encrypted traffic on 8542.0 8697.0 12726.0 kHz.

And, in the "Guess I somehow missed this announcement department," according to John Snyder on the Ocean Navigator Online website, CFH Halifax, the Canadian Forces Metoc (Meteorology and Oceanography), ceased high frequency weather and fax broadcasts on Sept. 2, 2010.

According to Senior Staff Officer Lt. Darryl Williams, "Canadian naval vessels are no longer using it because they receive weather information by other means. There are no plans to re-instate the HF weather and fax broadcast unless required for urgent military operational needs. The Canadian Coast Guard publication Radio Aids to Marine Navigation has been updated to reflect the status of the Canadian Forces Fleet Weather Broadcast."

Frequencies used by this former HF service included: 122.5 4271.0 6496.4 10536.0 13510.0 kHz.

## ❖ Coast Guard Air Miami Bids Farewell to the Jet Age

Coast Guard personnel celebrated the HU-25 Falcon jet's 29 years of service as the last two jets departed the station on their final Coast Guard missions to Cape Cod, Massachusetts, and Elizabeth City, North Carolina, back in June of this year.

During the 29-years at Air Station Miami, the HU-25 Falcon jets accrued more than 150,000 flight hours, prosecuted 4,000 search-and-rescue cases, 5,000 law enforcement cases which resulted in 3,000 lives saved or assisted, the interdiction of 20,000 undocumented migrants, and the seizure of 30,000 pounds of illegal drugs.

The HU-25 Falcon jets are being replaced by the HC-144 Ocean Sentry aircraft.

And that does it for this month. Until next time, 73 and good hunting.

# BROADCAST BANDSCAN

THE WORLD OF DOMESTIC BROADCASTING

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# Clear-Channel Stations to Return

DXers were surprised last year when two major 50,000-watt AM stations in Montreal went silent. We were even more surprised when the owners, rather than selling the stations, surrendered their licenses for cancellation.

Metromedia CMR Broadcasting, the firm that owned CINF-690 and CINW-940, has applied to have those licenses reinstated. They have an agreement with Transport Quebec to operate the stations to carry traffic reports. As during their lives as CINF and CINW – and as CBC outlets CBF and CBM before that – the 690 frequency will broadcast in French; 940 in English.

These will be 50,000-watt non-directional stations, using the same transmitters and antennas they used as CINF and CINW. They will be heard across most of the eastern part of the continent, and should be DXable in many places in the West. DXers should probably pay more attention to landing whatever other signals they can hear on these channels, before the two big Montreal signals come back. You'll have to try quickly: 690 & 940 expect to return to the air "this fall."

Some stations to try for on 690 include WIST New Orleans; KGGF Coffeyville, Kansas; KOAQ Terrytown, Nebraska; CBU Vancouver; and CBKF-1 Gravelbourg, Saskatchewan. The latter station broadcasts in French. I've not been nearly so lucky on 940, but there are stations here in Fort Atkinson, Wis. (WFAW); Des Moines (KPSZ); and again, New Orleans. (WYLD).

DXers have been asking, why use these monster 50,000-watt stations for traffic information? In the U.S., many communities use one or more low-powered transmitters, often in the expanded band above 1600 kHz. Powers are on the order of 25 watts. A series of 25-watt transmitters would seem to be a lot more economical than a pair of 50,000-watt outlets.

One advantage of using the 690/940 transmitters in Montreal is simply that they already exist! There's no need to build dozens of transmission sites across the city. Further, the 690/940 pair will require only one program feed per language, to the single transmitter. Low-powered transmitter networks require a feed to each transmitter. These links are not exactly cheap! And then there's maintenance – does an engineer visit a single site, or does he have to spend his time touring the city, inspecting dozens of locations?

Would it even be possible for a chain of low-powered transmitters to provide the coverage required? The U.S. systems generally only cover the major highways. A commuter living 5 miles from the Interstate may not know about the construction backup until it's too late to take an alternate route. The 50,000-watt transmitters will cover the entire Montreal metropolitan area, even those zones far from the nearest major highway.

It should be noted that expanded-band frequencies are not available for travelers' information stations in Montreal. (And, remember that two frequencies are required for this service, one English and one French.) Montreal is the only city with three existing expanded-band stations: CJWI-1610, CJRS-1650, and CJLO-1690. Frequencies in the "regular" band are available, but are of course subject to considerable interference.

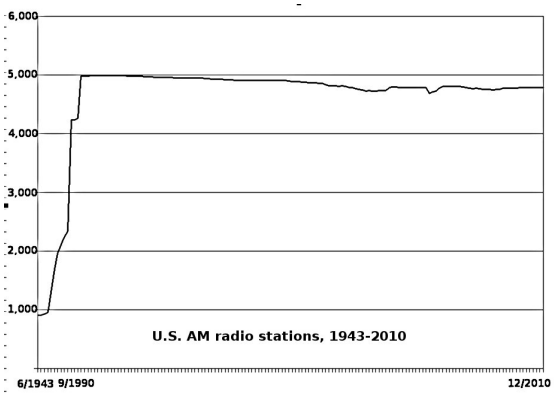
## ❖ IBOC Interference: Good for DXers?

DXers in parts of the East and Midwest have enjoyed the ability to receive CBC programming on CBE-1550, Windsor. This station has permission to move to 97.5 FM; when it does so, there will be no high-powered CBC AM transmitters left between Winnipeg and Cape Breton Island. The FM transmitter is now on the air; the license called for AM 1550 to be silenced by the end of March. That deadline has been extended to the end of September.

Quoting Bev Kirshenblatt, CBC's Senior Director, Regulatory Affairs, in a letter to the Canadian Radio-television and Telecommunications Commission (CRTC): "...our new FM frequency CBEW-FM Windsor on 97.5MHz is experiencing interference from HD Radio carriers from US stations that operate at 97.1 MHz and 97.9 MHz respectively. " ... "The interference area is in downtown Windsor and we estimate the zone of interference impacts between 20,000-40,000 people ..." Windsor is located directly across the Detroit River from Detroit, Michigan, where WXYT-FM occupies 97.1 and WJLB 97.9.

A report has been filed with Industry Canada, which will coordinate a response to the issue with the FCC. Kirshenblatt expects a resolution by the end of September. What that resolution will be is hard to guess. There has been some talk of the use of asymetrical IBOC sidebands – maybe WXYT could drop their upper IBOC sideband and WJLB their lower digital sideband, eliminating the interference. This will be interesting to watch, as there are other places along the border where IBOC issues are likely.

In any case, delays in the resolution of this FM interference problem are giving us a few more months to land an AM DX catch!




*The decline – and leveling off – of AM radio in the U.S.*

## ❖ Scorecard

Here in the U.S., the FCC releases a quarterly report listing the total number of broadcast stations in each category. One must suspect this report is not a very high priority, when the totals for the end of March are released in mid-May. But it can be interesting reading anyway.

As of the end of March, there were 4,778 AM stations authorized. That's down four – about 0.083% – from the end of 2010. Commercial FM stations are up slightly, with 6,533 authorized, an increase of seven.

One of the deleted AM stations was WVUV-648 at Leone, American Samoa. The 648 kHz frequency is not a typo. Stations in the Western Hemisphere operate on 10 kHz channels – 630, 640, 650, 660, etc.. Those in the Eastern Hemisphere are on 9 kHz channels – 630, 639, 648, 657, etc.

The big change is in non-commercial FM facilities. There are 3,417 of these authorized. Nearly 3% of these – 106 stations – were first authorized in the first three months of 2011. The FCC is continuing to work their way through a huge stack of pending applications. We should expect to see another large increase in non-commercial FM next quarter. Most of these stations are religious in nature, although public broadcasters and community stations (like the KZGM mentioned last time) are also receiving new permits. There remain 859 low-power FM stations, unchanged.

There's also been an increase in the number

***These three towers in Rochester, NY host a variety of FM and TV antennas.***

of FM translators, from 6,131 to 6,141. There are hundreds of applications pending for these stations as well. The Commission has had some trouble deciding what to do about them.

There's not much change among full-sized TV stations. Eight VHF commercial stations disappeared – I suspect they were all stations in isolated parts of the West which were authorized to broadcast but were never built. The UHF commercial total remains steady at 1,022, as does the total for non-commercial VHFs, at 107. Montana State University was granted one new non-commercial UHF station, on channel 46 at Kalispell.

Washington has also been busy canceling defunct TV translators and low-power stations. Roughly 1% of the 3,073 UHF translators have been deleted, along with about 3% of the 1,454 VHF translators. LPTV stations (516 VHF, 1,656 UHF) and Class A stations (76 VHF, 439 UHF) are also down slightly.

The total: as of the end of March, there are 30,643 broadcast stations in the U.S..

## ❖ "New" AM station in Nashville

Last time I mentioned a Nashville HD2 subchannel showing up in the ratings, by way of an analog translator. Now, there's another analog signal relaying this HD subchannel, and this time it's AM. WQZQ Goodlettsville, Tennessee is now on the air, on 830 with 2,000 watts daytime only. WQZQ was on 1550 from Clarksville, about 40 miles away. The Clarksville facility was destroyed in the big flood of 2010; in any case, plans had already been laid (and approved by the FCC) for the Goodlettsville move.

WQZQ-830 is using one of the WPLN-1430 towers north of Nashville. Again, the format is gospel music. This station should be quite DXable at sunrise and sunset; however, to my knowledge Steve Francis in Knoxville is the only DXer to report this station. (Besides myself, that is, but at 20 miles from my location WQZQ is hardly DX!)

## ❖ Digital TV DX

Analog TV was supposed to go off the air in Canada at the end of this month. However, the Canadian Radio-Television and Telecommunications Commission (CRTC) has given analog a reprieve. Only stations in "mandatory markets" will be required to convert. Other stations may continue to operate in analog indefinitely – as long as they operate below channel 52. Stations above 51 must either move to a lower channel or go dark.

DXers have been cleaning up on Canadian analog stations this spring. With the interference from U.S. ch. 2-6 analogs gone, there's not much in the way of foreign reception. Many of these will continue to be available after the September 1st partial changeover. Some of the more widely-seen Canadian analogs that will continue include CHBX-TV (2) Sault Ste. Marie; CITO-TV (3) Timmins; CJOH-TV-6 (6) Deseronto; and CKND-TV-2 (2) Minnedosa.

On the other hand, some of the more widely-seen stations are in mandatory markets and will convert. Such stations include CBWFT (3) Winnipeg (and their English counterpart CBWT (6)); CIII-TV-6 (6) Ottawa; CKPR-TV (2) Thunder Bay; and CKVR-TV (3) Barrie. CIII and CKPR will, however, be "flash-cutting" on their existing channels, leaving us with an opportunity for Canadian digital skip DX.

## ❖ Mailbag

Last time, I asked whether you listen to the radio using something other than a radio. Craig Campbell N0GTI wrote from Illinois to report listening on five (yes, five!) free-to-air satellite dishes. Craig receives more than 250 free TV channels and over 100 free radio channels. He notes that broadband Internet is very expensive in his rural location. Craig uses the LyngSat.com website to locate free-to-air satellite broadcasts. I also make extensive use of this site at work, for information on not-so-free channels, and find the site very useful.

John Schmelzer wrote from St. Louis with a few notes about interesting programming on distant stations. I mentioned DX on 1660; John finds that frequency home to what he considers the most interesting AM station: KXTR Kansas City. John believes that since WQXR-1560 New York switched to Radio Disney, KXTR is the only AM station left broadcasting classical music.

Certainly, music of all kinds is disappearing from AM; indeed, classical music is also vanishing rapidly from FM as public radio stations find spoken-word programming more popular. One might have expected the classics to have disappeared from AM decades ago.

But, in fact, KXTR is not the only AM station left broadcasting classical music. WCCC-1290 Hartford, Connecticut is also playing the classics on AM. As a 490-watt station (dropping to eleven watts at night), WCCC would be an excellent DX catch pretty much anywhere outside the Nutmeg State.

John also notes occasional daytime DX, from late November through the end of February. Around 2:00 o'clock, one December afternoon, a Fargo, North Dakota station faded in at his location. The program: a call-in show reminiscing about northwest Minnesota dumps and incinerators!

## ❖ 'Til Next Month

What have you heard on 690 and/or 940 with the big Montreal signals gone? 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

**http://americanbandscan.blogspot.com** - My DX blog
**www.radiobach.com/** - AM 1660 Kansas City, a rare AM classical music station
**www.lyngsat.com/** - LyngSat, a useful reference for satellite transponders
**www.mtq.gouv.qc.ca/portal/page/portal/A392CF51648F0334E04400144F0104BD** - Transports Quebec press release announcing new all-traffic radio in Montreal
**https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?AppNo=201100883** - CBC request citing U.S. IBOC as grounds for delaying an AM-to-FM shift

## BROADCAST STATION REPORT

### NEW

**Permits granted for new stations:**

| | | |
|---|---|---|
| Craig, Colorado | 1450 | 250/250 ND |
| Osceola, Indiana | 1210 | 2,500/219 DA-2 (near Elkhart) |
| Rowe, New Mexico | 1420 | 2,500/103 ND (25mi. SE of Santa Fe) |

**Applications for new stations dismissed:**

| | | |
|---|---|---|
| Halifax, Virginia | 1600 | |

**Applications for new stations:**

| | | |
|---|---|---|
| Montreal, Quebec | 690 | 50,000/50,000 ND |
| Montreal, Quebec | 940 | 50,000/50,000 ND |
| Montreal, Quebec | 1530 | unknown |

### CHANGES

**Frequency & location changes on the air:**

| | | |
|---|---|---|
| Goodlettsville, Tennessee | 830 | WQZQ 2,000 daytime only; from 1550 in Clarksville |

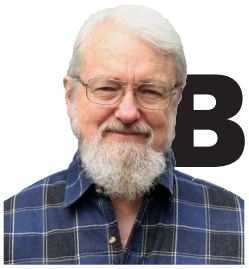
**Frequency & location changes granted:**

| | | |
|---|---|---|
| Soda Springs, Idaho | 800 | K B R V from 790; 10,000/150 ND |

**Stations deleted:**

| | | |
|---|---|---|
| Leone, American Samoa | 648 | WVUV |
| Pine Bluff, Arkansas | 1400 | KCLA |
| Pine Bluff, Arkansas | 1490 | KOTN |
| Cleveland, Mississippi | 1410 | WDSK |
| Winona, Mississippi | 1570 | WONA |
| Gaffney, South Carolina | 1180 | WFGN |
| Tyler, Texas | 690 | KZEY |

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



# BOATS, PLANES, AND TRAINS

**PLANES**

Iden Rogers
*idenrogers@monitoringtimes.com*

# Aero Frequencies

Various types of aero voice communications serving different functions are in the air, just waiting to be heard. The VHF aero band runs from 118.0 to 137.0 MHz in 25 kHz steps.

Most scanners receive this band plus the aeronautical radionavigation band from 108.0 to 117.975 MHz. Some folks are surprised to learn that the latter band can include some voice transmissions as well.

Each frequency is intended for a specific use and these are spelled out in *"47 C.F.R. Part 87 – Aviation Services."*

To help you better enjoy the hobby, let's try to make some sense of this!

## ❖ Airport Frequencies

Airports with control towers use several frequencies. Non-towered airports often have just one or two. Go to **www.airnav.com/airports/** and use the search box to find an airport. Then, scroll down to "Airport Communications." Most of the following will be listed for commercial airports.

**Clearance Delivery** is where you will hear flight plan details being read to pilots of IFR (Instrument Flight Rules) flights prior to taxi. Included in the exchange is the particular departure frequency that will be used, should you wish to follow the flight. The Clearance Delivery function sometimes occurs on the Ground Control frequency or is simulcast with Ground Control. During periods of low activity, Clearance Delivery, Ground Control, and Tower may all be simulcast. It works best to have them all programmed in for a given airport where you are able to hear the ground side.

Clearance Delivery example: Controller – *Horizon four zero five, Capitol Ground, cleared to San Jose Airport via heading one six five vectors Sacramento VOR, direct Modesto VOR to join the Modesto two one six radial, Lake intersection direct, maintain seven thousand, expect niner thousand five minutes after departure, departure frequency one two five point two five, Squawk four five zero one*.

At this point the pilot reads back the entire clearance and then the controller says – *Four zero five, readback correct*.

**Ground Control** is a position in the tower cab charged with controlling aircraft on the taxiways and in ramp / parking areas. A large metro-area airport may also have **Ramp Control** or **Gate Control** frequencies in addition to Ground Control.

To fully understand and take advantage of the runway, taxiway, and parking instructions, you need to refer to the airport diagram for the airport of interest. They are available via **http://AirNav.com**. Once at the desired airport page, look on the right. Under the thumbnail of the airport diagram is "Download PDF." It can be useful to print it out for reference.

Ground Control frequencies are typically in the 121.6 to 121.925 MHz range. If a given GC frequency is 121.7, for example, the handoff may be called out as *contact Ground point seven* with 121 being understood. A departing aircraft is handed off by Ground to the Tower when it taxis to near or reaches the end of the runway.

Here is an example of an airliner making a taxi request: Airliner – *Capitol Ground, Southwest seven thirty-four, taxi*. Controller – *Southwest seven thirty-four, Runway One Six Left, taxi via Yankee Two, Yankee, Delta*. Airliner – *Yankee Two, Yankee, Delta, One Six Left, Southwest seven thirty-four*.

Arriving airliner example, upon exiting Runway 16L: Airliner – *Southwest two forty-three, clearing Delta Nine*. Controller – *Southwest two-forty-three, Capitol Ground, taxi to the ramp via Delta, Charlie Two*. Airliner – *Delta, Charlie Two, to the ramp, Southwest two forty-three*.

If you download the airport diagram for SMF, you will see where he exited Runway 16L, then turned a hard right onto taxiway D, then to C3, and left into the parking area.

The **Tower** controls aircraft in the air in the immediate airport area and on the runways. Many but not all Tower frequencies are found in the 118.0 to 121.975 MHz range. Planes that have lifted off are handed off from the Tower to Departure Control. Arriving planes are handed off from Approach Control to the Tower.

Just handed off from NorCal Approach, destination Sacramento International Airport: Pilot – *Capitol Tower, Southwest ten thirty-three, right downwind for One Six Left*. Controller – *Southwest ten thirty-three, Capitol Tower, Runway One Six Left, cleared to land*. Pilot – *One Six Left, cleared to land, Southwest ten thirty-three*.

On Tower frequency, ready to depart: Controller – *Southwest five twenty-nine, Capitol Tower, maintain four thousand, Runway One Six Left, cleared for takeoff*. Pilot – *One Six Left, up to four thousand, Southwest five twenty-nine*.

**ATIS** – Most of the larger airports have ATIS (Automatic Traffic Information Service) transmissions. They are prerecorded, periodically updated broadcasts that cycle over and over. Each version is identified by a phonetic alphabet letter. If a version is identified as *Information Charlie*, the next updated version will be *Information Delta*, etc. The purpose of ATIS is to facilitate pilot acquisition of needed information from the broadcast, which relieves the controller from continually repeating it and occupying an ATC frequency.

Here is an ATIS example from Sacramento International Airport (SMF): *Sacramento International Airport Information Echo at one niner five three Zulu, wind calm, visibility one zero, sky clear below one two thousand, temperature two three, due point six, altimeter two niner niner four, simultaneous visual approaches in use, land runway one six right and left, Clearance Delivery is on 121.7, metering in effect for San Francisco International Airport, Los Angeles International Airport, use caution for bird activity and crop dusters in vicinity of the airport. Advise on initial contact you have Information Echo.*

**ASOS / AWOS** – These (ASOS - Automated Surface Observing System, and AWOS - Automated Weather Observing System) are automatic, continuously updated weather broadcasts which contain information derived from a variety of sensors. ASOS and AWOS are similar. If you wish to explore the differences, Google *ASOS vs. AWOS*. Some airports have neither and some have one or the other.

Here is an example of AWOS from Nevada County Airport (GOO): *Nevada County Airport Automated Weather Observation, two one five three Zulu, Wind – two seven zero at four knots, Peak Gusts – one four knots, Visibility – more then ten, Sky Conditions – clear below one two thousand feet, Temperature – one seven Celsius, Due Point – four Celsius, Altimeter – two niner niner four inches of mercury*. Note that the decimal in the spoken altimeter reading is always omitted – and 29.94 with it.

If you live in or near a metro area, search or tune through the VHF aircraft band with your scanner connected to a good outside antenna. You should hear several ASOS and/or AWOS broadcasts (ATIS as well).

**UNICOM** – Airports with a full time control tower or full-time Flight Service Station (FSS) use 122.95 MHz strictly for non-ATC communications, and it can be interesting to monitor at times. Unlike UNICOM frequencies at non-towered airports, 122.95 isn't used for airport advisories / pilot-to-pilot communications. Its use is similar to airliners, charters, and BizJets on ASRI (Aviation Spectrum Resources, Inc.) / FBO (Fixed base Operator) frequencies in the range of 128.825 to 132.0 and 136.5 to 136.975 MHz to state arrival times and request or inquire about fuel, repairs, various types of service, ground transportation, accommodations for passengers, etc.

UNICOM Frequencies at non-towered airports – Pilots at these airports announce their intentions prior to taxiing and departure, when arriving in the airport area, and as they progress through the various legs of the landing pattern. Pilots talk with each other and work out any coordination.

The UNICOM operator, when present, at a non-towered airport may provide wind speed and direction, altimeter setting, runway condition, fuel availability, transportation / food / lodging info,

etc., but no air traffic control.

A portion of small airports are quite busy and can be worth a listen. Some are home for things like forestry, law enforcement, medical transport, experimental aircraft, skydiving, and other users. You won't know until you listen.

Generally, non-towered airports have a UNICOM frequency licensed to them and it will be one of these: 122.7, 122.725, 122.8, 122.975, 123.0, 123.05 or 123.075 MHz.

## ❖ TRACON Frequencies

When you look up airport frequencies at **http://AirNav.com**, you will often see several Approach and Departure frequencies listed for an airport. These are not airport frequencies but instead TRACON (Terminal Radar Approach Control) frequencies. TRACON facilities are not necessarily located at airports.

Not long after an airliner or other IFR flight departs from the runway, the Tower controller will say "Contact Departure." The pilot uses the departure frequency given to him/her during the Clearance Delivery phase.

If the flight is going some distance, the TRACON controller will transition the flight through one or more sectors while it climbs to cruise altitude and the "enroute phase" – most always above 18,000 feet. It will, at some point, be handed off to the appropriate ARTCC (Air Route Traffic Control Center) sector controller. Such handoffs are usually pretty quick. NorCal TRACON Controller – *Zero one quebec, contact Oakland Center one three two point two*. Pilot - *One three two point two, zero one quebec, good day.*

The reverse is true when an IFR flight needs to descend from cruise altitude and ARTCC control and be transitioned through one or more TRACON sectors / controllers to near the approach end of the runway. At this point, a TRACON Approach controller will hand off the flight to the airport Tower.

Approach controller – *Mesaba thirty fifty-seven, Sacramento International Airport ten o'clock fifteen miles*. Pilot – *Sac, thirty fifty-seven*. Controller – *Mesaba thirty fifty-seven, cleared visual approach Runway One Six Left*. Pilot – *Visual One Six Left, Mesaba thirty fifty-seven*. A minute or so later, Controller – *Mesaba thirty fifty-seven, contact Capitol Tower one two five point seven*. Pilot – O*ne two five point seven, thirty fifty-seven, see ya*.

Short flights can originate and terminate all within the control area of a single TRACON. The ARTCC doesn't become involved with such flights.

Parts of the country away from the larger commercial airports may have no TRACON facilities. In such cases, the ARTCC for that area may provide that function by way of unmanned RCAG (Remote Communications Air/Ground) facilities. Such an AirNav.com listing would look something like this: *APCH/DEP SERVICE PROVIDED BY OAKLAND ARTCC FREQ 127.8/353.5 (MOUNT TAMALPAIS RCAG).*

TRACON controllers will give frequent traffic alerts. Here is an example: Controller – *Three Niner Victor Charlie, eleven o'clock and seven miles southwestbound regional jet one zero thousand five hundred descending through eight thousand*. Pilot – *Three Nine Victor looking, no contact, will advise*. Controller – *Three Niner Victor, Roger*.

***Airport control towers serve as the nerve center for aircraft movement at or near the airport.***

## ❖ ARTCC Frequencies

Like TRACONs, ARTCCs have multiple sectors (irregular chunks of three-dimensional airspace fitted together), some low altitude, some high altitude, and each with its own controller and a simulcast VHF/UHF frequency pair. The UHF side (225 to 380 MHz) is for military aircraft, though some mil aircraft will communicate on VHF.

The entire country is overlain by ARTCCs; Google *ARTCC map*. TRACON airspace is always beneath ARTCC airspace. You can gather ARTCC frequencies for your listening radius by writing down the handoff frequencies you hear and/or you can refer to references. See *A/FD* below and try Googling *ARTCC frequencies*.

## ❖ *Airport/Facility Directory*

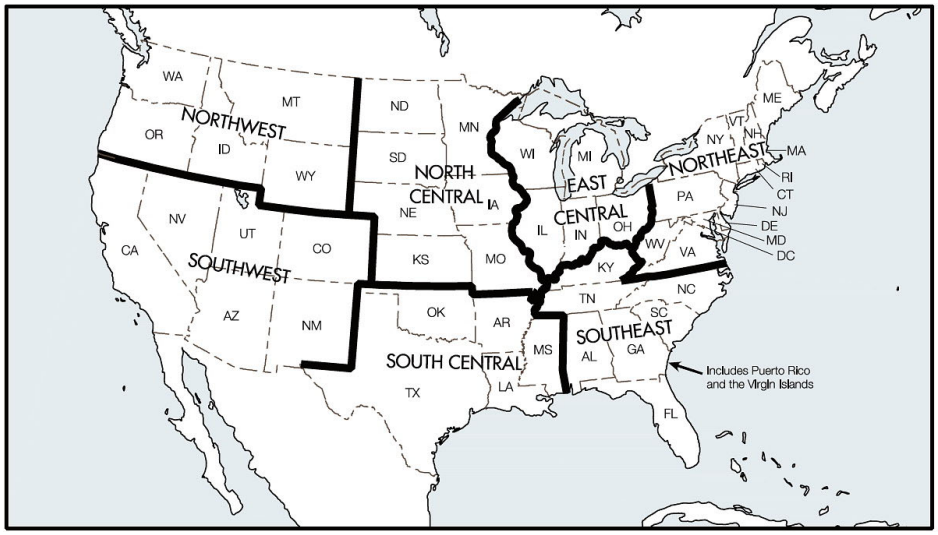
The *A/FD (Airport/Facility Directory)* is a mixed bag. It does, by way of its seven paper or digital volumes, have official frequency and other info for all public U.S. airports, but AirNav is much easier to use, contains more info, and offers more value to hobby listeners. On the other hand, the paper *A/FD* is easy to thumb through and can serve as a convenient portable reference.

The back section of each *A/FD* volume contains some interesting information on a variety of subjects. It is a pain to get there, but this is how you do it (and along the way you may find other interesting things to explore). Go to **www.faa.gov/air_traffic/flight_info/aeronav/** and click on "Free Digital Products." When that comes up and under "Applications," click on "*digital* - Airport/Facility Directory (*d* -A/FD)." If two dates are shown, click on the one showing the newer date. When that is up, click on a state of interest. Select an airport. Click on "Search."

To view the airport information on the selected airport, look under "Airport/NAVAID Results" and then under "PDF File," click on "View." You will see why AirNav.com is the winner over the *A/FD*, but, importantly, on the same page as the "View" link is a "Supplemental" link. This leads to a PDF download of 200+ pages that includes ARTCC VHF frequencies for the states covered by the particular *A/FD* volume.

Printed *A/FD* volumes may be found by Googling *airport facility directory purchase*.

Once again, I have run out of space. See you next time!




***The* Airport/Facility Directory *volumes are a source of U.S. airport and supplemental information.***

# GLOBALNET

**Exploring the World of Internet Radio and Television**

*Loyd Van Horn, W4LVH*
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# Sunshine Radio: Hot Florida Action

Sandy beaches, year-round mild temperatures and a mouse with a high-pitched voice: There are many reasons people flock to the state of Florida for recreation or permanent relocation. That creates a huge diversity of listening opportunities for those who know where to look.

Between theme parks, space exploration, and significant weather events, Florida has something for just about every type of communications hobbyist. Here at the height of hurricane season is a perfect time to tune in the sounds of the Sunshine State.

Given the size of Florida, it can be a bit overwhelming to try to organize a listening strategy. Therefore, I am going to break the state down into five key areas: Panhandle (Northwest), Jacksonville (Northeast), Tampa (West), Orlando (Central) and Miami (South).

In addition to highlighting where to find scanner and other communications, I will include a few of the major radio stations in each area; these are great choices when breaking news occurs in that part of the state. This list is by no means complete, but it should be a good starting point for tuning in communications from Florida, especially if tropical weather is heading its way.

## ❖ Panhandle (Northwest)

This region includes the state capital, Tallahassee, as well as popular tourist destinations such as Destin, Panama City, and Pensacola.

With the Gulf Coast experiencing a large share of hurricane landfalls, this area is one that bears watching over the next couple of months for storm-related communications. In addition, there are several military bases and many popular beaches that can provide interesting listening opportunities.

### Broadcast Radio Stations

WYOO 101.1FM - Panama City, FL - www.talkradio101.com/index.shtml
WCOA 1370AM - Pensacola, FL - www.wcoapensacola.com/
WNWF 1120AM - Destin, Fl - www.destin1120am.com/
WFLA - 100.7FM - Tallahassee, FL - www.wflafm.com/main.html
SouthWest Florida Local News (Internet Only) - Tallahassee, FL - www.southwestfloridalocalnews.com/

### NOAA Weather Radio

NOAA Weather RadioKEC86 - Pensacola, FL - http://tunein.com/radio/NOAA-Weather-Radio-1624-s88211/

### Scanners

Escambia County - www.radioreference.com/apps/audio/?ctid=332
Santa Rosa County - www.radioreference.com/apps/audio/?ctid=372
Okaloosa County - www.radioreference.com/apps/audio/?ctid=361
Holmes County - www.radioreference.com/apps/audio/?ctid=345
Jackson County - www.radioreference.com/apps/audio/?ctid=347
Liberty County - www.radioreference.com/apps/audio/?ctid=354
Gadsden County - www.radioreference.com/apps/audio/?ctid=335
Leon County - www.radioreference.com/apps/audio/?ctid=352
Wakulla County - www.radioreference.com/apps/audio/?ctid=380
Jefferson County - www.radioreference.com/apps/audio/?ctid=348

## ❖ Jacksonville (Northeast)

This region incorporates much of the "first coast" area, including St. Augustine. For the purposes of this column, we will consider this region as stretching down to Cape Canaveral and Daytona along the Atlantic coast.

In addition to communications from the city of Jacksonville, there are several airports, NASA communications, major sporting events in Jacksonville, Gainesville and Daytona, and miles of beaches. All of this gives listeners a large number of opportunities for interesting listening.

### Broadcast Radio Stations

WMMV 1350AM - Cocoa Beach, FL - www.wmmbam.com/main.html
WIXC 1060AM - Titusville, FL - www.wixc1060.com/
WNDB 1150AM - Daytona Beach, FL - http://daytonasun.com/News.html
WNZF 1550AM - Bunnell, FL - http://wnzf.com/
WSKY 97.3FM - Micanopy, FL - www.thesky973.com/
WOCA 96.7FM - Ocala, FL - http://thesource1370.com/
WBOB 600AM - Jacksonville, FL - www.600wbob.com/
WOKV 690AM - Jacksonville, FL - www.wokv.com/
WFQY 1240AM - St. Augustine, FL - www.1240news.com/

### Online Receivers

GlobalTuners Online Receiver (Registration required) - Vero Beach - www.globaltuners.com/receiver/109/

### Airport Communications

Jacksonville International Airport - www.liveatc.net/search/?icao=jax
Daytona Beach International Airport - www.liveatc.net/search/?icao=dab
Gainesville Regional Airport - www.liveatc.net/search/?icao=gnv
Melbourne International Airport - www.liveatc.net/search/?icao=mlb

### NOAA Weather Radio

NOAA Weather Radio WXJ70 - http://tunein.com/radio/NOAA-Weather-Radio-16255-s88214/
NOAA Weather Radio KHB39 - http://tunein.com/radio/NOAA-Weather-Radio-16255-s88213/

### Scanners

Brevard County (includes a link for NASA communications) - www.radioreference.com/apps/audio/?ctid=320
Jacksonville Fire/Rescue - http://tunein.com/radio/Jacksonville--FireRescue-s139102/
Volusia County - www.radioreference.com/apps/audio/?ctid=379
Flagler County - www.radioreference.com/apps/audio/?ctid=333
Putnam County - www.radioreference.com/apps/audio/?ctid=369
Alachua County - www.radioreference.com/apps/audio/?ctid=316
St. Johns County - www.radioreference.com/apps/audio/?ctid=370
Duval County - www.radioreference.com/apps/audio/?ctid=331

## ❖ Tampa (West)

This area incorporates the Tampa/St. Petersburg metro area, Clearwater and all the way down to Naples in the Southwest part of the state. Most of the major communications here will come from Tampa, with normal city communications, major sporting events and marine communications.

### Broadcast Radio Stations

WFLA 970AM - Tampa, FL - www.970wfla.com/main.html
WWBA 820AM - Largo, FL - http://820wwba.com/
WGUF 98.9FM - Naples, Fl - www.wguf989.com/
WINK 1200AM - Pine Island Center, FL - www.winknewsradio.com/
WENG 1530AM - Englewood, FL - www.wengradio.com/

### NOAA Weather Radio

NOAA Weather Radio KHB32 - Tampa, FL - http://tunein.com/radio/NOAA-Weather-Radio-16255-s89370/
NOAA Weather Radio WXK83 - Fort Myers, FL - http://tunein.com/radio/NOAA-Weather-Radio-162475-s88209/

### Airport Communications

Southwest Florida International Airport - Ft. Myers, FL - www.liveatc.net/search/?icao=rsw
Tampa International Airport - Tampa, FL - www.liveatc.net/search/?icao=tpa
St. Petersburg - Clearwater International Airport - St. Petersburg, FL - www.liveatc.net/search/?icao=pie
Charlotte County Airport - Punta Gorda, FL - www.liveatc.net/search/?icao=pgd

### Scanners

Pasco County - www.radioreference.com/apps/audio/?ctid=366
Hillsborough County - www.radioreference.com/apps/audio/?ctid=344
Pinellas County - www.radioreference.com/apps/audio/?ctid=367
Manatee County - www.radioreference.com/apps/audio/?ctid=356
Sarasota County - www.radioreference.com/apps/audio/?ctid=373
Charlotte County - www.radioreference.com/apps/audio/?ctid=323
Lee County - www.radioreference.com/apps/audio/?ctid=351
Collier County - www.radioreference.com/apps/audio/?ctid=326

## ❖ Orlando (Central)

The landlocked portion of the state houses some of the most unique communications in the state. The major theme parks, such as Disney World and Universal, are tantalizing choices for those wanting to hear "behind the scenes." Not only do the parks have their normal operating communications, but special events such as parades and shows give lucky listeners a front-row seat to the action that few have had the privilege of hearing before.

**Online Receivers** (Use the frequency list below to find local frequencies of interest for Walt Disney World communications)
W4GPL - http://www.dxzone.com/cgi-bin/dir/jump2.cgi?ID=19678

**Broadcast Radio Stations**
WFLF 540AM - Pine Hills, FL - www.540wfla.com/main.html
WDBO 580AM - Orlando, FL - www.wdbo.com/
WORL 660AM - Orlando, Fl - www.660worl.com/
WDYZ 990AM - http://radio.disney.go.com/music/yourstation/orlando/index.html
Walt Disney World Radio (Internet Only) - www.wdwradio.com/

**NOAA Weather Radio**
KIH63 - Orlando - http://tunein.com/radio/NOAA-Weather-Radio-162475-s88210/
Airport Communications
Orlando International Airport - www.liveatc.net/search/?icao=mco
Orlando Sanford International Airport - www.liveatc.net/search/?icao=sfb

**Scanners**
City of Orlando Fire - http://tunein.com/radio/City-of-Orlando-FD-s139213/
Orange County Fire/Resuce - http://tunein.com/radio/Orange-County-Fire-Rescue-s139092/
Orange County - www.radioreference.com/apps/audio/?ctid=363
Osceola County - www.radioreference.com/apps/audio/?ctid=364
Polk County - www.radioreference.com/apps/audio/?ctid=368
Lake County - www.radioreference.com/apps/audio/?ctid=350

## ❖ Miami (South)

From West Palm Beach all the way to the Keys, this portion of the state is both the most densely populated and the most active for radio communications. A major source of the action comes from DEA and other law enforcement efforts to stop drugs from entering into the United States; Miami is a popular choice for entry.

**Broadcast Radio Stations**
WIOD 1610AM - Miami, FL - www.610wiod.com/main.html
WFTL 850AM - West Palm Beach, FL - www.850wftl.com/
WJNO 1290AM- West Palm Beach, Fl - www.wjno.com/main.html
WDJA 1420AM - Delray, FL - www.jammin1420.com/

**NOAA Weather Radio**
NOAA Weather Radio KHB34 - Miami, FL - http://tunein.com/radio/NOAA-Weather-Radio-16255-s88206/
NOAA Weather Radio KEC50 - West Palm Beach - http://tunein.com/radio/NOAA-Weather-Radio-162475-s88207/

**Airport Communications**
Ft. Lauderdale / Hollywood International Airport - www.liveatc.net/search/?icao=fll
Miami International Airport - www.liveatc.net/search/?icao=mia
Palm Beach International Airport - www.liveatc.net/search/?icao=pbi

**Scanners**
Key West Public Safety - http://tunein.com/radio/Botes-Wild-Feed-s128008/
Coral Springs Police - http://tunein.com/radio/Coral-Springs-Police-Scanner-s18459/
Plantation Police Dispatch - http://tunein.com/radio/Plantation-Police-Dispatch-s133757/
Palm Beach County - www.radioreference.com/apps/audio/?ctid=365
Broward County - www.radioreference.com/apps/audio/?ctid=321
Dade County - www.radioreference.com/apps/audio/?ctid=328
Monroe County - www.radioreference.com/apps/audio/?ctid=359

Each area of Florida has its own attraction. If you like fast-paced public safety communications, start with Miami and then try Tampa or Orlando. If you are looking for marine communications, the Tampa/St. Pete area is a good start, with Jacksonville and the "First Coast" also yielding good results.

Miami has the busiest airport in the state, and Miami Center provides some excellent air communications. Public safety communications from Orlando during sporting events or special events at one of the theme parks should be interesting.

Of course, if a hurricane or other severe weather outbreak occurs, a combination of NOAA Weather Radio from the affected area, local news/talk radio stations, and public safety communications should provide you with the complete picture of what is actually happening on the ground.

This list should give you a good start to finding what you are looking for. The vast difference in culture and geography from the Northwest area along the Gulf Coast, down to the Southern tip and the Keys area, guarantees there is something for just about everyone to enjoy hearing online from the Sunshine state.

## ❖ A smartphone *isn't* a scanner, right?

Scanner enthusiasts have for years found state and local scanner laws to often be more than a little frustrating. Some have even found themselves the unlucky recipient of a fine or worse for mobile scanner use.

But that smartphone scanner app you just downloaded for your iPhone or Droid-based phone won't land you in hot water, will it?

Turns out, it could.

Law enforcement in scanner restricted areas are looking at scanner apps as if they were scanners themselves. A would-be robber in Indiana received misdemeanor charges after police found out he was using his scanner app on his cellphone to find out when police were closing in on his location.

People who live in states like Indiana, Florida and New York, where there are laws on the books concerning mobile use of scanners, might want to be careful about how and where they use their scanner apps.

It is a good idea for any scanner enthusiast to check into their state and local laws regarding scanner use, specifically mobile scanner use. If your area has laws concerning mobile scanner use, you may want to take the same precautions with your scanner apps that you would with an actual scanner.

Whether any charges regarding scanner app use would hold up in court remains to be seen. In the Indiana case, the misdemeanor charges were dropped. However, if this becomes a bigger issue, especially if more criminals use apps to aid in their activity, we could see a backlash against scanner apps as well.

## ❖ Is a Smartphone the new Walkman?

Don't let the above story scare you away from streaming audio apps on your smartphone. As a matter of fact, a study by Jacobs Media shows that people are using their smartphones more than ever for Internet radio listening.

But what does that mean for terrestrial radio? Fortunately for broadcasters, 20 percent of those who listen to Internet Radio still listen to at least four hours a day of broadcast AM/FM radio.

What can we glean from this study? People want media, and they want it to go with them no matter where they are. If they are in the car, at home, at work, in the park, by the pool or on the bus, they want to bring their media with them.

On a recent beach trip, I found myself using my Pandora app on my iPhone to listen to '80s music while enjoying the sun. I then turned on the NOAA Weather Radio stream for that area to find out what the weather was going to look like that day. I still listened to local radio while in the car driving, but no matter where I was, I was bringing my media experience with me.

So, maybe the smartphone is the new Walkman. At least my smartphone won't eat my cassette tapes like my Walkman used to do!

## GLOBALNET LINKS

OnTheRadio.net: Destin/Ft. Walton Beach Radio Stations - **www.ontheradio.net/cities/destin_fl.aspx**
Hidden Mickey's Walt Disney World Frequencies - **www.hiddenmickeys.org/WDW/WDW_Freqs.html**
Police Scanner Apps Could Get You Arrested - **http://phandroid.com/2011/05/25/warning-police-scanner-apps-can-you-lead-you-to-serve-hard-time/**
Police apps not 10-4 - **http://technolog.msnbc.msn.com/_news/2011/05/23/6704362-police-on-radio-scanner-apps-thats-not-a-10-4**
45% Of Internet Radio users do it on a smartphone - **http://satelliteradioplayground.com/2011/06/10/45-of-internet-radio-listeners-do-it-on-a-smartphone-study/**

# BELOW 500 kHz

DXING THE BASEMENT BAND

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

# Information for Free

Today, it's hard for me to imagine how we ever got along without the Internet. I can't remember the last time I wrote a column that *didn't* include some mention of a website or e-mail address. This month, we'll explore some of the websites that I use on a regular basis for LF information. The web can be a goldmine of data, helping you to get much more out of your radio hobby. It also helps level the playing field with the transmitting side of our hobby (Ham radio) by allowing listeners to "talk back" with other listeners in near real-time fashion. Gone are the days of thinking the web would replace our radio hobby: It has only enhanced it!

Do you recall when you first got online? I remember hearing about the Internet in the late 1980s when it was still run by the Department of Defense. Later, I heard that some companies and large universities had access to it, but it remained largely a mystery to me, and I certainly did not grasp the role it would later play later in the radio hobby. Sometime about 1994 I finally got an e-mail account at work, followed closely by web access, and I haven't looked back since. I continue to be amazed at the information and resources I find online to improve my experience in the radio hobby.

## ❖ Not Online?

I want to say a quick word to our readers who are not online. Be assured that we will not leave you hanging at *Below 500 kHz*! I understand that some folks have little or no interest in computers, or do not have the ability to get online for one reason or another. While we do make frequent use of web resources and e-mail, we will always welcome your traditional postal mail, and respect the fact that not everyone is online. Our main focus here will remain on *radio*.

However, if you have the slightest interest in exploring the Internet, I would ask you to try one thing… Take this issue of *MT* to your local library, where you can get online for free, and try visiting a few of the websites listed below in bold letters. If you're a complete novice with computers, don't worry. Library staff will be glad to assist you, and show you how to enter the website addresses.

Who knows, you might discover a new horizon once you're there, and if you don't like it, at least you can say that you gave the Internet a try! It's really much easier than you think. My father-in-law is 84 years old, and you should have seen him light up when I brought up some websites related to WWII aircraft – one of his favorite pastimes. He ended up showing *me* some of the features on the planes we saw on screen!

## ❖ Longwave Websites

Listed below, in no particular order, are many of my favorite sites related to the longwave hobby. Any list like this is subject to change as soon as it is printed. If you find that a link returns an error message, try entering some key words from the descriptions into your search engine. You may be able to find the site (or similar ones) in that way.

**www.lwca.org/**
The Longwave Club of America (LWCA) Home Page. If I could only pick a handful of sites to have in my "favorites" list, this would certainly be one of them. This site is maintained by John H. Davis, one of the columnists of the LWCA's monthly journal, the *Lowdown*. Here, you will find links to reference data, a message board for posting questions and comments, and information on joining the LWCA.

**www.ve3gop.com/**
Alex Wiecek's website has an emphasis on Canadian Longwave stations. Alex maintains several aviation beacons in Ontario as a career, and he brings a unique perspective to longwave monitoring. Be sure to check his online database of Canadian stations from 10 to 530 kHz, NDB photos, and his *WWSU* logging software, which you can download here.

**www.g0akn.aerthgroup.org.uk/page10.html**
Dedicated to John Taylor, GØAKN, and his VLF Earth Current Experiments. This site ties in well with our past discussions about "Through-Ground Radio." You'll be amazed at the ranges achieved by transmitting through the Earth with VLF signals.

**www.angelfire.com/space/proto57/rdf.html**
This is a site devoted to self-contained Radio Direction Finding (RDF) receivers that were once common on mid-sized boats before the advent of GPS. Nearly all of these operated on LF and MF frequencies, and they can make great DXing receivers today.

**www.radiosky.com/**
Resources for Amateur Radio Astronomers, Teachers and Students. If natural radio is your thing, be sure to check out this site.

**www.auroralchorus.com/**
Famed site by Stephen P. McGreevy for learning about all aspects of natural radio reception and recording. The *VLF Story* here is "must read" for anyone interested in the subject of whistlers, tweaks, dawn chorus, and the like.

**www.lfengineering.com/**
Website of the LF Engineering Company of East Haven, CT, longtime manufacturers of Low Frequency Equipment for LF Communications, Natural Radio Research, AM Broadcast, Marine and Shortwave Radio.

**http://500kc.com/**
Home Page of the 500 KC Amateur Radio Experimental Group. This group operates under special FCC authority just above 500 kHz. Their work has been very successful, and may lead to a ham allocation in the vicinity of 500 kHz in the future. The website gives details of the experiment, and provides a way for you to report any stations you hear.

**www.stormwise.com/**
Stormwise Lightning Detectors, Ferrite Rods, variable capacitors, and VLF Radio Equipment. Stormwise also has a line of LF antennas for listening, as well as plans for building radio projects, including a Whistler Receiver (see bottom of webpage).

**www.alexander.n.se/**
This website is home to a museum in Grimeton, Sweden which exhibits and operates the last working Alexanderson Alternator in the world. This unique transmitter uses no tubes or semiconductors, but operates by spinning an alternator at low RF frequencies (around 17 kHz). Click the British flag to view the site in English.

**http://worldaerodata.com/**
Website of the World Aeronautical Database. Here, you can look up almost any beacon or Navaid in the world. Very complete. Easy to use.

**www.airnav.com/**
AirNav provides free detailed aeronautical information on airports and navigation aids, and is completely searchable. Note: Does not include 2-letter "compass locator" beacons.

**www.w3eee.com/**
W3EEE Longwave website by Stephen Dove, featuring his unique *Grabulator* online receiver, which you can monitor. The receiver is located in Mt. Gretna, PA.

**www.hermanboel.eu/radiohistory/index.htm**
European LW/MW Broadcast History. Want to see what the LF broadcasting scene looked like in Europe from 1925 on? This is the place to find out.

**www.w8ji.com/ndb beacon fish buoy net beacons.htm**
Good overview on beacon transmitters, fish net beacons and causes of NDB harmonics and keying problems. (*Note: The spaces in this web address are intentional.-k.c.*)

**www.dxinfocentre.com/ndb.htm**
Bill Hepburn's very comprehensive list of LF/MF aeronautical & marine beacon stations.

**www.loran-history.info/**
In February, most LORAN navigation stations (100 kHz) ceased operations. Still, there is a fascinating history behind the development of these stations. This ground-based system got

the job done with an impressive accuracy, second only to today's GPS.

**http://members.shaw.ca/ve7sl/burhans.html**

In the mood for a project? This site describes a Shielded Loop for LF work that could be just the ticket to high performance, low noise reception of beacons and other longwave signals. This is the antenna we built over several issues of *MT* last year.

## ❖ Mailbag

**Robert Homuth, KB7AQD (AZ)** writes: This morning I logged MOG (404 kHz), Montague, CA under my local CHD (407 kHz) at Chandler Airpark, AZ. I hope to get a ride to Chandler to photograph the shack and antenna sometime. When I saw the recent AZ loggings from another listener, it looked like my list from 1986 with few exceptions, so it seemed like I was not missing much in all these years. What other part of the radio spectrum has so many constant transmitters running 24/7?

To find an e-mail address for an airport, I went to **www.airnav.com**. In the case of SYF, 386 kHz, St. Francis, KS, AirNav located a link to Grace Flying Services, so I sent a brief e-mail with bare details that I heard their NDB. If someone answers, then I can ask for more information.

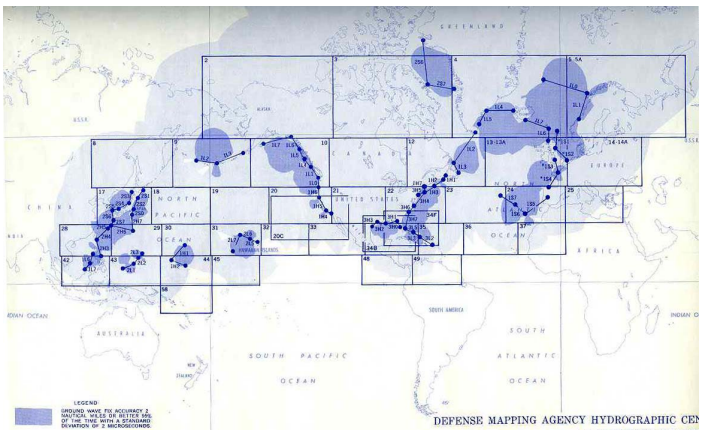
Also, using **www.airnav.com**, look for the decimal latitude and longitude of a given beacon. Cut and Paste it into Google Maps, and you will get some amazing satellite views of many NDB antennas and shacks, along with some street views if one runs by the given airport. For example, FCH-344 from Fresno, CA, one of my first catches, was found to be at latitude/longitude 36.7239419/-119.8336944. Copying and pasting that data into Google Earth provided a neat three-quarter aerial view of their tower!

### LORAN A – A Look Back

Most people are familiar with LORAN C, which only recently left its 100 kHz channel after decommissioning in early 2010. What is not so well known is that another system operated for many years near 1.9 MHz called LORAN A. This service caused frustration for ham operators on the 160-meter band, and caused severe restrictions to be placed on hams with respect to times of operation and power output levels. Many hams avoided 160 meters for these reasons.

**Jacques d'Avignon, VE3VIA**, provided some interesting history on this earlier service, along with a map of its coverage area. He notes that the system may have been the one used by Noah while in the Ark! On the map, note the location of the Greenland chain with one station on Baffin Island. By entering the coordinates into Google Earth one can still see the antennas that are there after 50 years, Jacques reports.

***The Loran A Chain as it existed in the 1960s.***




Jacques also passed along word that LF station HBG in Prangins, Switzerland (75 kHz) is scheduled to be shut down 31 December 2011. According to Wikipedia (**http://en.wikipedia.org/wiki/HBG_%28time_signal%29**) the reason given for the shutdown is "aging antennas."

**Andy Bell, KU4XR (TN)** writes: I have not been doing much radio lately, but the bug began to bite hard the other day, so I went home and dug out my old Sangean ATS-803A portable just to be able to hear *some kind* of radio noise. This was of course a compromise at its best description, but it did provide a little fun.

The Sangean is stock, but I rewound the loopstick antenna for optimum reception in the Lowfer band. I was using a 9-volt "wall-wart" and listening in a mobile home sub-division that has high tension lines running thru it, so not an ideal setup. I only listened for a couple of hours, and didn't hear anything I would consider "great," but it was nice to hear something. Here is what I heard: MNV-361 kHz (Madisonville, TN), TY-353 kHz (Knoxville, TN), CLB-216 kHz (Wilmington, NC), and MMI-242 kHz (Athens, TN).

*That's it for this month. 73, and best LW DX!*

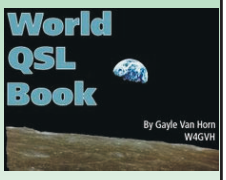
***Charles Dowdell, N2TYQ, snapped this photo of the LW radio in his Mercedes rental car while driving between England and France. He was tuned to the BBC, 198 kHz.***


## NOW AVAILABLE

Radio hobbyists interested in receiving and identifying radio stations in the HF/VHF/UHF radio spectrums now have a new whopping 1414 page CD-ROM publication to aid them.

***International Callsign Handbook*** is a concise world directory of various types of radio station identifications covering the military, government, maritime, aeronautical, and fixed radio stations on CD-ROM. Thousands of callsigns and other types of identifiers have been collected from our own personal log book, official sources and dedicated hobbyists who contributed their material.

***World QSL Book*** - Radio hobbyists interested in receiving verifications from radio station now have a new CD-ROM publication to aid them in the art of QSLing. This 528-page eBook covers every aspect of collecting QSL cards and other acknowledgments from stations heard in the HF spectrum.




*"I'm impressed. This is a comprehensive collection of worldwide radio identifiers likely (and even some less likely) to be heard on the air. Over the years the Van Horns have earned the well-deserved respect of the monitoring community. Accurately assembling a collection like this is a mammoth undertaking. Congratulations on a job well done."*
*Bob Grove - December 2008 What's New Column, Monitoring Times magazine*

Both books may be ordered directly from Teak Publishing via email at teakpub@brmemc.net or via our two main dealers, Grove Enterprises, www.grove-ent.com, and Universal Radio, www.universal-radio.com.

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# RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

*Marc Ellis, N9EWJ*
*marcellis@monitoringtimes.com*

# Power for the BC-1206-C

First let me mention how much I appreciated all the comments I received regarding the "high police band mystery" that came up in connection with the Philco 37-62 that was our last restoration project. Two of them were quoted in the last issue, and since then I've received two more thoughtful analyses. These came from Michael Allen (Fort Benton, MT) and Francis Wehner (Groton, CT). Thank you both for weighing in on this subject!

## ❖ Last Month's Progress

Last month we introduced a new restoration project: The BC-1206 beacon receiver. This diminutive (4' x 4" x 6 5/8") 200-400 kHz World War II era receiver is interesting both electrically and historically. An interesting electrical feature is that not only the tube heaters but also the plates and screens operate from a single 24-28 V d.c. supply. There are no dynamotors, vibrators, or other means to generate high voltage. The historical interest arises from the fact that, though it could be installed in a standard instrument panel opening, this radio was especially intended for a quick and easy temporary installation.

Why would such a feature be needed? Well, receivers in this frequency band were required to pick up weather and other information broadcast by airports, not to mention homing beacons that facilitated landing under conditions of limited visibility. But these were essentially domestic services not normally needed by fighter planes operating in war theaters – thus such receivers were generally not included in the normal radio equipment package.

Yet the ability to receive informational transmissions and beacons was important to pilots ferrying planes from the factories where they were built to their points of embarkation to war zones. Hence the need for the little 1206-C. As mentioned last month, these pilots were quite often women from an organization known as WASP (Woman Airforce Service Pilots). These women handled ferrying and other non-combat assignments to free up male pilots for battle.

Besides reviewing the radio's history, we discussed the circuitry and (with some difficulty) pried the set from its cabinet so we could take a look inside. There was the expected complement of paper capacitors of the type I would normally replace on sight. However, since most of them were rated at 250 volts or more and there was no voltage higher than 24 or so to be found in the set, I thought it would be safe to leave the original caps in place.

So, all that there was left to do was arrange for 24-28 volts d.c. at three-quarters of an ampere to power the radio. Back when I was in high school large amounts of surplus radio equipment were flooding the market, and a good friend whose interest in aviation was as intense as mine in electronics picked up a 1206-C. He was anxious for me to get it running for him but I was totally stumped by the power requirements.

There was no way, with the financial means and technical expertise of an average high school kid, that I could figure out how to generate that voltage and current using the technology of the time. Now, however, a quick shopping trip to Radio Shack supplemented by various items from the junk box netted me what I would need for under $25.00.

## ❖ The Remarkable LM-317

The power supply was built around the LM-317 3-terminal voltage regulator. This remarkable and inexpensive unit ($2.69 at Radio Shack) has been around for many more years than I know (for starters, it appears in a mid 1980s Radio shack databook that I own). Looking at a schematic diagram of the innards of this postage-stamp sized beastie, one is amazed by all of the active elements crammed into it – I suppose by some photographic process.

But, complex as it might be inside, the device is incredibly simple to use. Its pinout includes only three terminals – input, output and adjust. Add a couple of resistors and a couple of capacitors (see Fig. 1), and you have a circuit capable of delivering a regulated d.c. voltage of any value up to 37 volts at 1.5 smps (depending on input voltage and resistor values selected). Substitute a rheostat-connected potentiometer for one of the resistors and you have a continuously variable power supply delivering from a few volts up to the maximum.

You'll find a little calculator at **www.lm-317-circuits.com/calculator.html** that will compute the voltage output of the LM-317, up to the max of 37, for various resistor sizes. However, for every voltage output expected, the input voltage must be at least 2.5-volts higher.

To supply the d.c. input voltage to my regulator circuit, I purchased a 25.2V @ 2A transformer from Radio Shack (at $12.99, it was my largest purchase for this project). This I would pair up with a 4A bridge rectifier from the junkbox, connecting a 1000 uF 50-volt smoothing capacitor across the resulting d.c. output as recommended in the regulator manufacturer's application notes. This output would be fed to the regulator circuit between the input terminal and ground.

## ❖ Heatsinking

Normally, when I need to put together a special circuit for an *MT* project, I'll build it breadboard style – especially if the device is being constructed for demonstration purposes only and I don't intend to keep it. In this case, I would be building a continuously adjustable 0-24 volt (or so) 1-1/2 ampere d.c. supply that might very useful for other projects in the future. I already had on hand a perfect aluminum box to build it in. So I decided to take the extra time required.

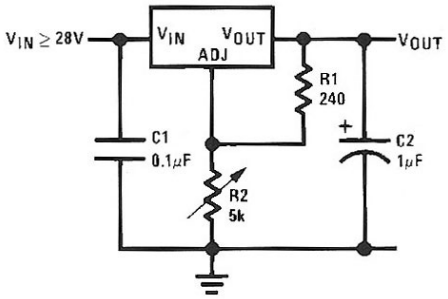
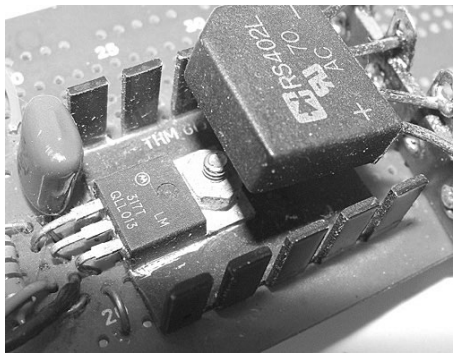



***Fig. 1. Typical LM-317 regulator circuit from manufacturer's data sheet.***

One of the first issues that had to be settled before construction could begin was the mounting of the LM-317. The literature warned that it had to be properly heatsinked if it was to provide its rated 1-1/2 ampere output. But what constitutes a proper heat sink? One might think that mounting it directly to the aluminum box would do the trick.



***To save space, large bridge rectifier unit (right) overhangs part of LM-317 heatsink.***

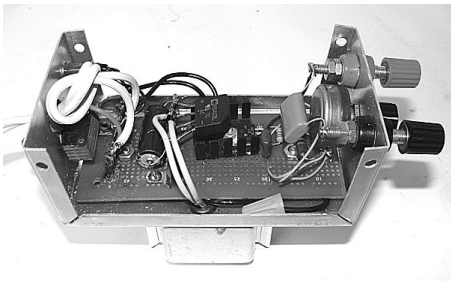
But there's a complication. The metal mounting tab of the LM-317 is connected to its output pin. If it's not appropriate for that pin

to be connected to the metal box, an insulated mounting kit has to be used. It includes a mica separator that goes between device and box and a fiber insulating washer for the mounting screw. Is a 317 thus mounted properly heatsinked? Probably, but I don't know.

Other heatsink choices were a little clip that could be slid over the device if it was to be mounted free-standing and a finned plate intended to be mounted under the device using a hole that lines up with the hole in the mounting tab. I chose the latter.

## ❖ Construction

The rectifier and regulator circuits were built up on a scrap of perforated board that was to be mounted inside the box using the same screws used to fasten the transformer on top. Since the parts were installed on the non-foil side of the board, I didn't have to worry about insulating under the heat sink. My junk box yielded most of the hardware I would need, including binding posts, a potentiometer for voltage control, a line cord and grommet, a resistor and the few capacitors.



*A look inside the completed power supply.*

However, before building the circuit into the box, I tack-soldered the transformer, potentiometer, etc. to the completed board for testing. Powering it up with a meter across the regulator output, I could see a voltage indication. But I was puzzled by the uneven response shown on the meter as I rotated the potentiometer through its range. Finally it struck me. I was using an audio taper potentiometer and I needed a linear taper unit.

I didn't have a linear pot of the 5k value needed for my desired voltage output. But I did have a 10k unit. So I paralleled a 10k fixed resistor across the half of the potentiometer I was using as a rheostat (I needed for the resistance to go up – thus increasing voltage output, as the control was turned clockwise.). The result, a linear transition from 0 to 5 k as the control was rotated matched by a linear increase in voltage throughout the control range.

Now I was ready to mount the parts in the box – which *definitely* took a lot longer than the breadboard construction I was used to!

I was very happy that I had recently added a Harbor Freight drill press to my bench top because there were a lot of holes to be carefully placed and drilled! But eventually the job was done and I was ready for the smoke test.

I first powered up the circuit without a load, observing about 23 volts at the output binding posts. Since about 32 volts were being delivered to the input of the LM-317 and the rated voltage drop across the device was just a couple or three volts, I had the potential of getting about 29 volts out of the supply.

But to do that, I would have to get a potentiometer with slightly larger maximum resistance. That was fine in theory, but awkward to arrange in practice. So, since the BC-1206 input was rated at 24-28 volts (at 0.75 amperes), I decided that I would be happy with the 23 volts. Now I was ready to smoke test the radio.

## ❖ Testing the BC-1206

With the radio still out of the cabinet, I clip-leaded its power input connections to the power supply output. The audio output of the radio was headphone level with the output transformer strapped for 300 ohms. This could be changed to 4,000 ohms by moving an internal connection, but I had a set of 600-ohm phones, so I left it alone. Besides plugging in the phones I had only to hook up my short basement antenna and turn on the set.

***The BC 1206 hooked up to power and ready for testing.***

With the power supply turned on and the set turned off, I was reading the expected 23 volts. Now I was curious to see how turning on the set would affect the reading. Clicking on the power switch, I went through a moment of discouragement as the voltage dropped precipitously to a much lower value. But apparently the regulating circuits within the LM-317 needed only a moment to do their magic because the voltage quickly rose again, stopping at exactly 23.

What did I hear in the phones, you ask? Well, the results were disappointing but expected. As the radio warmed up, I began to hear a loud raspy noise in the phones, but no stations were heard at any position on the dial. I haven't listened a lot at these frequencies, but I've been led to expect poor signals during the summer months as well as a lot of trash from such things as lamp dimmers, power company digital control codes and what not.

I'm pretty sure that the radio is working, since I hear static when running a screwdriver across the antenna terminal, and placing my finger on the terminal makes the raspy signals much louder. This last observation certainly suggests that those signals are being picked up over the air and not generated by the power supply or within the receiver.

Next time we'll touch up the alignment of the receiver and then set it up with an outside antenna to see what we might hear. I'm also planning to try listening late at night or in the very early a.m. when static due to lighting and various human activities might be at a minimum. See you then!

## ❖ The AWA Gateway

When I'm wearing my *Monitoring Times* columnist's hat, I don't usually switch to my Antique Wireless Association publication editor's hat, but forgive my making a short temporary exchange so that I can tell you about a new AWA electronic mini magazine. Called *The AWA Gateway*, it is a sister to our long-time print publication *The AWA Journal*. Both are quarterlies and they are published alternately. While only AWA members receive a subscription to the Journal – paid for with part of their membership fee, the Gateway is free to all and available at our web site: **www.antiquewireless.org**.

The content of *The AWA Gateway* has been kept at a very basic level with the intent of stimulating and encouraging interest in the antique radio hobby. But the publication is not exactly "Antique Radio for Dummies." Rather, it seeks to provide a broad overview for the sophisticated reader who is looking for a grounding in antique radio lore. Take a look and tell me what you think.

Care to make suggestions for improvement? Perhaps you'd like to contribute pictures and descriptions of your collections, projects and activities? I look forward to hearing from you.

## ❖ Coming Soon: the Annual AWA Convention

If you are free to visit Rochester, NY on August 16-20, take advantage of the opportunity to spend some time with us! The little ad running with this column touches on the high points, so I won't say much more. For more information, visit the AWA website **www.antiquewireless.org** and the special convention website **www.awaconference.com**. The latter offers an opportunity to register on line. Hope to see you there!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- ❑ Movie Night, Pizza Dance Party, Ladies' Luncheon, Banquet
- ❑ Saturday Auction Includes Items from Several Estates

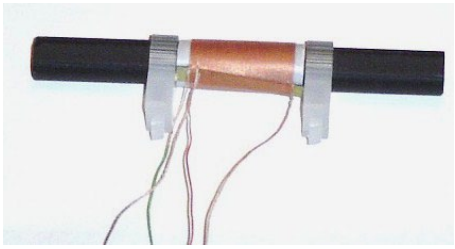
**From exit 46 of the New York Thruway (I-90),take I-390 North to NY 253 West to NY 15 South. Look for the RIT building about 0.7 miles on the right. More information at www.awaconference.com**

Dan Farber, AC0LW
*danfarber@monitoringtimes.com*

# Antennas for AM Listening
## *Hint: It's Not A Beam!*

This time around, friends, let's take a look at receiving antennas for the AM broadcast band. Back in the day, we called it "BCB," or sometimes "MW," for medium wave. Well, it was the sixties, and acronyms for everything was cool. What's really cool is that, even though FM, XM, and other newer radio services have come into vogue along the way, good old AM continues to serve its purpose. A number of commercially produced antennas for AM continue to be available to the eager consumer – and of course, we can always make our own.

If you're in the habit of thinking about "conventional" antennas such as we might use at higher frequencies, like dipoles, verticals and so forth, you'll have to go outside the box a bit to get your head around most of the popular AM antenna ideas. The designs we use at HF just aren't practical on the AM band. For example, a full-size dipole for 1000 kHz, in the middle of the band, would be 468 feet long! A full-size quarter-wave vertical at the same frequency would be 234 feet tall – not at all easy or convenient (or even legal) to erect in the typical back yard. Not to mention the obvious problems as lightning attractor and air traffic hazard, or the tremendous amount of noise it would pick up along with the desired signals.



***A typical ferrite loopstick antenna. (Image courtesy www.stormwise.com)***

Fortunately, a number of alternate solutions exist. No doubt the most prevalent, taking a number of different forms, is the *loop antenna.* This, as its name might imply, is a loop of wire, wound on various forms, in a number of different sizes and configurations. The beauty of this idea is that it fits a long piece of wire – essential in an antenna for these low frequencies – into a physically small and manageable package.

After all these years, the one that still impresses me the most is the very small loop antenna that has been used from day one *inside* "pocket size" radios. This takes the form of a coil of small diameter wire wound on a round rod (or flat rectangle) of ferrite, which is basically a ceramic compound composed largely of iron oxide. Such a coil, wound on ferrite, is often called a *loopstick.* The ferrite increases the coil's inductance considerably, making it appropriate for use at these low frequencies. Ingeniously, the coil serves as both the inductance of the radio's tuning circuit and as the antenna.

***Back view of 1948 Philco table radio. Note the loop antenna wound on the inner rear perimeter of the box. (Image copyright 2003-2010 Daryls Clocks Galore)***

What makes it possible to use such a physically small, internal, antenna for AM reception is mainly two simple facts: local AM stations are close by, and they run considerable amounts of power. This small antenna is woefully inadequate for DX listening. However, the majority of AM listening centers directly on these local stations, where the small antenna is certainly adequate. Thus it can be concealed inside a very small, portable radio. Kind of ironic, when we consider that ham and SWL operation, which take place at higher (in many cases, much higher) frequencies, nevertheless require much larger antennas! It's the combination of "close by" and "high power" that makes this setup work well.

Before those pocket radios ever came along and for quite some time after their appearance, the AM "table radio" was very popular. These tube-type radios, powered from a wall outlet, with a speaker built in and the antenna inside the cabinet, were quite a stride beyond the radios of the 1920s and '30s, with their bulky external loudspeaker (or worse yet, headphone-only operation), big clumsy external antenna, and messy and hazardous battery power sources.

***A typical small loop supplied nowadays with home stereos. (Photo by author)***

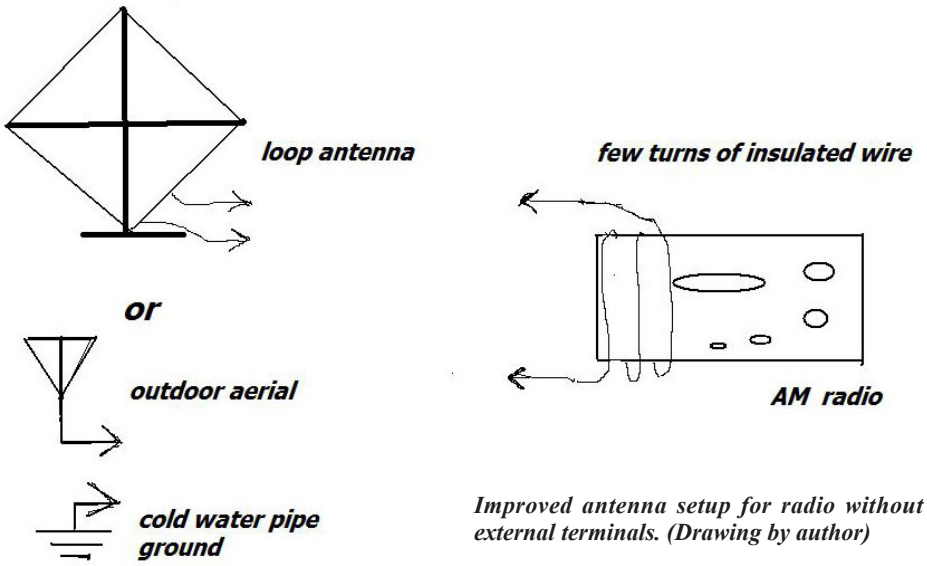
The internal antenna usually took the form of an open loop of wire wound inside the cabinet, as shown in this quaint 1948 Philco radio, or sometimes as a "pancake" on the inside of the back cover. Notice that since the loop is *physically* much larger than the little loopstick, a ferrite core is not needed to increase the inductance. (Increasing a coil's *diameter* is one of the easiest ways to increase its inductance, and when it's being used as an antenna, a large coil with few turns will intercept more signal than a small coil with many turns, even if their measured inductance is the same.)

Later on, as solid-state receivers began to replace tube-type units, the compact ferrite loop antenna made a reappearance, mounted externally on the backs of numerous home stereo receivers. Eventually these, too, became *passé* and manufacturers began providing small, open loop antennas in a plastic frame, to be connected to AM antenna terminals on the back of the receiver.

If you have an AM receiver with antenna terminals, there's no limit to the antennas you can try. Again, since most AM listening centers on local, high powered stations, antennas aren't terribly critical. Any sort of random wire or other miscellaneous antenna will certainly give the local AM listener all the coverage desired. If you're interested in DX listening at night, though – and let me hasten to say that this is quite a bit of fun – you'll need something more robust as an antenna.

One of the easier things to try is to hook up that big dipole or longwire that, as a ham or SWL, you may already have. Of course, it'll be quite short at the AM broadcast frequencies. However, at night, when long-range propagation kicks in, assisted by the fairly high power that AM broadcasters usually run, you might be pleasantly surprised by how much "BCB DX" you can haul in with such a dipole or longwire.

With the longwire, try hooking the other antenna terminal to a cold water pipe ground. Depending on the length of your ground wire – and whether you hooked it to a metal or a plastic cold water pipe! – you may get a dramatic improvement in signal strength. The big drawback here is how *noisy* this setup is. That's the beauty of the dipole: its "balanced" configuration helps greatly to cancel noise, which can be really fierce at night on these lower frequencies.



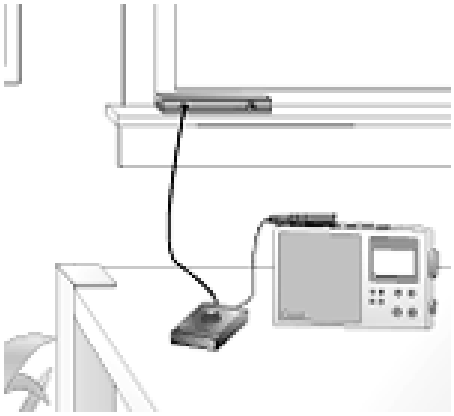

*Improved antenna setup for radio without external terminals. (Drawing by author)*

Another popular and effective solution is to turn once again to our old friend the loop antenna. If we arrange a physically larger loop than the internal ones we've been looking at, we can increase our "aperture" and haul in more of that nighttime DX. I described here, in my October 2010 column, a rather crude homemade loop that will start you down this road. Or you can consult Kevin Carey's excellent "Below 500 kHz" monthly column here in *Monitoring Times* to see some beautiful loop-building information. A loop, of course, has that same "balanced" nature that a dipole has, and thus can be very effective at reducing received noise.

If you don't have antenna terminals on your radio, try this slick solution. Wrap several turns of insulated wire *around your radio* and connect the two ends of the wire to the two wires of a loop antenna, or even one to an outdoor antenna and one to a cold water pipe ground. This is a neat little demonstration of the transformer concept. Reception of distant stations will improve dramatically. (Note: Your radio must have a plastic or wood case for this to work!)

The C. Crane Company sells an interesting variation on this last idea. The unit consists of a loopstick antenna in a plastic case, to be placed on a convenient window sill, connected by cable to a small preamplifier. A second cable connects this to a smaller encased loopstick that you place on top of your radio. You can learn more about this nifty setup on their website, **www.ccrane.com**.

This scratches the surface of what we can do with antennas for AM radio listening. Hopefully I've given you some ideas to try and to think about. There's plenty to listen to and enjoy on this band, both day and night. I encourage you to give it a whirl, or to revisit AM, if you haven't listened to it in a while. Join me here in the October issue, where we'll delve ever deeper into the world of antennas. Happy operating!



*C.Crane Company's nifty AM antenna setup. (Image courtesy www.ccrane.com)*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# SKY SURFING

**RADIO FROM THE OUTER REACHES**

Keith Baker, KB1SF / VA3KSF
*keithbaker@monitoringtimes.com*

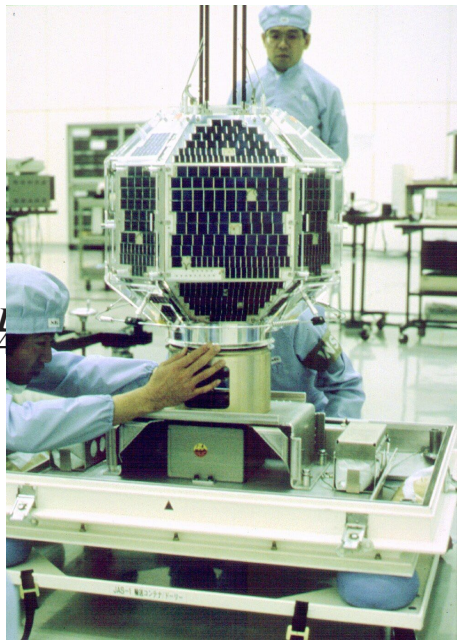
# Spotlight on the Japanese Amateur Radio Satellites

In previous columns, I've been showing readers how to equip their stations, watch for, track and then (for those so licensed and equipped) actually work through our various amateur radio satellites now in orbit.

In this installment, I'll be turning the spotlight onto a whole series of amateur radio satellites that were built, launched and controlled by our friends in Japan. One of these satellites still remains semi-operational to this day. I'll also bring our readers up to date on the latest on-orbit status of our most popular amateur satellite (AO-51) as well as an update on AMSAT's yet-to-be-tossed-overboard ARISSat-1.

## ❖ The FUJI Satellites

The very first Japanese amateur radio satellite, JAS-1a (which later became Fuji-Oscar 12 on orbit) was launched on August 12, 1986 on the very first test flight of Japan's new H-I launcher developed by Japan's National Space Development Agency (NASDA). It was part of a piggyback payload that rode into a nearly circular, 1497 x 1479 Km, Low Earth (LEO) orbit along with a Japanese experimental geodetic satellite called AJASAI (EGS). The FO-12 satellite consisted of a 26-sided polyhedron (about the size and shape of a large basketball) and weighed in at about 50 kg.



***Technicians put the finishing touches on the launch mechanism of JAS-1b, a linear transponder-equipped satellite that later became FUJI-OSCAR 20 (FO-20) in orbit. (Courtesy JAMSAT)***

FO-12 was the first Japanese amateur satellite developed by the Japan Amateur Radio League (JARL) with system design and integration performed at Japan's NEC Corporation. Unfortunately, eclipses kept FO-12 from producing enough electricity to keep it switched on for an entire orbit and it was eventually taken out of service on November 5, 1989 when the battery failed.

## ❖ JAS-1b (Fuji Oscar 20)

Fortunately, Japanese hams had a replacement satellite ready for launch three months after FO-12 had to be turned off. JAS-1b became the seventh amateur ratio satellite hurled to space in 1990 and was renamed Fuji-Oscar 20 soon thereafter. Another H-I rocket provided by NSADA ferried the 50 kg JAS-1b to a 750-mi.-high orbit on February 7, 1990. This H-I also carried two government satellites, MOS-1b and Debut, and it marked the very first time Japan had launched more than two satellites at one time.

***JAS-1b (FO-20) as it might have appeared in orbit. (Courtesy: JAMSAT)***

There were many positive features of FO-20. Its orbit was somewhat more elliptical than the most other LEO amateur satellites, so it often provided a somewhat larger footprint at Apogee and, therefore, a much larger area for potential contacts. I made many enjoyable contacts though this satellite, once I got used to FO-20s *very* rapid Doppler shift on the 70 cm downlink.

## ❖ The Benefits of Mode J

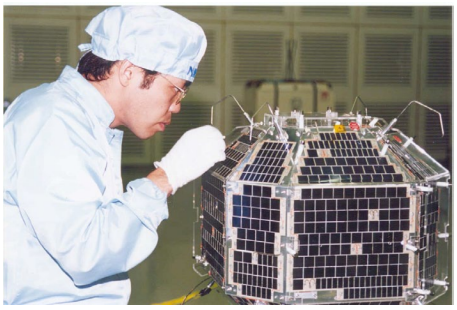
But the 70 cm downlink was not without its benefits. Indeed, for those who were so equipped, the 70 cm downlink of FO-20 provided many users with a way to escape the inherent man-made noise that's often present on both 10 and 2 meters, which, up to that point had been the "traditional" downlink frequencies for most of our amateur radio satellites. In many areas of the world, the 2 meter band is so crowded (or filled with electrical and other noise) that it makes satellite weak signal work nearly impossible.

Most of this interference is not present at 435 MHz, and spectrum space is somewhat less crowded at that frequency. So Mode J operation (2m up/70cm down) is often much preferred to Mode A (2m up and 10 meters down) or Mode B (70 cm up and 2m down) in those areas.

Unfortunately, for all of its positive aspects, FO-20 is no longer operational. However, once again, before it went silent, our Japanese compatriots had a follow-on satellite, JAS-2, built and ready for launch.

## ❖ JAS-2 (Fuji Oscar 29)

JAS-2 was successfully launched by NASDA, the Japanese National Space Development Agency, from their Tanegashima Space Center in southern Japan in August 1996 to become amateur radio's first new orbiting satellite of that year. As with their previous satellites, JAS-2 was principally designed by a team from the Japan Amateur Radio League (JARL) and was later built almost entirely by NEC under contract from JARL.

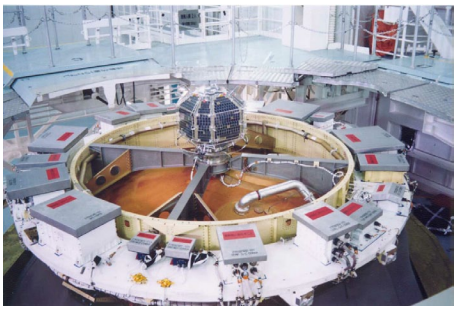


***A technician makes a final adjustment to the JAS-2 satellite prior to launch in 1996. Later re-named FUJI-OSCAR 29 (FO-29) on orbit, the satellite is still "semi-operational" to this day. (Courtesy: JAMSAT)***

Soon after JAS-2 successfully reached orbit, JARL requested that an OSCAR number also be assigned to their handiwork by the worldwide AMSAT community. The name Fuji OSCAR 29 (or just FO-29) was quickly given to the new satellite.

FO-29 contained both an inverting linear as well as packet radio transponder on board. It also contained a magnetic torque system to spin stabilize the satellite in a planned attitude perpendicular to the orbit's plane.

When its Mode J linear transponder was activated soon after launch, FO-29 provided *very* strong downlink signals, much stronger, in fact, than its aging FO-20 cousin. Also, FO-29 tended



***JAS-2 (FO-29) is dwarfed by its carrying structure. A Japanese H-II rocket launched from Japan's Tanegashima Space Center in southern Japan successfully placed the satellite into a circular, Low Earth (LEO) orbit. (Courtesy: JAMSAT)***

to strongly favor either left-hand or right-hand circular polarization depending on how the satellite was oriented with respect to the Earth.

Besides the stabilization system, there were many other electronic improvements carried aboard FO-29. The most obvious improvement was that, in addition to a 1200 bps AX.25 packet modem and BBS system, FO-29 also sported a 9600-baud FSK transponder as well. There was also a "digitalker" on board that stored and repeated about 25 seconds of speech unlinked from the FO-29 command station for later "broadcast" via the 435.91 MHz FM downlink. When its digitalker was activated, I still remember hearing it come over the horizon repeating the phrase, "This is JAS 2" over and over again in a digitized female voice. Another, less obvious improvement included the use of gallium-arsenide solar cells with a much higher efficiency (17%) than those carried on other satellites of the era.

Unfortunately, 15 years of exposure to the harsh environment of space has now taken its toll on FO-29 to the point that only the linear, Mode JA transponder is "semi-operational." It's been reported that the satellite's batteries are continuing to slowly fail due to long periods of darkness in some parts of its orbit. This condition has caused FO-29s ground handlers to keep the satellite completely switched off for upwards of several months at a time. But, when activated, this satellite is still a pure joy to work through. Hopefully, we will get a few more years of use out of this old bird before it goes completely silent.

The latest on-orbit status of FO-29 is always available via the AMSAT web site at: **www.amsat.org/amsat-new/satellites/satInfo.php?satID=5&retURL=/satellites/status.php**

## ❖ AO-51 Also Ailing

AMSAT Vice-President of Operations Drew Glasbrenner, KO4MA, recently reported that the AO-51 Command Team was having an extremely difficult time trying to restore AO-51 to full operation. Unfortunately, after nearly 7 years in orbit, this satellite's batteries have also now deteriorated to the point that the onboard computer will not retain an upload of the flight software during the time the satellite is eclipsed by darkness.

The AO-51s ground handlers still have a few more things to try in an attempt to restore AO-51 to full operation. However, with the length of eclipses peaking sometime this summer at approximately 27 minutes, the long-term outlook for the continued use of AO-51 remains uncertain. Fortunately, there is a brief period in November 2011 when eclipses will be as short as 16 minutes. But, after that, the length of time the satellite is in darkness on every orbit will remain at 30 minutes (or longer) for many years.

At press time, members of the AO-51 Command Team were also experimenting with ways to command the satellite "ON" during each orbit once it regained enough power from its solar panels. However, this restoration approach requires that someone be physically present at a command station to perform a manual reset of the satellite on each orbit. Stations with 96K digital capability can listen in on control station attempts at recovery on 435.150 MHz on many passes over the US. And, as always, the latest information about AO-51 restoration attempts and its current status can be found at**: www.amsat.org/amsat-new/echo/CTNews.php.**

***An ISS crewmember holds AMSAT's (still partially wrapped) ARISSat-1 satellite just after its unpacking from a Russian Progress re-supply vehicle. EVA deployment of the satellite was tentatively re-scheduled for July 2011. (Courtesy: The ARISSat Team and Energia)***

## ❖ Failure is Inevitable

The "lesson learned" from all of this is that, despite the very best efforts of our extremely capable satellite experimenters and dedicated ground handlers, any satellite that contains delicate electronic equipment and which is repeatedly subjected to the harsh environment of space for extended periods of time *will* eventually fail. And the best way to insure new amateur satellites will be built and launched to replace those that do is to generously support your country's non-profit AMSAT organization in whatever way you can.

## ❖ ARISSat-1 Update

As I reported to you in the May issue, the ARISSat-1 satellite was intended to be activated in April as part of the 50th anniversary of Yuri Gagarin's famous flight. However, when the crew tried to do so, no ground stations reported hearing the satellite. To follow up, the ARISSat-1 team had a teleconference with representatives of RSC-Energia (Russia) and NASA to request a clarification of the events leading up to this incident and to discuss what happened.

According to RSC-Energia officials, the battery in ARISSat-1 was only charged once on the ground and was then used for a variety of tests as well as during its February activation event once it arrived on the International Space Station (ISS). The battery was not recharged prior to the April Yuri Gagarin activity since it can only be charged a limited number of times on the ISS.

Also during the April event, the cosmonauts reported that they activated the satellite and confirmed that they heard the signal on the amateur radio equipment on board the ISS. Since the battery was nearly depleted of its original charge, they then switched the satellite off after six hours of operation in order to prevent over-discharging the battery. The battery was then removed from the satellite and stored separately according to their normal battery handling procedures. Readers may recall that the battery donated to AMSAT for use in ARISSat-1 is the same kind of battery used in the Russian extravehicular (EVA) space suits, so the crew is well familiar with its electrical characteristics.

RSC-Energia officials have since reported that their plan is to have the crew recharge the battery about three weeks prior to the EVA deployment. This will give the cosmonauts ample time to reinstall the battery and test the satellite to make absolutely sure that it is working properly before it is tossed overboard.

At press time, the EVA deployment for ARISSat-1 was planned for late July of this year. Hopefully, by the time you read these words, ARISSat-1 will be nearing that long-awaited milestone, or (fingers crossed) even be operational in orbit. To help you prepare to listen for (or work through) ARISSat-1 once it is finally deployed, I suggest you one again check out my column in the February 2011 edition of *MT,* where I outlined all of the satellite's planned on-orbit features, as well as its uplink and downlink frequencies. In the interim, stay tuned to the AMSAT Web site (**www.amsat.org**) and the ARISSat-1 Web site (**www.arissat.org**) for all the very latest information about ARISSAT-1.

***Three members of the ARISSat-1 experimenter team pose with the working engineering model of ARISSat-1 at AMSAT-NA's 2010 Annual Meeting and Space Symposium. From left are Lou McFadin, W5DID, Bob Davis, KF4KSS, and Doug Quagliana, KA2UPW. Symposium attendees got a chance to work through the new satellite's transponders with their radios during the conference. (Courtesy: KB1SF)***

***This is the 28 Volt Orlan Spacesuit battery whose lack of a full charge precluded ARISSat-1's on-orbit test in April. Russian Space Agency officials assured AMSAT that this battery would once again be fully charged and inserted back into the spacecraft prior to ARISSAT-1 being tossed overboard. (Courtesy: The ARISSat Team and Energia)***

# Mode S – IFF for the 21st Century

By Larry Van Horn, N5FPW
Monitoring Times Technical Editor

Our topic this month is the new monitoring buzzword that excites the aviation monitoring community like no other. Used in conjunction with aircraft capable scanners, suitably equipped radio hobbyists can dramatically increase their situational awareness of airspace usage in their local area. For many of us, it has provided a spark in our civilian and military monitoring hobby that we haven't had since the introduction of the first programmable aviation scanners.

So what is this magical buzzword? Mode S!

In the July 2011 *On The Bench* column, I presented some background material on the history of aviation's IFF (Identification Friend or Foe) mode that is the ancestral lineage of today's Mode S.

In this month's *Bench* column, I will cover a brief history of Mode S, some of the basics parameters of the mode, and how mode S interrogation and reply actually work.

## History of Mode S

In 1967 the newly formed government agency, the Department of Transportation (DoT), and its department head wanted a complete reassessment of the U.S. Air Traffic Control (ATC) System. To conduct the reassessment, DoT formed the Air Traffic Control Advisory Committee in 1968. Several key recommendations were made by this committee, including a new ATC system. It was determined that the old ATC Radar Beacon System (ATCRBS) was inadequate.

By the early 70s, an air traffic control technology had been developed by Lincoln Labs at the Massachusetts Institute of Technology. This technology, initially known as the Discrete Address Beacon (DABS) project, was later renamed Mode-S.

The Lincoln Labs DABS specification was delivered to the FAA in 1975 and the first commercial Mode-S transponder was manufactured in 1980. But the FAA was still slow to implement the new ATC standard, until a mid-air collision in 1986 over Cerritos, California, changed everything.

As a result of that Aeroméxico Flight 498 mid-air collision with a privately operated Piper PA-28-181 aircraft, Congress passed a law mandating that all commercial aircraft be equipped with a Traffic Collision and Avoidance System (TCAS) by 1993. TCAS uses mode S and it has been accepted as an international standard by the International Civil Aviation Organization (ICAO).

The idea behind this new technology was to develop a way of using the same Secondary Surveillance Radar (SSR) that was being used in IFF modes A and C, but to make it addressable, more accurate, reliable, and capable of greater capacity.

## Interoperability Helped Design Mode S

Air traffic control is a unique problem in that every aircraft in a given airspace must be tracked by a ground station. In a hybrid system, both systems must be able to operate in conjunction with the components of the other, in order to ensure the safety of all aircraft. The Lincoln Lab designers of Mode S were acutely aware of this problem and were determined to build a new air traffic control technology that would interoperate seamlessly with the existing system.

The deployment of any new air traffic control technology is always incremental. Out of necessity there will always be a long transition period during which both new and old systems must coexist. Adoption of a new air traffic control technology requires upgrading hundreds of ground stations, installing new equipment in thousands of aircraft, and training tens of thousands of people to use the new system.

Also, a new air traffic control system cannot assume that every aircraft will be fully compliant with the new standard. The global nature of aviation and the relative ease with which a pilot may fly aircraft virtually guarantees that some aircraft will not have the latest in air traffic control technology

The developers at Lincoln Labs made several specific design decisions that were influenced by interoperability with existing ATC system, and these included:

- Frequency – the choice of 1030/1090 MHz was made so Mode S and ATCRBS could communicate on the same channel.
- Modulation – the modulation scheme was chosen partially to minimize the effects of interference due to shared frequency channels.
- Signal Formats – the Mode S signal itself had to be designed so that it was transparent to existing transponders.
- Error Correction – ATCRBS limitations forced the Mode S signal to be short, so parity and addressing bits were overlaid to maximize data block size.

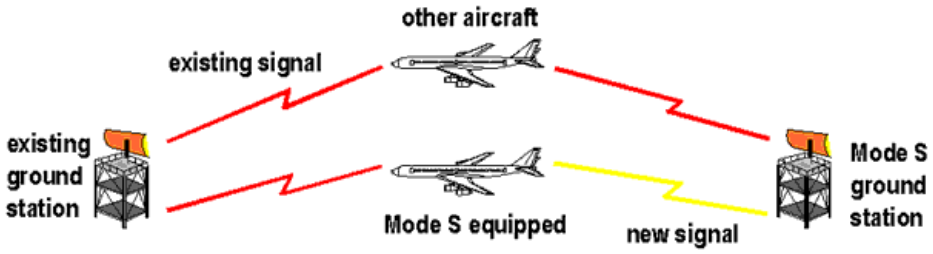
## Mode S and How it Works

Mode S or "Select" is a datalink technology that uses discretely addressed interrogations. Mode S equipment includes ground stations with sensors, and transponders aboard aircraft with unique addresses or identifications. The interrogations that ground sensors send planes include the identification information of the target plane. This method ensures that when other aircraft receive the interrogation, they will not respond. Replies contain information such as altitude reports.

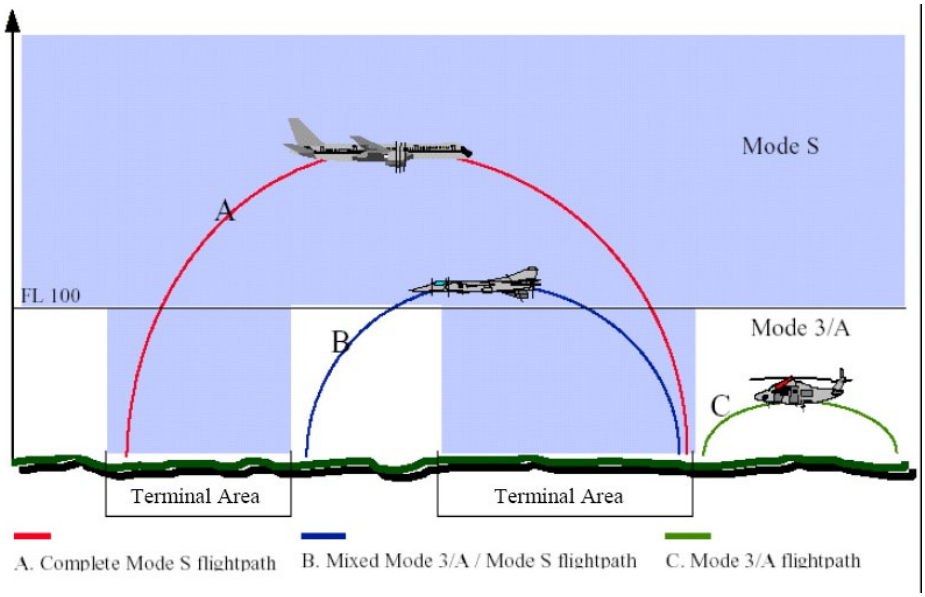
Mode S, despite being called a mode, is actually a radically improved ATC system intended to replace the previously mentioned ATCRBS altogether. All the countries in Europe have mandated the usage of mode S as of March 31, 2009. Many other countries, including the United States, have begun phasing out ATCRBS in favor of this system.

Despite being called a replacement transponder system for ATCRBS, mode S is actually a data packet protocol which is being used to augment existing transponder positioning equipment (radar and TCAS).

As I mentioned above, Mode S has the ability to interrogate a single aircraft at a time. With old ATCRBS technology, all aircraft within the beam pattern of the interrogating station would reply. In airspace with multiple interrogation stations, ATCRBS transponders in aircraft could be overwhelmed. By interrogating one aircraft at a time, workload on the aircraft transponder




*Interoperability Overview, courtesy of MIT*




*Cross Section of Mode S Airspace, courtesy of US Navy*

is greatly reduced.

Another major improvement with the implementation of mode S is increased azimuth accuracy. With primary and secondary surveillance radars (PSRs and old SSRs), the azimuth of the aircraft is determined by the half split method. The half split method is computed by recording the azimuth of the first and last replies from the aircraft, as the radar beam sweeps past its position. Then the mid-point between the start and stop azimuth is used for aircraft position.

This requires many interrogations and replies, reducing the target-handling capacity of the ATC SSR. The mode S system uses a monopulse SSR, which has an electrically narrowed beamwidth, typically 2.5 degrees. Apart from better azimuth accuracy the monopulse technique reduces the number of interrogations required to track a target, as it theoretically requires only one reply to obtain the azimuth and range of the airframe. This is calculated based on the RF phase of the aircraft reply, as determined by the sum and difference antenna elements, and is called monopulse. This monopulse method results in superior azimuth resolution.

The Mode S system also includes a more robust communications protocol for a wider variety of information exchange. Many years ago, mode A and C were developed for airframe identification and altitude reporting. This was and still is an important component of air traffic control and air space management. As more and more airframes were available to the private and commercial flying community, this basic form of surveillance was overwhelming the capacity of the air traffic control radar beacon system (ATCRBS).

Given the technology behind the mode A and C interrogation and reply, there were also problems with the "false reply uncorrelated in time" or FRUIT. This involves seeing replies from another interrogation, garbling one reply, and interfering with another. The problem is analogous to attempting to listen to several conversations at the same time. As such, the capacity of the ATCRBS was being taxed to its limit.

## ❖ Interrogation and Reply

The basic ATCRBS system relies on pulsed RF as its means of communications. These pulses are 0.8 µs wide and vary from 8.0 µs to 21 µs spacing for mode A and C respectively. The side lobe suppression or SLS P2 pulse is also transmitted omni-directionally and is used to suppress any replies to side lobe interrogations.

The mode-S SSR will interrogate using a 1030 MHz carrier with differential phase shift keying (DPSK) modulation. DPSK allows the interrogation frequency to have much more efficiency in sending information without interfering with mode A and C interrogations. DPSK also allows up to 4 MBps of data. The ground radar sends its 1030 MHz, DPSK interrogation signal, the airframe receives it, verifies the request and integrity of the signal, and replies using a 1090 MHz carrier encoded with a pulse positioning modulation (PPM) transmission.

The SSR is central to the mode S system. Mode S interrogations are generated at a rate of 50 times per second or 50 Hz pulse repetition frequency (PRF) and approximately 230 Hz for mode A/C interrogations. The reply will happen at the same PRF although mode-S SSR has the ability to tell the mode S transponder not to reply to every mode S interrogation it receives. Once the SSR has received the reply, it will decode the mode (A, C or S) and demodulate the information within each mode.

There are three interrogation types in a mode S SSR system:

- **ATCRBS all call** – This interrogation consists of pulse P1, P3 and a 0.8 $\mu$s P4 pulse. P2 SLS is transmitted as normal. All ATCRBS transponders reply with the 4096 identification code for mode A interrogations and altitude data from mode C. Mode S transponders do not reply on this interrogation.
- **ATCRBS/mode S all call** – This interrogation is identical to the ATCRBS all call above except P4 is 1.6 $\mu$s long. ATCRBS transponders reply with the same 4096 code or altitude data used by the ATCRBS all call. Mode S transponders reply with a special code, which contains the aircraft's discrete address.
- **Mode S discrete interrogation** – This interrogation is directed at a specific mode S transponder-equipped aircraft. The interrogation consists of pulses P1, P2 and P6. P2 is transmitted via the directional antenna and hence is the same amplitude as the P1 and P3 noted above. This effectively suppresses ATCRBS transponders from replying. P6 is actually a DPSK data block that contains either a 56-bit or 112-bit message. The DPSK modulation produces a spread-spectrum signal, which is immune to interference.

When the aircraft transponder receives a valid mode S discrete interrogation, it will return a reply at 128 µs after reception. The reply is transmitted on 1090 MHz and uses a 56-bit or 112-bit PPM (pulse position modulation) transmission.

## ❖ The Aircraft Mode S Address

Each mode S interrogation will have a 24-bit address unique to the aircraft (entered in as an 8-digit octal) as well as a 24-bit parity check for validation. Aircrews must ensure that the tail-number-assigned 24-bit code matches exactly to the default code for that particular aircraft.

Within the U.S. Department of Defense (DoD), the use of dynamic codes is an alternative, but only in accordance with DoD service specific guidance.

The basic mode S surveillance interrogation information is limited to the following: altitude reporting (DF0), aircraft identification (DF4) and basic airframe information (DF11). DF stands for download format and I will have more on that in a future column.

According to the ICAO standards for mode S, aircraft addresses shall be assigned to aircraft in accordance with following principles:

- At any one time, no address shall be assigned to more than one aircraft. Erroneous or duplicate codes compromise the safety and efficiency of air traffic control.
- Only one address shall be assigned to an aircraft, irrespective of the composition of equipment on board.
- The address shall not be changed except under exceptional circumstances and shall not be changed during flight.
- The addresses composed of 24 zeros or 24 ones shall not be assigned to aircraft.

In conjunction with programming the mode S control panel in DoD aircraft, I found this note in the DoD FLIP General Planning publication, chapter 4. Those of you who have mode S capability will find this statement interesting.

"Mode S aircraft identification entry must be entered in accordance with this reference and limits the entry of flight ID to seven alphanumeric characters. It is imperative also that the callsign entered in the flight plan (seven characters) match exactly to the flight identification entered into the mode S transponder interface"

This article has introduced some of the subtleties that make mode S monitoring an important tool for the aircraft enthusiast. I will have more on the operational and monitoring aspects of mode S and ADS-B in a future *Monitoring Times On The Bench* column.

# Apple TV – Let it change your life

By Loyd Van Horn, W4LVH

I am a self-admitted tech-junkie, but I wasn't always like this. There was a time, before I purchased my first iPod, that this type of stuff didn't really hold much appeal to me.

Sure, I have been an active Web surfer since 1993, have had WiFi in my laptop since 2003 and made the change from CDs to Mp3s without hesitation in 1999. However, it wasn't until I purchased my first iPod that the little light went off in my head and the entire future of my daily life flashed before my eyes in monochromatic LCD-screen glory.

The iPod changed my life in ways that I never anticipated possible from a music device. This had me on the lookout for other gadgets that could simplify or enhance my daily activities. I didn't anticipate that the next product to turn my world on its ear would be another product from Apple.

The first Apple TV release seemed interesting in concept, but the feature list wasn't quite on par with what I wanted to do, plus the price was way too high. Then came Apple TV 2.0 and I was ready to take the plunge. For those still on the fence, hopefully this review will entice you to come aboard.

It might not seem like much – a small 3.9"W x 3.9"D x 0.9"H black box with a few connection ports. But trust me, there is plenty of "punch" under the hood. My focus for this review will be mainly on using Apple TV as a streaming radio device, but I will also touch on some of the other features that you might find useful.

Word of note: Apple TV is not a TV; it is a streaming interface to a TV. You *will* need a TV or receiver that handles HDMI connections, or something with an adapter, because Apple TV only works in HDMI (audio and video) or fiber optic (audio only). You will also need an internet connection – either wireless or Ethernet.

## ❖ Out of the Box

Apple TV, like so many of the products coming from Apple, comes in a minimally packaged box containing the Apple TV device, the AC power cord, the aluminum remote and a 33-page setup guide.

After taking out the Apple TV device, the next thing you will see is the 3-button aluminum remote. The remote is extremely intuitive with a menu button, a play/pause button, and a select button that is surrounded by navigation arrows for going through the various menus. The remote is made of the same aluminum material as iMac and MacBook Pro laptops.

The set-up guide is extremely easy to read and has the same user-friendly feel that has made Apple a leader in the computing industry. It breaks down how to navigate the menus and connect to your network to the wireless a/b/g/n connection or through the 10/100 Base-T Ethernet port in the rear of the device.

The device itself is very basic. The top and sides are made from smooth plastic, with the top frosted except for the Apple TV logo. The bottom is rubberized to help prevent skidding on surfaces. The front side of the device houses a small, blue light to indicate when the device is in use, but it is recessed, so unless it is actually operational you won't see it. The back panel has the various connection ports: the port for the AC power adapter, an HDMI port (this is the only way to connect for video streaming), an optical audio port, an Ethernet port, and a micro-USB port for "service and support."

As media devices go, this one should be hardly noticeable at all in your home theater setup. It is sleek and stylish enough, but it is designed to operate in the background. It runs quiet and cool; I don't think I have heard a single sound from my device in the six months I have been using it.

Mine sits on top of my AT&T U-Verse set-top box very easily. I note that when plugged in with my HDMI cable, the cable sometimes pulls the Apple TV box at an angle, which makes remote control use a little more spotty. It just took moving the cable around to get my Apple TV device to sit squarely where I wanted it.

The AC adapter is a sleek, thin, 2-prong plug. In the days when so many devices are turning to large wall-warts, the Apple TV plug is easy to incorporate into even the most packed power strip or outlet.

The rest of the operation of Apple TV happens on-screen. Getting the unit up and running takes very little time at all. The speed at which your device operates will largely depend on the speed of your network (including signal strength of your wireless router).

### RATINGS

**Audio Quality – 4.5 out of 5**
Audio/video sync issues are rare; otherwise audio quality is excellent

**Video Quality – 4.5 out of 5**
Occasional buffering/digital noise, but this too is rare. The 720p picture quality is stunning.

**Performance – 5 out of 5**
Never had any issues, it just does what it is supposed to do when you want it to do it.

**Features – 4.5 out of 5**
AirPlay is genius; other features are fantastic, too. There are a few I would still like to see added, but I am too busy playing with Netflix and AirPlay to care right now.

**Design/Appearance – 5 out of 5**
They got it right: no big bulky device with a wall-wart, this is sleek, simple, hidden and sufficient.

**Overall rating – 4.75 out of 5**

*This is pretty close to perfect. A few features still need to be added to round it out, but please, go out and buy one now. You will thank me later.*

## ❖ The Set-up

I have set up many devices to connect to my home-theater system and to my wireless network, but as yet, I hadn't combined a device with both of them. I was a bit apprehensive that this might be a complicated process, but Apple once again has made it relatively painless.

I started with my HDMI cable plugged into the back of the Apple TV device. From here, you decide where you want to send the Apple TV signal. If you are running all of your devices through just your HDTV, you can just plug it into

one of the HDMI inputs on your television. If you are using a surround sound receiver, use one of the HDMI inputs there.

I had to improvise a little. My surround sound receiver's inputs were all full, but I wanted to still route audio from Apple TV through my surround sound (there is some Dolby Digital 5.1 audio to be found on Apple TV). So I plugged the HDMI cable from Apple TV into one of the inputs on my television, then used the fiber optic output from the TV into one of the fiber optic inputs on my receiver. I include this information, knowing that many receivers have only three HDMI inputs. If this is the case with your system, the above workaround works splendidly.

Once everything was plugged in, all I had to do was tell Apple TV how to connect to my wireless network. Doing so is relatively easy if you have any experience in entering text through a remote control or other non-keyboard interface. Once you have set up your wireless network and you are connected, you can begin to enjoy all that Apple TV has to offer. Once you get everything set up, you can also use the Apple Remote App on your iOS device, which allows you to type text in on the touchscreen keyboard.

## ❖ The Performance Test

There are so many features within Apple TV, that you could literally write an entire book to discuss them at length, so I won't even try. I will begin with Internet Radio, since that is the aspect of Apple TV that will most likely interest our readers.

If you have any experience at all with the streaming radio content on iTunes, then the Apple TV Internet Radio experience is going to be a breeze for you. You simply go to the main menu, select 'Radio' under the 'Internet' option and then select the genre for which you would like to find a station. If you have set up your favorites in iTunes using your iTunes account, you should be able to access them on Apple TV as well.

While there are a large number of Internet-only and a good number of terrestrial broadcasters on iTunes, it is by no means comprehensive. Wouldn't it be great if you could use your favorite iOS internet radio app to stream radio stations from your device through Apple TV? Well, you can, and this is because of one of my favorite features of Apple TV – AirPlay.

AirPlay allows you to stream content from your iOS-enabled device (iOS 4.2 or higher) through Apple TV, as well as music and videos from iTunes. Many media apps available on iOS devices now have the ability to stream their content through AirPlay; just look for the AirPlay logo (it looks like a box with a pyramid in the middle). Many of the popular media apps have AirPlay capability now, including Pandora, TuneIn, YouTube, iHeartRadio, and more.

So, if you find the iTunes Internet Radio station list to be inadequate, have no fear, your iOS device with your favorite Internet Radio app is ready to save the day.

Other than AirPlay, you will also find Apple TV packed with a ton of other worthy features. I had avoided Netflix for years until I tried the free one-month trial. I now gladly pay the $7.99 per month fee for unlimited streaming through my iPhone, my PC and Apple TV. There are also movies and TV shows through iTunes, podcasts, NBA/MLB games, Flickr photo sharing, and a lot more.

A few minor things came up in performance testing. Every once in a while, the audio and video will lose sync. The fix for this was simply pausing the content, rewind slightly, and resume the program. Also, there would occasionally be a hiccup of digital noise or buffer issues when streaming video, but this, too, was rare. Other than this, my experience with Apple TV over the past six months has been virtually bulletproof.

As an Internet Radio streaming source, the combination of streaming my apps through AirPlay makes this invaluable and definitely the easiest way to stream Internet Radio through my surround system.

## ❖ The Final Word

Apple TV hasn't quite reached the end-all-be-all convergence of my media and entertainment world status just yet, but it is getting there.

Once Apple opens up the ability for me to stream any audio or video content from my computer or mobile device – and once there is somehow a combination of a gaming system, satellite/cable television package and App-based content – then Apple TV will take its place as the most necessary device in your home next to your TV, phone and computer.

As it stands, Apple TV is pretty much a necessity in my home. I watch YouTube videos and Netflix on it constantly, using my iPhone 4 as my remote control. I stream music directly from my iPhone or even my iMac (where I have access to 10,000+ songs I have stored) so I can listen through my surround sound to my favorite tunes. I stream audio from my scanner apps and my LiveATC app; even my amateur radio EchoLink conversations take place with AirPlay and my Apple TV.

I recently even took it with me on a trip so I could connect it to the hotel WiFi network and watch movies in my hotel room through Netflix without paying the hotel extra for them.

If it seems like I didn't have to explain a lot about the interface, it is because I really didn't. Using it is simple and intuitive. Any questions you might have are easily answered by the set-up guide. Plus, the real bonus of Apple TV is interfacing your iOS device with your home theater system using AirPlay.

So, if you are wanting to combine streaming audio or video from your iOS device or computer with your home entertainment system, I cannot stress how much easier Apple TV makes everything. For $99 USD, I cannot think of a more practical and useful device to add to your home entertainment system.

Apple TV can be purchased through online retailers like Amazon.com, or directly from any Apple Store or the Apple Web site.

## WEBSITES

Apple TV - **www.apple.com/appletv/**
Apple TV in the Apple Store - **http://store.apple.com/us/browse/home/shop_ipod/family/apple_tv?mco=MTM3NTM1Nzk**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# What's NEW

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*Larry Van Horn, New Products Editor*

## AirNav Live Flight Tracker 8 Released

Have you ever wondered whether it is possible to track in real time any flight over Europe, North America and other regions of the world?

If your answer is yes, then a new version of AirNav Live Flight Tracker might be of interest to you. Live Flight Tracker is the only flight tracking application that integrates flight data from the FAA Radar Systems (ASDI) and AirNav Systems worldwide Mode-S/ADS-B network, resulting in an average of 7,000 flights being tracked worldwide.

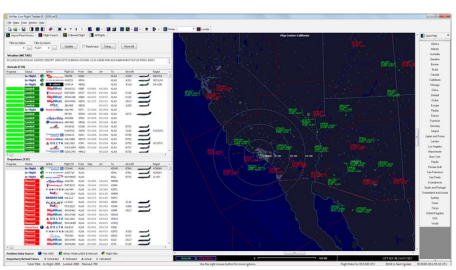
Some of the features of this new version include:

- New graphics and user interface.
- All airline and general aviation flights included: Allows the user to track blocked flights.
- New flight data source information.
- Allows the user to check aircraft registration.
- Optimized flight data processing routines.
- Auto detects your location.
- Automatic airport weather information / Real-time weather (METAR).
- Auto save of all application settings.
- Based on AirNav's robust RadarBox software technology.
- Different colors displayed for different flight stages.
- More frequent screen updates.
- Data Sources United States ASDI and RadarBox Worldwide Mode-S/ADS-B Network (Professional Edition can track flights using Flight Plan).
- FleetWatch Fleetwatch: monitor your fleet status H24.
- ADS-B Fully prepared for ADS-B NexGen technology – integrates ADS-B information.
- Low bandwidth requirement / faster downloads of data

This new version has a simple interface that lets you move your mouse over any of the program maps and over the aircraft icons to see detailed flight information (flight number, origin, destination, aircraft, altitude, heading, speed, elapsed and remaining time).You will also see detailed airport and airspace information.

AirNav promotes that they have more than 30,000 users. These users include NOAA, NASA, IBM, Sanford Airport Authority, Calgary Airport Authority, Delta Airlines, Honeywell, US Coast Guard, DaimlerChrysler, TV and radio stations and hundreds of airports, small jet operators and travel related companies.

Software operating system requirements are simple – Microsoft Windows, any version and an Internet connection.



Below is the current pricing for this service.

- US Edition: All US/Canada flights: $59.95 semi-annually or $14.95 per month
- European Edition: European flights: 59.95 semi-annually or 14.95 per month
- Worldwide Edition: All flights in the system: 79.95 semi-annually or 19.95 per month
- Professional Edition: All flights in the system including access to blocked flights: $149.95 per month or $1299.95 per year (save 25%).

You can get more information on AirNav and all their products at **www.airnavsystems.com/index.html.**

## Debuted at Dayton 2011

This year we sent our intrepid *MT* reporter, Bob Grove, to Dayton to check out what was new at the biggest show on the amateur radio calendar – 2011 Dayton Hamvention. When he got home, Bob handed me a huge package of stuff. So here is a taste of Whats New from this year's Hamvention.

The biggest attention getter this year came from Elecraft and their new 1.5 pound KX-3 transceiver. The KX-3 is a 10-Watt (160 to 6 meter) rig with the option to add an external 100-Watt (KXPA100) amplifier. The receiver is software-defined with an I/Q output and is direct conversion. At press time there was no announced selling price, but Electraft says that ordering and shipping dates will be in the Fall-Winter of 2011. Check out **www.elecraft.com/KX3/kx3.htm** for more information on this product.

MFJ displayed their new six band QRP transceiver – the MFJ-9200. This 5-Watt CW rig covers 80 through 15 meters through the use of interchangeable band modules. The 9200 comes with one module (band is your choice), with additional modules available for sale at $29.95 each.

There's also built-in iambic keying with a manual-key sensor, a programmable CQ message, and seamless QSK T/R switching. DDS frequency control delivers rock-solid stability, precise 100-Hz readout, and eight memory channels per band. Plus, you get a choice of three main-dial tuning rates and RIT with 10-Hz tuning resolution.

MFJ-9200 runs on any power source between 8 and 15 VDC and draws a miserly 40 mA on receive with the display backlight turned off – perfect for prolonged off-the-grid adventures.

MFJ also offers a wide range of QRP accessories to compliment the MFJ-9200 QRPocket CW Transceiver™. The MFJ-9200 retails for $249.95 and you can get more details at **www.mfjenterprises.com/Product.php?productid=MFJ-9217**.

If you are interested in software defined radios, those were not in short supply and a couple of new items made it to Dayton. The WinRadio WR-G33DDC "Excalibur" made is Dayton debut (see our *MT First Look* Review in the November 2010 issue).

Excalibur's frequency coverage runs from 9 kHz to 50 MHz, and the WR-G33DDC boasts a frequency stability of 0.5 ppm and a dynamic range of 107 dB. It also offers a 50 MHz wide real-time spectrum analyzer with a waterfall display. You can get more information on this professional grade SDR on the Grove website at **www.grove-ent.com**.

SSB Electronics also debuted its new Perseus SDR software engine – V4.0a. You get details of all the new features included in this software package on the SSB website at **www.ssb.de/**.

If antennas are your thing, MFJ introduced the HyGain SPT-500, a 5/8 wavelength vertical antenna for 10 meters that sells for $59.95. If 20 meters is your band, MFJ also debuted a portable 20-meter dipole, the MFJ-2299, a 1/2 wavelength antenna comprised of two telescoping elements. It also sells for $59.95.

There were quite a few more products that Bob spotted at Dayton, but we just do not have room to run them all. But keep an eye on our *MT First Look* review column in the future for reviews on things Bob brought back from this year's Hamvention.

## New Icom Receiver Software Update Released

Icom has released a software update – Version 2.20 – for the IC-PCR1500/2500 and IC-R1500/2500 receivers which give the user a compatible Microsoft Windows® 7 package. The update can be found on the Icom Japan website at:

**www.icom.co.jp/world/support/download/firm/IC-R1500_PCR_R2500_PCR/2_20c/index.html**

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, *larryvanhorn@monitoringtimes.com*.

When ordering or inquiring about the products mentioned in this column, be sure to tell them that you saw it in the pages of *Monitoring Times* magazine.

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# to the editors

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## Digital TV Audio?

Hello, Ken,

I liked your article on the portable TV's [*April Beginner's Corner*]. As soon as they came out for DTV I bought one on sale. My main reason for the email was, did you happen to notice if anyone sells a radio with audio for the new DTV? I currently have some older 5 band radios I that have AM/FM/TV1/TV2/WX.

*Frank Barren KB3EJV*

Thanks for your comments, Frank. I'm afraid that the days of multi-band radios that include the audio from the TV band are a thing of the past. Unlike the old analog TV era where the audio was an FM modulated subcarrier of the VHF or UHF transmission, digital TV audio is part of the digital stream sent along with the picture. Any receiver capable of tuning the audio would be tuning the video as well, and the manufacturer would want to display that.

But, now that we have ever smaller portable TV sets, they're looking at the product from the other way around. I found this Access HD DTV portable set that has a built-in AM and FM radio. Since most DTV stations have a weather channel, you effectively have an AM/FM/WX/TV portable, but with pictures and radar screen to boot!

One other problem that such sets have that

analog sets didn't have is trying to lock on the digital signal from any distance away. The old analog radios could tune in the FM subcarrier's booming signal with ease; not so with DTV. And, you could run those old analog multi-band radios for weeks without worrying about the batteries. The new sets? A couple of hours at best.

*Ken KS4ZR*

## China and Russia

Hi, Fred,

I always enjoy your *MT* column, and your recent comments in the April issue got me to write. I've been listening to China's shortwave radio since it was Radio Peking in the early 1970's. Their content over the years has certainly changed! The strong communist and class-struggle was very dry, but so different from anything coming out of mainstream America. I tuned in to hear the wonderful Chinese folk music.

Nowadays, CRI has very little if any shows devoted this type of music. *China Drive* is the worst program on shortwave today. I cannot listen to it for more than a minute before I must tune elsewhere. The station has become so westernized that sometimes it's hard to distinguish it from our current western radio that's programmed a thousand miles away from where it is heard. I guess there's no turning back on this homogenization of world cultures.

I loved your story about your immersion in all things Russian. It must have been very interesting and a real asset when scanning the bands. I spent many hours listening to Radio Moscow (in English) and their slant on politics and culture. Alas, Russian radio has gone the way of CRI and made their radio shows sound like what they think the west wants to hear. Oh well, I guess I'm showing my age!

Keep up the great columns, Fred. Yours is one of the reasons I'm still subscribing to *Monitoring Times*.

*Rob Holman*

Hi, Rob,

Thanks so much for your kind note and feedback on my column. It's much appreciated.

I think we see things about the same...so many international broadcasters (and now netcasters) seem to think we want to hear exactly that which we can hear on this side of the world, but it's not true. What made/makes them unique is stuff that we cannot hear here. Sadly they all want to be clones of US/Canadian broadcasters. Pity.

There was something almost "naughty" about listening to ideological foes during the Cold War. I kind of miss those days. Kind of. Whether CRI and Voice of Russia in 2011 are an accurate reflection of their countries is the 64 dollar question and makes them worth listening to.

*Fred*

## One More Museum

Howdy, Ken,

I note that every article I see in magazines about radio museums seems to miss the ONE that I have personally seen and been boggled by: **www.pavekmuseum.org/**

This one absolutely blew my mind in about 1998, while I was in Minneapolis for a summer meeting (and training workshop) of a national committee of transportation radio frequency coordinators (for AASHTO). I wailed and moaned and gnashed my teeth that I did NOT have a digital camera for the event. I saw stuff so rare that I thought I would never see its equal, only to see several variants in addition to the one I'd seen in the past.

It had original tape recorders for the Bing Crosby Show that had been brought over from Germany, ancient TV receivers with mirror lids, a whole broadcast station studio set up, an original Theremin from the '30s, whole wall segments devoted to various models from different manufacturers, military equipment, etc.

And for a treat, the guide led us into another area of about the same size of the museum, where they not only stored possible exhibit materials donated, but we got to talk to the 70+ year old tech who was working on bringing equipment up to a display or example state of working! It was a few bucks well spent and an afternoon to remember.

Enjoyed your article. I hope to one day get to visit more museums of radio lore.

*Rick Herndon K5FNI, retired AASHTO radio frequency coordinator and radio engineer*

Hi, Rick,

Thanks for the "up close and personal" account of your visit to the Pavek Museum. I hope other *MT* readers will get the chance to do so this summer as well. The Pavek Museum did appear in the article, listed as "Museum of Broadcasting," though its web site is called **www.pavekmuseum.org**. Hours, directions, admission, etc. are also in that listing. The museum was also listed in last year's *MT* radio museum guide, again listed as it is named. Hope you enjoyed last month's semi-annual vintage radio special with its eye-popping collection of some of the most colorful radios ever made.

(Courtesy: Pavek Museum of Broadcasting)

One final note, I did manage to misplace the Antique Wireless Association Museum, which several readers were kind enough to point out. Our own Kevin Carey noted that the address is 8 South Avenue East Bloomfield, NY 14443.

*Ken KS4ZR*

***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***

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***Rachel Baughn, Editor***

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*These blogs and web pages were created by some of our columnists to better serve their readers. While we highly recommend these resources, they are not official instruments of Monitoring Times.*

AMERICAN BANDSCAN
**http://americanbandscan.blogspot.com/** - by Doug Smith

ANTENNA TOPICS
www.wa5vjb.com - by Kent Britain

BELOW 500KHZ
**http://below500khz.blogspot.com/** - by Kevin Carey

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