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Monitoring Times®

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11th Annual Air Show Issue

Volume 29, No. 3
March 2010

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It's Show Time!

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In this issue:

- Which scanners work best at the show, which don't
- Deciphering Air Band Chatter
- CQ at 51,000 Feet and 565 MPH

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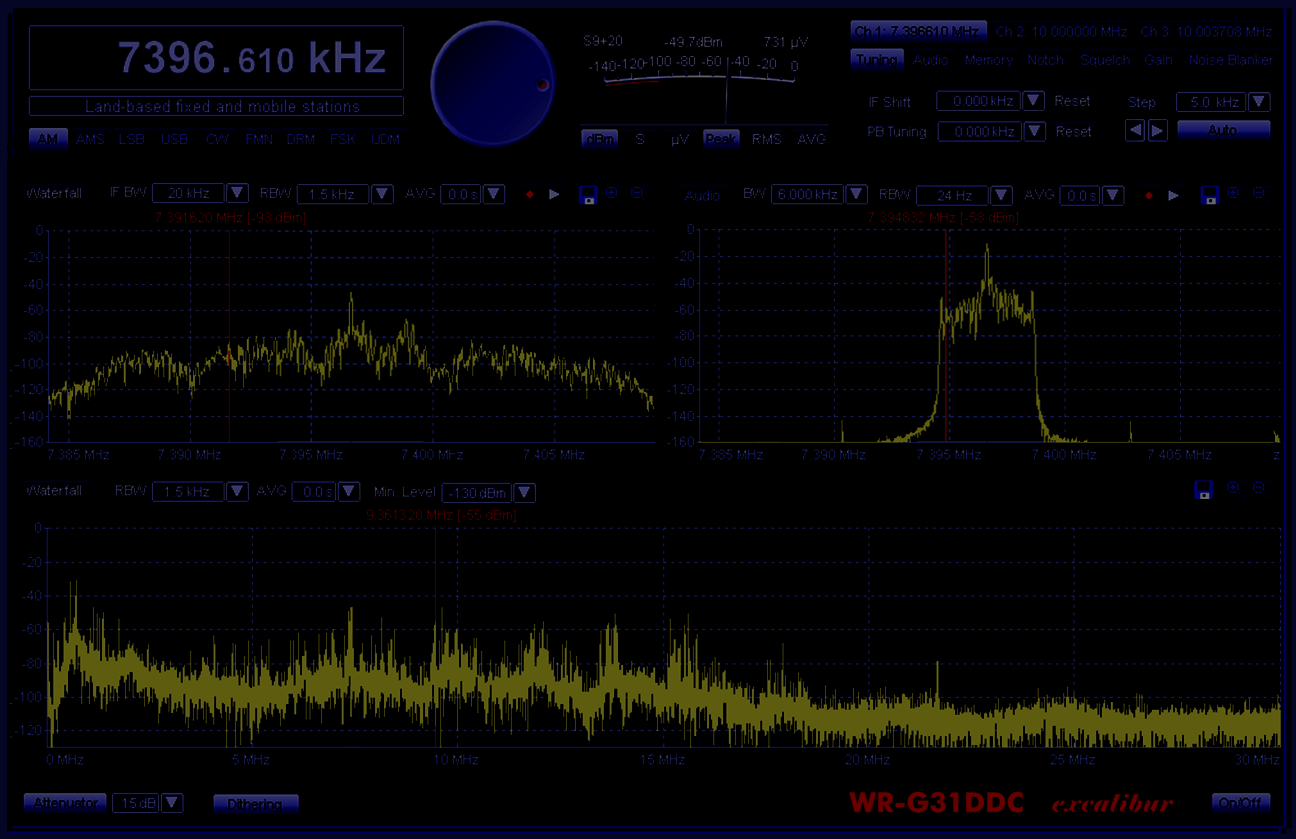

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Monitoring Times

Vol. 29 No. 3 March 2010

Monitoring the Air Show Experience:

The 11th Annual Air Show Guide

By Larry Van Horn N5FPW

This month *Monitoring Times* kicks off the 2010 air show season with its 11th annual air show guide. *MT* Assistant Editor and Milcom specialist, Larry Van Horn, gives you the inside information on the hottest frequencies for the whole season.

While everyone else at the air show is just watching, you'll be able to hear what's happening inside the cockpit, up in the tower, and on the ground with the hundreds of players that keep these screaming, state-of-the-art air machines thundering through the skies.

But, there's more to see and hear at air shows than the Birds and the Blues. Dozens of other precision flight teams, skydiving teams and vintage aircraft crews are in the air and *on the air.* Larry gives you the frequencies for them all!

On Our Cover

Top left: Canadian Snowbirds in a tight nine-plane formation. Top right: Two U.S.A.F. Thunderbirds. Bottom left: No margin for error as the Blues define the term "tight formation." Bottom right: F-15E Strike Eagle 1 torching the tarmac at an air show. (All photos courtesy: Don Edwards)

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R E V I E W S

MT XPRESS

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Subscription Questions?
belinda@grove-ent.com

Owners
Bob and Judy Grove
judy@grove-ent.com

Publisher
Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Managing Editor
Rachel Baughn, KE4OPD
editor@monitoringtimes.com

Assistant and Reviews Editor
Larry Van Horn, N5FPW
larryvanhorn@monitoringtimes.com

Features Editor
Ken Reitz
kenreitz@monitoringtimes.com

Art Director
Bill Grove

Advertising Svcs.
Beth Leinbach
(828) 389-4007
bethleinbach@monitoringtimes.com

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First Departments

Getting Started

You may contact any *MT* staff writer by email by combining their ***first and last name @ monitoringtimes.com.*** By postal mail, you may write them in care of *MT* Headquarters in Brasstown. Please enclose a self-adressed, stamped envelope if you wish the columnist to reply.

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Technical Departments

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COMMUNICATIONS

by Ken Reitz

AMATEUR RADIO/SHORTWAVE

Radio Response to Haitian Quake

The devastating earthquake that hit Haiti in mid-January brought quick reaction from the amateur radio community. With cell towers down, land lines destroyed and power to commercial stations limited, ham radio was among the first to report the scale of destruction to the outside world. John Henault, HH6JH, a priest in Port Au Prince, operating on emergency battery power, was said to be the first to describe the aftermath of the earthquake. Amateur operations received widespread coverage in U.S. media because of its first-responder role.

The Salvation Army was quick to set up HF operations when their Salvation Army Team Emergency Radio Network (SATERN) took over 14.265 MHz in the 20 meter ham band. Other frequencies on 40 and 80 meters, to cover the area during nighttime propagation, were also established. The International Assistance and Traffic Net (14.300 MHz), normally handling maritime traffic throughout the Atlantic, Gulf of Mexico and Caribbean, was also available for emergency traffic.

Destruction following the earthquake in Haiti. (Courtesy: SATERN)

The extensive Haitian community in the New York City metro area turned to a number of area radio stations for the latest information on the disaster in French and Creole, though some programming was also heard in English. Most of these stations are subcarrier authorization (SCA) broadcasts, identified incorrectly in some media reports as pirate radio stations, which have been on the air serving the local Haitian community for years. Among them are Radio Optimum and Radio Pa Nou, both from Brooklyn, New York and Radio Éclair on Long Island.

Florida's estimated 500,000 Haitians had a variety of AM/FM, SCA and on-line stations to tune into during the crises, including Radio Haiti Tropicale (Orlando); Radio Ideal FM (Ft. Lauderdale), and Radio Independence (Ft. Myers). Listeners found solace among those calling-in to express their concern about the health and welfare of family members in the aftermath of the quake.

Salvation Army Haiti Divisional Commander Major Lucien Lamartiniere (left) speaks with Disaster Services Director Bob Poff (right). (Courtesy: Salvation Army)

Radio Prague Bemoans End of SW

An extensive article on the Radio Prague web site (**www.radio.cz/en/article/124187**) provided a sober analysis of the future for shortwave broadcasting from the point of view of Radio Prague. Part of the analysis is that energy costs and a dwindling audience, seeking newer, more reliable reception (Internet streaming, podcasting and satellite radio, for example), have conspired to make shortwave broadcasting more expensive and thus, less cost effective, than ever. The article explained that statistics gleaned from the Radio Prague web site show that some 500,000 podcasts are downloaded from their website monthly while it has no way of knowing how many people are listening to their shortwave broadcasts at anytime.

Radio Evangelist Sentenced to 175 Years

A number of news outlets, including the *Associated Press* and the *Kansas City Star* reported last November the sentencing of radio evangelist Tony Alamo, whose ministry programs had been widely heard, according to his ministry web site, on U.S. AM outlets as well as shortwave stations WWCR and WINB. Alamo was convicted on sex charges relating to underage girls and sentenced to serve 175 years in a federal prison. In mid-January a federal judge ordered the 75 year-old preacher to pay each of his "teen brides" one-half million dollars each, though the government had sought $2.7 million apiece. Alamo remains in prison pending an appeal on the original conviction while his ministry, according to his web site, remains quite active.

PIRATE RADIO UPDATE

The lure of unlicensed broadcasting is universal, with an uncountable number of pirate radio stations staking out frequencies on the FM band all over the world. The complaint among pirate broadcasters is nearly universal: limited access to the band creates money-making monopolies that don't reflect the communities they're licensed to serve, regardless of which country that may be.

One way to defy the licensing system is to put a signal on the air without a license. The risk is that government powers will shut down such operations and participants will be faced with heavy finds and/or jail. But, in the U.S., jail time is rarely imposed and fines, when levied, are often reduced. Additionally, FCC enforcement apparatus, stretched thin in budget and personnel, works at a very deliberate pace. FM pirates may operate for years before the first warning letter, a Notice of Unlicensed Operation (NOUO), is issued.

Most U.S. FM pirates enjoy apparent immunity, that is, until agents of the FCC show up at the door asking questions. But, some pirate broadcasters don't get the kid glove treatment, instead, the FCC sometimes shows up with heavily armed local police units and the pirates are forcibly arrested.

It may seem that the FCC prefers to tackle FM pirates while leaving HF pirates alone. But, FM pirates are targeted because they, unlike their shortwave counterparts whose transmissions are relatively short and harder to locate through direction-finding techniques, often operate around the clock and just as often with announced addresses. So, they're the proverbial low hanging fruit.

Even worse for FM pirates, their signals often interfere with legitimate broadcasters who waste no time filing complaints with the FCC. Still, inexpensive and easy to operate FM transmitters of 100 watts or more are widely available and sold daily on the Internet. In other words, FM piracy in the U.S. is spreading considerably faster than the FCC can possibly cope. What follows are five recent stories of pirate radio operations around the world.

3,000 Spanish Pirate Stations Targeted

Andy Sennitt reported on his *Radio Netherlands Worldwide blog*, Media Network (**http://blogs.rnw.nl/medianetwork**), that Spain's State Radio Communications Agency will look into the operations of some 3,000 unlicensed FM broadcasters said to be operating throughout Spain. According to his report, pirate broadcasters outnumber licensed radio stations in some areas by as much as three to one. The agency will attempt to close 482 stations in the Canary Islands alone. These stations are said to be mostly English broadcasters catering to vacationing Brits, but crowding out licensed Spanish language broadcasters.

IC & RCMP Pull Plug on Teenage Pirate (Literally!)

Several Canadian media sources reported in December the antics of a teenage boy who was operating his own pirate FM station in the Ottawa area and attracting a lot of listeners with a reported Effective Radiated Power (ERP) of some 3,000 watts. After receiving a letter to cease broadcast operations from Industry Canada (I.C., that country's broadcast licensing body) the youth did so, but cranked up the transmitter again on Christmas Eve. Following receipt of another such letter, the station went silent again. By January 15, the kid was once more at it, but this time IC had heard enough. With the assistance of the Royal Canadian Mounted Police, the station was raided and the broadcast equipment was removed. Well, they found the antenna, but had trouble locating the transmitter. The station is currently heard only on the Internet, but, the youngster had vowed to return to the air one way or another.

Taiwanese Government *v.* FM Pirates

A report in the *Malaysian Insider* decried the existence of "underground" unlicensed FM radio stations in Taiwan that peddle "dubious drugs and extreme political views." According to the report, drugs believed to combat a variety of ailments are offered through on-air advertisements. The article noted that there could be as many as 200 illegal stations on the air in the island nation just off mainland China that has only 174 licensed stations. Profits of the pirate stations are said to be so great that operators can afford to pay the fine, roughly $1,900 (U.S.), and stay on the air.

FCC Cites Rare AM Pirate

A Boston area man was issued an NOUO by the FCC January 7, for illegally broadcasting on 1580 kHz. The man was apparently operating the station out of his place of business with a signal FCC agents measured at 350,000 microvolts/meter at 46 meters. The maximum allowable signal for a Part 15 (unlicensed transmitter) is 15.19 microvolts/meter at 30 meters. Legitimate Part 15 operators using FCC approved FM transmitters have an output of 100 mW and an effective service range of about 200 feet (61 meters). The NOUO is a warning to close illegal broadcast operations or face a fine and/or imprisonment.

C.Crane's FM transmitter, a true Part 15, FCC certified, 100mW FM transmitter. (Courtesy: C. Crane)

Three Bronx FM Pirates Nabbed

In the pirate broadcast industry there has to be a certain cachet in being the year's first FM pirate to be busted by the FCC. According to FCC documents, for 2010 that honor goes to an operator out of Bronx, New York, who received an NOUO for operating on 91.3 FM with an output measured at 7,280 microvolts/meter at 639 meters. One other Bronx operator was similarly busted for operations on 107.3 FM and a third was issued a Notice of Apparent Liability of Forfeiture (NAL) for an early NOUO and also operating on 107.3 FM. The fine was set at $10,000. Two Brooklyn residents were jointly hit with a separate $10,000 NAL. In the first eight days of January, the last official filing before this issue went to press, seven FM pirates were busted by FCC agents.

AM/FM/TV BROADCASTING

FCC Stalled on OTA Giveaway

Last month in this column it was reported that the FCC, egged on by wireless broadband interests, was considering taking spectrum space away from Over-the-Air (OTA) TV and delivering it to those broadband interests for commercial exploitation. The ever-hungry broadband lobby claims it will need 800 MHz worth of space and, since all of broadcast TV occupies only 300 MHz, taking over OTA will be just the beginning. But a coalition of some 226 TV stations, according to an article on *Television Broadcast.com*, has filed a response asking the FCC to study the issue more closely. The FCC had been given a deadline to devise a coherent national broadband plan by February 17, but has since asked for a one month extension on that deadline.

LG Introduces Mobile DTV Receiver

After 3D movie technology, portable digital TV reception was all the rage at January's Consumer Electronics Show (CES), the annual geek-fest where public relations people run wild and production specialists run behind them explaining why the products promoted by the PR people are delayed to market. Still, LG Electronics' small DTV receiver is likely to be a product you'll end up buying before the year is out, especially if you live in a Gulf coast state prone to hurricane excitement. With the shift to digital TV last year, reception of DTV signals on portable TV sets was difficult and the old method of listening to the analog audio on a TV audio portable radio disappeared forever. LG's larger DP570MH portable DTV with integrated DVD player (pictured) will cost $249.

LG Electronics portable and mobile digital TV receiver. (Courtesy: LG Electronics)

PUBLIC SERVICE

FL Scanner Listeners Being Shut Out

A report in *Florida Today* looked at current moves statewide by public service agencies to shut out legitimate scanner listeners so that criminals, who might use scanners, won't be able to follow police activity. The article noted that at issue are American citizens' rights to monitor the goings on of their taxpayer-funded public servants using their taxpayer-owned airwaves in pursuit of protecting the lives and property of those same taxpayers. Meanwhile, police agencies would like to keep much of what they do under wraps for fear that criminals may take advantage of something they hear over a scanner. The article pointed out that it is illegal, and has been for some time, for Florida residents without an amateur radio license, to have a scanner mounted in a vehicle. The article also quoted the Palm Bay police chief as doubting that there would be wholesale encryption of scanner frequencies. He noted that there's a great value in the public's knowledge about accidents or natural disasters such as hurricanes.

FCC: No More 700 MHz Wireless Mics

In an effort to clear the vacated 700 MHz band for eventual use by public safety entities, the FCC has banned the use of wireless FM microphones in that band as of June 12, 2010. Details on the move may be found at **www.fcc.gov/cgb/wirelessmichrophones**. One company, Shure, which had been selling such products, has been offering rebates in a program that ends June 30, 2010. Details on that program may be found at **www.shure.com/700**.

Cell Phone Dummies on Parade

So many stories are received every month at the *Communications* desk regarding inept criminals, who are forever leaving their cell phones at the scene of the crime, that one regular contributor sends these reports under the subject heading *cell phone dummies*. Here are just two cases in point:

Recently, Ohio police were able to use the built-in GPS system in a stolen phone to track the criminal who stole the phone. According to a report in the *Cleveland Plain Dealer*, police have been using cell phone technology to trace the location of a person using a cell phone for more than ten years. But, in those instances, cooperation from the phone service provider has to be secured and the target's phone must be on. Now, with the advent of GPS embedded technology, that job just got a whole lot simpler.

In January, an alleged car burglar in Puerto Rico was caught after he inadvertently left his cell phone behind at the scene of a car he was said to have been burgling. The article in the *San Juan Monitor* noted that the culprit was linked to other similar crimes through his cell phone and, when apprehended, he was (oops!) carrying several bags of cocaine in his pockets.

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

photo credit: Don Edwards

Monitoring the Air Show Experience: The 11th Annual MT Air Show Guide

By Larry Van Horn, N5FPW, MT Assistant Editor

If the bits of radio chatter in the box below sound familiar to you, chances are you have monitored the exciting communications transmitted by the U.S. Navy Blue Angels at a military air show in the recent past. And, nothing will stir up the milcom monitoring enthusiast's juices more than those two magical words: Air Show!

Responding to a survey, recently conducted on my blog (**http://mt-milcom.blogspot.com**), military radio hobbyists around the world have said that high on their list of favorite monitoring activities is monitoring air show communications.

Every year, from March through November, millions of people hit the road to watch the excitement and thrills as military and civilian aero teams put their high performance aircraft through their paces to entertain the crowds and perform at air shows all over the world. In recent years, with better radio equipment, monitors have added a new dimension to the sights and sounds of the show: communications from the cockpits of the performers.

What started out as an answer to a question by an *MT* reader of the Milcom column eleven years ago has grown into one the most eagerly anticipated features in this magazine, with good reason. *Monitoring Times* not only gives you the frequencies to monitor, but you also get our recommended list of radio equipment, and the major military flight demonstration team schedules for the upcoming air show season.

Now it's time again to pack up the radio wagons, charge up the batteries, and get ready for a new season of thrills. Here's your 11th edition of our annual Monitoring Times Milcom Air Show Guide.

Where do you hear the action?

From time to time, frequencies for air show teams do change, by design or need, so it's important to know where to search for potential new frequencies. When the U.S. Navy Blue Angel flight demonstration team made some major changes back in 2004, seasoned veterans knew the right bands to scan, looking for the new frequencies being used. In 2008, we saw major changes in the VHF frequencies used by the famed U.S. Air Force Thunderbirds. Again, thanks to veteran monitors who knew where to listen, we were the first to report the frequency changes used by the boys in Blue during their aerial performances.

You can make the most of your air show visit by doing the same thing that the milcom veterans do. If you concentrate on the frequency bands listed below, you should be able to locate most air show activity at the show you are attending. All frequencies in this article are in MHz unless otherwise indicated.

"A little more pull, a little power. Standby boards…boards!"

118.000-137.000 - 25 kHz search steps (AM mode) Note: We have reports of some new air show activity in the new portion of the civilian aero band – 136-137 MHz. Be sure to check out this frequency range out for both civilian and military demo aircraft communications.
122.7000-123.5750 - 25 kHz search steps (AM)
138.0000-144.0000 - 12.5 kHz search steps (AM/Narrowband FM)
148.0000-150.8000 - 12.5 kHz search steps (AM/NBFM)
162.0000-174.0000 - 12.5 kHz search steps (NBFM)
225.0000-380.0000 - 25 kHz search steps (AM)
380.0000-400.0000 - 12.5 kHz search steps (NBFM)
406.1000-420.0000 - 12.5 kHz search steps (NBFM)

U.S. Navy Blue Angels

The premier U.S. Navy/Marine Corps military flight demonstration team on the air show circuit is the Blue Angels flying their F/A-18 Hornet aircraft. The team is home based at Forrest Sherman Field, Naval Air Station Pensacola, Florida. However, the squadron does spend January through March each year training pilots and new team members at the Naval Air Facility in El Centro, California.

During their performances, the Blue Angels exhibit the skills possessed by all naval aviators. These include the graceful aerobatic maneuvers of the four plane diamond formation, in concert with the fast paced, high performance maneuvers of the two solo pilots. At the close of every show, the team illustrates the pinnacle of precision flying, performing maneuvers locked as a unit in the renowned, six jet delta formation.

The Blue Angels are scheduled to fly 67 air shows at 35 air show sites in the continental United States, Alaska and Hawaii during the 2010 season, as the team celebrates 24 years of flying the F/A 18 Hornet. Since its inception in 1946, the Blue Angels have performed for more than 457 million fans.

The other major piece of flying hardware in the squadron is their C-130T Hercules transport aircraft, affectionately known as "Fat Albert Airlines." It is the only Marine Corps aircraft permanently assigned to support a Navy squadron and is flown by an all Marine Corps crew of three pilots and five enlisted personnel. Fat Albert Airlines flies more than 140,000 miles during the course of a show season. It carries more than 40 maintenance and support personnel, their gear, and enough spare parts and communication equipment to complete a successful air show.

Towards the end of last season it was confirmed that 2009 was the last year of the Jet Assisted Take-Off (JATO) for the Fat Albert Airlines C-130 aircraft. Fat Albert JATO take-offs have been a tradition for the Blue Angels since November 22, 1975.

After coping with a multitude of changes during the 2004 season, the 2009 season was relatively stable in terms of frequency for this team. The UHF frequencies monitored during last season are listed below.

Blue Angel Frequencies

Frequency	Usage (AM mode)
-------	Pensacola (KNPA) frequencies <Channels 1-7>
-------	Team frequencies <Channels 8-10>
-------	Show Site frequencies <Channels 11-15>
-------	Team frequencies <Channels 16-18>
-------	Unknown <Channels 19-20>
237.8000	Solos when not in the show box <Channel 8> Also used for cross country air-to-air.

251.6000 Unknown usage, heard at air show in the mid-west US
255.2000 Circle and arrivals discrete <Channel 17> Also used for cross country air-to-air.
275.3500 Diamond when not in the show box <Channel 9> Also used for cross country air-to-air.
284.2500 Show Box - Diamond/Solos/Delta <Channel 16> Also used for cross country air-to-air.
289.8000 Aerial Refueling (during cross country trips)
305.5000 Fat Albert "Bert" Primary/Solos (West Coast)/Maintenance Officer <Channel 10>
305.9000 Fat Albert "Bert" *New* for 2009 – Heard during San Francisco Fleet Week/Pensacola homecoming show (no 305.5000)
346.5000 "Checklist Freq" – Pre-show checklist, ground start/roll out and maintenance <Channel 18>

During the 2005 show season, the Blues started using a new communications cart "comcart" for ground communications. The frequencies that have been reported include:

142.6125 Tower Spotter <Alpha>.
139.8125 Maintenance Crews <Bravo>
141.5625 Usage Unknown <Charlie> First reported in 2007 and monitored in 2009 on the West Coast

Although we believe that the older 162.0-174.0 MHz Blue Angel FM LMR "comcart" frequencies may no longer be in use, I have not deleted them from this list, since we continue to receive some sporadic reports that some are being heard at select air shows (especially on the West Coast). We also had a field report this last year at a mid-west air show that 169.400 MHz might have been used by the Blues for ground operations. More reports will be needed to see if any of the frequencies in boldface in our list below are still in use by the team.

I encourage those of you with Signal Stalker® and Close Call® capability to include the various government and military LMR bands mentioned previously in your scan profiles to find any additional frequencies that may be used by the team's ground crews.

Other Possible Blue Angels Frequencies

Maintenance/Ground communications [Old communications comcart/ground frequencies] (NBFM)
163.0000 164.9000 165.2250 167.5000 167.8000 168.9000 169.4000 170.9000

Previously used UHF frequencies that have not been reported in recent years (AM)
236.4500 249.6250 250.9750 (Diamond first heard in 2008, but not reported in 2009) 254.5000 256.2500 262.8500 263.3500 264.3500 264.5500 265.0000 273.3000 286.0000 289.9000 (aerial refueling) 299.6500 302.1000 (Fat Albert Secondary) 302.1500 307.7000 381.0000

U.S. Air Force Thunderbirds

The premier U.S. Air Force flight demonstration team is known as the Thunderbirds.

P-51 Mustang "Glamorous Gal" (Courtesy: Don Edwards)

2010 marks the 57th season that the T-Birds have performed air shows and this year they will conduct more than 65 shows in 27 States and Canada. They will perform formation flying and solo routines during each performance.

Like the Blue Angels, the four aircraft diamond formation demonstrates the training and precision of Air Force pilots, while the solos highlight the maximum capabilities of the F-16. The pilots perform approximately 30 maneuvers in a demonstration. The entire show, including ground and air, runs about an hour and 15 minutes.

The Thunderbirds recently completed a swap of their older F-16 Block 32 Fighting Falcon aircraft for more advanced and powerful F-16 Block 52 airplanes.

During the 2008 air show season, we noted a host of new VHF frequencies used by the team and published them in last year's guide. Several of the older standard frequencies have apparently been abandoned in favor of these new VHF frequencies. More than likely these new frequencies are a result of the new band plan being implemented by the Department of Defense (DoD) in the 138.0-144.0 and 148.0-150.8 MHz bands. I have compiled a separate list of the older frequencies and included them in this year's guide in case the active frequencies below aren't used. They might revert back to some of the older frequencies from time-to-time.

I have also had several readers last year ask about who is using the Thunderbird 14 callsign. This is normally used by an Air Mobility Command transport aircraft carrying the team maintenance/ground crew personnel and their equipment to the various shows. In 2009 this was typically a C-17 aircraft.

USAF Thunderbird Actively Reported Frequencies

Frequency Usage
139.8000 Diamond formation <Victor 2> (AM)
139.2250 Diamond formation <Victor 1> (AM) Noted at a West Coast air show
140.7000 Diamond formation <Victor 1> (AM)
141.0750 Diamond formation <Victor 1> (AM) Appears to be the primary VHF frequency used in 2009.
143.7000 Diamond and Delta formations <Victor 1> (AM)
148.1250 Diamond formation <Victor 1> (AM)
225.1750 Thunderbirds <Uniform 1> (AM)
235.2000 Thunderbird Control/ComCart (AM) Also used for cross country air-to-air.
235.2500 Pre-Engine Start and Solo aircraft on/off show center/ linked to PA system (AM) <Uniform 1>
322.9500 Engine Starts/Solo aircraft (5-6) Air-to-Air (AM) <Uniform 2>

Maintenance/Ground teams (NBFM)
216.7250 Announce PA feed - Music and show narration <Channel 55>
216.9750 Team air show frequency feeds/mix – air-to-air simulcast <Channel 60>
413.2750 Ground Maintenance/MOC/Public Affairs – Analog (DCS 431)
413.3250 Ground Maintenance – Analog (DCS 503)
413.3750 Ground Maintenance – Analog, monitored in Hawaii
901.5000 Comm Cart Headset
905.3500 Comm Cart Headset

Previously reported frequencies used by the team are listed below. If you hear any of these frequencies in 2010, please contact us at our email address listed in the Milcom column masthead.

140.4000 Support Operations. (AM) Also used for cross country air-to-air.
141.8250 Alternate Diamond <Victor 2> (AM)
141.8500 Diamond formation linked to PA system <Victor 2> (AM)
142.1750 Appears to have been replaced by the 413 MHz ground frequencies noted in our list above. (NBFM)
142.5750 Program audio/Air-Ground communications (NBFM)
143.2500 Pre-Engine Start (AM)
143.8500 Reported cross country frequency in the southern U.S. <Victor 1> (AM)
143.9000 Appears to have been replaced by the 413 MHz ground frequencies noted in our list above. (NBFM)
148.8500 Alternate Diamond <Victor 2> (AM)
150.1500 Alternate Diamond <Victor 2> (AM)
216.7750 Announce PA feed - show narration <Channel 56>
235.0250 Unknown usage (AM)
413.0000 Ground Communications (P25)
413.0250 Ground Communications (Analog channel 1)
413.1000 Ground Communications (Analog channel 2)
413.2500 Ground Communications (Analog)
413.3500 Ground Communications (P25)
413.3750 Ground Communications (P25) only analog reported on this one recently

Thunderbirds (Courtesy: Don Edwards)

We have recent reports that frequencies around 216 MHz are being used by the T-Birds. These are being transmitted using Comtek gear and are interesting to monitor from the unit "comcart." You can get a complete Comtek band plan for that frequency range in our online resource guide in this month's Milcom column. If you don't hear the comcart on the frequencies that I have identified above, do a scanner search using the frequency chart listed in the Comtek document I mentioned above.

Other US DoD Military Flight Demo Teams

In addition to the Blues and T-Birds mentioned above, the Navy and the Air Force also have other units that perform at civilian and military air shows and flyovers nationwide. In addition, other branches of the DoD use a wide variety of VHF and UHF frequencies during air shows. We have compiled a list of possible VHF/UHF frequencies to program in a separate bank of your scanner to aid in looking for this other activity.

VHF (AM mode)
138.1500 138.2000 138.2500 138.5000 138.5500 138.5750 138.6000 138.6250 138.6750 138.7500 138.8250 138.9500 139.0000 139.2250 139.3000 139.5250 139.6000 139.7000 139.9000 140.2000 140.3000 140.5000 141.1500 141.2500 141.3000 141.4000 141.5500 141.6000 141.6500 141.9500 142.3000 142.6000 142.7000 142.8000 142.9000 143.0000 143.1500 143.2000 143.2500 143.5500 143.6000 143.6250 143.7000 143.7500 143.8250 148.1250 148.1500 149.0000 150.1500 150.2500 150.3000 MHz

UHF (AM mode)
225.1750 226.4250 227.6750 228.5750 229.1750 230.1500 235.1250 238.3500 238.5750 245.2500
252.1250 255.1500 259.3750 265.9500 266.2500 271.7500 273.3750 281.8500 294.5250 298.3500
308.0750 316.2250 326.9000 328.0750 335.7500 341.6500 348.5000 356.9500 364.0500 371.8000 372.0750 379.3750 MHz

Blue Angels' C-130 "Fat Albert" (Courtesy: Don Edwards)

Some of the specific frequencies that have been recently reported at air shows or associated with the units that support these teams are listed below.

US Military Flight Demo Teams

*(AM mode, * indicates a primary frequency)*

Air Force ACC A-10 Thunderbolt Demonstration Teams: East Coast – 23 Wing based at Moody AFB, GA picked up the demo duties in 2009 and West coast – 355 Wing based at Davis Monthan AFB, AZ
136.5750 138.1250 138.1500 138.2500 138.2750 138.4750 138.5000 138.7500 139.6250 139.7000 139.8000 140.1250 140.1500 140.2000 140.4000 142.2000 142.3000 142.6250 143.7000 143.7500 143.8250 236.8500 251.9750 268.1000 283.7000 305.4000 327.7000 343.0000 376.0250* 384.5500*

Air Force ACC F-15E Strike Eagle Demonstration Teams: East Coast – Demonstration team based 4th FW Seymour-Johnson AFB, NC and West Coast – The 366th Wing at Mountain Home AFB in Idaho will stand up another Strike Eagle Demo Team in 2009. The previous west coast team based at Eglin AFB stood down on May 1, 2009 due to the transition on the base to the F-22 Raptor.
235.7500 252.5250 252.7750 276.6000 280.5000 289.3000 295.6000 296.1000 298.3000 298.6000 300.1250 300.2250 300.4250 300.5250 300.6250 300.7250 300.8250 300.9250 301.0250 301.1250 301.2250 301.3250 301.5250 305.6000 316.9000 333.3000 333.4000 333.5000 335.1000 335.2000 335.3000 335.4000 335.5500 335.9000 336.2250 336.4000 336.9000 341.7500 370.0250 (new in 2009) 376.0250* 376.1000 377.8500 384.5500*

Air Force ACC F-16CJ Viper Demonstration Teams: East Coast – Shaw AFB, SC and West Coast – Hill AFB, UT
136.5750 136.6750 138.0250 138.1000 138.1500 138.1750 138.2000 138.2250 138.2500 138.3000 138.3250 138.4250 138.4750 138.5000 138.5250 138.7250 138.7750 138.8750 138.9000 138.9250 138.9500 139.1500 139.2250 139.3000 139.7250 139.7500 139.8000 139.8250 139.9000 139.9250 139.9500 139.9750 140.1250 140.1750 140.2000 140.3750 140.4250 140.7000 140.9250 141.4750 141.5500 141.6000 141.6500 141.6750 141.7000 141.7500 141.7750 141.9000 142.1250 142.2000 142.3000 142.4000 142.5000 142.5500 142.7750 143.4250 143.8000 143.8750 148.1250 229.0750 238.5000 257.1000 261.2000 273.7000 280.5000 301.6000 303.6000 311.2000 317.8000 320.5000 320.5250 320.7000 344.9000 360.6750 347.3000 354.5750 376.0250* 384.5500*

Air Force ACC F-22A Raptor Flight Demonstration Team: 1st FW Langley AFB, VA
228.4500 228.9500 236.5500 238.1750 238.6250 238.8250 238.8250 252.7750 253.2000 257.0750 262.0250 262.0500 264.0000 264.9750 269.9000 270.4000 276.6750 282.6750 285.1500 287.7750 292.3000 292.7000 293.3000 296.9000 296.9250 298.3500 301.5250 305.6500 315.1250 315.8500 317.8000 319.3250 325.3250 325.7250 325.7750 328.5000 333.5500 351.0000 357.1000 358.8500 364.0000 364.1250 359.2250 376.0250* 379.8000 384.5500* 385.7000

Air Force ACC Heritage Flight
122.4750 122.9250 123.1500 123.4250 123.4500 123.6000 123.9000 127.1500 136.5750 136.6750 238.1500 282.8000 376.0250* 384.5500*
Air Force B-1B Bomber Flyover 238.1500
Air Force B-2 Bomber Flyover/Static displays: 509BW Whiteman AFB, MO
266.2000 273.4500 273.4750 300.1000 381.0500 359.2500 370.900 388.8500* 393.0000
Air Force B-52 Bomber Flyovers
376.0250*
Air Force Combat search and rescue (SAR) demonstrations
138.1000 139.7000 225.4500 236.000 (SAR Bravo) 242.0000 251.9000 (SAR Alpha) 252.8000 259.0000 282.8000 381.0000 384.5500*
Army Aviation Heritage Foundation
123.4500 234.5000 242.4000
Army Blackhawk Demo 30.4000 (PL 151.4 Hz) 46.8500 242.4000 (Primary) (NBFM)
Coast Guard Aircraft/SAR Demonstrations (Aero Frequencies)
122.9000 237.9000 282.8000 326.1500 345.0000 (Demo) 379.0500
Coast Guard Aircraft/SAR Demonstrations (Marine Channels)
- 157.0500 Show Control/Show Center Boats <Marine Channel 21>
- 157.0750 Search and Rescue Demo/Command Post (NBFM) <Marine Channel 81>
- 157.1000 Show Warning Broadcast <Marine Channel 22>
- 157.1250 Unknown usage <Marine Channel 82>
- 157.1500 Show Control/Show Center boats <Marine Channel 23>
- 157.1750 Boats to Show Center <Marine Channel 83>

Coast Guard HITRON Drug Interdiction Demonstration 157.0500 (NBFM) <Marine Channel 21>
Maine Corps AV-8B II Flight Demonstration Teams (frequency information is needed for the west coast unit): East Coast – MCAS Cherry Point, NC 363.300 and West Coast – MCAS Yuma, AZ
Marine Corps Helicopter Demonstrations
237.400 315.375 315.400
Navy F/A-18C Hornet Flight Demonstration Teams (frequency information is needed for these units): East Coast – NAS Oceana, VA and West Coast – NAS Lemoore, CA
Navy F/A-18F Super Hornet Flight Demonstration Teams (frequency information is needed for these units):
East Coast – NAS Oceana, CA and West Coast – NAS Lemoore, CA
Navy LCAC Communications 40.4000 (NBFM)
Navy Light Amphibious Vehicle comes 30.0000 (NBFM)
Navy Search and Rescue Demonstrations
242.5000 282.0000 283.1000

DoD Military Parachute Demonstration Teams

One of the favorites of all the DoD military parachute teams on the air show circuit is the **U.S. Army Golden Knights** based out of Fort Bragg, North Carolina. The team aircraft used during air shows is either the C-31A Friendship or UV-18A Twin Otter.

Look for their communications on the

frequently reported frequencies of 122.7750, 123.4000, 123.4750 or 123.5000 MHz. Other frequencies you should keep plugged into your scanner for possible GK team activity include 32.3000, 32.4000, 122.5750, 124.8750, 126.2000, 238.0000, 284.9000, and 367.7000 MHz. A possible new VHF frequency of 142.8000 MHz may be utilized in the near future by the Golden Knight Black and Gold teams.

The U.S. Army actually has more parachute teams than just the Golden Knights. The U.S. Army Special Operations Command has a parachute demonstration team known as the **Black Daggers** (see *MT* Milcom May, 2004). Several frequencies for this unit have been uncovered during the last few seasons including: 123.4500 136.0000 136.5000 138.6500 237.3000 238.1500 MHz.

Another U.S. Army parachute outfit is the **Silver Wings**. This is the Fort Benning, Georgia, Command Exhibition Parachute Team. They have been monitored on 34.6500 and 44.9000 MHz. However, both these frequencies were common landing zone frequencies in the area they were performing in, so if neither of the two frequencies above are heard at a performance you attend, I suggest you initiate a search for them in VHF-low band military frequency subbands.

In addition to the VHF low band frequencies mentioned above, ground and safety personnel associated with this team have been heard using 467.6125 MHz (FRS channel 10/GMRS) for communications. There was also one report that the team was using an Intra Squad radio frequency of 397.5000 MHz.

The U.S. Army has several more teams, but we still do not have frequency information for them. We would appreciate field reports on the following U.S. Army teams if you catch them performing this air show season:

All American Free Fall Team (82nd Airborne) Fort Bragg, North Carolina
Green Beret Parachute Team Fort Bragg, North Carolina
Black Knights US Military Academy, West Point, New York

The U.S. Special Operations Command has a team based out of MacDill AFB in Florida. They have been heard on the following frequencies: 122.4500 123.4500 and (no, this is not a misprint) 151.6250 MHz, a nationwide business itinerant frequency.

During the 2007 show season, frequencies used by the U.S. Air Force Academy Parachute Team **Wings of Blue** were found. These two frequencies were used for air-to-ground jump coordination and heard on 121.9500 MHz (AM) and 407.5000 MHz (NBFM).

We now have the first confirmed frequency for the **Screaming Eagles** (101st Airborne Division) Parachute Team, based out of Fort Campbell, Kentucky: 44.2000 MHz (NBFM).

And last, but not least, the colorful U.S. Navy Seal Parachute Team, known as the **Leap Frogs,** are frequent visitors around the country at various sporting events and air shows. This team has been regularly reported on 270.0000 (AM) and 407.5000 MHz (NBFM 131.8-Hz PL tone) nationwide over the last several years.

Canadian Flight Demo Units

The Canadian Forces Snowbird aircraft demonstration team (431 Air Demonstration Squadron) is another regular on the U.S./Canada air show circuit. The following frequencies have been recently reported for this popular aerial team: 123.325 227.600, 242.600 <Push 13> 243.400, 245.500, 245.750, 246.500, 272.100 (Primary) <Push 11> 284.900, 299.500, 333.300 <Push 14> 340.100 MHz. A bit of a strange VHF frequency that has been noted in use during the last few air show seasons for this team's solo aircraft is 116.000 MHz (AM).

The Canadian Forces also have a CF-18 demonstration team. A couple of years ago Brian "Check your Six" Topolski, in Connecticut, passed along these possible frequencies for that team:

128.9750 129.0250 130.0750 245.5000 263.5000 263.7000 264.6000 (East Ops) 274.4500 285.9750 312.5500 (Air/Air) 316.5500 323.3000 333.3000 335.6000 340.2000 (West Ops) 341.7000

GMRS Frequencies

During the 2001 and 2002 seasons I received several reports that the Golden Knights were using GMRS (General Mobile Radio Service) frequencies 462.6250, 467.5625, and 467.6125 MHz. In addition to hearing air show demo crews, monitors have found vendors and other military ground units using GMRS frequencies. You should make these frequencies part of your scanner load-out prior to the air show.

A	B	C
462.5500	467.5500	462.5625
462.5750	467.5750	462.5875
462.6000	467.6000	462.6125
462.6250	467.6250	462.6375
462.6500	467.6500	462.6625
462.6750	467.6750	462.6875*
462.7000	467.7000	462.7125
462.7250	467.7250	

*(462.6750/467.6750 National Emergency Frequency pair)

Legend:
A. Base station, Mobile relay, Fixed station, or Mobile station
B. Mobile station, Control station, Fixed station operating in Duplex mode.
C. Interstitial frequencies, base and portable simplex

Family Radio Service/ Intra-Squad Radio Frequencies

We have also received several reports of the ground pyrotechnics personnel from the Tora Tora Tora and Warbirds flight demonstration team using Family Radio service (FRS) radios for communications during shows. You will also find military monitoring enthusiasts attending an air show using FRS radios to coordinate meetings with fellow monitors. Load up FRS frequencies below (NBFM mode) in your scanner or carry a FRS radio to the show, and you might make a new milcom monitoring friend or two.

Dan McClung's "Red Eagle" (Courtesy: Don Edwards)

462.5625 <Ch 1> 462.5875 <Ch 2>
462.6125 <Ch 3> 462.6375 <Ch 4>
462.6625 <Ch 5> 462.6875 <Ch 6>
462.7125 <Ch 7> 467.5625 <Ch 8>
467.5875 <Ch 9> 467.6125 <Ch 10>
467.6375 <Ch 11> 467.6625 <Ch 12>
467.6875 <Ch 13> 467.7125 <Ch 14>

The government version of the FRS is known as the Inter-Squad Radio or ISR. As mentioned above, I have seen several reports over the last few years that these radios might be in use at air shows by military units, including the Civil Air Patrol (CAP), see below. It might be a good idea to program these frequencies in your scanner as part of your air show load out.

396.8750 <Ch 1> 397.1250 <Ch 2>
397.1750 <Ch 3> 397.3750 <Ch 4>
397.4250 <Ch 5> 397.4750 <Ch 6>
397.5500 <Ch 7> 397.9500 <Ch 8>
398.0500 <Ch 9> 399.4250 <Ch 10>
399.4750 <Ch 11> 399.7250 <Ch 12>
399.9250 <Ch 13> 399.9750 <Ch 14>

U.S. Civil Air Patrol Frequencies

Finally, you should program U.S. Air Force Civil Air Patrol frequencies in your scanner as well. We have received field reports of CAP frequencies (repeater and simplex) being used for ground support at several air shows.

The Civil Air Patrol has been transitioning to narrowband allocations/equipment over the last year. Even though transition was to have been completed by October 1, 2007, many regions did not make that deadline due to frequency conflicts. Therefore, we have included both the old assignments as well as some of the new assignments (all these frequencies were found in the public domain).

Old assignments: 143.7500 143.9000 148.1250 148.1375 148.1500 148.5375 148.9750 149.5375 MHz

141.5750 Simplex Command Control 1 <CC1> 127.3 Hz pl
141.0000 Simplex Command Control 2 <CC2> 131.8 Hz pl
149.2750 Simplex Air 1 <Air1> 141.3 Hz pl
150.5625 Simplex Air 2 <Air2> 151.4 Hz pl
150.2250 Simplex Guard 1 <Guard1> 162.2 Hz pl
139.8750 Simplex Tactical use <TAC1> 173.8 Hz pl
148.1250 Simplex Primary Talkaround (PA TA) <R65CAT> 100.0 Hz pl
148.1500 Simplex Secondary Talkaround (PB

F-15E Strike Eagle 1 torching the tarmac (Courtesy: Don Edwards)

TA) <R66CAT> 100.0 Hz pl
148.1250/143.5500 Nationwide repeater pair <R63>
148.1500/143.7000 Nationwide repeater pair <R64> 203.5 Hz pl

There are more frequency designators built around the repeater pairs mentioned above, but we aren't quite ready to present that list. Further monitoring will be required nationwide to finish flushing out all of the PL tone versus designators being used by the CAP.

Other possible CAP frequency assignments to watch out for include: 138.0125 140.6375 142.2250 143.7250 143.9000 148.1750 148.7750 150.1625 150.5625 150.6375 MHz

Civilian/Foreign Air/Parachute Demonstration Teams

At most air shows the military flight demonstration units aren't the only performers. Civilian organizations, companies, and individuals sponsor a wide variety of aerobatics teams and parachutists to thrill the crowd. Many different frequencies are used by these teams in the civilian aviation band. Load your scanner with the following frequencies and you shouldn't miss out on communications used by the civilian acts.

122.7250 122.7500 122.7750 122.8250 122.8500 122.8750 122.9250 122.9500 122.9750 123.0250 123.0500 123.0750 123.1500 123.1750 123.3000 123.3250 123.3500 123.4000 123.4250 123.4500 123.4750 123.5000 126.4000 129.6500 129.9250 136.5750 136.9750

Some specific frequencies reported to us for other foreign military and US civilian flight demonstration teams are provided in the following list.

Search and rescue demonstration (Courtesy: Don Edwards)

Civilian Flight Demonstration Teams and Air show Companies

Aeroshell Aerobatics Team (AT-6 Texans) 123.1500
Aerostars CJ-6/YAK-52 Flight Formation Team 118.7000 122.7750
Chapman/Mancuso Aerobatics 136.9750
Civilian Air Show Discrete Common 123.1500
Dave Schultz Air Shows 118.7000(Ground Ops) 132.950 (Operations) *135.6500 (Airboss) *238.1500 (Airboss) 350.3000
Flight for Diabetes (Michael Hunter) 123.4250
Firecat (Rich Perkins) 123.5000
Flying Colors Hang Glider Aerobatic (Dan Buchanan) 123.1500 123.3000 123.4500 128.6750 132.9500
Geico Extra 300 (Tim Webber) 123.1500
"Hamster" Biplane (Ed Hamill) 123.1500
Iron Eagles Aerobatic Team 122.9250 123.1500 123.4750
John Klatt Air shows 120.6000 123.4750
Julie Clark's (T-34) American Aerobatics 118.7000 120.6000 135.9250
Lima Lima Flight Team 123.1500 123.1750 123.4250 123.5750
Manfred Radius Glider Aerobatics Team 123.1500
Oreck Vacuum Cleaners Aerobatic Demo (Frank Ryder) 122.8250 123.4250 123.4500
Otto the Helicopter 123.1500 123.3000
Patty Wagstaff Air Shows Inc 122.7500 123.4750
Red Eagles Aerobatic Team 120.6000 123.1500 123.4250 123.4750
Ritchie's Pyro 467.6375 (233.6 Hz pl)
Robosaurus – World's First CAR-NIVOROUS Monster Spotter 462.7125 (DCS464)
Sean Tucker Power Aerobatics 118.7000 122.8750 122.9500 123.1500 123.4500 123.4750
SIAI Marchetti SF260 (Debbie Gary) 123.1500
Showcopters 123.1500 134.7000
Sky Soldiers Demonstration Team (Army Aviation Foundation) 118.7000 123.0250 234.5000 242.4000
Skytypers Team 122.7500 122.7750 123.4250 (Formation) 122.7750 123.1500 123.4250 123.4500 (Solos)
Super Decathlon (Greg Koontz) 123.1500
Swift Magic Aerobatic Team 122.7750 122.9250
Team Red 123.3500
The Patriots (L39) Jet Team 127.3000
Tora Tora Tora Warbirds Team (Commemorative Air Force) 118.7500 122.8500 122.8750 123.1500 123.4500 469.5000 (NBFM) 469.5500 (NBFM)
Vintage Thunderbird (T-33) Aerobatics (Fowler Cary) 123.1500

Foreign Military Flight Demonstration Teams

Asas de Portugal, Esquadra 103 (Wings of Portugal 103 Squadron) Flight Team 262.1500
Battle of Britain Memorial Flight (BBMF) (UK) 120.8000 122.7000
Black Cats Royal Navy Helicopter Display Team (UK) 280.4750
Blue Eagles Royal Army Air Corps Flight Team (UK) 135.9500 135.9750 136.9750 382.0000
Blue Tango Helicopters 123.6000
Brazilian Air Force Team (Brazil) 130.5500 130.6500 132.2500
Brazilian Smoke Squadron (Brazil) 133.4500
British Army Red Devils Parachute Team (UK) 462.6250
Canadian Forces Skyhawks Parachute Jump Team (Canada) 123.0000 294.7000
Falcons Royal Air Force Parachute Jump Team (UK) 255.1000 256.9000 465.1000 (NBFM)
Frecce Tricolori Military Flight Team (Italy) 123.4750 (Ground Secondary) 140.6000 (Ground Primary) 362.6250 (Primary) 263.2500 (Secondary) 307.8000 Unknown usage
Grasshopper Helicopter Team (Netherlands) 281.1000
Halcones Military Flight Team (Chile) 136.1750
Horseman P-51 Acro Team 122.9250
La Patrouille Adecco Air Force Flight Team (France) 121.8500 123.6000 138.4500 141.8250 143.1000 143.8500 242.6500 243.8500
La Patrulla Aguila Military Flight Team (Spain) 130.5000 252.5000 337.9750
Le Royal Jordanian Teams (Jordan) 123.5000
Les Breitling (Switzerland) 127.3500
Les Iskry (Poland) 123.6000
Marche Verte [Green March] (Morocco) 135.0000 135.9250 (Ground) 135.5000 (Air-to-Air)
Midnight Hawks Finnish AF Academy Demo Team (Finland) 140.6250
Patrouille Suisse Military Flight Team (Switzerland) 266.1750 288.8500 388.0750
Red Arrows Royal Air Force Flight Team (UK) 242.2000 243.4500 253.4500
Team Guinot Formation Wing Walkers (UK) 118.0000
Turkish Stars Military Flight Team (Turkey) 225.750 264.400 279.600
Yak Aerostars Team (UK) 122.4750 122.9500 123.3500 124.4500

In Closing

It is always difficult to predict what a new season will bring, so I strongly encourage readers to watch my Milcom Blog and the Monitoring Times home page for any late breaking news and frequency information during the 2010 air show season.

I would like to publicly thank the real heroes of the annual air show guide, the hundreds of radio monitors who took the time to share with me what they heard at each air show. Without these caring radio hobbyists, there would be no guide. It's to you that I dedicate this latest edition of the air show guide.

If you have found this guide helpful and would like to help, how about taking a minute or two to pass along what you have heard? It's really important that we get reports from the field since I can't make it to many of the shows (we just don't have a budget for that sort of thing).

Our goal next year is to have a report from each major air show that has a military performer at it. This will greatly aid in the production of the next annual listing. You can reach me via our snail mail address at MT Milcom, 7540 Highway 64 West, Brasstown, NC 28902 or via e-mail at larryvanhorn@monitoringtimes.com. And, before you head out for a show, check the Milcom Blog for the latest information.

Now, break out those scanners, plug in those frequencies, and get ready for the ride of a lifetime: a front row seat at the air show!

"Blue Angel Delta: Standby Boards…Boards!"

MT

Monitoring the Air Show Experience: Equipment and Prices

By Larry Van Horn N5FPW

Now that you know who the crack military flight demonstration teams are and where to find the frequencies they use for air-ground coordination and other communications, I'll take a look at two other important considerations for successful monitoring: where and when you can find an air show in your area and what equipment is required to listen in. While I don't have a favorite, I have prepared the list of receivers and scanners that meet all the requirements as outlined below.

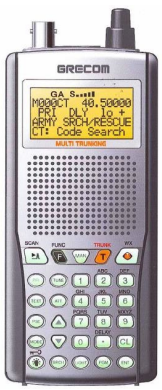
Not Just Any Old Scanner Will Do

Some scanners currently being marketed, and most older scanners on the used market, are not suited for air show monitoring. There are certain requirements your air show radio has to meet in order to successfully monitor the two major military aerial demonstration teams, the Blues and T-Birds.

If you are going to a Thunderbird show, you will need a scanner that can monitor the 138-150 MHz military land/mobile band in the AM mode. Most of the older Uniden scanners cannot be used for air show monitoring due to their lack of independent transmission mode selection.

You also need a scanner that has the 225-400 MHz military aeronautical band in it. Most of the action (especially the Blues) will be heard in this military UHF portion of the spectrum. Adding this criterion to the mix of possible radios narrows our choice for air show scanners further.

The information on this page includes current Grove Enterprises stock codes/prices (if carried by Grove) for the items indicated, but the price does not include shipping or taxes (if applicable). Prices are subject to change without notice, so be sure to call the Grove order department at 800-438-8155 or visit the Grove website at **www.grove-ent.com** for current pricing.



If you are going to use a handheld scanner at the air show, there is another purchase you should consider: an extra set of charged batteries. Murphy's Law applies here and nothing is worse than having your batteries die halfway through the show with no replacements.

TABLE ONE: MILITARY AIR SHOW CAPABLE RECEIVERS

Note: Prices and availability are subject to change without notice. You should call or visit the Grove website for the latest updates. This list is for reference purposes only. Radios listed with n/a are not available from Grove, but are still being sold new from fine *MT* advertisers such as Universal Radio.

Handheld Unit	Grove Stock No	Price
AOR AR-8200 MK III	SCN51	$629.95
AOR AR-Mini B	n/a	$279.95
GRE PSR-300	SCN13	$179.95*
GRE PSR-500	SCN18	$449.95***
GRE PSR-700 ex	n/a	Not FCC certified, so no pricing currently available*
Icom IC R-5 Sport	SCN12	$174.95
Icom IC R-20	SCN20	$519.95
Icom IC-RX7	n/a	$199.95
MFJ-8322	n/a	$199.95*
Radio Shack Pro-107	n/a	$229.99*
Radio Shack Pro-106	n/a	$499.99***
Radio Shack Pro-164	n/a	$199.99*
Uniden BC-246T	SCN46	$189.95*
Uniden BC-346XT	SCN45	$219.95*
Uniden BCD-396XT	SCN53	$499.95***
Yaesu VR-500	SCN06	$219.95

Base/Mobile Unit	Grove Stock No.	Price
AOR AR-8600 Mk IIB	RCV11	$919.95
GRE PSR-400	SCN14	$179.95*
GRE PSR-600	SCN19	$449.95***
Radio Shack Pro-163	n/a	$199.99*
Radio Shack Pro-197	n/a	$499.99*
Uniden BCT-15X	SCN31	$219.95*
Uniden BCD996XT	SCN21	$499.95***
Yaesu VR-5000	n/a	$619.95

Computer Receivers	Grove Stock No.	Price
Icom IC-R1500	RCV25	$599.95
Icom IC-R2500	RCV52	$899.95
Icom R-9500	RCV27	$13,500.00
WinRadio WR-G305e	RCV63	$619.95**
WinRadio WR-G305i	RCV53	$519.95**
WinRadio WR-G305e/PD	RCV63P	$719.95**
WinRadio WR-G305i/PD	RCV53P	$619.95**
WinRadio WR-G315e	RCV64	Contact Grove for pricing**
WinRadio WR-G315i	RCV54	Contact Grove for pricing**
WinRadio WR-3500e	RCV49-E	$1,995.00*
WinRadio WR-3500i-DSP	RCV49-I	$2,195.00*
WinRadio WR-3700e	RCV50-E	$2,895.95*
WinRadio WR-3700i-DSP	RCV50-I	$2,895.95*

Professional Receivers	Grove Stock No.	Price	
AOR AR-Alpha	RCV01	$10,299.95	Government only sales
AOR AR-One	RCV12-G	$4,849.95	Government only sales
AOR AR-One-C	RCV13-G	$5,299.95	Government only sales
AOR SR-2200	RCV24-G	$1,169.95	Government only sales
Icom IC-R1500	RCV25-G	$599.95	Government only sales
Icom PCR-1500U	RCV15-G	$479.95	Government only sales
Icom IC-R2500	RCV52-G	$999.95	Government only sales
Icom R-8500	RCV14-G	$1849.95	Government only sales
Icom R-9500	RCV27-G	$13,500.00	Government only sales

Discontinued radios/scanners that are capable of air show monitoring

Alinco	DJ-X2T, DJ-X10T
AOR	AR-16B, AR-1000, AR-1500, AR-2515, AR-2700, AR-3000AB, AR-5000+3B, AR-7000B, AR-8000, AR-8200B, AR-8600B
Icom	IC-R1, IC-R2, IC-R3, R10, R100, R7000, R7100, PCR-100, PCR-1000, PCR-1500
Kenwood	RZ-1
Radio Shack	Pro-2004, Pro-2005, Pro-2006, Pro-43
Uniden	BCT-15*, BC-296*, BR-330T*, BC-796***, BCD-396T***, BCD996T***
WinRadio	WR-1000i/e, WR-1500i/e, WR-3000i-DSP, WR-3100i-DSP
Yaesu	VR-120, VR-120D

* includes trunk capability
** Includes APCO-25 digital decoder
***Includes APCO-digital/trunk capability

Beginner's Guide to Monitoring the Air Band

By C. L. "Cory" Koral K2WV

photo credit: Author

I began my career in private aviation as a teenager in the late 1960s. It was a time when, if you were lucky enough to have an air band receiver, tower and ground control communications were about all you could hear. But, if your local airport was big enough to have radar, you might be able to monitor approach control as well.

Today, it's totally different. With the advent of computers, much more selective scanning radios, and air traffic control repeaters, far more channels and information have been crammed into the same frequency band. There are synthesized voices transmitting weather and airport information and, with radar coverage everywhere, departure and tower frequencies abound. With about 7,000 civilian and commercial aircraft in the air at any given time over the US, there's a lot to listen to.

How to get started

The first thing you'll need is a small portable receiver that covers the aircraft communications band (118 to 136 MHz AM); has an ear plug (for private listening when you're at an airport), and an external antenna jack (for better reception when you're at home). It's also helpful, but not necessary, for the receiver to be capable of monitoring aircraft navigation frequencies (108-118 MHz); more about that later. Most such receivers cover the AM/FM broadcast bands, and some even have the 162 MHz NOAA weather channels pre-programmed. Basic desktop receivers with scanning capability are available for around $150 and up. Portable units with scanning features will be $100 and up.

If you're going to be doing most of your air band monitoring at home, get the desktop version, but plan on attaching a good external antenna for maximum range, and make sure the receiver has ALC (Automatic Level Control). If you live in a rural area, you will be able to hear enroute air traffic, but unless you're within 30 miles or so of an ARTCC (Air Route Traffic Control Center) repeater and have a good external antenna, you probably will only hear the aircraft side of the transmission, not the ground controller. Overhead aircraft will come booming in at maximum volume, while ground stations will be weak, hence the need for ALC.

If you're a serious air band monitor, you're going to need a portable receiver so you can go where the action really is: the airport. And, the bigger the airport the more action you'll hear. Once you have a receiver, you'll need to get a Sectional Aeronautical Chart for your area. These charts show the location and primary frequencies of every airport in your area. They also list selected approach control frequencies, and have an extensive legend on the back helping you to decipher the voluminous information shown on these charts.

Sectionals are available at flight schools, executive jet services, or online (Google "Pilot Supplies" or "Aeronautical Charts") for about $10 each. There are a number of online sites that provide similar information for free. One is **www.airnav.com.** Just click on "airports" and type in your local airport.

Listening at the Airport

Automatic Surface Observation System (ASOS)/Automatic Weather Observation System (AWOS)

These are robot weather observers (sensors connected to a computer) that transmit information such as ceiling, visibility, surface wind and barometric pressure, automatically every minute, 24/7 in a synthesized voice.

Automatic Terminal Information System (ATIS)

These are closed loop recordings made by tower personnel or in a synthesized voice giving the current active runway, winds and any other pertinent information that a pilot needs before using a tower controlled airport. They are all identified by a phonetic code. For example, a typical ATIS message might be, "Rochester International information Charlie. Winds light and variable. Altimeter 29.97. Active runways: Two Five and Two Eight. Caution: Mowing operations near departure end of runway Two Eight. Taxiway Alpha 2, closed. Advise on initial contact, you have information Charlie."

Every effort has been made in the last 50 years to reduce frequency congestion and controller workload, and ATIS is a good example of this. A pilot requesting taxi clearance need only say, "Ground control, this is November Two Three Eight Nine Hotel, taxi with information Charlie." The controller now knows the pilot has all the pertinent information and need only reply, "Eight Nine Hotel, taxi runway Two Five."

At smaller controlled airports, the ATIS message may be quite short. At others, such as Dulles International, these recordings may be quite lengthy, but all of the information is essential for by arriving and departing pilots. AWOS and ATIS frequencies are shown on the sectional chart with the airport data.

Unicom

At airports without control towers, pilots provide their own traffic separation by communicating directly with each other over a common frequency, or *unicom*. If the airport is attended, office personnel may provide wind, active runway and traffic information from a base station; however, they cannot legally separate traffic, as only an air traffic controller is qualified to do that. Unicom's are also used at larger, tower controlled airports, but for auxiliary services, not traffic separation. For example, "Chicago Executive unicom, this is Hawker Four Two

Radio Shack's model #20-404 ($100) hand-held 200 channel programmable scanner makes air band monitoring easy with one button access. It also has a removable rubber antenna to connect to an outdoor antenna. (Courtesy: Radio Shack)

Fox, we'll be arriving in 15 minutes and need a quick turn around after we land. We've got some passengers who need transportation to overnight accommodations, and we need some Jet A (fuel)." The reply might be, "Roger Hawker Four Two Fox, take taxiway Kilo Three to the air services ramp. We'll have a cab and a fuel truck standing by."

Aircraft band antennas bristle out of the top of this ATC tower in Oneida, New York. (Courtesy: Don Edwards)

Ground Control

The job of Air Traffic Control (ATC) is to provide safe separation of known aircraft in the air and on the ground. Everything that moves at a controlled airport, meaning an airport with a control tower, has to have permission or be "cleared" to move. This obviously includes aircraft approaching and departing, but it also applies to any vehicles that operate on the runways and taxiways, such as mowers, maintenance, snow removal and fire fighting vehicles.

Aircraft are addressed by their registration or flight number, vehicles by a single phonetic letter /number pair. A typical aircraft registration number would be N8029F, pronounced, "November Eight Zero Two Nine Foxtrot," or just, "Two Nine Foxtrot," after initial contact. Airliners use flight numbers, such as "United Seven Fifty Three". A ground vehicle might typically be referred to as "Charlie Two" or "Charlie Seven". Regardless, every number is transmitted separately and every letter pronounced phonetically to avoid any confusion. Aviation communications are the briefest and most precise communications you'll ever hear.

All runways are laid out according to their magnetic compass heading and are numbered accordingly. A north-south runway would be designated as runway one-eight or three-six, indicating an alignment with a compass heading of 180 degrees (south) or 360 degrees (north). Taxiways are designated by a letter and sometimes a number, such as taxiway Bravo Four. Airport diagrams show the layout of the runways and taxiways.

If you're going to be visiting the larger airports in your area, you would do well to get a copy of the Airport Facility Directory (A/FD) for your region. The A/FD contains a lot of specific airport information that is not available on sectional charts, such as ground control, and clearance delivery frequencies and the above airport diagrams. They also list all the enroute radar frequencies, and FSS (Flight Service Station) frequencies for home listening. A/FD's are published every 56 days, and you can get them at the airport or online for about $5. At small airports with towers, the same tower controller may double as the ground controller. At larger airports, not only do they have a separate ground control, but a clearance delivery frequency as well.

Clearance Delivery

This is the frequency where departing aircraft that are flying on instruments receive clearance through the air traffic control system. Since aircraft flying on instruments can't see and avoid each other, they need to be spaced apart through the assignment of different routes, altitudes and departure times. This aerial choreography is determined by feeding all of the flight plans into a computer which spits out each aircraft's instructions.

A typical clearance spells out the destination, route of flight, altitude, squawk code and departure control frequency. For example, you may hear: "ATC clears Cessna Three One Four Seven Delta to Philadelphia International via direct Geneseo, Slate Run, Philipsburg, Harrisburg, Victor Two Ten, BUNTS intersection. Climb and maintain 7 thousand; squawk Two Four Seven Zero; contact departure control on 124.25."

The route of flight in this clearance is defined by ground based navigation stations known as VOR's (VHF Omni-directional Radio Range), in this case Geneseo, Slate Run, Philipsburg and Harrisburg VOR stations, airway route numbers (Victor 210), and intersections (BUNTS). Squawk codes are unique identifiers that pilots enter into their transponders, or radar beacons, so that they can be instantly identified on the radar scope. Some clearances are quite lengthy and since many of the clearances require repeating the same route information to several aircraft, pre-published instructions called SID's (Standard Instrument Departure), or STAR's (Standard Terminal Arrival Route) are used to reduce frequency congestion.

The exchanges you will hear on clearance delivery will be the most cryptic. You can download SID's, STARS, airport diagrams and other interesting charts for further study, free from **www.sportys.com,** click under "Charts" on the top bar, then select "View online charts".

Tower

Everybody knows what *Cleared to land* and *Cleared to take-off* mean, but what about: *Cleared Touch and Go*? This is a training maneuver in which the aircraft touches down and takes right off again. It is more often seen at airports with one or more flight schools than at major metropolitan airports.

Hold Short means don't go beyond a certain specified point, for example, "Aztec Seven Eight Tango, taxi across runway one eight, hold short of runway two four."

Crosswind, Downwind, Base and Final denotes specific legs of the visual traffic pattern. Each runway has a rectangular traffic pattern with left turns standard. The first left turn after take-off is the crosswind leg, the leg parallel to the runway is the downwind leg, the leg 90 degrees inbound to the runway is the base leg and final means the final approach leg, the leg lined up with the runway. Pilots use these terms to identify where they are in the traffic pattern, for example, "Beechcraft Two Three Kilo, downwind, touch and go, runway two five," or "Cessna Six Seven Juliet, turning base behind the Lear Jet on final."

Ground Point Seven: There are only two ground control frequencies, 121.7 and 121.9 MHz, so the tower abbreviates it. For example, you may hear, "Gulfstream Seven Four Tango, left turn onto taxiway Charlie, ground point nine."

Approach and Departure Control

Incoming flights are typically handed off to approach control 20 or 30 miles out by an enroute radar facility. Approach control spaces these arrivals among other arrivals and take-offs. Departure control separates aircraft from other aircraft in the terminal area until they can be handed off to enroute radar.

Listening at Home

TRACON: If you are close enough to a Terminal Radar Approach Control, or radar controlled airport, you may be able to monitor approach and departure control from home. For example, Jacksonville, Florida International Airport has the following VHF radar approach control frequencies: Arrivals from 270 to 339 degrees: 119.0 MHz; 340 to 090 degrees: 127.0 MHz; 091 to 180 degrees (above 5,000 feet): 118.0 MHz; below 5,000 feet: 124.9, 181 to 229 degrees (above 6,000 feet): 121.3; below 6,000 feet: 118.6 MHz: 230 to 269 degrees (above 4,000): 123.8 MHz; below 4,000 feet: 124.4 MHz. These frequencies are shown in the side panel of the Jacksonville, Sectional Chart, and some are shown in the A/FD, Southeast Edition. Consult your local sectional chart or A/FD for frequencies in your area.

Macom AR-108AE ($119) aircraft band-only hand-held receiver covers 108-136.975 MHz. Lack of removable antenna makes this receiver less versatile. (Courtesy: Aviation Supermart.com)

Enroute Radar: Cross-country air traffic is separated via a system of remotely located radar stations and their associated voice repeaters. There are 20 enroute air traffic control centers (ARTCCs) in the continental U.S., each with its own area, and each of those areas are broken down into sectors. These frequencies are listed in the A/FD. Cleveland Center, for example, has 10 sectors for a total of 18 VHF frequencies.

Since aircraft at cruise altitude will have great radio range, you will easily be able to receive them from 100 miles away or more, but you won't hear the center controller unless you're within about 30 miles of the repeater.

Look under the sector frequencies which are listed alphabetically by the closest town. If you get a copy of the Low-Altitude Enroute Chart for your area, you'll be able to track these flights. These charts show basically only the navigational aids, intersections and airways and are much simpler to read than Sectionals. Low-Altitude Enroute Charts are available at some airports or online for about $6. High-Altitude Enroute Charts show the high altitude route structure including jet routes, and are available as a set of 6 charts covering the entire US. They are available online for about $30 for the set.

Popular Uniden BC72XLT ($95) hand-held scanner with removable antenna covers many bands including the air band from 108-136.9875 MHz. (Courtesy: Communications Electronics, Inc.)

Flight Service Stations (FSS): These facilities do not provide traffic separation, but provide the pilot with weather briefings and other information such as NOTAMS (Notices to Airmen), PIREPS (Pilot Reports), and accept and handle flight plans submitted from pilots on the ground or enroute. If you are within 30 miles of a VOR station, you will probably be able to monitor FSS. These frequencies are also listed in the A/FD as "AFSS" or Automated Flight Service Stations, right after the center frequency listings. Some are also shown above the data box of VOR stations on your sectional chart.

Flight Watch: This is an FSS service which provides an abbreviated weather update for enroute aircraft on 122.0 MHz.

Navigation Band Opportunities

TWEB / HIWAS: Transcribed Weather Broadcast / Hazardous Inflight Weather Advisory Service are continuous weather broadcasts transmitted over the VOR frequency. You won't be able to receive these broadcasts unless your receiver can cover the aircraft navigation band (108- 118 MHz). A "T" or "H" in the VOR data box shows whether these services are available on the VOR frequency. If you are too far away to receive your nearest VOR station, TWEB can be accessed via telephone in some locations; look under the National Weather Service telephone numbers section of the A/FD.

Sometimes an FSS will communicate with pilots via duplex, in other words, receive on one frequency and transmit on another. The frequency shown with an "R" after it means the FSS will receive on this frequency and transmit on the VOR frequency. You will need two receivers, one with navigation band capability, to monitor both sides of these transmissions, unless you can set up your scanner to monitor both.

Monitoring the aircraft band is excellent preparation if you intend to get your pilot's license, and even if you don't, you'll come away with an appreciation for how much knowledge is required to be a pilot or air traffic controller. You will also receive tremendous insight into our airspace system and the army of highly skilled people that it takes to keep it running. If you aren't near an airport with significant traffic or just want to be able to monitor some of the more congested airfields, try this web site: **www.liveatc.net.**

About the author: C. L. "Cory" Koral, K2WV, first soloed in 1967; received his Private Pilot's license in 1968 and a Commercial Pilot's license in 1983. He was first licensed as a General Class amateur radio operator in 1970 as WA2NRX; Advanced Class in 1976 as WA4POQ and Extra Class in 1999. He lives in an off-the-grid, solar-powered home on a 300 acre farm in Rappahannock County, Virginia.

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1,000 Channels • 10 banks • CTCSS/DCS • S Meter

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

Bearcat® BCT8 Trunk Tracker III

Manufacturer suggested list price $299.95

CEI Special Price $169.95

250 Channels • 5 banks • PC Programmable

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

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

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

Bearcat® BCD396T Trunk Tracker IV

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

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

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

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

More Radio Products

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Bearcat 898T 500 channel Trunktracker III base/mobile	$209.95
Bearcat 796DGV 1,000 channel Trunktracker III base/mobile	$519.95
Bearcat BCD396T APCO 25 Digital scanner with Fire Tone Out	$519.95
Bearcat 246T up to 2,500 ch. Trunktracker III handheld scanner	$214.95
Bearcat Sportcat 230 alpha display handheld sports scanner	$184.95
Bearcat 278CLT 100 channel AM/FM/SAME WX alert scanner	$129.95
Bearcat 248CLT 50 channel base AM/FM/weather alert scanner	$104.95
Bearcat 92XLT 200 channel handheld scanner	$109.95
Bearcat 72XLT 100 channel handheld scanner	$99.95
Bearcat BR330T up to 2,500 ch. Trunktracker III with Tone out	$274.95
Bearcat BCT8 250 channel information mobile scanner	$169.95
Bearcat 350C 50 channel desktop/mobile scanner	$104.95
AOR AR16BQ Wide Band scanner with quick charger	$199.95
AOR AR3000AB Wide Band base/mobile receiver	$1,079.95
AOR AR5000A+3B Wide Band 10 KHz to 3 GHz receiver	$2,599.95
AOR AR8200 Mark IIIB Wide Band handheld scanner	$594.95
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Frequency Coverage:
25.0000-54.0000 MHz., 108.0000-174.0000 MHz., 216.0000-224.9800 MHz., 400.0000-512.0000 MHz., 806.0000-823.9875 MHz., 849.0125-868.9875 MHz., 894.0125-956.000 MHz., 1240.0000 MHz.-1300.0000 MHz.

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

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CQ at 51,000 Feet and Mach .85

By Rick Dougherty NQ4I
All photos by author

My name is Ralph A. Dougherty, Jr., but, to most of my friends all over the world, I'm known either as "Rick" or by my call sign, NQ4I. I've been blessed with the privilege of operating ham radio from every continent except Antarctica. How did this world-wide, globe-trotting adventure begin? For me, it began by mixing my two favorite hobbies, ham radio and aviation. While aviation became my vocation, amateur radio remained my avocation.

Novice Ham to Fighter Pilot

I was born and grew up in Griffin, Georgia, a suburb of metro Atlanta, Georgia, where I currently live today. I received my first ham radio license, the Novice Class, at age 12 in 1961, then my General Class at age 13. My first call was WN4ARV and that changed to WA4ARV when I passed the General Class exam. I was very active in ham radio contesting from the beginning, participating primarily in the various QSO Parties with both phone and CW (Morse code). Contesting has always been my main interest in ham radio. My "Elmer," or ham radio educator, was John Howell, then W4AN. John went to the same church as I did and he was great at helping explain ham radio and answering the questions of a 12 year-old.

I received my Private Pilot License at age 16 in 1964, Commercial Pilot License at 18, Multi-Engine Rating at 20, and Instrument Rating at age 21. All these licenses did not exempt me for my school requirements and after high school I went on to Texas A & M University, earning a degree in Aeronautical Engineering. I was probably the only student that A & M ever had who owned his own multi-engine airplane, a Champion Lancer.

The Lancer was a way my dad could help me obtain flying time while going to college. In my fourth year in college, on my Christmas break, he showed me the aircraft he bought. The Lancer had a pair of Continental O-200 engines; fixed gear and fixed pitch props; tandem seating; throttles that hung from the ceiling; wheel in front and stick in the back seat (there were only two seats). I put over 800 hours on it in a two year period. The Lancer burned 9-10 gallons per hour, so it was cheap to operate. I repainted it during summer school and sold it at the end of my fifth year for slightly more than my dad had paid for it.

Even though college was a little more demanding of my time than high school, I was still able to continue my radio operating and contesting during my college years by operating as a guest operator wherever I could find an empty seat.

After college, I attended the United States Air Force's Pilot Training Program at Vance Air Force Base and earned my USAF pilot's wings in 1972. I was assigned to the Air National Guard Unit at Fort Smith, Arkansas where I flew F-100's for about ten years. Later, I was reassigned to Dannelly Field in Montgomery, Alabama, where I flew the F-4 Phantom II for about ten years and then the F-16 Falcon for my last two years. I was also rated in the T-39, T-33, T-37, and T-38 training aircraft during my National Guard career. I rated as a Command Pilot with over 2,600 hours of military flight time. This service qualified me for military retirement which I finally received on my sixtieth birthday, retiring as a Major. While the military flight status consumed most of my time, I still found time to operate as a guest operator at local ham stations and participate in an occasional amateur on-air contest.

Settling in for a day of hard work in the front office of a Gulfstream G5.

While serving in the Arkansas National Guard, I was hired by Eastern Airlines and that eventually led to my moving back to the Atlanta area. I was first based in Philadelphia, Pennsylvania, where I flew the Boeing 727. This gave me the opportunity to be associated with the Frankfort Radio Contesting Club (FRC), one of the biggest contest clubs in the world. I was not only accepted into the membership, but was also invited to operate with the K3WW multi-multi contest station. In 1980 I got my first taste of contesting from outside the United States when I entered the ARRL International DX Contest and finished #1 in Bermuda by making 3,500 contacts with a Kenwood TS-820 transceiver and a Butternut vertical antenna.

In 1982, I was reassigned to the Douglas DC-9 and transferred to Atlanta, where I was promoted to Captain. After Eastern Airlines ceased operations in 1991, I had a temporary job flying DC-9's for Express One and became a regular commuter to Atlantic City, New Jersey.

Getting Serious about Contesting

Settling down in Peachtree City, Georgia gave me the first real opportunity to build my own personal contest station. Eight or ten other north Georgia hams, with an interest in contesting, met at my house one evening and the Dixie DXer's Contest Club (DDCC) was created. Most of those hams are still around though now contesting with the SECC (Southeast Contest Club). When the DDCC began to make a name for itself others began to take notice, and pretty soon there was a very active interest in contesting locally. The DDCC eventually dissolved and essentially resurfaced as the SECC. The SECC has become a contest club to be reckoned with. Even though we've grown to more than 200 members we are still considered a small contest club.

During the years that I was building my first contest station, I took advantage of working for the airlines to make some major DXpeditions for contesting purposes. We even started building a contest station in Haiti, where we operated with the special call sign of 4V2C. In 1983, after a year of antenna work between Georgia and Haiti, I led the 4V2C team to #1 in the world in the

multi-single category.

In 1984, I won #3 in the world as a single operator from Guyana operating as 8R1Z. In 1985, I went back to Guyana and got my first #1 in the world as a single operator with the call sign 8R1X. In 1986, I operated as 9Y4TT from Trinidad & Tobago, where I got my second #1 in the world as a single operator. In 1987, I tried again from 9Y4TT but came in a close #2 behind EA8BH. I was able to operate quite a few other contests from various locations in the Caribbean, Central and South America, and I was lucky enough to win a few more of the major DX contests on some of those trips.

Hamming in the Gulfstream 5

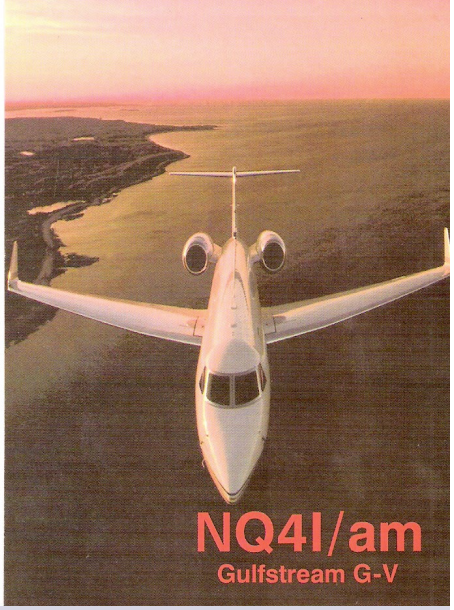
In 1991, I was rated on the Gulfstream G2, G3, and G4 and flew as a demonstration pilot for Gulfstream for two years out of Savannah, Georgia. In 1996, I accepted a job as Captain on a G4. I was subsequently re-rated and was promoted to Captain on the G450, G550 and G5 and I still fly these Gulfstream's today. This Gulfstream job has taken me to every continent except Antarctica and given me the opportunity to meet, visit and operate with thousands of amateur operators all over the world.

During my aviation career, I have accumulated over 28,000 hours of accident-free and incident-free flying time. For the past fourteen years I've been fortunate to be able to operate the High Frequency (HF) radio equipment aboard the Gulfstream as an Aeronautical Mobile (AM) station. My favorite frequency for AM operation is on the 20 meter band at 14.200 MHz. When the opportunity to operate presents itself, I can be heard making QSOs with other hams throughout the world looking to make contacts with Aeronautical Mobiles. I have had some success on the 75 meter band, but the 10 meter band has not been very productive for contacts due to the extremely low level of sun spot activity at the higher frequencies.

The radio equipment in the Gulfstream is a Rockwell Collins HF-9000 transceiver. It runs approximately 200 watts on Single Side Band (SSB). This radio is not particularly "user friendly" for combing the bands, due to the fact that operating frequencies have to be typed in for every frequency change. That's why I usually monitor just one frequency when operating aeronautical mobile. The antenna is embedded in the leading edge of the vertical stabilizer (tail) that's about 2.3 meters or roughly 7 feet long, and there's an antenna coupler in the unpressurized tail compartment of the plane.

The most difficult thing about operating in the G5 is finding the spare time to get on the air. When I do, and even though the antenna is relatively small, I can generate some huge pile-ups on 20 meters. I guess I have the record for the tallest antenna, having operated many times from 45,000 feet and above. I have used a 2 meter HT a few times while operating aeronautical mobile but, from the cockpit, the signal tends to go toward the rear of the aircraft making communications unpredictable.

When operating aeronautical mobile, the operator must be cognizant of the radio operating rules and regulations of each country over which the operator happens to be flying. When operating in international airspace I use the call sign NQ4I/Aeronautical Mobile. When operating in U. S. airspace I use the call sign NQ4I/Airplane Mobile. Knowing this, the listeners can tell a little bit about where I might be before they give me a call.



Flying the Gulfstream 5

For flights of 10 hours or less, the crew configuration is two pilots and one flight attendant; for flights 10-12 hours, three pilots and one attendant are required, and, for flights over 12 hours, the range limit (15 hours) requires four pilots and one flight attendant. G5 aircraft are configured for total seating of 14 passengers, but the typical load is two.

The normal cruise speed is Mach 0.85 (that's 85% of the speed of sound) and is typically (in still air) about 565 MPH. Range on a fully fueled G5 is approximately 6,500 nautical miles. On a long range flight, the crew will level off at Flight Level 410 (41,000 feet) and remain there until fuel is burned off to allow a step-climb to FL430 and later climbs to FL450, 470, 490, and finally, 510 (51,000 feet). Fuel economy is best when the plane is operated at the highest altitude consistent with its gross weight (fuel in the tanks).

The G5 is fueled to a total of 40,500 pounds (6,045 gallons) at an average cost of $4.65/gallon. It costs about $28,000 to fully fuel the G5 and the burn is approximately 3,500 pounds/hour or about $2,400/hour just for fuel. Other fixed costs and the approximate operating cost per hour is nearly $6,000/hour. A typical seven hour flight to Europe can cost over $40,000 not including the Eurocontrol costs for using the European airways and the cost of crew expenses.

World Class Home Contest Station

I moved back to my birthplace of Griffin, Georgia in 1989 and have since been building a competitive contest station. While we suffer a handicap in terms of geographic location with other parts of the country, we have been holding our own and most recently have become quite competitive. We have been operating most of the major contests these past ten years and have managed to win seven first place finishes in the CQWPX contests in both phone and CW.

The NQ4I contest station currently consists of nine towers (50-ft to 200-ft) and thirteen fully equipped operating positions. The station has about 17 very large stacked beam antennas on 10, 15, 20, and 40 meters. Some of these beams are fixed on specific areas, but many are rotatable. There are ten vertical antennas on 80 meters that can be combined and phased in different directions as propagation changes during the contests. There are three full-size vertical antennas for 160 meters and these can be phased for directivity. Finally, there are six long Beverage antennas for listening on the lower frequencies. This arsenal of antennas gives us a total of about thirty-six antennas from which to choose.

The operating equipment consists of eight Ten-Tec Orion transceivers, three Yaesu FT-1000 MP transceivers, five Alpha amplifiers, and seven Henry amplifiers. All radios are computer controlled and networked together running the latest and greatest contest software available. Some operators bring their own head phones and a radio or amplifier just to use as spares.

The Southeast Contest Club has been very active in promoting the Georgia QSO Party for the past few years. In support of the SECC's effort, I've opened my full station to any and all local hams, contesters or not, who want to participate in a real contest and see what it's like to operate a significant amateur radio station. This serves multiple purposes and we have been able to recruit a few new contesters to our ranks as a result of this.

Needless to say, I make quite a few contacts every year with all this operating. For those that are interested in collecting QSL cards, whether ham radio operators or shortwave listeners, I have been very fortunate to have a great QSL manager who has stuck with me for a number of years and responds to all QSL requests. Those wishing to QSL may send cards via the bureau or directly to K4PK at the Callbook address or the address posted on **www.qrz.com**. I believe he told me recently that he had been handling as many as 20,000 QSL cards per year for about the past thirteen years.

In addition to being president of the Dixie DXers Contest Club, the Southeast Contest Club, I have been a member the Charles E. Newton Radio Club (K4HYB) of Griffin, GA since 1961. I guess that some folks might think that I live in a dream world and they just might be right. However, I have been able, not only to dream, but to realize many of my dreams through the application of ham radio and aviation. I would encourage all young people with any interest in either of these hobbies to get serious about them and make something of it for themselves. If anyone has any further interest in the NQ4I aeronautical mobile operation or the NQ4I contest station, please check my web site at **http://www.nq4i.com/** or my email at *nq4i@contesting.com* .May all your reports be 59+ and your skies VFR (That's radio and aviation jargon for the very best). "73 es gl de Rick, NQ4I/AM" MT

SCANNING REPORT

THE WORLD ABOVE 30MHZ

Dan Veeneman
danveeneman@monitoringtimes.com
www.signalharbor.com

Mastering the LTR Frequency Search

Frequencies are the primary ingredient for successful scanning. Finding, verifying and programming proper frequencies are all necessary tasks the listener must learn to do in order to get the most out of their scanner. This month we walk through the process of finding new frequencies for a business-related trunked system and review the core issues related to the 800 MHz rebanding process.

❖ Logic Trunked Radio

Dan,

I found some articles written by you which seem to help with my dilemma, however I am still confused. Hopefully you can help.

I received a Uniden trunk-tracking BCT8 for Christmas and I'm trying to program it. I searched the Internet and came up with the following information:

01 463.6000
02 464.8750
05 464.7750
06 452.6250
09 463.5750
10 452.9750
13 451.8250
14 452.2125
17 451.7250
18 464.3750

Talkgroup	Mode	Description	Type
0-01-075	A	Parking Garage	Business
0-01-085	A	Hyatt Engineer	Business
0-01-088	A	Unknown Engineering	Business
0-01-100	A	Bellevue Place Security	Business
0-02-039	A	Unknown Housekeeping	Business
0-02-045	A	Bellevue Square Inside	Business
0-02-055	A	Bellevue Square Maintenance	Business
0-02-100	A	Bellevue Square Security	Business
0-02-102	A	Lincoln Square Security	Business
0-02-118	A	Lincoln Square Garage	Business
0-02-125	A	Hilton Housekeeping	Business
0-02-128	A	Unknown Conference Setup	Business
0-02-131	A	Food Ops	Business

I've tried all sorts of different combinations for programming but nothing seems to be working. I just now programmed the channels (frequencies) to the channels listed, ie: 1,2,5,6,9,10,13,14,17,18 respectively and it stops on channel "210" (as I am using bank 5, 201 to 250. Channel 210 is programmed to 452.9750) where it gives what sounds like a squelch break. On occasion it sends out Morse code, I'm assuming an identifier, but I'm not tagged for CW, so I don't know what it's saying. I have had a stop on "channel 1" twice in about the last 10 minutes and also gives CW. I have everything set as "LTR" setting and it only does these two phenomena when I have "trunk" off; when I turn it on it just scans.

Do you have any suggestions that I might try to get this going?

Respectfully,

David in Auburn

The BCT8 is a base/mobile scanner introduced in late 2003. It can track Motorola, EDACS and LTR analog trunked systems and has 250 user-programmable memories, organized as five banks of 50 channels each.

The BCT8 has several ways of scanning trunked systems, as described on page 33 of the Owner's Manual. You probably want to be in "ID Search" mode, which will scan your programmed trunk frequencies and stop on any active talkgroup. While a talkgroup is active, you can press the "Down Arrow" key to see the frequency on which the conversation is taking place. This feature is described on page 37 and will be useful as we try to figure out if we need to add new frequencies to the LCN list you provided.

LTR Control

Unlike the other common trunked radio systems, LTR does not have a dedicated control channel. Each LTR channel can be used for voice communication and carries digital control messages as a sub-audible data stream below the range of the human voice. These messages include information about which channels are idle and what talkgroups are active on which channels.

LTR Talkgroup Format

Area Code	Home Repeater	User ID

Area Code: 0 or 1
Home Repeater: 01 to 20
User ID: 000 to 254

LTR talkgroup identifiers are built up from three numbers. The first is a single digit called an *area code* and is either a 0 or a 1. Area codes are used to distinguish between two nearby LTR systems: one system will use 0 and the other will use 1. The second number in a talkgroup identifier is called the *home repeater* and indicates which of the 20 possible channels is used for that talkgroup. The third number is the *user identifier*, and ranges between 0 and 254.

Idle LTR repeaters typically transmit a half-second data burst every ten seconds or so, letting radios know that the system is active and ready. This would sound like the "squelch break" you describe. Keep in mind that you may only hear these bursts on home channels, since the system operator has the option to turn off this feature on the more lightly used channels.

The Morse code you hear is probably automatic call sign identification. If you look at the scanner display when the Morse code is active, you might see a talkgroup with a user identifier of 253 and a home repeater that matches the channel number.

Bellevue Square

The Logic Trunked Radio (LTR) system you describe is a combination of several FCC licenses related to the commercial property developments of Bellevue Square, Bellevue Place and Lincoln Square, located a few miles east of the City of Seattle, Washington. These retail and office properties include a 180-store shopping mall, office space, and several hotels.

The table of LCNs and frequencies you provided has some gaps. This is not uncommon with LTR systems, which do not require that LCNs be sequential. However, it may be worth checking to see if there are additional frequencies that might be missing from the list and need to be programmed. Remember that a missing LCN means that your scanner won't be able to tune to that frequency, which results in you not hearing any conversations that take place on that channel.

Let's see if we can try to find some candidate frequencies that might help fill out that table. We'll do this by checking the FCC database at **http://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp** and looking for additional licensed frequencies that are associated with frequencies we already know.

Select "Advanced License Search" and you'll be presented with a search form. In the "Licensee" section choose "Washington" for the State, then under "License Detail" check the "Active" box to limit the results to active

licenses. Finally, further down under the "Frequencies" area, select the "Exact" choice and enter the frequency you're looking for. I started with 463.6000 MHz and worked my way down your list.

Call sign WPXF825, assigned to Bellevue Square Managers, is licensed to use 463.3000 MHz, along with a number of other frequencies. Looking at the locations and frequencies listed and matching them up with your LCN list, I can put together this table of frequency information:

Frequency	Type	Reported LCN
451.9375	Fixed and Mobile	
452.2125	Fixed and Mobile	14
452.6250	Fixed and Mobile	06
452.9750	Fixed and Mobile	10
456.9375	Mobile	
457.2125	Mobile	
457.6250	Mobile	
457.9750	Mobile	
463.6000	Fixed and Mobile	01
468.6000	Mobile	

Continuing the process, 464.8750 MHz can be found under call sign WQAM384, which is licensed to Bellevue Place. It is noted as a hotel with the following frequencies:

Frequency	Type	Reported LCN
464.7750	Fixed and Mobile	05
464.8750	Fixed and Mobile	02
469.7750	Mobile	
469.8750	Mobile	

The FCC data also reveals the Hyatt Regency Bellevue as a license holder for 464.8750 MHz, under the call sign WNPU454.

Frequency	Type	Reported LCN
464.3750	Fixed	18
464.8250	Fixed and Mobile	
464.8750	Mobile	02
469.3750	Fixed and Mobile	

The next frequency to find is 451.8250 MHz, which is assigned to call sign WPXF827. This is listed as Bellevue Place and described as retail management:

Frequency	Type	Reported LCN
451.7250	Fixed and Mobile	17
451.8250	Fixed and Mobile	13
451.9625	Fixed and Mobile	
456.7250	Mobile	
456.8250	Mobile	
456.9625	Mobile	
463.5750	Fixed and Mobile	09
468.5750	Mobile	

We've now located license holders for all of frequencies in the original LCN list. In our searches, we've noticed that all of these license holders have 'Bellevue' in their name and are related to Bellevue Square. So, we can do another type of search, where we look for the name of the license holder.

Back at our Advanced License Search form, click the "Reset" button in the upper-left corner to clear any previous information, then skip down to the "License Detail" section and check the "Active" box for Status. Then move to the "Licensee" section, select "Washington" as the state, and enter "Bellevue Square" in the Name field. Click on the "Search" button in the lower right corner of the form.

We find two entries; one we've already checked and a second that is licensed to Bellevue Square Managers as call sign WPUT751, with a description of property management, where the radios are used for security and operations.

Frequency	Type	Reported LCN
464.3750	Fixed and Mobile	18
464.9250	Fixed and Mobile	
469.3750	Mobile	

Unchecked Frequencies

Looking back over the data we've collected, let's put all of the fixed frequencies into a single table. We exclude the mobile-only frequencies because they should not be used from a repeater and would not be part of the LTR system.

Frequency	Type	Reported LCN
451.7250	Fixed and Mobile	17
451.8250	Fixed and Mobile	13
451.9375	Fixed and Mobile	
451.9625	Fixed and Mobile	
452.2125	Fixed and Mobile	14
452.6250	Fixed and Mobile	06
452.9750	Fixed and Mobile	10
463.5750	Fixed and Mobile	09
463.6000	Fixed and Mobile	01
464.3750	Fixed and Mobile	18
464.7750	Fixed and Mobile	05
464.8250	Fixed and Mobile	
464.8750	Fixed and Mobile	02
464.9250	Fixed and Mobile	
469.3750	Fixed and Mobile	

This combined table has a total of 15 frequencies, ten of which are identified from your LCN list. This leaves us with five additional frequencies, some or all of which might be part of the LTR system: specifically 451.9375, 451.9625, 464.8250, 464.9250 and 469.3750 MHz. There are a few ways we can check to see where these frequencies fit.

One way is to program them in a separate bank as conventional channels. They won't trunk-track correctly, of course, but if transmissions occur on them that sound like part of a conversation, you will have some evidence that they could be part of the LTR system. This method is even more effective with a second scanner, since you could track the LTR system with the BCT8 while simultaneously scanning these five frequencies with the other one.

There is an interesting pattern in the original LCN list you provided. It is not uncommon to find a five-channel LTR system using LCNs 01, 05, 09, 13, and 17. Your list has this same pattern, but doubled with a second set at 02, 06, 10, 14, and 18. If additional frequencies need to be added to the list, this pattern might help us figure out where they should go.

If we assume the original LCNs on your list are correct, then we can try to add the five additional frequencies at slots 03, 07, 11, 15, and 19. If one of these new LCNs is not used by the system, adding it into your scanner won't hurt anything. If a new LCN slot is used but has the wrong frequency programmed into it, your scanner will tune to that frequency but will obviously miss part of the conversation.

Another technique is to pick one of the five frequencies and program it into each of the ten remaining LCNs. If you hear a conversation on that frequency, you know it belongs in the LCN list. This may take some time, especially if the system is not fully active, since some of these frequencies may be "overflow" channels used only when all others are busy.

As you're scanning Bellevue Square, keep in mind that there are also independent radios operating in the 400 MHz band. For instance, the J.C. Penney store uses 451.2375 MHz. A basic search between 450 to 470 MHz may reveal other activity in the local area that could be related to the Bellevue properties.

❖ Rebanding

HI Dan,

I sure enjoy your monthly column in MT. I have a Uniden 396T with the latest firmware. The question is, do I need to do anything special to program a rebanded EDACS system, or does it only apply to Motorola systems? I noticed that one of the sites for the city of Reno, Nevada, which uses an EDACS/wide system, has been rebanded. I did not see anything either in the scanner or the Butel ARC software to take this into consideration. This might be a good question for you to print...(hint!)

Thanks very much,

Dave in Brush Prairie, Washington

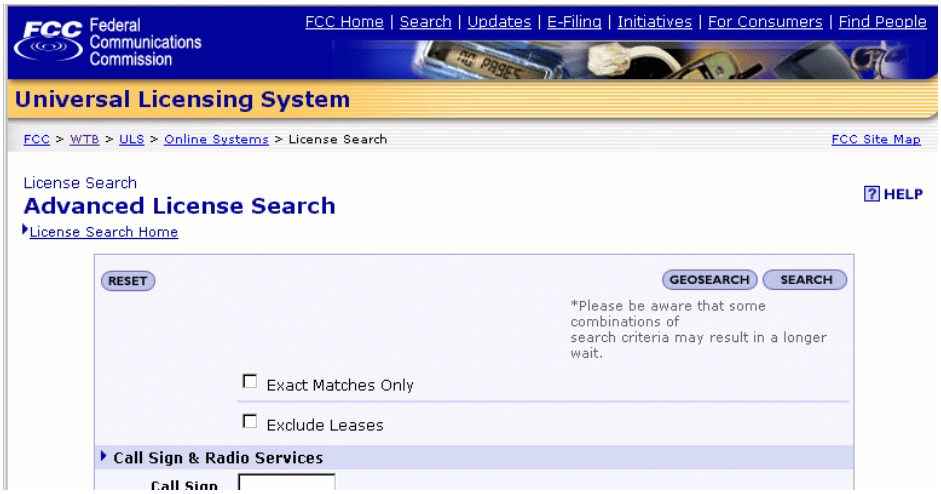
In 2004 the Federal Communications Commission (FCC), which controls non-Federal use of the radio bands in the United States, ordered the reorganization of the 800 MHz band to alleviate interference between public safety systems and commercial radio users.

Historically, public safety and commercial radio frequencies were intermixed in the 800 MHz band. As the commercial service provider Nextel expanded operations and increased coverage, it became commonplace to find numerous high-power Nextel sites transmitting on frequencies adjacent to lower power public safety systems. Numerous complaints of interference and a lack of adequate regulatory enforcement eventually led the FCC to decree that commercial operations be aggregated in an upper part of the 800 MHz band and that public safety likewise be relocated to a lower part of the band. This movement of frequency assignments has come to be called "rebanding."

In practice, rebanding means that some of the 800 MHz frequencies used by public safety agencies move downward in the band. This has not been good news for scanner listeners, since many manufacturers did not anticipate such a change and their older units lack the flexibility to track some of these lower frequencies properly.

Control Channel Messages

The problem lies in the way that scanners interpret control channel messages. Recall that control channels are transmitted from a system controller out to radios in the field. Like the radios, your scanner monitors a control channel to find out what talkgroups are active on what



voice channels.

Control channels carry instructions and status messages, telling the radios when they can access the system and where to tune. The format of these tuning instructions varies according to the type of system, but the end goal is very simple: Regardless of format, the radio must be able to tune to the correct radio frequency as instructed by the controller.

Tuning messages do not carry the actual frequency itself, like 851.2750, but instead use some kind of number to represent that frequency. It is the job of the radio, and of your scanner, to convert that number into its corresponding frequency.

Logic Trunked Radio (LTR) and Enhanced Digital Access Communications System (EDACS) use Logical Channel Numbers (LCNs) to indicate what channels to use. Each radio in an LTR or EDACS system has a list of frequencies, and each frequency has an associated LCN. Here is an example of the current Nassau County, New York Public Safety EDACS frequency list, which was rebanded last November:

LCN	Frequency
01	851.1875
02	851.3375
03	851.5875
04	851.7375
05	851.8375
06	851.9000
07	852.1125
08	852.1750
09	852.9000
10	853.1750
11	853.4250
12	853.5750
13	853.7250
14	853.6500

Using this list, when the Nassau system controller wants to tell a radio to use, for instance, 852.1750 MHz, it sends a message on the control channel that tells the radio to tune to LCN 08. The radio looks up LCN 08 in its own frequency list, sees that it is 852.1750 MHz, and tunes there.

Because LTR and EDACS systems have these LCN lists, when they are rebanded all you need to do is program the new frequencies in their proper LCN order and you will be back up and scanning.

Trunked digital systems that are "pure" APCO Project 25, meaning they use the P25 standard for the control channel format, can also be tracked after rebanding by simply reprogramming the system frequencies.

Motorola Confusion

The main problem with rebanding occurs with systems that use the very common Motorola "3600-baud" control channel format. Messages on these control channels use a "channel number" to tell the radio where to tune. These channel numbers are based on an old 800 MHz band plan that became outdated with the FCC rebanding order. The band plan equates channel numbers with radio frequencies, so that when a radio receives a channel number it can compute the corresponding frequency.

Under the new band plan, the frequencies that correspond to a subset of channel numbers have changed, so that some channel numbers now represent a different frequency than they did prior to rebanding.

Unfortunately, the new band plan was not available when older scanners were manufactured, so they have the old band plan instead. Some scanner models can be updated with new firmware, giving them the new band plan, but many cannot. The newest scanners are capable of handling rebanded systems without difficulty.

Scanners that support rebanded Motorola systems include:

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

Older model scanners that do not appear in this list will probably have difficulty scanning rebanded systems.

More information and links related to scanning and radio equipment are available on my website at **www.signalharbor.com**, and I welcome your electronic mail to *dan.veeneman@monitoringtimes.com*. As always, I'd love to hear about the systems you're listening to, whether they've been rebanded or not. Until next month, happy scanning!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Q. *How did sunspots affect communications in the years 1939-1945? Could Americans listen to WWII shortwave broadcasts as well as tactical communications like low-power spy radios using Morse code transmissions? (J.J. Owens, NC)*

A. When the 11-year sunspot cycle peaked in 1942, it was only slightly less than in 1953 when that cycle reached its pinnacle of the 20th Century. I got my amateur radio license in 1951 and remember vividly the global DX that saturated the high frequency (HF) spectrum. I could work the world from my car on 10 and 20 meters with my trusty Elmac transmitter using a simple 8-ft. whip.

The years on either side of 1942 saw the growth, then fade of incredible long-distance radio reception. Although radio receivers were not quite as sensitive as they are now, that wasn't a problem, since atmospheric noise is the limiting factor on shortwave, and large receiving antennas were the rule.

A fellow radio ham showed me some CW spy radios that he had acquired while in an intelligence unit; they were hand-constructed in small suitcases and ran less than a watt. Even commercially-constructed transmitter/receiver rigs for insurgents ran no more than a few watts; parts had their manufacturers' names removed, ostensibly to protect them from identification and association with well-known companies.

At the right time of day or night, on the right frequency without interference, these rigs were capable of intercontinental communications for both the allies and the axis.

Q. *Should CDs and DVDs be stored on their side (like phonograph records) or is it OK to stack them flat in tall columns? (Mark Burns, Terre Haute, IN)*

A. It doesn't make any difference, just so long as the surfaces don't rub against each other and there are no pressures against them that could cause them to warp over time.

33-1/3 and 45 RPM phonograph records were made of soft vinyl, vulnerable to heat, and they were heavier, so their sag could become permanent if stored horizontally. CDs and DVDs are not vinyl, they are very light, and their thicker hub keeps the surfaces from touching when they are stored horizontally on a vertical spindle.

Q. *When you go to compute antenna length using 468 / frequency in MHz, is the resonance of the antenna dependent upon the impedance of the feed line? (John Bishop, Hawthorne, FL)*

A. The resonant frequency of the antenna is independent of the feedline impedance; no matter where you feed the antenna along its length, the feedpoint impedance remains essentially uniform. The impedance of the antenna wire is a function of its length, free-space environment, and excitation frequency.

The impedance of the transmission line is determined by its own distributed capacitance and inductance, not the termination resistance or impedance.

Q. *In the past, foreign-distributed scanner brands like Yupiteru never became legal in the U.S.; some had cellular frequency coverage, and some did not. There are non-U.S. companies that will ship such scanners to the U.S; since all cell phones are now digital and cannot be monitored with these analog scanners, can they be legally owned by U.S. citizens? (Scott D'Amico, email)*

A. No. As outmoded as the anti-cellular-frequency-scanner law is, it is still the law. No one in the U.S. other than a government agency, cellular service provider or technical laboratory requiring such a device is allowed to own a scanner that is not FCC type accepted, whether or not it includes cellular frequency coverage.

Even though the law applies equally to individuals and marketers, the FCC is far too overworked and underfunded to go after private owners.

Q. *I have two Grove FlexTennas hanging in my windows, and they get excellent reception, but depending on the direction of the signal, one antenna may outperform the other. Can I simply combine the two antennas with a standard TV-style splitter for even better, more uniform reception? (Howard Buford, email)*

A. The main problem with combining two antennas is that, depending on the direction in which a particular signal is received, the waves may add (stronger signal) or they may subtract (weaker signal). It is a phase angle issue related to the wavelength of the signal and it's almost impossible to predict when you are tuning around whether the combined signals are going to get better or worse!

If two identical antenna elements are mounted outside and it the clear like on a rooftop or tower, their separation may be calculated for special directional effects like nulling out interference from a specific location, or even adding together in other directions.

With directional beams, they can be mounted over/under or side by side, and their mutually-collected signals may be combined in a TV-style splitter (now a combiner) with equal coax lengths for improved signal strengths of about 3 dB.

Q. *Since there will be a ban on incandescent lamps in 2012, how does one cope with replacement heat lamps, bright flood lights, and other incandescents? My present CFL bedside lamp causes interference to my clock radio. (Mark Burns, Terre Haute, IN)*

A. It's not that bleak. CFLs are getting whiter, incandescent efficiency is gradually getting better, and LEDs are coming to the market as well. Radio Frequency Interference (RFI) is not a problem more than a few feet away, and even that goes away when using Light Emitting Diodes (LEDs) and higher-efficiency (halogen) incandescents.

The legislation mandates a 30% improvement in efficiency for conventional 40-150 watt bulbs, and doesn't apply to reflector flood lights, 3-way bulbs, candelabra bulbs, colored bulbs, plant lights, and rough-service bulbs, so you can leave those 300 watters plugged in!

100 watt bulbs will be affected in 2012, and 40-watt bulbs in 2014. By 2020, all general-purpose bulbs must produce at least 45 lumens per watt – similar to today's CFLs.

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

Hugh Stegman, NV6H
hughstegman@monitoringtimes.com
www.ominous-valve.com/uteworld.html
http://mt-utility.blogspot.com

MARS Gets New Name and Mission

No don't worry, they're not about to subtract another planet from the solar system. The MARS in question here is the United States quasi-amateur radio service that supports the military. Late last year, a US Department of Defense (DoD) "instruction" brought major change to the organization.

First off, we have a new name. MARS is now the Military *Auxiliary* Radio System, rather than the Military *Affiliate* Radio System.

A military auxiliary is defined here as follows: "An organized body of volunteers prepared to supplement the uniformed services or any designated civilian authorities by provision of specialized autonomous services when called upon or when situations warrant (e.g., Civil Air Patrol, U.S. Coast Guard Auxiliary)."

This is a lot of words to say that the rather nebulous status of MARS just became far clearer. Its mission is now quite clearly defined as relating to "contingency radio communications support."

We have a definition for that too: "The provision of radio-based transfer or exchange of information to assist with DoD or civilian authorities' operations during, or responses to, any major disruption of DoD or other communications networks, such as those associated with official national security or emergency preparedness events or activities."

Again, words are important. This firmly establishes the service's first priority as supplying skilled radio operators and equipment to fill immediate needs to maintain important operations. It makes the national security/ emergency preparedness (NS/ EP) function of the old MARS into its reason for existence.

However, the old health and welfare and morale messages will not vanish from the airwaves. Part "d" of the policy section states that: "MARS shall provide health, morale, and welfare radio communications support to military members, civilian employees and contractors of DoD Components, and civil agency employees and contractors, when in remote or isolated areas, in contingencies or whenever appropriate."

I assume this means that DoD aircraft will still be making the air-ground MARS patches we have come to know and love. The best frequency for these is 13927.0 kilohertz (kHz), upper sideband voice mode (USB).

One would also assume, probably accurately, that the US Navy/ Marine Corps MARS is here to stay. All "combatant commands" are instructed to work with MARS. Presumably, this supersedes some ambiguous earlier Navy orders that disbanded certain MARS operations by Navy personnel.

The entire 8-page "instruction" document is at **www.dtic.mil/whs/directives/corres/pdf/465002p.pdf** .

❖ Utilities Inside Amateur Bands

The edges of the international amateur radio bands should not stop the utility hunter. After all, they don't always stop the utilities.

For a start, some utilities operate legally in the ham bands. The older bands are exclusively amateur in the United States, but not in a lot of other places.

80 meters, for example, is shared between amateurs and utilities in two of the world's three International Telecommunications Union (ITU) regions. Some countries have gaps in the middle where no amateurs are allowed. Often, it stops at 3800 kilohertz (kHz) instead of the 4000 allowed in the United States. Some areas even allow high-power international broadcasting just below 4000.

And then, we don't even talk about 40 meters, which until very recently was fair game for international broadcasting in two regions, making everything above 7100 kHz essentially useless at night. This situation is changing, but slowly, as some broadcasters seem to be slow getting the hint.

This intense spectrum warfare leads the hams to aggressively defend what they do have. Radio societies often run Intruder Watches, which publish lists of their catches on the World Wide Web. Like the ITU direction finding logs, these write-ups are subjective and hardly authoritative information. Still, they are good for seeing who is transmitting where.

❖ Military

Most of the interesting utilities in the amateur bands are military. These operate in something of a regulatory grey area. It's pretty much been agreed that military stations can legally operate just about anywhere on the high-frequency band (HF; 3 to 30 megahertz), as long as they don't interfere. Of course, opinions diverge wildly on just what constitutes interference.

Since 80 meters is shared, it's a good stalking ground for military, especially in Russia, China, and the Commonwealth of Independent States. One hears a lot of those weird tactical Morse code continuous-wave (CW) nets with the 4-figure callsigns, using tight procedures to pass short coded messages.

Some people like to chase all the Russian single-letter beacons. Especially in Europe, it's hard to tune 80 and 40 without running into plenty of these. Some are channel markers. Most striking, though, are the beacon clusters, one in each band. The CW center frequencies are 3594 and 7039 kHz, respectively.

Both of these follow the uniform spacing and position setup common to all the clusters. This goes as follows: xxxx.7 kHz, "D," Sevastopol, Ukraine; .8, "P," Kaliningrad; .9, "S," Severomorsk; .0, "C," Moscow; .1, "A," Astrakhan (?); .2, "F," Vladivostok; .3, "K," Kamchatskiy; and.4, "M," Magadan.

Also, there's more than one mysterious radio fax station using 80 and 40. The most reported one sends large charts at a slow 60 lines per minute, identified with the cryptic designation of "GM-11F." This is probably the Russian Navy.

Then there's the really weird stuff. Lately, I've been hearing a very strange signal over a Web-based radio in Holland. It's on 3756.0 kHz, double-sideband amplitude modulation (AM). "Numbers" enthusiasts generally refer to it from the compellingly weird sound it makes: "The Pip." We have learned that The Pip is actually a channel marker for a military station in Rostov-Volgograd. Voice and data transmissions are sometimes heard.

Similarly weird Russian noises are The Buzzer, a marker for military station UZB76 on 3824 and 3842 kHz AM, and The Squeaky Wheel, on 3829. Both are also named from their truly bizarre sounds. They also interrupt on occasion for voice and data transmissions.

❖ Higher Bands

30 meters, a newer band between 10100 and 10150 kHz, is shared, and always will be. A few good, legal utilities turn up near the low end. The best is on 10100.8 kHz, plus or minus dial offset. It's DDK9, Hamburg Meteorological, from the historic site in Pinneberg. It runs continuous weather information in radio teletype (RTTY), using a 450-hertz shift at a baud rate of 50. FAV22, the French Morse code training

net, has been reported in CW on 10102 kHz, again plus or minus offsets and errors.

And then, there is 20 meters. It is exclusively amateur in all regions, and popular with nets and award hunters. It's probably the most intensively monitored 350 kHz of the entire radio spectrum. If an intruder wants to attract all the junk yard dogs, 20 is the place to do it.

Not all are deterred. Hams can't safely transmit right on the 14000-kHz lower limit, and so this frequency has become a bad neighborhood. Some sort of weirdness is always happening there. Recently, there has been a phase-shifted carrier that has been tentatively traced to the Israeli Navy.

In the rest of the band, one often hears Chinese traditional music, courtesy of "Firedrake." This is a jammer, which chases a couple of broadcasters all over HF.

Despite the extended solar minimum, 15 meters still has some military operation. 10 meters has CW drift net beacons, unidentified spread-spectrum, and the occasional incursion by 11-meter "freebanders."

❖ Yet More Life on 600 Meters

Richard Dillman is one of the key figures in the preservation of mighty KPH and creation of the new KSM. They're both at the historic Marconi/RCA/ MCI transmit and receive sites on Point Reyes, CA. He writes to remind me that I missed a few stations active on this band.

Well, he's right. I've even heard some of these. There are several restored World War II Liberty and Victory ships operating with vintage equipment. The SS (Steam Ship) *Jeremiah O'Brien*, radio call KXCH, uses 425 and 500 kHz CW from its original Radiomarine radio room console. SS *Red Oak Victory*, KYVM, has a restored Mackay console. SS *Lane Victory*, KECW, has another Radiomarine setup. There's also the SS *American Victory*, KKUI.

There are also at least two warships preserved as WWII memorials that have capability on this band. They include LST-325, a Landing Ship, Tank; and USS *Cassin Young*, NTTH, a Fletcher-class destroyer.

Meanwhile, the US Federal Communications Commission still licenses commercial maritime traffic stations on this band. Along with KSM, there's the new WFT, Palmetto, FL, on 500 and 486 kHz CW. Also there's WNE, Stoneham, MA, 500 and 427 kHz CW; and KDR, Bellevue, WA, 500 and 482 kHz CW. All are under construction. None expect to move much traffic, but just to keep this band alive.

Message passed. We'll meet you back on the calling channel next month.

ABBREVIATIONS USED IN THIS COLUMN

AFB.....Air Force Base
ALE .....Automatic Link Establishment
ARQ.....Automatic Repeat reQuest (teleprinting).
Camslant .....Communications Area Master Station, Atlantic
Camspac.....Communications Area Master Station, Pacific
CIS .....Commonwealth of Independent States
CW .....On-off keyed "Continuous Wave" Morse telegraphy
E10.....Israeli "female," phonetic call and 5-letter groups
EAM.....Emergency Action Message
FAX .....Radiofacsimile
HFDL .....High-Frequency Data Link
HF-GCS .....High-Frequency Global Communication System
LDOC .....Long-Distance Operational Control
LSB .....Lower Sideband
MARS .....US Military Auxiliary Radio System
MCTS.....Marine Communications and Traffic Service
MX.....Generic for Russian single-letter beacons/ markers
NDB.....Non-Directional Beacon
NS/EP .....National Security/Emergency Preparedness
RTTY .....Radio Teletype
Selcal .....Selective Calling
Sitor-A/B .....Simplex Telex Over Radio, mode A or B
STANAG.....Standardization Agreement
STANAG 4285.....Military 8-state data mode
UK .....United Kingdom
Unid .....Unidentified
US .....United States
USAF.....US Air Force
USCG .....US Coast Guard

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 ().

147.3 DDH47-German Weather Office, Pinneberg, cross-band CW amateur contacts for Marconi/Braun Nobel centennial, at 2305 (DL8AAM-Germany).
274.0 SAL-NDB, Sal, Cape Verde Islands, CW identifier and dash at 2318 (PPA-Netherlands).
286.5 001-Differential Global Positioning System beacon, Baltiysk/ Kaliningrad, Russia, 100-baud Minimum-Shift Keying at 1926 (PPA-Netherlands).
363.0 RNB-NDB, Millville, NJ, CW identifier at 0118 (MDMonitor-MD).
366.0 YMW-NDB, Maniwaki Quebec, CW at 0101 (MDMonitor-MD).
475.0 "P"-Russian Navy CW channel marker (MX), Kaliningrad, at 2225 (Ary Boender-Netherlands).
499.0 PAT-Pirate CW New Year's Eve beacon, Ireland, identifying "HNY PAT" (Happy New Year), at 2123 (DL8AAM-Germany).
516.0 YWA-NDB, Petawa, Ontario, CW at 0055 (MDMonitor-MD).
2008.0 WQ6N-CIS military, usual 4-figure tactical callsign and procedures, similar activity on 2822, 3207, 3299, 4526, 4586, 4832, CW at 2008 (MPJ-UK).
2142.5 ZLST-German Customs Control Post, Cuxhaven, working DVLK, Customs Boat ZB Hiddensee, ALE and data, also on 2673, 3831, and 4553.5, at 2053 (MPJ-UK).
2311.0 EIMZ-Irish merchant vessel Arklow Rock, checking in with Arklow Radio, Dublin, also other vessels, at 1720 (Michel Lacroix-France).
2586.0 OXZ-Lyngby Radio, Denmark, maritime bulletins at 2139 (Lacroix-France).
2598.0 Unid-Canadian Coast Guard MCTS, maritime weather in English and French, at 0019 (MDMonitor-MD).
2677.0 CROSS MED-French Coast Guard, La Garde, maritime weather at 1753 (MPJ-UK).
2720.0 SPS-Witowo Radio, Poland, Baltic Sea weather in Polish, at 1940 (Lacroix-France).
2749.0 Unid-Canadian Coast Guard MCTS, weather in English and French at 0150 (MDMonitor-MD). VCG-MCTS, English and French weather at 0744 (Lacroix-France).
2872.0 Speedbird 228-British Airways B767 (G-BNWY), working Shanwick at 0700 (Lacroix-France).
2899.0 Reach795-USAF Air Mobility Command, working Shanwick at 2058 (Lacroix-France).
2971.0 ACA888-Air Canada B767 (C-FCAE), working Shanwick at 0747 (Lacroix-France).
3016.0 CFG249-Condor Airlines B767, working Shanwick at 0654 (Lacroix-France).
3167.0 "P"-Russian Navy CW channel marker (MX), Kaliningrad, also on 3256, at 1826 (PPA-Netherlands).
3291.0 "P"-Russian Navy, Kaliningrad, CW marker followed by Cyrillic 5-figure groups, then marker and encrypted RTTY, all at 1835 (PPA-Netherlands).
3302.0 GFF-Kinloss Rescue, Scotland, sent Sierra 131 to 3026, at 1822 (PPA-Netherlands).
3455.0 New York-Atlantic oceanic air control, NY, position from Transat 882 (Air Transat, Canada), came from 6577, at 2342. New York, working Cactus 741 (US Airways), at 2346 (Allan Stern-FL).
3593.7 "D"-Russian Navy CW cluster beacon (MX), Sevastopol, Ukraine, also on 5153.7, 8494.7, and 16331.7, at 2132 (Boender-Netherlands).
3593.8 "P"-Russian Navy CW cluster beacon (MX), Kaliningrad, also on 4557.8, 5153.8, 8494.8, 10871.8, and 13527.8, at 2132 (Boender-Netherlands).
3699.5 "P"-Russian Baltic Fleet, Kaliningrad, CW channel marker at 2215 (MPJ-UK).
3890.0 UWS3-Kiev Radio, Ukraine, CW marker and traffic list, simulkeyed 6470 and 8571, at 2030 (MPJ-UK).
3900.0 VS006V-Virgin Atlantic A340 (G-VEIL), HFDL position for Reykjavik, at 0635 (Lacroix-France).
4002.9 AAA4RD-US Army MARS Region 4 Net, with AAM4ETN, TN, AAT4WH, GA, and AAM4ITN, TN, LSB at 0110 (Mark Cleary-SC).
4149.0 Tug Adventurer-Crowley Maritime (WBN 3015), status for "WPE Jacksonville," at 1756 (Cleary-SC).
4152.5 DHJ59-German Navy, Wilhelmshaven, working submarine DRDR, voice and STANAG 4285, at 0737 (Lacroix-France).
4207.0 YQFT-PetroMar, Sitor-A status report regarding Romanian Black Sea oil operations, at 0355 (ALF-Germany).
4325.9 "R"-Russian CW channel marker (MX), Izhevsk, also 5454.9, at 2146 (Boender-Netherlands).
4372.0 India Foxtrot-US Navy, Link-11 Coordination Net with Delta, at 2130 (Cleary-SC).
4469.0 Florida CAP 517-Civil Air Patrol, control in Florida Net, at 0130 (Cleary-SC).
5230.0 ULX1-Israeli intelligence AM phonetic station (E10), test format with no message, at 1530 (Mike-West Sussex, UK).
5270.0 IGB-Pantelleria Island, Italy, working unknown ship at 1512 (Lacroix-France).
5316.0 Sierra Whiskey-US Navy, air defense net with Mike, Romeo, November, Oscar, and Kilo, at 1243 (Cleary-SC).
5517.0 Emirates 764-Emirates Airlines Boeing 777 (A6-ECF), answering selcal FK-BM from unknown Africa net ground station, at 2205 (Patrice Privat-France).
5544.0 VT-INQ-IndiGo A320, HFDL log-on to Muharraq, at 1643 (MPJ-UK).
5550.0 New York, selcal with JetBlue 820 enroute JFK, at 0835 (Stern-FL).
5596.0 Arkhangelsk-Arkhangelsk Aeradio, Russia, comm checks in Russian with Vorkuta and Ukhta, at 0535 (ALF-Germany).
5598.0 Condor188-Condor Airlines B767 (D-ABUH) working Shanwick at 1635 (Lacroix-France).
5621.0 Unid-Unknown broadcast feeder, starts daily with "Bollywood" music, ends after Asian-language program with 2-way operator chatter, at 0545 (ALF-Germany).

5649.0 New Zealand 1-Air New Zealand B747 (ZK-SUI), answering selcal CP-GL at 1800 (Privat-France).
5658.0 Mumbai-Middle East Area 2 air traffic control, India, position from Cathay Pacific flight, at 0156 (Prez-MD). Etihad 411-Etihad Airways A330, registration A6-EYF, answering selcal JM-AR at 1745 (Privat-France).
5696.0 Camslant-USCG, working HC-130J Coast Guard 2006 at 0425 (Stern-FL). Camslant, position from MH-60J Coast Guard 6003, at 1536 (MDMonitor-MD).
5725.0 "3-L-T"-Multinational naval net, tracking link coordination with "9-P-E" and "3-Q-V," at 2053 (ALF-Germany).
5732.0 LNT-USCG Camslant, VA, calling J10 (MH-60J Coast Guard 6010), ALE at 1948 (MDMonitor-MD).
5736.0 RGV82-Russian Navy vessel, calling RCV, also on 3832, CW at 0046 (ALF-Germany).
6230.0 VMW-Australian Bureau Of Meteorology, Wiluna, voice-synthesized weather for western Australia, parallel on 8113, at 2140 (Prez-MD).
6330.0 RJF94-Russian Naval Air Transport, Moscow "Central Station," CW signal checks with RCB (Kaliningrad), RJC48 (Sevastopol), and RJC38 (Murmansk), at 1501 (ALF-Germany).
6496.4 CFH-Canadian Forces, Halifax, NS, FAX 24-hour surface prognosis chart at 1708 (Prez-MD).
6507.0 VMC-Australian BOM, Charleville, voice-synthesized weather at 0838 (Lacroix-France).
6525.0 Unid-Unknown oil shipping company, taking daily status report from tanker White Sea (Pacific Tanker Management, Liberian registry), others, at 0435 (ALF-Germany).
6586.0 New York, sending various flights to daytime primary of 11330, secondary of 8918, at 1154 (Stern-FL).
6596.0 VT-INK-IndiGo A320, HFDL log-on to Krasnoyarsk, at 1652 (MPJ-UK).
6622.0 N604DE-Canadair Challenger 604 bizjet, Duke Energy Corporation, position and selcal CH-BK with Shanwick at 1321 (ALF-Germany).
6628.0 New York, telling several flights that 2962 is secondary, at 0217 (Stern-FL).
6640.0 New York LDOC-Aeronautical Radio, Inc., selcal check and secondary frequency of 3494 kHz with JetBlue flight, at 0151 (Stern-FL).
6673.0 San Francisco-Pacific oceanic air control, CA, position and selcal check with Air Canada 057, at 0105 (Prez-MD).
6697.0 Publicize-US military, EAM at 2240 (Cleary-SC).
6701.0 Unid-Unknown broadcast feeder, starts daily with Arabic Islamic prayer, ends after religious program with 2-way operator chatter, at 0400 (ALF-Germany).
6712.0 Abortive-US military, attempting a patch with Andrews HF-GCS, MD, came from 11175 and ultimately went to 11220, at 2114 (Jeff Haverlah-TX).
6739.0 Andrews-USAF HF-GCS control, Andrews AFB, MD, EAM at 0813 (Lacroix-France).
6761.0 Reach 449-USAF, calling any station, no joy, at 1357 (Cleary-SC).
6803.1 LTRCAR176-US NS/EP, Little Rock, AR calling CHPNSC141P, SC Telecom portable unit, SC, also on 7480.1 and 7697.1, ALE at 1951 (Jack Metcalfe-KY).
6912.0 RCV-Sevastopol Naval Radio, Ukraine, CW 280-group Cyrillic Morse message to RGV82, at 1646 (MPJ-UK).
6998.0 HH7-"The Crazy Italian Pirate," typical markers, bogus call, and rant about the Pope in Italian, all CW, at 1320 (DL8AAM).
7038.9 "S"-Russian Navy CW cluster beacon (MX), Severomorsk, also on 10871.9, at 0837 (Boender-Netherlands).
7039.0 "C"-Russian Navy CW cluster beacon (MX), Moscow, also on 8495, 10872, 13528, and 16332, at 2132 (Boender-Netherlands).
7527.0 01Z-USCG, raised F33 in ALE, then voice as 01Z tracking an iceberg with HU-25 Foxtrot 33 at 1912 (MDMonitor-MD).
7598.0 IEA-Italian police net, working 32, 34, 36, and 41 in Italian, LSB at 0736 (Lacroix-France).
7635.0 Columbus 37-US Civil Air Patrol, net at 1502 (Cleary-SC).
8113.0 VMW-Australian Bureau Of Meteorology, Wiluna, voice-synthesized weather for western Australia, at 2140 (Prez-MD).
8156.0 C6LS-Royal Bahamas patrol boat, working Coral Harbour with request to enter and refuel, at 2235 (Cleary-SC).
8291.0 Camslant-USCG, calling distressed vessel, no joy at 2217 (Cleary-SC).
8297.0 ZLM-Kaupo Maritime Radio, New Zealand, Pacific weather at 1033 (Eddy Waters-Australia).
8337.6 Shark 19-USCG Cutter Confidence, clear and secure with Shark 16, Cutter Diligence, at 2116 (MDMonitor-MD).
8424.0 SVO-Olympia Radio, Greece, Sitor-B news and exchange rates in Greek, at 0645 (Lacroix-France).
8434.0 TAH-Istanbul Radio, testing in Sitor-A at 1335 (Lacroix-France).
8438.3 KSM-Maritime Radio Historical Society commercial CW station, Bolinas, CA, Pacific high seas weather at 2131 (MDMonitor-MD).
8467.5 Unid-Kyodo News, Japan, FAX newspaper in Japanese, at 1525 (Lacroix-France). [Either JJC or JSC; anyone know? -Hugh]
8495.1 "A"-Russian CW cluster beacon (MX), Astrakhan/ Baku, also on 16332.1, at 1951 (MPJ-UK).
8646.0 FUJ-French Forces, Noumea, Fiji, STANAG 4285 test loop (300 baud/ long), at 1047 (Waters-Australia).
8764.0 NMC-USCG Camspac Point Reyes, CA, voice-synthesized "Iron Mike" Pacific forecast, at 1650 (Prez-MD). NMN-USCG Camslant, "Iron Mike" weather at 2145 (Lacroix-France).
8776.0 Out Curve-US military airborne command post, working Jet Prop (unheard), went to 13155, at 1956 (MDMonitor-MD).
8846.0 New York-Caribbean air route control, position and selcal with Condor 162 at 2112 (MDMonitor-MD).
8879.0 Reach 191-USAF, working Gander at 1440 (Lacroix-France).
8888.0 Luanda-Africa Area 4 air traffic control, Angola, taking position from unknown flight at 2002 (Prez-MD).
8912.0 LNT-USCG, raised K61 in ALE, then voice as Camslant Chesapeake working MH-65C Kilo 61, inbound from a search and rescue at 1945 (MDMonitor-MD). Rescue 1717-USCG HC-130, patch via Service Center to Coast Guard Air Station Clearwater for weather, at 2211 (Cleary-SC).
8930.0 Stockholm-LDOC, Sweden, selcalling KM-EG, unknown aircraft enroute to Kazakhstan, at 1232 (Lacroix-France).
8971.0 Fiddle-US Navy, FL, calling P-3C Fighting Tiger 71C, at 2232 (Cleary-SC).
8983.0 Camslant, position and ops-normal from HU-25 Coast Guard 2117, at 1832 (MDMonitor-MD).
9007.0 Trenton Military-Canadian Forces, patching Akela 71 (USAF MC-130P) to Kirtland AFB, at 2230 (MDMonitor-MD).
9010.0 Pathfinder 30-Canadian Forces CP-140, working Halifax Military at 1509 (Cleary-SC).
9025.0 Juliet 04-USCG MH-60J, ALE-initiated patch via Andrews, at 1455. 220109-USAF C-17A, calling OFF (Offutt AFB, NE), ALE at 2127 (Cleary-SC).
9110.0 RIW-Moscow Naval Radio, working RDND in CW, also on 10438 and 14556, at 1128 (MPJ-UK).
9224.0 KBPNNN-US Navy/ Marine Corps MARS station NNN0KBP, ALE sounding with other stations on Tri-Service Net, at 1916 (MDMonitor-MD).
10066.0 "06"-HFDL ground station, Hat Yai, Thailand, uplinking arrival info for Kunming Airport, China, to B-6373, a China Eastern A320, at 1406 (MPJ-UK).
10242.0 C02-US Army Corps of Engineers Rapid Response Vehicle # 2, ALE sounding, also on 8912, at 1500 (MDMonitor-MD).
10536.0 CFH-Canadian Forces, Halifax, NS, FAX pressure gradient chart at 1805. CFH, RTTY aviation weather at 2030 (MDMonitor-MD).
10780.0 Canoe 04-USAF E-8, patch with Cape Radio, FL, at 1522 (Cleary-SC).
10944.0 CFH-Canadian Forces, NS, RTTY marker at 2041 (MDMonitor-MD).
11175.0 Snow Drop-US military, at least three EAMs under Andrews HF-GCS also broadcasting same, at 1930. Andrews, same EAM at 1942 (Haverlah-TX). King 74-USAF rescue HC-130, sent to 11232 for a patch with Puerto Rico HF-GCS, at 2023 (MDMonitor-MD). [Latest procedure takes patches off 11175, leaving it clear for calls. -Hugh]
11214.0 King 64-USAF rescue HC-130P, radio check with King Ops, Patrick AFB, FL, at 2300 (Stern-FL).
11220.0 Reach 5147-USAF, came from 11226 to finish patch via Puerto Rico HF-GCS, at 1506 (MDMonitor-MD). Abortive-US military, came from 6712 and 11175, finally making the patch with an orderwire request, at 2118 (Haverlah-TX).
11226.0 Offutt-USAF HF-GCS, NE, attempting patch for Reach 5147, then changed to Puerto Rico and went to 11220, at 1456 (MDMonitor-MD).
11232.0 Canforce 85-Canadian Forces, working Trenton Military for weather at Thule Air Base and Canadian Forces Station Alert, at 1730 (Cleary-SC). [Cold, no doubt. -Hugh] Puerto Rico-USAF HF-GCS, Salinas, came from 11175 to patch King 74 to Kirtland AFB, NM, for arrival weather, at 2024 (MDMonitor-MD).
11312.0 LY-SKR-Aurela Airlines B757 flight GSLSK9, HFDL position at 1336 (MPJ-UK).
11451.0 HFESIL160-AT&T NS/EP, IL, calling CHPNSC141P, SC Telecom NS/EP portable unit, ALE at 1730 (MDMonitor-MD).
11494.0 LNT-USCG, raised J41 in ALE, then voice as Camslant for position of Juliet 41, at 1937 (MDMonitor-MD). November 03-USCG HC-144A, radio check with Camslant at 2113 (Cleary-SC).
12222.0 Camslant, securing guard with MH-65C Kilo 18 at 2101 (MDMonitor-MD).
12603.5 SVO-Olympia Radio, Sitor-B exchange rates in Greek, then holiday greetings, at 1404 (MPJ-UK).
12664.5 FUM-French Forces, Papeete, Tahiti, STANAG 4285 test loop (300/long), at 1004 (Waters-Australia).
12789.9 NMG-USCG, New Orleans, LA, FAX schedule at 2032 (MDMonitor-MD).
12843.0 HLW2-Seoul Radio, South Korea, CW marker, simulkeyed on 12916.5, 12923, 12935, 16990, and 17129.8, at 0647 (Waters-Australia).
12856.0 XSG-Shanghai Radio, China, Sitor-B weather, also on 16892 and 16898.5, at 0652 (Waters-Australia).
13200.0 Offutt-USAF, Offutt AFB, NE, calling Nutmeat at 2039 (Cleary-SC).
13261.0 Brisbane Radio-Oceanic air control, working Qantas 131 and United 870, at 0638 (Waters-Australia).
13416.5 SSE-Egyptian diplomatic, Sitor-A message at 1326 (Lacroix-France).
13510.0 CFH, RTTY aviation weather at 1329 (Lacroix-France).
13927.0 Hawk 81-USAF B-1B, USAF MARS patch to Hawk Ops at Dyess AFB, TX, with message for Mustang 3, at 1430 (Stern-FL). OPEC 76-USAF KC-10A tanker, patch via USAF MARS AFA9AY, CA, to Reef Control (Homestead AFB, FL), at 2319 (Cleary-SC).
14396.5 AAV4AR-US Army MARS, checking stations into the weekly SHARES (Shared Resources) net, at 1605 (MDMonitor-MD).
14822.5 S1B-Lithuanian Navy, working P1G, ALE at 1105 (MPJ-UK).
14902.0 Iowa CAP 04-Civil Air Patrol, national net with Florida CAP 251 and Columbus 37, at 1516 (Cleary-SC).
15010.0 Andrews-USAF ground station, Andrews AFB, MD, came from 11175 for a patch with Rama 41 for arrival weather, at 2008 (MDMonitor-MD).
15016.0 Puerto Rico-USAF GF-GCS, working P-3C Navy LT, at 2145 (MDMonitor-MD).
15867.0 Z29-USCG Sector San Diego, CA, raised J33 in ALE, then voice as Zulu 29 working Juliet 33, an MH-60J, at 2015 (MDMonitor-MD).
16127.5 PEJATEN-Large Indonesia net, ALE with KUP, JAM, PAD, KEP, ADO, and MAK, at 0433 (Waters-Australia).
16131.5 Unid-North Korean foreign ministry, Pyongyang, encrypted ARQ messages to unknown embassy, at 0444 (Waters-Australia).
16898.5 XSG-Shanghai Radio, China, CW channel marker at 0654 (Waters-Australia).
17231.0 JFC-Misaki Fishery Radio, Japan, CW messages, then signed with call, at 0840 (Waters-Australia).
17430.0 9VF-Kyodo News, Singapore, weak-readable FAX newspaper in Japanese, 60 lines per minute, at 0026 (Hugh Stegman-CA).
17490.0 Cape Radio-USAF, FL, radio check with Trackstar at 1508 (Cleary-SC).
17976.0 ICZSPR-USAF, Sigonella, Italy, also on 18042 and 18100, ALE at 1324 (MPJ-UK).
18042.0 ICZ-USAF, Sigonella, Italy, also on 18100, ALE sounding at 1324 (MPJ-UK).
20890.0 T91-US Customs Piper PA-42-720R, ALE sounding at 2025 (MDMonitor-MD).

DIGITAL DIGEST

DIGITAL MODES ON HF

Mike Chace
mikechace@monitoringtimes.com
www.chace-ortiz.org/umc

The Forthcoming Budget Decoder from Hoka

With the exit of SkySweeper from the hobby market in the summer of 2009, there is now a vast price (and capability) gulf between the free or nearly free decoders and the semi-professional units from Hoka and Wavecom. For a manufacturer willing to take on the serious hobbyist market for the right price, there is clearly now some open ground to be occupied.

As we reported in the Fall of 2009, it appeared that Hoka was poised to enter this space with the release of a new budget version of their successful and widely-used Code300-32 software. Many months since it was first announced at the Ham Radio 2009 exhibition in Friedrichshaven, Germany, the new software, called Code3-32 Platinum, finally appears to be seeing the light of day.

Some important details about the specifications for the new software and some pointers to what potential users will have to live without when they compare Platinum with the Standard or Extended versions of Code300 are also available:

Most importantly, the list of modes available to decode remains very complete, with well over 100 individual systems available to listeners. Though, as we have pointed out in previous columns, this is not entirely meaningful, as many of these modes have long since left the air and very unlikely to ever return.

Modes not included are: PacTOR-I special variants, G-TOR, MEROD, SkyFAX, AUM13, NUM13, RS-ARQ, Coquelet-8 variants, MIL-188-110A 39 Tone HF Modem and INMARSAT-C modes. Given that there is still plenty of use made of special PacTOR-I and Coquelet-8 modes, in addition to SkyFAX and even G-TOR, it is a pity that these are not part of the budget feature set.

Optional modules cannot be added. This rules out Clover-2000, Codan 9001/3012 and PacTOR-III. However, these are usually only available to professional and government users and at considerable cost, so this again is not a deal-breaker for most listeners.

As in previous budget decoders released by Hoka, the biggest hit is in analysis tools, and Platinum is no different. Most of the complex analysis tools are missing, particularly those aimed at deconstructing Phase Shift Keyed systems. However, the tools that are available are certainly enough for the most discerning budget user.

Also gone are all the remote control and LAN output options available in the Standard and Extended versions.

Software updates do not appear to be included in the price.

Price will be €799 (currently about US$1150) for the standard version, and an extra €100 will get you a version of the decoder with built-in control of the popular Perseus Software Defined Receiver (SDR). IfS, the company behind the PC Frequency Manager software and the Technical Handbook for Radio Monitoring (see the May 2005 and October 2009 issues of this column) is acting as primary distributor for the Platinum software.

All in all, given that Platinum represents a saving of about US$5,000 over the standard version of Code300-32, with little that will be seriously missed by a listener, this a very cost-effective jump to the semi-professional level of decoder software.

We hope to have a review for you as soon as the software is available.

New Signal for German Weather Service

Fax signals from the German Weather Service on 7880 kHz have been a long-term feature on the HF bands. I was quite surprised then to hear a 50bd/850 Hz Baudot RTTY signal on this frequency one evening while checking through various Fax station channels.

Leaving the decoder running for an hour or so confirmed the signal as coming from Pinneberg (often referred to as Hamburg) Meteo. Even stranger is the fact that Pinneberg uses 425 Hz shift on all its other frequencies, so why one should suddenly be using 850Hz is not known. The RTTY was heard for a couple of days before reverting to the normal fax signal. Look out for this unusual one!

International Federation/International Committee of Red Crosses

Not surprisingly, the shortwave operations and history of the ICRC and IFRC closely mirror that of the MSF (Medicins Sans Frontieres), featured in last month's edition of this column. The Red Cross also made the transition from SITOR-A equipment to PacTOR during the mid- to late-nineties and has since also stuck with this system for the majority of its HF communications.

Like the MSF, most locations can be discerned from the selcals sent by stations during call-ups. The old SITOR selcals were quite simple: for example, AMMA for Amman, Jordan and BAMA for Bamako, Mali. The headquarters of the organization in Geneva is usually called via its mailbox selcal which is now GVAMB1, or sometimes 1HB8GVA.

It is interesting to note that the HQ is registered with the ITU as callsign HBC88 – 88 being the traditional CW shorthand for "love and kisses".

ICRC and IFRC outstations tend to be using modest transmitter powers of a few hundred watts at most and poor antennas. The net result is that they are often hard to catch, but because amateur (ham) gear usually provides the cheapest set-up, they are often to be found close to the edges of amateur bands. However, they are a regular inhabitant of a well-known pool of frequencies that you can try for on most days of the week.

IFRC: 10990.3, 13998 and 20815 kHz (center of data)

ICRC: 6994.3, 6997.7, 6999.7, 9311.0, 10281.3, 13963.6, 13974.4, 18052.3, 18063.3, 18066.4, 18066.7, 20754.5 and 20942 kHz (center of data)

The following selcals and locations have been noted as active in the past few years:

RC1YAO..... Yaounde, Cameroon
RC1NAI..... Nairobi, Kenya
RC1NAT..... Nalchik, Russia
TBIMB1 ..... Tbilisi, Georgia
NAIMB1 ..... Nairobi, Kenya
GVAMB1 ..... HQ, Geneva
RC1KHA..... Khartoum, Sudan
RC1LOK..... Lokichokio, Kenya
RC1KIN..... Kinshasa, Congo
RC1GVA ..... HQ, Geneva
HB8GVA ..... HQ, Geneva
RC1ASM..... Asmara, Eritrea
RC1HAR..... Harare, Zimbabwe
IFRCBGH..... Baghdad, Iraq
IFRCBUK ..... Bukavu, Congo
IFRCBZV..... Brazzaville, Congo
IFRCGVA..... HQ, Geneva
IFRCABJ ..... Abidjan, Ivory Coast
IFRCBAK..... Baku, Azerbaijan
IFRCKGL ..... Kigali, Rwanda

Your Input on Future Topics

Do you want to know how to get active with some digital mode?
Have a question about how to break down a signal from scratch?
Need help with equipment choices?
Puzzled as to how to identify one mode from the next when you hear it?
Need to know where to tune to hear specific mode?

These are all examples of the kinds of questions I've tried to answer through the column over the decade that I've been writing it, and many times those ideas have come straight from you, the reader. So please keep up the feedback and questions in 2010 and let me know what you want to see in future columns.

Until next time, enjoy your digital DX!

RESOURCES

Code3-32 Platinum	**www.frequenzmanager.de**
ICRC	**www.icrc.org**

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

T.J. "Skip" Arey, N2EI
tjarey@monitoringtimes.com

Hams Lead the Way

It's hard to believe now that over thirty years ago I drove through a snowstorm to Jon WB2KKS's house because he upgraded his Radio Shack TRS-80 personal computer from 4K of memory to 16K of memory and I just HAD to see that!

Hams have had an intimate relationship with the home computer movement all the way back to its beginnings. Apple Computer inventor/founder Steve Wozniak was licensed as WA6BND. His mentor John "Captain Crunch" Draper held the callsign WB6EWU. Dale Heatherington, the inventor of the personal computer "smart modem" is still active as WA4DSY. Atari founder Nolan Bushnell was formerly W7DUK. Wayne Green W2NSD pioneered the hobby computer publishing industry beside his amateur radio magazine *73*. You get the picture.

In the mid 1970s, the first person in any neighborhood to own a personal computer was likely to be the same guy who had all those funny antennas strung up in his back yard. Amateur radio operators have always been early adopters of new technologies.

We have come a long way from the home soldered S100 buss boards, "Trash 80s," and even the first generation IBM PCs. Instead of being an oddity, personal computing is ubiquitous. Ubiquitous to the point that new ways of making use of personal computing power have gone far beyond the ideas of those early hams hand coding "miniprop" into their systems. (I still have nightmares over that.)

The last few years have shown growth in some areas that have yet to be fully tapped by the amateur radio community. Specifically, you will have to look long and hard to find a ham who is not using the World Wide Web to enhance their amateur radio experience in some way.

My two purposes for this column have always been, to get you to play ham radio *and* to get you to think. With that in mind, let's give a glance at some of the more recent personal computer developments and see how they can give a little bit back to those hams who got the ball rolling over thirty years ago.

❖ Podcasting

Hams have always been willing to share their expertise with one another – over the air, at club meetings, at hamfests; a few of us have even been known to write a few words on the subject. Podcasting is a way that some hams are getting the word out using "Internet Broadcasting" to share their thoughts. Amateur Radio Newsline <**www.arnewsline.org**/> – for years heard rebroadcast on repeater systems all over the country – was one of the first operations to also release their ham radio information service by way of Internet downloading. Many others were to follow, including This Week in Amateur Radio <**www.twiar.org/**>, The Practical Amateur Radio Podcast <**http://myamateurradio.com/**>, The ARRL Newsletter <**www.arrl.org/arrlletter/audio/**>, and Soldersmoke <**http://soldersmoke.com/**> to name a few.

One of the more exciting developments in podcasting for amateur radio is Podclass </**www.hamradioclass.org/**>. John KF8KK and Mike N7LMJ share their years of experience to help folks get their license or upgrade to a higher license.

I have to confess that keeping up with all the hot topics in ham radio is tough, even for an old timer like me. Loading up my iPod Nano™ with the prominent ham related podcasts gives me a chance to stay current during my commute to and from my "real world" job. (By the way, my pocket sized podcast player holds 16G – *62,500 times* more memory than my friend Jon's Radio Shack computer.)

But how else can hams use podcasting creatively? How about picking up a few words of Spanish, French, Russian or other languages to improve your communications with those DX stations you encounter? A website called Open Culture <**www.openculture.com/2006/10/foreign_languag.html**> offers access to podcasts that teach dozens of languages. Stretch your mind, increase you multi-lingual vocabulary and you just might improve your return QSL quotient.

❖ Social Networking

Let's see now…using technology to connect with friends and others who share a common interest… Hams have been doing that on the air since the Spark Gap days! Most of my long time ham radio friends were complete strangers to me until we struck up a conversation on a local 2 meter repeater.

I must admit that, when I first heard about services such as MySpace and FaceBook, it was from my college age sons who were using it to make friends and meet people. In recent months, I was enticed away from my CW key by a "friend" request e-mail to join Mark N8ICW on FaceBook <**www.facebook.com**>. Connecting with Mark, and then "friending" his friends (and friends of friends), I found myself in the midst of a vibrant and active radio hobbyist community online. I even discovered topic dedicated groups with interests in CW and QRP operation (my favorites).

The ARRL has a FaceBook presence as well as other ham, shortwave and scanner organizations. I have even gone on to my FaceBook "Wall" and announced that I was QRV on a particular frequency. More than once, someone in the group would get on the air and answer my CQ. Sort of like setting up a personal Spotting Network.

So how can hams make even better use of the social networking system? I can think of a few ways, but setting up skeds for specific purposes would be the most obvious. A FaceBook group dedicated to County Hunting would let folks share when they were going to be in specific county locations. Satellite aficionados could share Keplarian data and activity times. Moon Bounce and other weak signal folks could tell others when they were up and running. Sharing information about QSL routes (an often changing matter in the DX world) could also be on the table.

If you want to join the fun and get on FaceBook, don't forget to do a search for Skip Arey. I'll be happy to add you as a friend.

❖ YouTube

YouTube <**www.youtube.com**> (in case you have been living in a cave) is where folks share short video presentations with one another on just about any subject you can imagine. If you do a search from the main YouTube page on amateur radio, you will find no shortage of interesting video clips of hams doing all the things hams enjoy doing.

You will see folks telling you about their equipment. You will find hams demonstrating various Morse code keys, bugs and keyers. There are video clips from many of the great DXpeditions such as Peter1 (off Antarctica), K5D (Desecheo), TX5C (Clipperton Island), VP6DI (Ducie Island) and dozens of others. Instead of watching what passes for entertainment on network television, I find much more pleasure watching amateur radio in action on YouTube.

There are also training events conducted by hams that can be found on YouTube. For example, the Orange County Amateur Radio Club KB9OHY posted a great class on traffic handling. Mike M0RRQ has a demonstration video on how to build the W3DZZ Multiband Dipole.

How else can hams make use of this internet phenomenon? If you have followed my column for any length of time, you know I have an affinity for the elder statesmen (and women) in our hobby. I love to sit with any old timer from the early days of radio and hear what it was like back in the days when all radio was amateur radio.

I think it would be a great club project to make some short videos of your more senior mem-

bers telling their ham radio story. Posting these videos on YouTube would inspire more than a few folks, I am certain. If your senior members are too shy, start telling your own stories. We all end up as old timers eventually.

❖ Blogging

Blogging has become a catchall term for everything from serious online journalism to personal diaries. Anybody who thinks he or she has something to say can set up a blog spot and go at it. As you can imagine, you have to wade through a lot of marginal stuff to find the valuable blogs. But in the ham radio world, I can assure you that it is worth it.

Two blogs I read daily are Soldersmoke by Bill N2CQR <**http://soldersmoke.blogspot.com/**> (supporting the above mentioned Soldersmoke podcast) and Ripples in the Ether by Jason NT7S<**www.nt7s.com/blog/**>. These blogs spend a lot of time discussing amateur radio design and construction with an emphasis on low power operation. My cup of radio tea exactly!

If you have other interests, the ham radio blogsphere is a big place. One great place to get a handle on all that is out there is Planet Ham <**www.planetham.com**>. This site lists dozens of ham related blogs, sorted primarily by callsign. By the way, Planet Ham is a wonderful amateur radio blog in its own right.

Maybe you have a ham radio tale to tell as well. You can easily set up your own blog using a site like Blogger <**https://www.blogger.com/start**>. If you do, let me know so I can follow you. This way of communicating online has many possibilities for hams.

❖ Good Ham Reading

We have looked at some interesting new computer technologies. Let's shift gears a bit to an amateur radio based digital system with this month's recommended reading.

Nifty E-Z Guide to D-STAR Operation
By Bernie Lafreniere N6FN
ISBN# 978-1442141988
104 pages, $13.95
Nifty Ham Accessories, publisher
www.niftyaccessories.com
The American Radio Relay League
225 Main Street
Newington, CT 06111-1494
ARRL Order #0125
www.arrl.org/shop/1-888-277-5289

I have been keeping an eye on the moving and shaking going on in the digital modes within our hobby. Right now, within my particular region of the country, D-STAR is making quite a name for itself. Trying to get an idea of how you might jump into the D-STAR digital world can make your brain sweat.

Thankfully, somebody came along with a simple guide to aid you in making choices about equipment and operating practices. Bernie N6FN is well known for his series of Quick Reference Guides and Mini Manuals that help us all keep our complicated radios sorted out. I probably wouldn't buy a rig these days if Bernie and his wife Cheryl N6FTY didn't have a guide out for it.

Building on his reputation, Bernie has written a comprehensive, yet easy-to-read guide to D-STAR. Using plain language and dozens of illustrations, Bernie covers the equipment available for D-STAR (including non-radio devices such as the DV-Dongle). He details the programming procedures for all the current systems and radios on the market. He explains how to route messages through the D-STAR system of repeaters and reflectors and gives a clear explanation about how to use D-STAR's text messaging and file transfer capabilities. It's well worth the cover price for both beginner and experienced D-STAR folks.

If you haven't noticed, we are starting to see a few decent sunspots showing up on Ole' Sol. Time to get cracking on filling up the log book with interesting DX entities. I'll see you at the bottom end of 40 meters, but don't be too surprised if you hear me banging out CQDX on 20 meters as well. I am a long way from being listed on the "Honor Roll". Have fun!

❖ Twitter

Here is another online way of doing business that I first heard about from my kids. Put simply, Twitter <**www.twitter.com**> is a system whereby you can share brief, near real time messages with anybody who decides that what you have to say is worth reading. Think of it as a little teeny blog. Because the messages are so short (140 characters maximum) they can be read on almost any digital communications device, including cell phones.

Once you start playing with Twitter, you will find folks posting everything from the profound to the inane. Don't let this discourage you. If you are patient and sort things through, I think you will find it has great potential. I see its greatest use to hams being a mobile DX spotting network, not unlike the online spotting networks in use by many hams today.

❖ So, where is this all going?

Or as the editors used to say to me, "What's your point, Uncle Skip?!"

I wanted to bring you up to date on some of the new PC based activities and systems that are fast taking over the personal computing world. Why is this so important? Or more importantly, why is this so important to hams? Lean in close… I have a secret to tell you… The personal computer is about to become extinct!!

There… it's out… I've said it! Look at the latest crop of netbooks and smart phones. By the time you read this, it is expected that Apple™ will be releasing its long awaited tablet computer. Instead of driving through a snow storm to check out a friend's latest desktop computer, he or she will be able to stick their full service personal computing device in his or her pocket and stop by to see you.

Massively portable (and massively powerful) computing power is already available at reasonable prices. Wireless Internet access is quickly moving across the firmament, aided by government incentive plans to spread computer connectivity the way programs like the TVA provided rural electrification in the early part of the last century.

All of the computer based activities I discussed in this article (and many others) have already migrated to this new portable platform. It is up to us as amateur radio operators to find ways to make use of these new technologies to further enhance the radio art. Hams as a group have always led the way in finding innovative uses for the latest technology. We have come a long way and, I am happy to say, we still have a wonderfully long way to go!

GETTING STARTED

THE BEGINNER'S CORNER

Ken Reitz, KS4ZR
kenreitz@monitoringtimes.com

International TV and Radio Reception via MPEGII FTA Satellite Receiver

Last month I reviewed the Pansat 9200HD, a top of the line Free-to-Air (FTA) MPEGII satellite receiver. This month I'll put the receiver to work and take a look at what's available on C and Ku-band satellites both over the U.S. and the Atlantic. You should know, however, that an expensive receiver such as the Pansat 9200HD ($400) is not necessary to tune in any of the channels you see pictured here. Virtually any inexpensive FTA receiver is capable of watching all of these channels.

As also mentioned in the previous column, the Pansat 9200HD excels at bringing the growing number of C/Ku-band MPEGII-HD FTA channels to your HDTV set as well as tuning in Over-the-Air (OTA) TV signals. It does a great job with both.

❖ Bird Watching

Before getting started, here are some basic facts about DXing the C/Ku-band satellites visible from North America. All of the satellites I'll refer to are in geosynchronous orbit, they are roughly 23,000 miles up, and they rotate with their relative position on the Earth so that they appear to be stationary.

While such satellites are "line-of-sight," factors that will prevent your actually seeing a satellite are trees, buildings, and mountains which might obstruct your view. Viewers living on the East Coast will see far more satellites over the Atlantic than those in the Midwest or West, and those on the West Coast will see more satellites out over the Pacific than those in the Midwest or on the East Coast.

Given the tree lines at my location, I can see as far west as 137ºW (AMC7) to 40.5ºW (NSS 806) at my extreme East. Viewers on the West Coast, with an unobstructed view to the East, might see as far as 58ºW (Intelsat 9), but could see as far West as 169ºE (Intelsat 2), according to Mike Kohl's very helpful web site, **www.global-cm.net**. A larger dish will let you "see" a little farther.

Argentine Folk Music from Canal Siete Buenos Aires.

Band News International: Brazilian TV News in Portuguese.

In the CONUS (Continental U.S.) portion of the Clarke Belt (139ºW-AMC8 to 72ºW-AMC6) both C-band and Ku-band satellites are used to transmit MPEGII FTA signals. To get the most use out of an FTA receiver, you should have a 10-foot dish with C/Ku-band LNBs and some way to drive the dish. To view C-band signals on NSS-806 (40.5ºW) you will need a circularly polarized feed horn. C/Ku-band birds over the U.S. are linearly polarized (horizontal and vertical polarity). I've used a dish as small as 4 feet in diameter to watch C-band signals from Intelsat 9.

Cubavision Internacional: Tirelessly combats TV Marti in Spanish

To view Ku-band satellites in the U.S. portion, it's possible to receive excellent pictures on a dish as small as 2 feet (61 cm), but it's always a good idea to buy the biggest dish you can afford. Look for a place in your yard that will give you line-of-sight to the southern hemisphere. Even if you live in a "restricted covenant" area, FCC rules allow you to put a dish up to 3 feet in diameter in any space under your control, no matter if you are a homeowner, lease or rent.

For a line-up of all satellites in the U.S., Atlantic and Pacific regions, consult the above mentioned web site for the details as to what is being transmitted on which transponder and which satellite.

Most big dish satellite TV systems have 18-inch or 24-inch actuator arms on the drive motor that moves the dish across the sky. It's best to have a 36-inch actuator arm or a horizon-to-horizon mount to go the whole distance from East to West. But, you can adjust a shorter arm at the dish mount to view more of the East or Western portion of the arc.

Kung Fu Lessons via CCTV 9 in English.

❖ What You'll See and Hear

As you look at the screen shots on these pages, you'll realize that there is a literally a world of unencrypted international video programming available to anyone with a big dish and an FTA MPEGII receiver. But, remember too, that many video channels also provide audio subcarriers that may have local AM or FM radio stations from the same country as the TV signal. There are also many non-video related audio channels available, including several prominent international shortwave broadcasters.

Bloomberg TV Brazil from U.S.

Here's a chart of the broadcasters and where you'll find them. As of the time this was written, all services listed were observed and heard from my location. Details on the reception parameters – frequency, symbol rate and polarity – can be found at **www.global-cm-net**. The format on this site lends itself to printing, and I recommend you make a hard copy for convenience when chasing signals either from your living room or out at the dish.

INTERNATIONAL TV

Service Satellite *(Position) Notes*

Antenna 1 (Greece) AMC1 (103ºW) Greek language programming direct from Greece

Al Jazeera International Intelsat 9 (58ºW) and Galaxy 23 (121ºW) World news, politics,

sports, weather in English

Band News International (Brazil) Intelsat 9 (58ºW) Portuguese

Bloomberg TV Latin America NSS-806 (40.5ºW) business news in English with Portuguese crawl

Canal 1 International (Ecuador) Intelsat 805 (55.5ºW) Spanish language

Canal 4 (Managua, Nicaragua) Intelsat 805 (55.5ºW) Pro-government (Sandinista) public TV

Canal 10 (Managua, Nicaragua) Intelsat 805 (55.5ºW) American movies/TV (dubbed or subtitled)

Canal Siete (Buenos Aires, Argentina) NSS-806 (40.5ºW) Folk music, dance, rodeo

CCTV 4 (China) Intelsat 9 (58ºW) Chinese programming from China

CCTV 9 (China) Intelsat 9 (58ºW) English News and Culture from China

Cubavision International NSS-806 (40.5ºW) Pro-Castro but lots of beisbol during the season

Deutsche Welle-TV Intelsat 9 (58ºW) and AMC1 103ºW) World and German news in German, English, and Spanish

France 24 Galaxy 23 (121ºW) World news in English from France

JNN Jamaica News Network Intelsat 805 (55.5ºW)

NHK World-TV Intelsat 805 (55.5ºW) Japanese news, business, politics, culture, and sports in English

Panamericana TV (Peru) Intelsat 805 (55.5ºW) Multi-source Latin American News is Spanish

RAI News 24 (Italy) Intelsat 9 (58ºW) World and Italian news, sports, weather in Italian

RTP-TV Portugal (Portugal) Intelsat 805 (55.5ºW) in Portuguese

Russia Today Intelsat 9 (58ºW) World and Russian news in English

TV Martí NSS-806 (40.5ºW) Anti-Castro programming without the beisbol

USIA World Net NSS-806 (40.5ºW) U.S. Information Agency in English and other languages.

WAPA America (San Juan, Puerto Rico) Galaxy 16 (99ºW) Popular U.S. and Latin American programming including telenovellas (Spanish soap operas) in Spanish.

WVGN-TV NBC-14 St. Thomas U.S. Virgin Islands

INTERNATIONAL RADIO

Service Satellite *(Position) Notes*

BBC World Service Intelsat 805 (55ºW) Has channels for several languages including English

China Radio International Intelsat 9 (58ºW) Chinese, English, Spanish channels

Deutsche Welle Intelsat 9 (58ºW) World and German news in German, Spanish and English

EWTN Catholic Radio Intelsat 9 (58ºW) English and Spanish religious programming

NHK World Radio (Japan) Intelsat 9 (58ºW) World and Japanese news in English and Japanese

Radio France Internationale NSS-806 (40.5ºW) Two channels: French and Portuguese

RAI International (Italy) Intelsat 9 (58ºW) News, sports, and entertainment from Italy in Italian

RTU (Equador) News, sports and general programming in Spanish.

RDP International (Portugal) Intelsat 805 (55.5ºW) World and Portuguese news in Portuguese

RTU Radio (Quito, Ecuador) Intelsat 805 (55.5ºW) News and music from Ecuador in Spanish

VOA (U.S.) Numerous channels for video and audio including VOA *News Now* and VOA *Music Mix* in several languages

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

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

Programming from the Emerald Isle

Ireland is a land of contrasts. Centuries of distinctive and endearing culture; centuries of sectarian conflict. It has seen periods of great poverty and more recently, periods of great wealth. For most of the past century, it has been divided between a predominantly catholic republic in the south, and a predominantly protestant province of the United Kingdom in the north.

Over the last two centuries an enormous wave of Irish immigration has seen Irish communities spread to Canada, the United States and other countries of the world. And they have become leading citizens in both countries. Think of the President Kennedy and his family, Ronald Reagan, and Brian Mulroney.

Here in communities across North America there are only two kinds of people on March 17th, St. Patrick's Day – those who are Irish and those who want to be.

My own community of St. Catharines, Ontario probably owes much of its existence to the Irish laborers and immigrants who built the first Welland Canals, and the impressive mid-19th century buildings downtown. In an amusing turnabout, one of these, once an impressive bank building, is now a very popular Irish pub!

So this month let's shine the *Programming Spotlight* on Ireland and the Irish.

For an authentic taste of Ireland, one can hear the terrific programming of **RTE, Raidió Teilifís Éireann** (Radio and Television of Ireland). To describe the vast quantity of online and archived material available at the RTE website in its entirety is far beyond the scope of this column. But I would encourage you to explore their website and discover for yourself the diverse options.

"RTÉ is Ireland's national Public Service Broadcaster, serving the public by telling the stories of Ireland's relationship with itself and with the rest of the world." (RTE Website)

RTE 1 is similar to CBC Radio One in Canada or perhaps BBC Radio 4. It features some music and light entertainment along with factual programming. RTE 2 and RTE lyric fm are music channels. In addition, RTE has a number of other digital music channels, all of which are accessible online. These are RTÉ 2XM, RTÉ Chill, RTÉ Choice, RTÉ Digital Radio News, RTÉ Gold, RTÉ Junior, RTÉ Pulse and RTÉ Radio 1 Extra.

I particularly enjoy RTE 1 programming. As with many broadcasters, you have a number of ways to listen. You can listen live at: **www.rte.ie/radio/index.html**

Many programs are available as podcasts. These are accessible at: **www.rte.ie/radio/podcast/** According to the website, more than 500,000 RTE clips and programs are downloaded each month.

Listening tastes are subjective, but I am sure you will find any number of appealing programs. As a history buff, I like to poke around the archival material at **www.rte.ie/laweb/** As one can imagine in a country with not just centuries of history, but millennia, there is lots to choose from.

RTE 1 has become a favorite for me at Christmas. On Christmas Eve and Christmas Day, wall-to-wall programming for this special time of year is heard. On New Years Eve 2008-09, RTE 1 was my choice for listening at Midnight UTC.

Perhaps my favorite RTE 1 program is ***Seascapes***, the "maritime" program "for This Island Nation, covering all aspects of the marine sector. The programme particularly welcomes listeners' involvement, through views and comments or topics and stories for broadcast. The programme provides comprehensive coverage of all aspects of the marine sector. It is presented by Tom MacSweeney, RTÉ's Marine Correspondent." It is heard Fridays at 2230 UTC, or listen to the Podcast.

The Tubridy Show is heard daily at 0900 UTC and features "conversation and music presented by Ryan Tubridy, with personal stories, debate on the big issues, celebrity gossip and Ireland's biggest book club."

At 0400 UTC Saturdays, where else would you expect to find a program of bluegrass, country rock, Cajun and western swing music than, of course, RTE! The show is called ***Roots Freeway***.

Documentary on One is heard every Saturday evening at 6.05pm on RTÉ Radio 1.

"Running at about forty minutes every week, the ***Documentary on One***... productions are radio stories about real life.

"It's all about ideas, life, events, experiences, perspectives but most importantly - stories." **www.rte.ie/radio1/doconone/**

One of the biggest annual events for RTE is the All-Ireland Hurling Final. It is one of the only times of the year that RTE broadcasts on shortwave (via transmitters in South Africa). This annual event takes place in September and it is a spirited affair.

I first heard of this sport when an exhibition match was played in Toronto some years ago. Hurling or Hurley seems to be a rather interesting and athletically challenging sport unique to Ireland, although it is or has been played wherever Irish immigrants have settled. From my admittedly sketchy understanding of it, it appears to be similar to field hockey, and has its origins in Irish antiquity.

I asked Mr. Google to explain the game to me, but the explanation was clear as mud until I saw this video. Wow! **www.youtube.com/watch?v=TmzivRetelE**

As September approaches, check the RTE site, and the usual DX resources, for broadcast times and frequencies. For the 2009 game, 7265 and 17505 kHz from 2-6pm "Irish time" were used, as well as 12050 kHz from 3.30-5.30pm. (Irish time is the same as UTC.) As reported on Gayle Van Horne's blog last fall, Alokesh Gupta in India heard the broadcast.

"RTÉ Radio 1, 17,860/ 17,710 kHz. Full data verification on station letterhead, signed by Mrs. Bernie Pope-Network Support. Received in 17 days for an English report to info@rte.ie for special broadcast of Hurling Games. Station address: RTÉNL, Nutley Building, Donnybrook, Dublin 4, Ireland. (Alokesh Gupta, India) Website: **www.rte.ie/** Email: Bernie.pope@rte.ie"

http://mt-shortwave.blogspot.com/2009/08/its-about-time-qsling-standard-time-and.html

RTE via World Radio Network

RTE programming is featured several times during the day via the World Radio Network to North America. This schedule may be out of date. The weekly WRN newsletter contradicts it in a few cases. Daily at 0200 UTC one can hear ***The Dialogue*** (Mon, Sat, Sun), ***Documentary*** (Tues), ***This Week*** (Wed), ***Outside the Box*** (Thur, Fri). The schedule at 1400 is ***The Tubridy Show*** (7 days per week). At 19 and 22 UTC WRN re-broadcasts ***Drivetime*** (M-F), and ***The Dialogue*** on Sundays. On Saturdays, the 1900 broadcast features ***Documentary*** and at 2200 ***RTE Sports***. Access the World Radio Network online at **www.wrn.org**

The 1900 UTC transmission is re-broadcasted by WRMI in Miami. Try 9955 kHz or online at **www.wrmi.net/**

Northern Ireland

As one would expect with anything connected with the BBC brand, BBC Radio Ulster, the service for Northern Ireland, is an excellent, fascinating window into Northern Ireland. They

occasionally feature a program called ***A Short History of Ireland***…in 240 parts! I have always wondered how long the "long" version would be, but I digress. These 5-minute segments run daily with an "omnibus" version (all the week's episodes) on the weekend. The program has also been heard on BBC Radio 7. It is a wonderful primer on the history of this amazing country. Check out BBC Radio Ulster for this and other programs: **www.bbc.co.uk/radioulster/**

The Irish Diaspora

As mentioned earlier, the Irish have spread throughout the world bringing their unique culture with them. On Sunday afternoons, you can get a taste of this culture by tuning in to clear channel Toronto radio station CFZM AM 740. This former CBC Toronto frequency can be heard over a vast listening area. Alternatively, AM 740 can also be heard online at **www.am740.ca**

At 4pm one can hear ***A Little Breath of Scotland***, 2 hours of Scottish music, culture and history. This is followed by ***Radio Erin*** hosted by Frankie Benson at 6pm. Both of these programs have rated highly, and are among the most popular programs in their time slot in the entire province of Ontario. Each week Frankie plays the music of Ireland, brings news of events from "back home" (and from RTE) and updates the local activities of the Irish community.

Perhaps its no surprise that there are four Irish radio programs in Toronto alone; after all, there are seven "ethnic" stations broadcasting from or to Toronto! To demonstrate the importance of radio to the community, in 2009 the Irish-Canada Chamber of Commerce for the first time named four co-winners of its "Irish Person of the Year."

"Never have so many been so honoured by, well, so many.

"For the first time in the history of Toronto's Irish community, the Irish Person of the Year Committee has decided to quadruple its pleasure by honouring the four men who keep the city's Irish-Canadians, and those who love Ireland, informed and entertained every weekend.

"Perhaps picking a cue that if four provinces are good enough for Ireland, honouring the four Brothers of the Airwaves certainly makes sense, as the community honours Frankie Benson, Colm O'Brien, Eamonn O'Loghlin and Hugo Straney." You can read about them and their awards at **www.icccto.com/**

❖ The Winter SWL Fest

As you read this, the annual Winter SWL Fest is or shortly will be taking place in Kulpsville, Pennsylvania. The Fest is organized by our friends Richard Cuff and John Figliozzi (John is well known to *MT* readers as he was my esteemed predecessor as editor of this column) and the good folks of NASWA. Certainly the largest such gathering in North America, it may well be the largest such annual get-together in the world.

Rich was kind enough to fill me in on some of the planned and potential activities at the Fest.

"**WBCQ** is the only SW broadcaster that has had a significant 'live' Fest presence in recent years. ***Allan Weiner Worldwide*** and ***Radio TimTron International*** have both originated from the Fest; I am not sure of others; we really haven't co-ordinated their Fest presence at all; it just happens.

"Over the years, Allen Graham has interviewed John and I in the weeks leading up to the Fest; when he's attended, he's aired interviews afterwards in DXPL.

"Sheldon Harvey, one of the hosts of ***International Radio Report*** of CKUT, is a regular Fest participant and will be talking about the Fest in advance of the event.

"Jeff White (**WRMI**) and Michael Murray (**KBS World Radio**) also aired interviews. Unfortunately there have been fewer broadcasters on site in recent years, so we've had less programming originate from Kulpsville. In years past, Kim Elliott (***Communications World***), Franz Vossen (**RVI**), and Jonathan Marks (**RNW**) brought microphones to the Fest when these guys hosted programming. One year RNW was having a special Saturday-long radio Festival, and part of the day featured Jonathan interviewing Andy Sennitt.

"Hope this info helps and (of course) if you can extricate yourself from the snowbanks in St. Catharines, you would be welcomed too!" (Rich Cuff)

"I can't say yet whether we will be able to attend the Winterfest, but you can be sure that Allen Graham will be covering it in ***DX Party Line*** and Adrian Peterson and I will be covering it in ***Wavescan*** as much as possible." (Jeff White)

"Each year, the Fest is attended by several people who enjoy listening to pirate radio stations, that is, radio stations not licensed by the Federal Communications Commission in the United States, or the equivalent authority in other countries. And, 'if one were to know' (a phrase heard often at the Fest), pirate radio stations always seem audible within the Fest hotel, either on FM, or on the popular shortwave pirate frequency of 6955 kilohertz. Indeed, every year at the Fest, at midnight Saturday, the pirate broadcast Voice of Pancho Villa can be heard. The first Fest, in 1988, was held in the Pancho Villa Room of the now demolished Fiesta Motor Inn in Willow Grove, Pennsylvania. Now midnight is usually past my bedtime, but I managed to stay awake until the broadcast, which I found on 6945 kilohertz. As I listened, it switched frequency to 6955, so I followed it on my shortwave dial." (Kim Andrew Elliott, *Communications World*, March 17, 2001)

There are a number of presentations from the 2009 Fest on Youtube.

A number of my friends have attended the Fest. The late Brian Smith and I always talked about taking a trip down there "some year." Brian attended a few times and always spoke highly of it. It is not possible for me to get down there this year, but I plan to do my level best to sneak away from home and drop in on the fest(ivities) in 2011.

Sheldon Harvey and Rachel Baughn

Radio listening is traditionally a solitary pursuit. Any opportunity to attend such a gathering of listeners and broadcasters should be seized upon, if you can. Any time I have attended an event, such as the ANARC Convention in 1987, or similar, smaller events sponsored by the ODXA (Radio Fest, Toronto Chapter meetings) I have come away with renewed friendships and almost always some new insight into the hobby we all enjoy.

With any luck I may be able to attend the National Association of Shortwave Broadcasters this May in Hamilton, Ontario, just a half hour trip down the highway from my home. I'll have more on this in a future column!

How to Use the Shortwave Guide

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

① ② ⑤ ③ ④ ⑥ ⑦

Convert your time to UTC.

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

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

Find the station you want to hear.

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

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

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

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

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

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

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

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

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

MT MONITORING TEAM

Gayle Van Horn
Frequency Manager
gaylevanhorn@monitoringtimes.com

Larry Van Horn, MT Asst. Editor
larryvanhorn@monitoringtimes.com

Additional Contributors to This Month's Shortwave Guide:

Thank You to …

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

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Shortwave Broadcast Bands

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

Notes

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

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

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

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

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

0000	0020		Japan, NHK World/ Radio Japan			5960eu
			6145na	13650as	17810as	
0000	0030		Australia, HCJB Global		15400as	
0000	0030		Egypt, Radio Cairo7580na			
0000	0030		Thailand, Radio Thailand World Service			9680na
0000	0030		USA, Voice of America		7405as	
0000	0030		USA, Voice of America/Special English			6180as
			9325as	9620as	9715as	11695as
			12005as	15185as	15205as	15290as
			17820as			
0000	0045		India, All India Radio		6055as	7305as
			9705as	11645as		
0000	0045		USA, WYFR/Family Radio Worldwide			6085na
			11720sa			
0000	0057		Canada, Radio Canada International			9880as
0000	0057		China, China Radio International			6005na
			6020na	6180na	7350as	7425as
			9425as	9570as	11650as	11885as
			11730as	11790as		
0000	0100	twhfas	Albania, Radio Tirana		7425na	
0000	0100		Anguilla, Worldwide Univ Network			6090am
0000	0100		Australia, ABC NT Alice Springs			4835do
0000	0100		Australia, ABC NT Katherine		5025do	
0000	0100		Australia, ABC NT Tennant Creek			4910do
0000	0100		Australia, Radio Australia		9660as	12080pa
			13690pa	15240pa	17715pa	17750as
			17665as	17795pa		
0000	0100		Bahrain, Radio Bahrain		6010me	9745al
0000	0100		Bulgaria, Radio Bulgaria		5900na	7400na
0000	0100		Canada, CFRX Toronto ON		6070na	
0000	0100		Canada, CFVP Calgary AB		6030na	
0000	0100		Canada, CKZN St John's NF		6160na	
0000	0100		Canada, CKZU Vancouver BC		6160na	
0000	0100		Germany, Deutsche Welle		7265as	9785as
			15640as			
0000	0100		Malaysia, RTM/Traxx FM		7295do	
0000	0100		New Zealand, Radio NZ International			15720pa
0000	0100	DRM	New Zealand, Radio NZ International			17675pa
0000	0100		Russia, Voice of Russia		6240eu	7250eu
0000	0100		Spain, Radio Exterior de Espana			6055na
0000	0100		UK, BBC World Service		5970as	6195as
			7360as	9410as	9740as	13735as
			15335as	15360as		
0000	0100		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0000	0100		USA, EWTN/WEWN Vandiver AL			15610af
0000	0100		USA, WBCQ Monticello ME		5110am	7415am
0000	0100		USA, WHRI Cypress Creek SC		5875na	7385na
0000	0100		USA, WINB Red Lion PA		9265ca	
0000	0100		USA, WJHR International Milton FL			15550usb
0000	0100	vl	USA, WRMI Miami FL		9955va	
0000	0100		USA, WTJC Newport NC		9370na	
0000	0100		USA, WWCR Nashville TN		3230na	5070na
			9980na			
0000	0100		USA, WWRB Manchester TN		3185na	3215na
			5050am	5745af		
0000	0100		USA, WYFR/Family Radio Worldwide			5950na
			7360ca	9505na	9595na	15440na
0000	0100		Zambia, 1 Africa Radio/CVC		4965af	
0005	0100	twhfa	Canada, Radio Canada International			9755na
0010	0100	m	Greece, Voice of Greece		7475va	9420va
0030	0100		Australia, Radio Australia		15415as	
0030	0100		Thailand, Radio Thailand World Service			12095na
0030	0100	sfa	UK, Bible Voice Broadcasting		9490as	
0030	0100		USA, Voice of America		6170va	
0030	0100		USA, Voice of America/Special English			6170as
0030	0100		Uzbekistan, CVC Intl/ The Voice Asia			7395as

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

0100	0104		Canada, Radio Canada International			9755na
0100	0127		Czech Republic, Radio Prague		6200na	7355na
0100	0127		Slovakia, Radio Slovakia International			6040na
			9440sa			
0100	0130		Australia, Radio Australia		9660as	12080pa
			13690pa	15240pa	15415as	17715pa
			17750as	17795pa		
0100	0130		Vietnam, Voice of Vietnam		6175na	
0100	0156		Romania, Radio Romania International			6145na
			9800na			
0100	0157		Canada, Radio Canada International			6040as
			6165as			
0100	0157	DRM	China, China Radio International			6080na
0100	0157		North Korea, Voice of Korea		7140as	9345as
			9730as	11735sa	13760sa	15180sa
0100	0200		Anguilla, Worldwide Univ Network			6090am
0100	0200		Australia, ABC NT Alice Springs			4835do
0100	0200		Australia, ABC NT Katherine		5025do	
0100	0200		Australia, ABC NT Tennant Creek			4910do
0100	0200		Australia, HCJB Global		15400as	
0100	0200		Bahrain, Radio Bahrain		6010me	9745al
0100	0200		Canada, CFRX Toronto ON		6070na	
0100	0200		Canada, CFVP Calgary AB		6030na	
0100	0200		Canada, CKZN St John's NF		6160na	
0100	0200		Canada, CKZU Vancouver BC		6160na	
0100	0200		China, China Radio International			6005as
			6020eu	6080eu	6175as	7350as
			9570na	9580as	11650as	11730as
			11885as			
0100	0200		Cuba, Radio Havana Cuba		6000na	6140na
0100	0200		Malaysia, RTM/Traxx FM		7295do	
0100	0200		New Zealand, Radio NZ International			15720pa
0100	0200	DRM	New Zealand, Radio NZ International			17675pa
0100	0200		Russia, Voice of Russia		6240eu	7250eu
0100	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0100	0200		Taiwan, Radio Taiwan International			11875as
0100	0200		UK, BBC World Service		5940as	5970as
			9410as	9740as	11750as	12070as
			15335as	15360as	17615as	
0100	0200		Ukraine, Radio Ukraine International			7440na
0100	0200		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0100	0200		USA, EWTN/WEWN Vandiver AL			11520af
0100	0200		USA, Voice of America		7325va	9435va
			11705va			
0100	0200		USA, WBCQ Monticello ME		5110am	7415am
0100	0200		USA, WHRI Cypress Creek SC		5875na	7385na
0100	0200		USA, WINB Red Lion PA		9265ca	
0100	0200		USA, WJHR International Milton FL			15550usb
0100	0200	vl	USA, WRMI Miami FL		9955va	
0100	0200		USA, WRNO New Orleans LA		7505am	
0100	0200		USA, WTJC Newport NC		9370na	
0100	0200		USA, WWCR Nashville TN		3230na	5070na
			5935na	9980na		
0100	0200		USA, WWRB Manchester TN		3185na	5050am
			5745af			
0100	0200		USA, WYFR/Family Radio Worldwide			7455na
			9505na	15440na		
0100	0200		Uzbekistan, CVC Intl/ The Voice Asia			7395as
0100	0200		Zambia, 1 Africa Radio/CVC		4965af	
0105	0110	m	Greece, Voice of Greece		7475va	9420va
			12105va			
0105	0200		Canada, Radio Canada International			9755na
0130	0145	twhfas	Albania, Radio Tirana		6130na	
0130	0158	mtwhfa	Serbia, International Radio of Serbia			6190na
0130	0200		Iran, Voice of Islamic Rep. of Iran			6120na
			7250na			
0130	0200	ta	USA, Voice of America/Special English			5960ca
			7405ca			
0140	0200		Vatican City State, Vatican Radio			5895as
			7335as			

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

0200	0204		Canada, Radio Canada International			9755na
0200	0227		Czech Republic, Radio Prague		6200na	7355na
0200	0227		Iran, Voice of Islamic Rep. of Iran			6120na
			7250na			
0200	0230		Thailand, Radio Thailand World Service			15275na
0200	0230		Uzbekistan, CVC Intl/ The Voice Asia			7395as
0200	0257		China, China Radio International			9550as
			11785as	13640as	15435as	
0200	0257		North Korea, Voice of Korea		13650as	15100as
0200	0258	DRM	Germany, Deutsche Welle		15205eu	
0200	0300		Anguilla, Worldwide Univ Network			6090am
0200	0300	twhfa	Argentina, Radio Nacional RAE			11710am
0200	0300		Australia, ABC NT Alice Springs			4835do
0200	0300		Australia, ABC NT Katherine		5025do	
0200	0300		Australia, ABC NT Tennant Creek			4910do
0200	0300		Australia, HCJB Global		15400as	
0200	0300		Australia, Radio Australia		9660pa	12080pa
			13690pa	15240pa	15415as	15515pa
			17750as	21725pa		
0200	0300		Bahrain, Radio Bahrain		6010me	9745al
0200	0300		Canada, CFRX Toronto ON		6070na	
0200	0300		Canada, CFVP Calgary AB		6030na	
0200	0300		Canada, CKZN St John's NF		6160na	
0200	0300		Canada, CKZU Vancouver BC		6160na	
0200	0300		Cuba, Radio Havana Cuba		6000na	6140na

SHORTWAVE GUIDE

0200	0300		Egypt, Radio Cairo	6270na		
0200	0300		Indonesia, Voice of Indonesia	9525va		11785al
			15150al			
0200	0300		Malaysia, RTM/Traxx FM	7295do		
0200	0300		New Zealand, Radio NZ International			15720pa
0200	0300	DRM	New Zealand, Radio NZ International			17675pa
0200	0300		Philippines, PBS/ Radyo Pilipinas			11880me
			15285me	17770me		
0200	0300		Russia, Voice of Russia	6240eu		7250eu
0200	0300	DRM	Russia, Voice of Russia	15735as		
0200	0300		South Korea, KBS World Radio			9580sa
0200	0300		Sri Lanka, SLBC	6005as	9770as	15745as
0200	0300		Taiwan, Radio Taiwan International			5950na
			9680na			
0200	0300		Uganda, UBC Radio	4976do		
0200	0300		UK, BBC World Service	5940as		6005af
			6195me	9410as	15310as	
0200	0300		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0200	0300		USA, EWTN/WEWN Vandiver AL			11520af
0200	0300		USA, KJES Vado NM	7555na		
0200	0300		USA, WBCQ Monticello ME	5110am		7415am
0200	0300		USA, WBCQ Monticello ME	5110am		7415am
0200	0300		USA, WHRI Cypress Creek SC	5875na		7385na
0200	0300		USA, WINB Red Lion PA	9265ca		
0200	0300		USA, WJHR International Milton FL			15550usb
0200	0300	vl	USA, WRMI Miami FL	9955va		
0200	0300		USA, WRNO New Orleans LA	7505am		
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WWCR Nashville TN	3215na		5070na
			5890na	5935na		
0200	0300		USA, WWRB Manchester TN	3185na		5050am
			5745af			
0200	0300		USA, WYFR/Family Radio Worldwide			4985na
			5985na	6890na	7455na	9505na
			9525na			
0200	0300		Zambia, 1 Africa Radio/CVC	4965af		
0215	0230		Nepal, Radio Nepal	5005as		
0230	0300		Sweden, Radio Sweden	6010na		11550va
0230	0300		Uzbekistan, CVC Intl/ The Voice Asia			11970as
0230	0300		Vietnam, Voice of Vietnam	6175na		
0245	0300	twhfas	Albania, Radio Tirana	6130eu		
0245	0300		Zambia, ZNBC (Radio Two)	6165do		
0250	0300		Vatican City State, Vatican Radio			6040am
			7305am			

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

0300	0315	Sun	Swaziland, TWR Swaziland	3200af		
0300	0330		Croatia, Croatian Radio	3985va		7375va
0300	0330		Egypt, Radio Cairo	6270na		
0300	0330		Philippines, PBS/ Radyo Pilipinas			11880me
			15285me	17770me		
0300	0330		Sri Lanka, SLBC	6005as	9770as	15745as
0300	0330		Vatican City State, Vatican Radio			7360af
			9660af			
0300	0355		South Africa, Channel Africa	6120af		
0300	0357		China, China Radio International			6190na
			9460na	9690na	9790as	
0300	0357		North Korea, Voice of Korea	7140as		9345as
			9730va			
0300	0400		Anguilla, Worldwide Univ Network			6090am
0300	0400		Australia, ABC NT Alice Springs			4835do
0300	0400		Australia, ABC NT Katherine	5025do		
0300	0400		Australia, ABC NT Tennant Creek			4910do
0300	0400		Australia, Radio Australia	9660as		12080pa
			13690pa	15240pa	15415as	15515pa
			17750as	21725pa		
0300	0400		Bahrain, Radio Bahrain	6010me		9745al
0300	0400		Bulgaria, Radio Bulgaria	5900na		7400na
0300	0400	twhfas	Canada, CBC NQ SW Service	9625na		
0300	0400		Canada, CFRX Toronto ON	6070na		
0300	0400		Canada, CFVP Calgary AB	6030na		
0300	0400		Canada, CKZN St John's NF	6160na		
0300	0400		Canada, CKZU Vancouver BC	6160na		
0300	0400		Cuba, Radio Havana Cuba	6000na		6140na
0300	0400		Germany, Deutsche Welle	11695as		17800as
0300	0400	Sun	Greece, Voice of Greece	7475va		9420va
0300	0400		Malaysia, RTM/Traxx FM	7295do		
0300	0400		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0300	0400		New Zealand, Radio NZ International			15720pa
0300	0400	DRM	New Zealand, Radio NZ International			17675pa
0300	0400		Oman, Radio Oman	15355af		
0300	0400		Russia, Voice of Russia	6240eu		7250sa
			12030eu	12040eu	13735eu	
0300	0400	DRM	Russia, Voice of Russia	15735as		
0300	0400		South Africa, Channel Africa	3345af		
0300	0400		Taiwan, Radio Taiwan International			5950na
			15320as			
0300	0400		Uganda, UBC Radio	4976do		
0300	0400		UK, BBC World Service	3255af		6005af
			6105af	6145af	6190af	6195as
			7255af	7445af	9410as	12095as
			15310as	17790as		
0300	0400		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0300	0400		USA, EWTN/WEWN Vandiver AL			11520af
0300	0400		USA, Voice of America	4930af		6080af
			9885af	15580af		
0300	0400		USA, WBCQ Monticello ME	5110am		7415am
0300	0400		USA, WHRI Cypress Creek SC	5875na		7385na
0300	0400		USA, WJHR International Milton FL			15550usb
0300	0400	vl	USA, WRMI Miami FL	9955va		
0300	0400		USA, WRNO New Orleans LA	7505am		
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WWCR Nashville TN	3215na		5070na
			5890na	5935na		
0300	0400		USA, WWRB Manchester TN	3185na		5050am
			5745af			
0300	0400		USA, WYFR/Family Radio Worldwide			7455na
			9505na	9930ca	9985eu	
0300	0400		Zambia, 1 Africa Radio/CVC	4965af		
0300	0400		Zambia, ZNBC (Radio Two)	6165do		
0300	4000		Uzbekistan, CVC Intl/ The Voice Asia			11970as
0330	0400	twhfas	Albania, Radio Tirana	6150na		
0330	0400	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0330	0400		Sweden, Radio Sweden	6010na		
0330	0400		UK, BBC World Service	11945af		
0330	0400		Vietnam, Voice of Vietnam	6175na		
0340	0400		Vatican City State, Vatican Radio			9545as
0345	0400	vl/Sat/Sun	Uganda, UBC Radio	4976do		

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

0400	0427		Czech Republic, Radio Prague	6200na		7345na
0400	0430		France, Radio France International			7315af
			9805af			
0400	0445		USA, WYFR/Family Radio Worldwide			7445na
			9505na			
0400	0455		Turkey, Voice of Turkey	6020va		6040me
			7240na			
0400	0456		Romania, Radio Romania International			6130na
			7310na	9690as	11895as	
0400	0457		China, China Radio International			6190na
			9460na	13620as	15120as	17725as
			17855as			
0400	0458		New Zealand, Radio NZ International			15720pa
0400	0458	DRM	New Zealand, Radio NZ International			17675pa
0400	0500		Anguilla, Worldwide Univ Network			6090am
0400	0500		Australia, ABC NT Alice Springs			4835do
0400	0500		Australia, ABC NT Katherine	5025do		
0400	0500		Australia, ABC NT Tennant Creek			4910do
0400	0500		Australia, Radio Australia	9660pa		12080pa
			13690pa	15240pa	15515pa	17750as
			21725pa			
0400	0500		Bahrain, Radio Bahrain	6010me		9745al
0400	0500	twhfas	Canada, CBC NQ SW Service	9625na		
0400	0500		Canada, CFRX Toronto ON	6070na		
0400	0500		Canada, CKZN St John's NF	6160na		
0400	0500		Canada, CKZU Vancouver BC	6160na		
0400	0500		Cuba, Radio Havana Cuba	6000na		6140na
0400	0500		Germany, Deutsche Welle	5905af		5945af
			6180af	15600af		
0400	0500		Malaysia, RTM/Traxx FM	7295do		
0400	0500		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0400	0500		Russia, Voice of Russia	6240ca		12030na
			12040na	13735eu		
0400	0500	DRM	Russia, Voice of Russia	15735as		
0400	0500		South Africa, Channel Africa	7230af		
0400	0500	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0400	0500		Uganda, UBC Radio	4976do		
0400	0500		UK, BBC World Service	3255af		6005af
			6190af	7255af	7445af	9410as
			11945af	12035af	15310as	15360as
			17790as			
0400	0500		Ukraine, Radio Ukraine International			7440na
0400	0500		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0400	0500		USA, EWTN/WEWN Vandiver AL			11520af

0400	0500		USA, Voice of America	4930af	4960af	
			6080af	9885af	15580af	
0400	0500		USA, WBCQ Monticello ME	5110am	7415am	
0400	0500		USA, WHRI Cypress Creek SC	5875na	7385na	
0400	0500	Sat	USA, WHRI Cypress Creek SC	9640af		
0400	0500		USA, WJHR International Milton FL		15550usb	
0400	0500	vl	USA, WRMI Miami FL	9955va		
0400	0500		USA, WRNO New Orleans LA	7505am		
0400	0500		USA, WTJC Newport NC	9370na		
0400	0500		USA, WWCR Nashville TN	5070na	5890na	
			5935na	15825na		
0400	0500		USA, WWRB Manchester TN	3185na		
0400	0500		USA, WYFR/Family Radio Worldwide		6915na	
			9680na	9715na		
0400	0500		Uzbekistan, CVC Intl/ The Voice Asia		11970as	
0400	0500		Zambia, 1 Africa Radio/CVC	4965af	7160af	
0400	0500		Zambia, ZNBC (Radio Two)	6165do		
0430	0457		Czech Republic, Radio Prague	9855va		
0430	0500	twhfas	Albania, Radio Tirana	6100na		
0430	0500		Australia, Radio Australia	15415as		
0430	0500	mtwhf	Swaziland, TWR Swaziland	3200af	6120af	
			9500af			
0459	0500		New Zealand, Radio NZ International		11725pa	
0459	0500	DRM	New Zealand, Radio NZ International		13730pa	

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

0500	0507	twhfas	Canada, CBC NQ SW Service	9625na		
0500	0530		France, Radio France International		7315af	
			9805af			
0500	0530	DRM	France, Radio France International		11995af	
0500	0530		Germany, Deutsche Welle	6130af	6180af	
			9755af	12045af	15600af	
0500	0530		Japan, NHK World/ Radio Japan		5975eu	
			6110na	9770va	15325as	17810as
0500	0530		Vatican City State, Vatican Radio		7360af	
			9660af	11625af		
0500	0600		Anguilla, Worldwide Univ Network		6090am	
0500	0600		Australia, ABC NT Alice Springs		4835do	
0500	0600		Australia, ABC NT Katherine	5025do		
0500	0600		Australia, ABC NT Tennant Creek		4910do	
0500	0600		Australia, Radio Australia	9660pa	12080pa	
			13630as	13690pa	17750as	
0500	0600		Bahrain, Radio Bahrain	6010me	9745al	
0500	0600		Bhutan, Bhutan Broadcasting Service		6035as	
0500	0600		Canada, CFRX Toronto ON	6070na		
0500	0600		Canada, CKZN St John's NF	6160na		
0500	0600		Canada, CKZU Vancouver BC	6160na		
0500	0600		China, China Radio International		5960na	
			6190af	7220as	11880as	15350as
			15465as			
0500	0600	Sat/Sun	Clandestine, Sudan Radio Service/ SRS		13720af	
0500	0600		Cuba, Radio Havana Cuba	6000na	6010na	
			6060na	6140na		
0500	0600		Malaysia, RTM/Traxx FM	7295do		
0500	0600		Malaysia, RTM/Voice of Malaysia		6175as	
			9750as	15295as		
0500	0600		New Zealand, Radio NZ International		11725pa	
0500	0600	DRM	New Zealand, Radio NZ International		13730pa	
0500	0600		Nigeria, Voice of Nigeria/External Service		15120af	
0500	0600		Russia, Voice of Russia	9855na	9840na	
			12030na			
0500	0600	DRM	Russia, Voice of Russia	15735as		
0500	0600		South Africa, Channel Africa	7230af		
0500	0600		Taiwan, Radio Taiwan International		5950na	
0500	0600		Uganda, UBC Radio	4976do		
0500	0600		UK, BBC World Service	3255af	3995eu	
			5875eu	6005af	6190af	7255af
			9410as	11765af	11945af	12095eu
			15310as	15360as	17640af	17790as
0500	0600	smtwhf	UK, BBC World Service	15420af		
0500	0600		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0500	0600		USA, EWTN/WEWN Vandiver AL		11520af	
0500	0600		USA, Voice of America	4930af	6080af	
			9885af	15580af		
0500	0600		USA, WBCQ Monticello ME	5110am	7415am	
0500	0600	Sun	USA, WHRI Cypress Creek SC	11565va		
0500	0600		USA, WHRI Cypress Creek SC	5875na	7385af	
0500	0600		USA, WJHR International Milton FL		15550usb	
0500	0600	vl	USA, WRMI Miami FL	9955va		
0500	0600		USA, WTJC Newport NC	9370na		
0500	0600		USA, WWCR Nashville TN	5070na	5890na	
			5935na	15825na		
0500	0600		USA, WWRB Manchester TN	3185na		
0500	0600		USA, WYFR/Family Radio Worldwide		6915na	
			9680na			
0500	0600		Uzbekistan, CVC Intl/ The Voice Asia		11970as	
0500	0600		Zambia, 1 Africa Radio/CVC	4965af	7160af	
0500	0600		Zambia, ZNBC (Radio Two)	6165do		
0515	0530		Rwanda, Radio Rwanda	6055do		
0530	0600	mtwh	Slovakia, IRRS/Euro Gospel Radio		5990va	
0530	0600		Thailand, Radio Thailand World Service		11730va	

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

0600	0615	Sat/Sun	South Africa, TWR	11640af		
0600	0620		Vatican City State, Vatican Radio		4005eu	
			5965eu	7520eu		
0600	0630	Sat/Sun	Australia, Radio Australia	15180as	15290as	
			15415as			
0600	0630		France, Radio France International		11995af	
			13680af	15160af		
0600	0630	DRM	France, Radio France International		9765af	
			15160af			
0600	0630		Germany, Deutsche Welle	5945af	7240af	
			12045af			
0600	0630		Laos, Lao National Radio	7145as		
0600	0630	mtwh	Slovakia, IRRS/Euro Gospel Radio		5990va	
0600	0630		Uzbekistan, CVC Intl/ The Voice Asia		11970as	
0600	0645	mtwhf	South Africa, TWR	11640af		
0600	0655		South Africa, Channel Africa	15255af		
0600	0657		China, China Radio International		6115af	
			11750af	11770as	11880as	13645as
			15145as	15350as	15465as	17505va
			17540as	17710as		
0600	0658		New Zealand, Radio NZ International		11725pa	
0600	0658	DRM	New Zealand, Radio NZ International		13730pa	
0600	0700		Anguilla, Worldwide Univ Network		6090am	
0600	0700		Australia, ABC NT Alice Springs		4835do	
0600	0700		Australia, ABC NT Katherine	5025do		
0600	0700		Australia, ABC NT Tennant Creek		4910do	
0600	0700		Australia, Radio Australia	9660pa	12080pa	
			13630as	13690pa	15160pa	15240pa
			17750as			
0600	0700		Bahrain, Radio Bahrain	6010me	9745al	
0600	0700		Canada, CFRX Toronto ON	6070na		
0600	0700		Canada, CFVP Calgary AB	6030na		
0600	0700		Canada, CKZN St John's NF	6160na		
0600	0700		Canada, CKZU Vancouver BC	6160na		
0600	0700		Cuba, Radio Havana Cuba	6000na	6010na	
			6060na	6140na		
0600	0700		Greece, Voice of Greece	7475eu	9420eu	
0600	0700		Malaysia, RTM/Traxx FM	7295do		
0600	0700		Malaysia, RTM/Voice of Malaysia		6175as	
			9750as	15295as		
0600	0700		Nigeria, Voice of Nigeria/External Service		15120af	
0600	0700		Russia, Voice of Russia	9855na	9840na	
			12070na			
0600	0700		South Africa, Channel Africa	7230af		
0600	0700		Swaziland, TWR Swaziland	4775af	6120af	
			9500af			
0600	0700		Uganda, UBC Radio	7195do		
0600	0700		UK, BBC World Service	3995eu	5875eu	
			6005af	6190af	9860af	11760as
			11765af	12015af	12095eu	15310as
			17640af	17790as		
0600	0700	Sat/Sun	UK, BBC World Service	15420af		
0600	0700	DRM	UK, BBC World Service	3995eu		
0600	0700		Ukraine, Radio Ukraine International		7440na	
0600	0700		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0600	0700		USA, EWTN/WEWN Vandiver AL		11520af	
0600	0700		USA, Voice of America	6080af	9885af	
			15580af			
0600	0700		USA, WBCQ Monticello ME	5110am	7415am	
0600	0700		USA, WHRI Cypress Creek SC	5875na	7465na	
			9615af			
0600	0700		USA, WJHR International Milton FL		15550usb	
0600	0700	vl	USA, WRMI Miami FL	9955va		
0600	0700		USA, WTJC Newport NC	9370na		
0600	0700		USA, WWCR Nashville TN	3215na	5070na	
			5890na	5935na		
0600	0700		USA, WWRB Manchester TN	3185na		
0600	0700		USA, WYFR/Family Radio Worldwide		5745sa	
			6000ca	9680na	9985eu	11530va
0600	0700		Zambia, 1 Africa Radio/CVC	6065af	13590af	
0600	0700		Zambia, ZNBC (Radio Two)	6165do		
0630	0656		Romania, Radio Romania International		7370eu	
			17780pa	21600pa		
0630	0656	DRM	Romania, Radio Romania International		6020eu	

0630	0700		Australia, Radio Australia	15415as		
0630	0700		Uzbekistan, CVC Intl/ The Voice Asia	15700as		
0630	0700		Vatican City State, Vatican Radio	7360af	9660af	11625af
0659	0700		New Zealand, Radio NZ International	9765pa		
0659	0700	DRM	New Zealand, Radio NZ International	13730pa		

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

0700	0705		Croatia, Croatian Radio	6165eu		
0700	0727		Slovakia, Radio Slovakia International	13715va	15460va	
0700	0730	DRM	France, Radio France International	15605af		
0700	0730	Sun	UK, Bible Voice Broadcasting	5945eu		
0700	0745		USA, WYFR/Family Radio Worldwide	5745sa	5950na	
0700	0757		China, China Radio International	11785as	11880as	13645as
				15125eu	15350as	15465as
				17505as	17540as	17710as
0700	0800		Anguilla, Worldwide Univ Network	6090am		
0700	0800		Australia, ABC NT Alice Springs	4835do		
0700	0800		Australia, ABC NT Katherine	5025do		
0700	0800		Australia, ABC NT Tennant Creek	4910do		
0700	0800		Australia, Radio Australia	9475as	9660pa	9710as
				11945pa	12080pa	13630as
				15160pa	15240pa	
0700	0800		Bahrain, Radio Bahrain	6010me	9745al	
0700	0800	DRM	Belgium, TDP Radio	17755as		
0700	0800		Canada, CFRX Toronto ON	6070na		
0700	0800		Canada, CFVP Calgary AB	6030na		
0700	0800		Canada, CKZN St John's NF	6160na		
0700	0800		Canada, CKZU Vancouver BC	6160na		
0700	0800		Cuba, Radio Havana Cuba	6060na		
0700	0800	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
0700	0800	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
0700	0800	DRM	Germany, Deutsche Welle	3995eu	6130eu	
0700	0800		Greece, Voice of Greece	12105va		
0700	0800		Malaysia, RTM/Traxx FM	7295do		
0700	0800		Malaysia, RTM/Voice of Malaysia	6175as	9750as	15295as
0700	0800		Myanmar, Myanma Radio	9730do		
0700	0800		New Zealand, Radio NZ International	9765pa		
0700	0800	DRM	New Zealand, Radio NZ International	9870pa		
0700	0800		Palau, T8WH/Sound of Hope Radio	13840as		
0700	0800	DRM	Russia, Voice of Russia	11635eu		
0700	0800		Russia, Voice of Russia	17665pa	17805pa	
0700	0800		South Africa, Channel Africa	9625af		
0700	0800		Swaziland, TWR Swaziland	4775af	6120af	9500af
0700	0800		Uganda, UBC Radio	7195do		
0700	0800		UK, BBC World Service	6190af	9860af	11760me
				11765af	13820af	15310af
				15400af	15575as	17790as
				17830af		
0700	0800	Sat/Sun	UK, BBC World Service	15420af		
0700	0800	Sat	UK, Bible Voice Broadcasting	5945eu		
0700	0800		USA, American Forces Network	4319usb	5446usb	5765usb
				6350usb	7812usb	10320usb
				12133usb	12759usb	13362usb
0700	0800		USA, EWTN/WEWN Vandiver AL	11520af		
0700	0800		USA, WBCQ Monticello ME	5110am	7415am	
0700	0800		USA, WHRI Cypress Creek SC	5875na	7385na	7465eu
0700	0800	Sun	USA, WHRI Cypress Creek SC	11565va		
0700	0800		USA, WJHR International Milton FL	15550usb		
0700	0800	vl	USA, WRMI Miami FL	9955va		
0700	0800		USA, WTJC Newport NC	9370na		
0700	0800		USA, WWCR Nashville TN	3215na	5070na	5890na
				5935na		
0700	0800		USA, WWRB Manchester TN	3185na		
0700	0800		USA, WYFR/Family Radio Worldwide	5950na	6915na	7455na
				9495ca	11580va	
0700	0800		Uzbekistan, CVC Intl/ The Voice Asia	15700as		
0700	0800		Zambia, 1 Africa Radio/CVC	6065af	13590af	
0700	0800		Zambia, ZNBC (Radio Two)	6165do		
0730	0745		Vatican City State, Vatican Radio	4005eu	5965eu	7250eu
				9645 et	11740eu	15595eu
0730	0800		Australia, HCJB Global	11750as		
0730	0800		Bulgaria, Radio Bulgaria	5900eu	7400eu	
0730	0800		Clandestine, Cotton Tree News	11875af		
0745	0800	Sun	Germany, TWR Europe	6105eu		
0745	0800	Sun	Monaco, TWR Europe	9800eu		
0745	0800	f	UK, Bible Voice Broadcasting	5945eu		

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

0800	0815	Sat	UK, Bible Voice Broadcasting	5945eu		
0800	0827		Czech Republic, Radio Prague	7345eu	9860eu	
0800	0830		Australia, ABC NT Alice Springs	4835do		
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek	4910do		
0800	0830		Myanmar, Myanma Radio	9730do		
0800	0845		USA, WYFR/Family Radio Worldwide	11580va		
0800	0850	mtwhf	Germany, TWR Europe	6105eu		
0800	0850	Sun	Germany, TWR Europe	6105eu		
0800	0850	mtwhf	Monaco, TWR Europe	9800eu		
0800	0850	Sun	Monaco, TWR Europe	9800eu		
0800	0857		China, China Radio International	9415as	11785as	11880as
				15350as	15465as	15625as
				15465as	15625as	17490eu
				17540as		
0800	0858	DRM	Germany, Deutsche Welle	12005as		
0800	0900		Anguilla, Worldwide Univ Network	6090am		
0800	0900		Australia, HCJB Global	11750pa		
0800	0900		Australia, Radio Australia	5995pa	9475as	9580pa
				9590pa	9710pa	11945pa
				12080pa	13630as	
0800	0900		Bahrain, Radio Bahrain	6010me	9745al	
0800	0900	m/DRM	Belgium, TDP Radio	6015eu		
0800	0900		Bhutan, Bhutan Broadcasting Service	6035as		
0800	0900		Canada, CFRX Toronto ON	6070na		
0800	0900		Canada, CFVP Calgary AB	6030na		
0800	0900		Canada, CKZN St John's NF	6160na		
0800	0900		Canada, CKZU Vancouver BC	6160na		
0800	0900		China, Guangxi FBS/Beibu Bay Radio	5050as	9820as	
0800	0900		Cuba, Radio Havana Cuba	6060na		
0800	0900	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
0800	0900	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
0800	0900	DRM	Germany, Deutsche Welle	9610eu	13810eu	
0800	0900		Malaysia, RTM/Traxx FM	7295do		
0800	0900		Malaysia, RTM/Voice of Malaysia	6175as	9750as	15295as
0800	0900		New Zealand, Radio NZ International	9765pa		
0800	0900	DRM	New Zealand, Radio NZ International	9870pa		
0800	0900		Nigeria, Voice of Nigeria/External Service	9690af		
0800	0900		Palau, T8WH/Sound of Hope Radio	13840as		
0800	0900	DRM	Russia, Voice of Russia	11635eu		
0800	0900		Russia, Voice of Russia	17650af	17665af	17805af
0800	0900	Sun	South Africa, Amateur Radio Mirror Intl	7205af	17860af	
0800	0900		South Africa, Channel Africa	9625af		
0800	0900		South Korea, KBS World Radio	9570as		
0800	0900		Swaziland, TWR Swaziland	4775af	6120af	9500af
0800	0900		Uganda, UBC Radio	7195do		
0800	0900		UK, BBC World Service	6190af	9860af	11760me
				15310as	15400af	15575as
				17640af	17790as	17830af
				21470af		
0800	0900		USA, American Forces Network	4319usb	5446usb	5765usb
				6350usb	7812usb	10320usb
				12133usb	12759usb	13362usb
0800	0900		USA, EWTN/WEWN Vandiver AL	11520af		
0800	0900		USA, KNLS Anchor Point AK	6150as	9615al	
0800	0900		USA, WBCQ Monticello ME	5110am	7415am	
0800	0900		USA, WHRI Cypress Creek SC	5875na	7385na	7465eu
0800	0900	mtwh	USA, WHRI Cypress Creek SC	11565va		
0800	0900	Sun	USA, WHRI Cypress Creek SC	5875va		
0800	0900		USA, WJHR International Milton FL	15550usb		
0800	0900	vl	USA, WRMI Miami FL	9955va		
0800	0900		USA, WTJC Newport NC	9370na		
0800	0900		USA, WWCR Nashville TN	3215na	5070na	5890na
				5935na		
0800	0900		USA, WWRB Manchester TN	3185na		
0800	0900		USA, WYFR/Family Radio Worldwide	5950na	6915na	7455na
0800	0900		Uzbekistan, CVC Intl/ The Voice Asia	15700as		
0800	0900		Zambia, 1 Africa Radio/CVC	6065af	13590af	
0800	0900		Zambia, ZNBC (Radio Two)	6165do		
0815	0850	Sat	Germany, TWR Europe	6105eu		
0815	0850	Sat	Monaco, TWR Europe	9800eu		
0820	0900	smtwhf	Guam, KTWR/TWR	15170as		
0830	0900		Australia, ABC NT Alice Springs	2310do		
0830	0900		Australia, ABC NT Katherine	2485do		
0830	0900		Australia, ABC NT Tennant Creek	2325do		
0830	0900	mtwhfa	Guam, KTWR/TWR	11840pa		

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

0900	0910	mtwhfa	Guam, KTWR/TWR	11840pa		
0900	0930		Australia, HCJB Global	11750pa		
0900	0930		Japan, NHK World/ Radio Japan	9625pa		
			9825pa	11815as	15590as	
0900	0930		Uzbekistan, CVC Intl/ The Voice Asia	15700as		
0900	0957		China, China Radio International	9415as		
			15210va	15270eu	15350as	17490eu
			17570eu	17690va	17750as	
0900	1000		Anguilla, Worldwide Univ Network	6090am		
0900	1000		Australia, ABC NT Alice Springs	2310do		
0900	1000		Australia, ABC NT Katherine	2485do		
0900	1000		Australia, ABC NT Tennant Creek	2325do		
0900	1000		Australia, Radio Australia	9475as	9580pa	
			9590pa	11945pa		
0900	1000		Bahrain, Radio Bahrain	6010me	9745al	
0900	1000	t/DRM	Belgium, TDP Radio	6015eu		
0900	1000		Canada, CFRX Toronto ON	6070na		
0900	1000		Canada, CFVP Calgary AB	6030na		
0900	1000		Canada, CKZN St John's NF	6160na		
0900	1000		Canada, CKZU Vancouver BC	6160na		
0900	1000		China, Guangxi FBS/Beibu Bay Radio	5050as		
			9820as			
0900	1000		Cuba, Radio Havana Cuba	6060na		
0900	1000	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
0900	1000	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
0900	1000	2nd Sun	Germany, Blue Star Radio	6140eu		
0900	1000		Germany, Deutsche Welle	17710as	21780as	
0900	1000	3rd Sun	Germany, European Music Radio	6140eu		
0900	1000	4th Sun	Germany, Radio Gloria International	6140eu		
0900	1000		Malaysia, RTM/Traxx FM	7295do		
0900	1000		Malaysia, RTM/Voice of Malaysia	6175as		
			9750as	15295as		
0900	1000		New Zealand, Radio NZ International	9765pa		
0900	1000	DRM	New Zealand, Radio NZ International	9870pa		
0900	1000		Nigeria, Voice of Nigeria/External Service	9690af		
0900	1000		Palau, T8WH/Sound of Hope Radio	13840as		
0900	1000		Russia, Voice of Russia	17605af	17665af	
			17805af			
0900	1000	3rd Sat	Slovakia, IRRS/Radio City	9510va		
0900	1000	1st Sat	Slovakia, IRRS/Radio Joystick	9510va		
0900	1000		South Africa, Channel Africa	9625af		
0900	1000		Tajikistan, Voice of Tajik/Radio 2	7245as		
0900	1000		Uganda, UBC Radio	7195do		
0900	1000	DRM	UK, BBC World Service	9610eu	13810eu	
0900	1000		UK, BBC World Service	6190af	6195as	
			9740as	9860af	11760me	15310as
			15400af	15575as	17640af	17760as
			17830af	21470af		
0900	1000		USA, American Forces Network	4319usb		
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0900	1000		USA, EWTN/WEWN Vandiver AL	9390as		
0900	1000		USA, WBCQ Monticello ME	5110am	7415am	
0900	1000		USA, WHRI Cypress Creek SC	5875na	7385na	
			7465eu			
0900	1000	Sun	USA, WHRI Cypress Creek SC	11565va		
0900	1000		USA, WJHR International Milton FL	15550usb		
0900	1000	vl	USA, WRMI Miami FL	9955va		
0900	1000		USA, WTJC Newport NC	9370na		
0900	1000		USA, WWCR Nashville TN	3215na	5070na	
			5890na	5935na		
0900	1000		USA, WWRB Manchester TN	3185na		
0900	1000		USA, WYFR/Family Radio Worldwide	5950na		
			6915na	7455na	9465as	
0900	1000		Zambia, 1 Africa Radio/CVC	6065af	13590af	
0900	1000		Zambia, ZNBC (Radio Two)	6165do		
0930	1000		Australia, CVC International	15535as		
0930	1000		Saudi Arabia, Saudi Radio	15250af		

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

1000	1005		Croatia, Croatian Radio	11675va		
1000	1029		Czech Republic, Radio Prague	9955sa	15700as	
			21745af			
1000	1030	Sat/Sun DRM	Bulgaria, Radio Bulgaria	11900eu		
1000	1030		Vietnam, Voice of Vietnam	9840as	12020as	
1000	1057		China, China Radio International	5955na		
			7215as	11640as	13590as	13720va
			15190as	15210as	15350as	17490eu
			17690va			
1000	1057		Netherlands, R Netherlands Worldwide	6040va		
			9720as	12065as		
1000	1057		North Korea, Voice of Korea	11710sa	11735as	
			13650as	15180sa		
1000	1058		New Zealand, Radio NZ International	9765pa		
1000	1100		Anguilla, Worldwide Univ Network	11775am		
1000	1100		Australia, ABC NT Alice Springs	2310do		
1000	1100		Australia, ABC NT Katherine	2485do		
1000	1100		Australia, ABC NT Tennant Creek	2325do		
1000	1100		Australia, CVC International	15535as		
1000	1100		Australia, Radio Australia	9475as	9580pa	
			9590pa	11945pa		
1000	1100		Bahrain, Radio Bahrain	6010me	9745al	
1000	1100	w/DRM	Belgium, TDP Radio	6015eu		
1000	1100		Canada, CFRX Toronto ON	6070na		
1000	1100		Canada, CFVP Calgary AB	6030na		
1000	1100		Canada, CKZN St John's NF	6160na		
1000	1100		Canada, CKZU Vancouver BC	6160na		
1000	1100		Cuba, Radio Havana Cuba	6060na		
1000	1100	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
1000	1100	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1000	1100		India, All India Radio	7270as	13710pa	
			15235as	15260as	17800as	17895pa
1000	1100		Indonesia, Voice of Indonesia	9525va	11785al	
1000	1100		Malaysia, RTM/Traxx FM	7295do		
1000	1100	DRM	New Zealand, Radio NZ International	9870pa		
1000	1100		Nigeria, Voice of Nigeria/External Service	9690af		
1000	1100		Palau, T8WH/Sound of Hope Radio	13840as		
1000	1100		Russia, Voice of Russia	7205af	17650af	
			17665af	17805af		
1000	1100		South Africa, Channel Africa	9625af		
1000	1100		Uganda, UBC Radio	7195do		
1000	1100	Sat/Sun	UK, BBC World Service	15400af	17830af	
1000	1100	DRM	UK, BBC World Service	9545eu	13810eu	
1000	1100		UK, BBC World Service	6190af	6195as	
			9545eu	9740as	9860af	11760me
			11895as	15310as	15575as	17640af
			17790as	21470af		
1000	1100		Ukraine, Radio Ukraine International	9950eu		
1000	1100		USA, American Forces Network	4319usb		
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1000	1100		USA, EWTN/WEWN Vandiver AL	9390as		
1000	1100		USA, KNLS Anchor Point AK	6150as		
1000	1100		USA, WBCQ Monticello ME	5110am	7415am	
1000	1100		USA, WHRI Cypress Creek SC	7385na	7520eu	
1000	1100	Sun	USA, WHRI Cypress Creek SC	11565va		
1000	1100		USA, WINB Red Lion PA	9265ca		
1000	1100		USA, WJHR International Milton FL	15550usb		
1000	1100	vl	USA, WRMI Miami FL	9955va		
1000	1100		USA, WTJC Newport NC	9370na		
1000	1100		USA, WWCR Nashville TN	5070na	5935na	
			9985na			
1000	1100		USA, WWRB Manchester TN	3185na		
1000	1100		USA, WYFR/Family Radio Worldwide	5950na		
			6890na	6915na	7455na	9460as
			9465as			
1000	1100		Zambia, 1 Africa Radio/CVC	6065af	13590af	
1000	1100		Zambia, ZNBC (Radio Two)	6165do		
1015	1045	Sun	UK, Bible Voice Broadcasting	5910as		
1030	1100		Australia, HCJB Global	15400as		
1030	1100		Iran, Voice of Islamic Rep. of Iran	15460as		
			17660as			
1030	1100		Mongolia, Voice of Mongolia	12085as		
1030	1100	Sun	Slovakia, IRRS/Euro Gospel Radio	9510va		
1059	1100		New Zealand, Radio NZ International	13660pa		

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

1100	1105	mtwhf	Croatia, Croatian Radio	7370va		
1100	1105		Pakistan, PBC/ Radio Pakistan	17700eu		
1100	1127		Iran, Voice of Islamic Rep. of Iran	15460as		
			17660as			
1100	1130		Australia, CVC International	15535as		
1100	1130	DRM	South Korea, KBS World Radio	9760eu		
1100	1130		Vietnam, Voice of Vietnam	7285as		
1100	1145		USA, WYFR/Family Radio Worldwide	5950na		
			6000ca			
1100	1157		China, China Radio International	5955as		
			5960na	6060as	9570as	11650as
			11795as	13590va	13645eu	13665eu
			13720as	17490va		
1100	1158	DRM	New Zealand, Radio NZ International	9870pa		
1100	1200		Anguilla, Worldwide Univ Network	11775am		
1100	1200		Australia, ABC NT Alice Springs	2310do		
1100	1200		Australia, ABC NT Katherine	2485do		
1100	1200		Australia, ABC NT Tennant Creek	2325do		
1100	1200		Australia, HCJB Global	15400as		
1100	1200		Australia, Radio Australia	5995pa	6020pa	
			9475as	9560pa	9580pa	9590pa
			11945pa	12080pa		

1100	1200		Bahrain, Radio Bahrain	6010me	9745al
1100	1200	h/DRM	Belgium, TDP Radio	6015eu	
1100	1200	Sat/Sun	Canada, CBC NQ SW Service	9625na	
1100	1200		Canada, CFRX Toronto ON	6070na	
1100	1200		Canada, CFVP Calgary AB	6030na	
1100	1200		Canada, CKZN St John's NF	6160na	
1100	1200		Canada, CKZU Vancouver BC	6160na	
1100	1200	mtwhf	Equatorial Guinea, Radio Africa # 2		15190af
1100	1200	Sat/Sun	Equatorial Guinea, Radio East Africa		15190af
1100	1200	DRM	Germany, Deutsche Welle	9545eu	13810eu
1100	1200		Malaysia, RTM/Traxx FM	7295do	
1100	1200		New Zealand, Radio NZ International		13660pa
1100	1200		Nigeria, Voice of Nigeria/External Service		9690af
1100	1200		Palau, T8WH/Sound of Hope Radio		13840as
1100	1200		Russia, Voice of Russia	7205af	
1100	1200		Saudi Arabia, Saudi Radio	15250af	
1100	1200	Sun	Slovakia, IRRS/Euro Gospel Radio		9510va
1100	1200		South Africa, Channel Africa	9625af	
1100	1200		Taiwan, Radio Taiwan International		7445as
			11715as		
1100	1200		Uganda, UBC Radio	7195do	
1100	1200	Sat/Sun	UK, BBC World Service	15400af	
1100	1200		UK, BBC World Service	6190af	6195as
			9545eu	9605as	9740as	9860af
			11760me	11895as	15310as	15575as
			17640af	17790as	17830as	21470af
1100	1200		USA, American Forces Network		4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1100	1200		USA, EWTN/WEWN Vandiver AL		9390as
1100	1200		USA, WBCQ Monticello ME	5110am	7415am
1100	1200		USA, WHRI Cypress Creek SC	5875na	7385na
			7520eu		
1100	1200		USA, WINB Red Lion PA	9265ca	
1100	1200		USA, WJHR International Milton FL		15550usb
1100	1200	vl	USA, WRMI Miami FL	9955va	
1100	1200		USA, WTJC Newport NC	9370na	
1100	1200		USA, WWCR Nashville TN	5070na	5935na
			9985na		
1100	1200		USA, WWRB Manchester TN	3185na	
1100	1200		USA, WYFR/Family Radio Worldwide		6890na
			7455na	11725ca	11830sa	
1100	1200		Zambia, 1 Africa Radio/CVC	6065af	13590af
1100	1200		Zambia, ZNBC (Radio Two)	6165do	
1105	1200	Sun	Greece, Voice of Greece	9420va	15650va
1115	1130	mtwhf	UK, Bible Voice Broadcasting	5945as	
1115	1200		UK, Bible Voice Broadcasting	5945as	
1115	1200	Sat	UK, Bible Voice Broadcasting	5945as	
1130	1157		Czech Republic, Radio Prague	11640eu	17545va
1130	1200		Australia, CVC International	15535as	
1130	1200	sthf	Guam, KSDA/ AWR	15260as	
1130	1200	f	Vatican City State, Vatican Radio		15595as
			17765as		
1130	1200		Vietnam, Voice of Vietnam	9840as	12020as
1145	1200		Australia, HCJB Global	15340as	

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

1200	1230		Australia, CVC International	15535as	
1200	1230		France, Radio France International		21620af
1200	1230		Germany, AWR-Europe	15495as	
1200	1230		Japan, NHK World/ Radio Japan		6120na
			9625as	9695as	9790eu	
1200	1230		Saudi Arabia, Saudi Radio	15250af	
1200	1245		USA, WYFR/Family Radio Worldwide		6890na
1200	1256		Romania, Radio Romania International		11970eu
			15105eu	15430af	17760af	
1200	1257		China, China Radio International		5955as
			7250as	9460as	9600as	9645as
			9730va	9760as	11650as	11690as
			11760va	11980as	12015as	13665eu
			13790eu	17490eu		
1200	1258		New Zealand, Radio NZ International		13660pa
1200	1300		Anguilla, Worldwide Univ Network		11775am
1200	1300		Australia, ABC NT Alice Springs		2310do
1200	1300		Australia, ABC NT Katherine	2485do	
1200	1300		Australia, ABC NT Tennant Creek		2325do
1200	1300		Australia, HCJB Global	15340as	
1200	1300		Australia, Radio Australia	5995pa	6020pa
			9475as	9560pa	9580pa	9590pa
			11945pa			
1200	1300		Bahrain, Radio Bahrain	6010me	9745al
1200	1300	f/DRM	Belgium, TDP Radio	6015eu	
1200	1300	Sat/Sun	Canada, CBC NQ SW Service	9625na	
1200	1300		Canada, CFRX Toronto ON	6070na	
1200	1300		Canada, CFVP Calgary AB	6030na	
1200	1300		Canada, CKZN St John's NF	6160na	
1200	1300		Canada, CKZU Vancouver BC	6160na	
1200	1300	Sat/Sun	Equatorial Guinea, Radio East Africa		15190af
1200	1300	DRM	Germany, Deutsche Welle	9545eu	13810eu
1200	1300		Malaysia, RTM/Traxx FM	7295do	
1200	1300		Malaysia, RTM/Voice of Malaysia		6175as
			9750as	15295as		
1200	1300		Nigeria, Voice of Nigeria/External Service		9690af
1200	1300		Palau, T8WH/Sound of Hope Radio		13840as
1200	1300		Russia, Voice of Russia	7340af	7350af
			9695af	11660af		
1200	1300	Sun	Slovakia, IRRS/Euro Gospel Radio		9510va
1200	1300		South Korea, KBS World Radio		9650na
1200	1300		Uganda, UBC Radio	7195do	
1200	1300		UK, BBC World Service	5875as	6190af
			6195as	9545eu	9605as	9740as
			9860af	11760me	15310as	15575as
			17640af	17790as	17830af	21470af
1200	1300		Ukraine, Radio Ukraine International		9950eu
1200	1300		USA, American Forces Network		4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1200	1300		USA, EWTN/WEWN Vandiver AL		9390as
1200	1300		USA, KNLS Anchor Point AK	6150as	6915as
1200	1300		USA, Voice of America	7575va	9640va
			11705va	11730va	11750va	
1200	1300		USA, WBCQ Monticello ME	5110am	7415am
1200	1300		USA, WHRI Cypress Creek SC	7385na	15665va
1200	1300		USA, WINB Red Lion PA	9265ca	
1200	1300		USA, WJHR International Milton FL		15550usb
1200	1300	vl	USA, WRMI Miami FL	9955va	
1200	1300		USA, WTJC Newport NC	9370na	
1200	1300		USA, WWCR Nashville TN	5935na	7490na
			9980na	15825na		
1200	1300		USA, WWRB Manchester TN	9385am	
1200	1300		USA, WYFR/Family Radio Worldwide		7455na
			11530ca	11970am		
1200	1300		Zambia, 1 Africa Radio/CVC	6065af	13590af
1200	1300		Zambia, ZNBC (Radio Two)	6165do	
1215	1300		Egypt, Radio Cairo	17835as	
1230	1300		Australia, CVC International	13635as	
1230	1300		Bangladesh, Bangladesh Betar		7250as
1230	1300	mtwhf	Ethiopia, Radio Ethiopia/National Service		5990do
			7110do	9704do		
1230	1300		Thailand, Radio Thailand World Service		9720va
1230	1300		Vietnam, Voice of Vietnam	9840as	12020as

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

1300	1330		Egypt, Radio Cairo	17835as	
1300	1345		USA, WYFR/Family Radio Worldwide		7455na
			11970na		
1300	1357		China, China Radio International		5995as
			7300na	9570na	9730as	9765va
			9870as	11760as	11885as	11900eu
			11980as	13790eu	15230na	17490va
1300	1357		North Korea, Voice of Korea	9335na	11710na
			13760eu	15245eu		
1300	1400		Anguilla, Worldwide Univ Network		11775am
1300	1400		Australia, ABC NT Alice Springs		2310do
1300	1400		Australia, ABC NT Katherine	2485do	
1300	1400		Australia, CVC International	13635as	
1300	1400		Australia, HCJB Global	15340as	15400as
1300	1400		Australia, Radio Australia	5995pa	6020pa
			9560pa	9580pa	9590pa	
1300	1400		Bahrain, Radio Bahrain	6010me	9745al
1300	1400	a/DRM	Belgium, TDP Radio	6015eu	
1300	1400	Sat/Sun	Canada, CBC NQ SW Service	9625na	
1300	1400		Canada, CFRX Toronto ON	6070na	
1300	1400		Canada, CFVP Calgary AB	6030na	
1300	1400		Canada, CKZN St John's NF	6160na	
1300	1400		Canada, CKZU Vancouver BC	6160na	
1300	1400	Sat/Sun	Equatorial Guinea, Radio East Africa		15190af
1300	1400	DRM	Germany, Deutsche Welle	9545eu	13810eu
1300	1400		Indonesia, Voice of Indonesia	9525va	11785al
1300	1400		Malaysia, RTM/Traxx FM	7295do	
1300	1400		Malaysia, RTM/Voice of Malaysia		6175as
			9750as	15295as		
1300	1400		New Zealand, Radio NZ International		6170pa
1300	1400		Nigeria, Voice of Nigeria/External Service		9690af
1300	1400		Poland, Polish Radio	11675eu	11860eu
1300	1400		Russia, Voice of Russia	7205af	
1300	1400		South Korea, KBS World Radio		9570as
			9770as			
1300	1400		Uganda, UBC Radio	4976do	

1300	1400		UK, BBC World Service	5875as	6190af	
			6195as	9410as	9545eu	9740as
			9860af	11760me	11835as	15310as
			15420af	15575eu	21470af	
1300	1400		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1300	1400		USA, EWTN/WEWN Vandiver AL			13835eu
1300	1400		USA, Voice of America	7575va	9640va	
			9760va	11705va		
1300	1400		USA, WBCQ Monticello ME	5110am	7415am	
1300	1400		USA, WHRI Cypress Creek SC	9840na	15665va	
1300	1400		USA, WINB Red Lion PA	9265ca		
1300	1400		USA, WJHR International Milton FL			15550usb
1300	1400	vl	USA, WRMI Miami FL	9955va		
1300	1400		USA, WTJC Newport NC	9370na		
1300	1400		USA, WWCR Nashville TN	7490na	9980na	
			13845na	15825na		
1300	1400		USA, WWRB Manchester TN	9385am		
1300	1400		USA, WYFR/Family Radio Worldwide			7560as
			9310na	11830na	11620as	11560as
			11855na			
1300	1400		Zambia, 1 Africa Radio/CVC	6065af	13590af	
1300	1400		Zambia, ZNBC (Radio Two)	6165do		
1310	1340		Japan, NHK World/ Radio Japan			9875as
1330	1357	fa/ DRM	Czech Republic, Radio Prague	9850eu		
1330	1400	mtwhfa	Guam, KSDA/ AWR	15660as		
1330	1400		India, All India Radio	9620as	11620as	
			13710as			
1330	1400		Laos, Lao National Radio	7145as		
1330	1400		Sweden, Radio Sweden	7405va		
1330	1400		Turkey, Voice of Turkey	12035eu	15300as	
1330	1400		Vietnam, Voice of Vietnam	9840as	12020as	

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

1400	1425		Turkey, Voice of Turkey	12035eu	15300as	
1400	1427		Czech Republic, Radio Prague	11600as	13580na	
1400	1430		Australia, HCJB Global	15400as		
1400	1430	Sun	Germany, Pan American Broadcasting			13645as
1400	1430	`	Japan, NHK World/ Radio Japan			5995as
			9875as	11705na	11780eu	21560va
1400	1430		Thailand, Radio Thailand World Service			9725va
1400	1430	Sun	United Arab Emirates, FEBA Radio			12045as
1400	1440		Guam, KTWR/TWR	9975as		
1400	1457		China, China Radio International			5955na
			6075na	7300na	7325na	9460as
			9560as	9700as	9765va	9870as
			11665as	13675eu	13685eu	13740na
			15230af	17630af		
1400	1459		Netherlands, R Netherlands Worldwide			12080va
			15595va			
1400	1500		Anguilla, Worldwide Univ Network			11775am
1400	1500		Australia, ABC NT Alice Springs			2310do
1400	1500		Australia, ABC NT Katherine	2485do		
1400	1500		Australia, ABC NT Tennant Creek			2325do
1400	1500		Australia, CVC International	13635as		
1400	1500		Australia, Radio Australia	5995pa	6080pa	
			7240pa	9590pa		
1400	1500		Bahrain, Radio Bahrain	6010me	9745al	
1400	1500	s/DRM	Belgium, TDP Radio	6015eu		
1400	1500		Bhutan, Bhutan Broadcasting Service			6035as
1400	1500	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1400	1500		Canada, CFRX Toronto ON	6070na		
1400	1500		Canada, CFVP Calgary AB	6030na		
1400	1500		Canada, CKZN St John's NF	6160na		
1400	1500		Canada, CKZU Vancouver BC	6160na		
1400	1500	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1400	1500		Germany, CVC Intl-Christian Vision			17770af
1400	1500		India, All India Radio	9620as	11620as	
			13710as			
1400	1500		Libya, LJB/Voice of Africa	17725af	21695af	
1400	1500		Malaysia, RTM/Traxx FM	7295do		
1400	1500		New Zealand, Radio NZ International			6170pa
1400	1500		Nigeria, Voice of Nigeria/External Service			9690af
1400	1500		Oman, Radio Oman	15140va		
1400	1500	DRM	Russia, Voice of Russia	5905eu		
1400	1500		Russia, Voice of Russia	7205af	7340af	
			11660af	12055af		
1400	1500		South Africa, Channel Africa	9625af		
1400	1500		Uganda, UBC Radio	4976do		
1400	1500		UK, BBC World Service	5875as	5975as	
			6190af	6195as	9410as	9545as
			9625as	9740as	9860af	11760as
			15420af	17640af		
1400	1500	DRM	UK, BBC World Service	9545eu	13590eu	
1400	1500	Sat/Sun	UK, Bible Voice Broadcasting	15680af		
1400	1500		United States, Overcomer Ministries			6110eu
			13810va			
1400	1500		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1400	1500		USA, EWTN/WEWN Vandiver AL			13835eu
1400	1500		USA, KJES Vado NM	11715na		
1400	1500		USA, KNLS Anchor Point AK	6890as		
1400	1500		USA, Voice of America	4930af	6080af	
			7575va	9760va	9930va	11985va
			12150va	15205va	15580af	17650af
			17715af			
1400	1500		USA, WBCQ Monticello ME	5110am	7415am	
1400	1500		USA, WHRI Cypress Creek SC	9840na	17540af	
1400	1500		USA, WINB Red Lion PA	13570ca		
1400	1500		USA, WJHR International Milton FL			15550usb
1400	1500	vl	USA, WRMI Miami FL	9955va		
1400	1500		USA, WTJC Newport NC	9370na		
1400	1500		USA, WWCR Nashville TN	7490na	9980na	
			13845na	15825na		
1400	1500		USA, WWRB Manchester TN	9385am		
1400	1500		USA, WYFR/Family Radio Worldwide			6225as
			9485as	9770as	11560na	11855na
			13695na	11565na	17760na	
1400	1500		Zambia, 1 Africa Radio/CVC	6065af	13650af	
1400	1500		Zambia, ZNBC (Radio Two)	6165do		
1400	1557		China, China Radio International			5955as
			6095as	7325as	7405as	9435na
			9870as	13685as	13740na	17630va
1405	1500	Sat	Greece, Voice of Greece	9420eu		
1415	1430	mtwhfa	Germany, Pan American Broadcasting			13645as
1415	1430		Nepal, Radio Nepal	5005as		
1425	1455	mtwhf	Swaziland, TWR Swaziland	6065af		
1430	1445	Sun	Germany, Pan American Broadcasting			13645as
1430	1500		Australia, Radio Australia	9475as	11660as	
1430	1500		China, CPBS/CNR Business Radio			6155do
			7245do	7315as	7335as	7375as
			9820as	9775as		
1430	1500		Sweden, Radio Sweden	9400va		

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

1500	1510	mtwhfa	Turkmenistan, Turkmen Radiosi			5015eu
1500	1515	Sun	UK, Bible Voice Broadcasting	15680af		
1500	1527		Czech Republic, Radio Prague	9955na		
1500	1530		Australia, HCJB Global	15340as		
1500	1530	Sun	China, Voice of the Strait	4940as		
1500	1530	Sat/Sun	Clandestine, Sudan Radio Service/ SRS			17745af
1500	1530		Guam, KSDA/ AWR	15255as		
1500	1530		UK, BBC World Service	9410af	11860af	
			15105af			
1500	1530	Sat	UK, Bible Voice Broadcasting	11880as		
1500	1530		Vietnam, Voice of Vietnam	7285as	9840as	
			12020as			
1500	1545		USA, WYFR/Family Radio Worldwide			15210sa
1500	1550		New Zealand, Radio NZ International			6170pa
1500	1557		Canada, Radio Canada International			9635as
			11975as			
1500	1557		China, China Radio International			5955as
			6060as	6100as	7235as	7255as
			7420as	7435as	9435as	9525eu
			9570as	9600na	11650as	
1500	1557		Libya, LJB/Voice of Africa	17725af	21695af	
1500	1557		Netherlands, R Netherlands Worldwide			12080as
			15595va			
1500	1557		North Korea, Voice of Korea	9335na	11710na	
			13760eu	15245eu		
1500	1600		Anguilla, Worldwide Univ Network			11775am
1500	1600		Australia, ABC NT Alice Springs			2310do
1500	1600		Australia, ABC NT Katherine	2485do		
1500	1600		Australia, CVC International	13635as		
1500	1600		Australia, Radio Australia	5995pa	6080pa	
			7240pa	9475as	9590pa	11660as
1500	1600		Bahrain, Radio Bahrain	6010me	9745al	
1500	1600	DRM	Belgium, TDP Radio	6015eu		
1500	1600	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1500	1600		Canada, CFRX Toronto ON	6070na		
1500	1600		Canada, CFVP Calgary AB	6030na		
1500	1600		Canada, CKZN St John's NF	6160na		
1500	1600		Canada, CKZU Vancouver BC	6160na		
1500	1600	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1500	1600		Germany, CVC Intl-Christian Vision			17770af
1500	1600		Malaysia, RTM/Traxx FM	7295do		
1500	1600		Myanmar, Myanma Radio	5985as		
1500	1600		Russia, Voice of Russia	4975me	7260af	
			9660af			
1500	1600	DRM	Russia, Voice of Russia	5905eu		

1500	1600		South Africa, Channel Africa	9625af		
1500	1600		Uganda, Dunamis Shortwave	4750af		
1500	1600		Uganda, UBC Radio	4976do		
1500	1600		UK, BBC World Service	5875as	5975as	
			6190af	6195as	7395as	9740as
			9855as	9860af	12095af	15400af
			15420af	17640af		
1500	1600	DRM	UK, BBC World Service	5790eu	13590eu	
1500	1600		United States, Overcomer Ministries		6110eu	
			13810va	17485eu		
1500	1600		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1500	1600		USA, EWTN/WEWN Vandiver AL		15610me	
1500	1600		USA, KJES Vado NM	11715am		
1500	1600		USA, Voice of America	4930af	6080af	
			7545va	9310va	9685va	9930va
			11525va	11765va	12150va	15580af
			17715af	17895af		
1500	1600		USA, Voice of America/Special English		6140va	
			7520va	9760va	15460va	
1500	1600		USA, WBCQ Monticello ME	5110am	7415am	
			9955na			
1500	1600		USA, WHRI Cypress Creek SC	9840na		
1500	1600	mtwhfa	USA, WHRI Cypress Creek SC	21640af		
1500	1600		USA, WINB Red Lion PA	13570ca		
1500	1600		USA, WJHR International Milton FL		15550usb	
1500	1600	vl	USA, WRMI Miami FL	9955na		
1500	1600		USA, WTJC Newport NC	9370na		
1500	1600		USA, WWCR Nashville TN	7490na	9980na	
			13845na	15825na		
1500	1600		USA, WWRB Manchester TN	9385am		
1500	1600		USA, WYFR/Family Radio Worldwide		6280as	
			9495as	11565na	11855na	12015as
			17760na			
1500	1600		Zambia, 1 Africa Radio/CVC	6065af	13650af	
1500	1600		Zambia, ZNBC (Radio Two)	6165do		
1515	1530		Vatican City State, Vatican Radio		7585as	
			9310as	11850as	13765as	
1525	1600	Sat/Sun	Swaziland, TWR Swaziland	6065af		
1530	1545		India, All India Radio	7255as	9620as	
			9820as	9910as		
1530	1600	mtwhfa	Albania, Radio Tirana	13640na		
1530	1600		Iran, Voice of Islamic Rep. of Iran		6160as	
			7380as			
1530	1600		Mongolia, Voice of Mongolia	9665as		
1530	1600		Sweden, Radio Sweden	9360me		
1530	1600	Sat	UK, BBC World Service	9410af	11860af	
			15105af			
1530	1600	Sun	UK, Bible Voice Broadcasting	13590me		
1530	1600		UK, Bible Voice Broadcasting	15680as		
1530	1600	Sat	Vatican City State, Vatican Radio		7585as	
			11850as	13765as		
1545	1600	mtwhfa	UK, Bible Voice Broadcasting	13590me		
1551	1600		New Zealand, Radio NZ International		6170pa	
1551	1600	DRM	New Zealand, Radio NZ International		7440pa	

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

1600	1610		Pakistan, PBC/ Radio Pakistan	7535me	15100af	
1600	1615	f	UK, Bible Voice Broadcasting	13590me		
1600	1620	t	UK, Bible Voice Broadcasting	13590me		
1600	1625	Sat/Sun	Swaziland, TWR Swaziland	6065af		
1600	1627		Iran, Voice of Islamic Rep. of Iran		6160as	
			7380as			
1600	1630		Guam, KSDA/ AWR	9585as	11690as	
1600	1630		Myanmar, Myanma Radio	9730do		
1600	1630	Sat	USA, Voice of America	11750af		
1600	1630		Vietnam, Voice of Vietnam	7220me	7280eu	
			9550me	9730va		
1600	1645		USA, WYFR/Family Radio Worldwide		11565na	
			11830na	17760na		
1600	1657		North Korea, Voice of Korea	9990va	11545va	
1600	1700		Anguilla, Worldwide Univ Network		11775am	
1600	1700		Australia, ABC NT Alice Springs		2310do	
1600	1700		Australia, ABC NT Katherine	2485do		
1600	1700		Australia, CVC International	13635as		
1600	1700		Australia, Radio Australia	5995pa	6080pa	
			7240pa	9475as	9710pa	11660as
1600	1700		Bahrain, Radio Bahrain	6010me	9745al	
1600	1700	Sat	Canada, CBC NQ SW Service	9625na		
1600	1700		Canada, CFRX Toronto ON	6070na		
1600	1700		Canada, CFVP Calgary AB	6030na		
1600	1700		Canada, CKZN St John's NF	6160na		
1600	1700		Canada, CKZU Vancouver BC	6160na		
1600	1700	Sat	Clandestine, Cheetah Radio	11730as		
1600	1700		Egypt, Radio Cairo12170af			
1600	1700		Ethiopia, Radio Ethiopia/External Service		7165af	
			9560af			
1600	1700		France, Radio France International		15605af	
1600	1700		Germany, CVC Intl-Christian Vision		17770af	
1600	1700		Germany, Deutsche Welle	5965as		
1600	1700		Malaysia, RTM/Traxx FM	7295do		
1600	1700		New Zealand, Radio NZ International		6170pa	
1600	1700	DRM	New Zealand, Radio NZ International		7440pa	
1600	1700		Russia, Voice of Russia	4975me	6130eu	
			7305af	9470va	11630af	
1600	1700		South Korea, KBS World Radio		9515eu	
1600	1700		Taiwan, Radio Taiwan International		9785as	
			11550as			
1600	1700		Uganda, Dunamis Shortwave	4750af		
1600	1700		Uganda, UBC Radio	4976do		
1600	1700		UK, BBC World Service	3255af	3995eu	
			5790eu	5975as	6190af	7255as
			9740as	11860af	12095eu	13820af
			15400af	15420af	17640af	
1600	1700	DRM	UK, BBC World Service	3995eu	5790eu	
1600	1700	Sat	UK, BBC World Service	9410af	15105af	
1600	1700	Sun	UK, Bible Voice Broadcasting	13590me		
1600	1700		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1600	1700		USA, EWTN/WEWN Vandiver AL		15610me	
1600	1700		USA, KJES Vado NM	11715am		
1600	1700		USA, Voice of America	4930af	6080af	
			15580af	17715af	17895af	
1600	1700		USA, Voice of America/Special English		9395va	
			13600va	15445va		
1600	1700		USA, WBCQ Monticello ME	5110am	7415am	
			9955na			
1600	1700		USA, WHRI Cypress Creek SC	9840na	21640af	
1600	1700		USA, WINB Red Lion PA	13570ca		
1600	1700		USA, WJHR International Milton FL		15550usb	
1600	1700	vl	USA, WRMI Miami FL	9955na		
1600	1700		USA, WTJC Newport NC	9370na		
1600	1700		USA, WWCR Nashville TN	7490na	9980na	
			13845na	15825na		
1600	1700		USA, WWRB Manchester TN	9385am		
1600	1700		USA, WYFR/Family Radio Worldwide		5960na	
			6085af	6225af	9795af	11740af
			11830eu	13695eu	17690eu	18980eu
			21455eu			
1600	1700		Zambia, 1 Africa Radio/CVC	6065af	13650af	
1600	1700		Zambia, ZNBC (Radio Two)	6165do		
1600	1757		China, China Radio International		6060af	
			6100as	7235as	7255as	7420as
			7435as	9435as	9525eu	9570as
			9600eu	11650va		
1605	1700		Canada, Radio Canada International		9610na	
1605	1700	DRM	Canada, Radio Canada International		9800na	
1615	1645	mtwhf	Swaziland, TWR Swaziland	6130af		
1615	1700	Sun	UK, BBC World Service	9410af	11860af	
			15105af			
1615	1700		UK, Bible Voice Broadcasting	13590me		
1630	1700		China, Xizang People's BC Station/ Tibet		6200do	
1630	1700		Guam, KSDA/ AWR	9840as		
1630	1700	Sat/Sun	Swaziland, TWR Swaziland	6130af		
1640	1650	mtwhfa	Turkmenistan, Turkmen Radiosi		4930eu	

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

1700	1704		Canada, Radio Canada International		9610na	
1700	1704	DRM	Canada, Radio Canada International		9800na	
1700	1727		Czech Republic, Radio Prague	5930eu	15710af	
1700	1730		Croatia, Croatian Radio	6165va		
1700	1730		Sweden, Radio Sweden	7465me		
1700	1730		UK, Bible Voice Broadcasting	13590me		
1700	1745		USA, WYFR/Family Radio Worldwide		18980eu	
1700	1746		UK, BBC World Service	6005af	9410af	
1700	1750		New Zealand, Radio NZ International		6170pa	
1700	1750	DRM	New Zealand, Radio NZ International		7440pa	
1700	1755		South Africa, Channel Africa	15235af		
1700	1757		China, China Radio International		6090af	
			6100as	6140as	6165af	7205af
			7255af	7335as	7410eu	7420af
			7425eu	7435va	9570eu	
1700	1800		Anguilla, Worldwide Univ Network		11775am	
1700	1800		Australia, ABC NT Alice Springs		2310do	
1700	1800		Australia, ABC NT Katherine	2485do		
1700	1800		Australia, CVC International	13635as		
1700	1800		Australia, Radio Australia	5995pa	6080pa	
			9475as	9580pa	9710pa	11880pa
1700	1800		Bahrain, Radio Bahrain	6010me	9745al	
1700	1800	Sat	Canada, CBC NQ SW Service	9625na		

1700	1800		Canada, CFRX Toronto ON	6070na		
1700	1800		Canada, CFVP Calgary AB	6030na		
1700	1800		Canada, CKZN St John's NF	6160na		
1700	1800		Canada, CKZU Vancouver BC	6160na		
1700	1800		Egypt, Radio Cairo	12170af		
1700	1800		Equatorial Guinea, Radio Africa			7190af
			15190af			
1700	1800		Germany, CVC Intl-Christian Vision			17770af
1700	1800		Kuwait, Radio Kuwait	11990va		
1700	1800		Malaysia, RTM/Traxx FM	7295do		
1700	1800		Nigeria, Voice of Nigeria/External Service			15120af
1700	1800		Russia, Voice of Russia	4975me		7240af
			7305af	9470va		
1700	1800		Swaziland, TWR Swaziland	3200af		9500af
1700	1800		Taiwan, Radio Taiwan International			11850af
1700	1800		Tajikistan, Voice of Tajik/Radio 2			7245as
1700	1800		Uganda, Dunamis Shortwave	4750af		
1700	1800		Uganda, UBC Radio	4976do		
1700	1800		UK, BBC World Service	3255af		3995eu
			5975as	6190af	7355as	12095af
			13820af	15400af	15420af	17830af
1700	1800	DRM	UK, BBC World Service	3995eu		
1700	1800	Sat	UK, Bible Voice Broadcasting	9430me		
1700	1800	Sun	UK, Bible Voice Broadcasting	13590me		
1700	1800		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1700	1800		USA, EWTN/WEWN Vandiver AL			15610me
1700	1800		USA, Voice of America	6080af		13710af
			15580af	17895af		
1700	1800		USA, WBCQ Monticello ME	5110am		7415am
			9955na			
1700	1800		USA, WHRI Cypress Creek SC	9840na		21640af
1700	1800		USA, WINB Red Lion PA	13570ca		
1700	1800		USA, WJHR International Milton FL			15550usb
1700	1800	vl	USA, WRMI Miami FL	9955va		
1700	1800		USA, WTJC Newport NC	9370na		
1700	1800		USA, WWCR Nashville TN	9980na		12160na
			13845na	15825na		
1700	1800		USA, WWRB Manchester TN	9385am		
1700	1800		USA, WYFR/Family Radio Worldwide			6225af
			7390me	13695af	17505af	17555na
			21455eu	21680af		
1700	1800		Zambia, 1 Africa Radio/CVC	4965af		13590af
1700	1800		Zambia, ZNBC (Radio Two)	6165do		
1705	1800		Canada, Radio Canada International			9610na
1705	1800	DRM	Canada, Radio Canada International			9800na
1717	1730		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu	7290eu	9645eu
1720	1740	Sat/Sun	USA, Voice of America/Studio 7			4930af
			12080af	15775af		
1730	1757		Slovakia, Radio Slovakia International			5915eu
			6055eu			
1730	1800		Clandestine, Sudan Radio Service/ SRS			9840af
1730	1800		UK, Bible Voice Broadcasting	13590me		
1730	1800	Sun	UK, Bible Voice Broadcasting	9430me		
1730	1800	mtwhf	USA, Voice of America/Studio 7			4930af
			12080af	15775af		
1730	1800		Vatican City State, Vatican Radio			9755af
			11625af	13765af		
1745	1800		Bangladesh, Bangladesh Betar			7250as
1745	1800	DRM	India, All India Radio	9950eu		
1745	1800		India, All India Radio	6180eu		7410eu
			11935af	15075af		
1751	1800		New Zealand, Radio NZ International			9765pa
1751	1800	DRM	New Zealand, Radio NZ International			9890pa
1755	1800		Clandestine, Radio Dialogue	3955af		

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

1800	1804		Canada, Radio Canada International			9610na
1800	1804	DRM	Canada, Radio Canada International			9800na
1800	1815	Sun	UK, Bible Voice Broadcasting	13590me		
1800	1827		China, China Radio International			6020eu
1800	1827		Czech Republic, Radio Prague	5930eu		9400va
1800	1830		Australia, CVC International	13635as		
1800	1830	w	Austria, AWR Europe	9515af		
1800	1830	DRM	Romania, Radio Romania International			5895eu
1800	1830		South Africa, AWR Africa	3215af		3345af
			11830af			
1800	1830		UK, BBC World Service	5975as		7260as
			7355as			
1800	1830		UK, Bible Voice Broadcasting	13590me		
1800	1830	fa	UK, Bible Voice Broadcasting	9430me		
1800	1830		USA, Voice of America	4930af		6080af
			11975af	12080af	13710af	15580af
			15775af	17895af		
1800	1830	Sat/Sun	USA, Voice of America	4930af		
1800	1830		Vietnam, Voice of Vietnam	5955eu		
1800	1850		New Zealand, Radio NZ International			9765pa
1800	1855		Clandestine, Radio Dialogue	3955af		
1800	1856		Romania, Radio Romania International			7215eu
1800	1856	DRM	Romania, Radio Romania International			6065eu
1800	1857		China, China Radio International			6100eu
			7265eu	7405eu		
1800	1857		Netherlands, R Netherlands Worldwide			6020af
			11655af	12045af		
1800	1857		North Korea, Voice of Korea	13760eu		15245eu
1800	1859		Canada, Radio Canada International			9740af
			11845af	13650af	15365af	17790af
1800	1900		Anguilla, Worldwide Univ Network			11775am
1800	1900	mtwhf	Argentina, Radio Nacional RAE			9690eu
			15345eu			
1800	1900		Australia, ABC NT Alice Springs			2310do
1800	1900		Australia, ABC NT Katherine	2485do		
1800	1900		Australia, Radio Australia	6080pa		7240pa
			9475as	9580pa	9710pa	11880pa
1800	1900		Bahrain, Radio Bahrain	6010me		9745al
1800	1900		Bangladesh, Bangladesh Betar			7250eu
1800	1900		Canada, CFRX Toronto ON	6070na		
1800	1900		Canada, CFVP Calgary AB	6030na		
1800	1900		Canada, CKZN St John's NF	6160na		
1800	1900		Canada, CKZU Vancouver BC	6160na		
1800	1900		Equatorial Guinea, Radio Africa			7190af
			15190af			
1800	1900		Germany, CVC Intl-Christian Vision			17770af
1800	1900	DRM	Germany, Deutsche Welle	3995eu		
1800	1900	DRM	India, All India Radio	9950eu		
1800	1900		India, All India Radio	9445af		11935af
			15075af			
1800	1900		Kuwait, Radio Kuwait	11990va		
1800	1900		Malaysia, RTM/Traxx FM	7295do		
1800	1900	DRM	New Zealand, Radio NZ International			9890pa
1800	1900		Nigeria, Voice of Nigeria/External Service			15120af
1800	1900		Poland, Polish Radio	9650eu		
1800	1900	DRM	Poland, Polish Radio	6130eu		
1800	1900		Russia, Voice of Russia	4975me		7240af
			7270me	7305af	7330eu	
1800	1900		South Korea, KBS World Radio			7275eu
1800	1900		Swaziland, TWR Swaziland	3200af		9500af
1800	1900		Taiwan, Radio Taiwan International			3965eu
1800	1900		Uganda, Dunamis Shortwave	4750af		
1800	1900		Uganda, UBC Radio	4976do		
1800	1900		UK, BBC World Service	3255af		3995eu
			5875eu	5945as	5955as	6190af
			7390eu	11810af	12095af	13820af
			15400af	15420af		
1800	1900	Sun	UK, Bible Voice Broadcasting	6130eu		9430me
1800	1900		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1800	1900		USA, EWTN/WEWN Vandiver AL			15610me
1800	1900		USA, WBCQ Monticello ME	5110am		7415am
			9955na			
1800	1900		USA, WHRI Cypress Creek SC	9840na		21640af
1800	1900		USA, WINB Red Lion PA	13570ca		
1800	1900		USA, WJHR International Milton FL			15550usb
1800	1900	vl	USA, WRMI Miami FL	9955ca		
1800	1900		USA, WTJC Newport NC	9370na		
1800	1900		USA, WWCR Nashville TN	9980na		12160na
			13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9385am		
1800	1900		USA, WYFR/Family Radio Worldwide			6045na
			6915na	7395af	9895af	13695na
			15115af	17535na	17555na	
1800	1900		Zambia, 1 Africa Radio/CVC	4965af		13590af
1800	1900		Zambia, ZNBC (Radio Two)	6165do		
1830	1845		Rwanda, Radio Rwanda	6055do		
1830	1900		Bulgaria, Radio Bulgaria	6200eu		7400eu
1830	1900	DRM	Bulgaria, Radio Bulgaria	9700eu		
1830	1900		UK, BBC World Service	6005af		9410af
1830	1900	f	UK, Bible Voice Broadcasting	9430me		
1830	1900		USA, Voice of America	4930af		6080af
			11975af	13710af	15580af	17895af
1845	1900		UK, Bible Voice Broadcasting	11830af		
1851	1900		New Zealand, Radio NZ International			11725pa

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

1900	1930		Germany, Deutsche Welle	9735af		11690af
			13780af			
1900	1930		Vietnam, Voice of Vietnam	7280eu		9730eu
1900	1935	DRM	New Zealand, Radio NZ International			9890pa
1900	1945	DRM	India, All India Radio	9950eu		

1900	1945		India, All India Radio	9445af	11935af	15075af
1900	1945		USA, WYFR/Family Radio Worldwide	6085na	15565as	
1900	1957		China, China Radio International	7285eu	7295va	9440va
1900	1957		Netherlands, R Netherlands Worldwide	7425af	12080af	
1900	1957		North Korea, Voice of Korea	7100af	9975va	11910af 11535va
1900	2000		Anguilla, Worldwide Univ Network	11775am		
1900	2000		Australia, ABC NT Alice Springs	2310do		
1900	2000		Australia, ABC NT Katherine	2485do		
1900	2000		Australia, Radio Australia	6080pa	7240pa	9500as 9580pa 9710pa 11880pa
1900	2000		Bahrain, Radio Bahrain	6010me	9745al	
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St John's NF	6160na		
1900	2000		Canada, CKZU Vancouver BC	6160na		
1900	2000	f	Clandestine, Voice of Biafra Intl	17520af		
1900	2000		Egypt, Radio Cairo	11510af		
1900	2000		Equatorial Guinea, Radio Africa	7190af		15190af
1900	2000		Germany, CVC Intl-Christian Vision	17770af		
1900	2000	DRM	Germany, Deutsche Welle	3995eu		
1900	2000		Kuwait, Radio Kuwait	11990va		
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		New Zealand, Radio NZ International	11725pa		
1900	2000		Nigeria, Voice of Nigeria/External Service	15120af		
1900	2000		Russia, Voice of Russia	4975me	5985me	7290me 7330eu
1900	2000	fas	Slovakia, IRRS/Euro Gospel Radio	6170va		
1900	2000	mtwhf	Spain, Radio Exterior de Espana	9605af		9665eu
1900	2000		Swaziland, TWR Swaziland	3200af		
1900	2000		Thailand, Radio Thailand World Service	7570eu		
1900	2000		Uganda, UBC Radio	4976do		
1900	2000		UK, BBC World Service	3255af	5875eu	5955as 6005af 6190af 7390eu 9410af 11810af 12095af 13820af
1900	2000		UK, Bible Voice Broadcasting	11830af		
1900	2000		USA, American Forces Network	4319usb	5446usb 5765usb 6350usb 7812usb 10320usb 12133usb 12759usb 13362usb	
1900	2000		USA, EWTN/WEWN Vandiver AL	15610af		
1900	2000		USA, KJES Vado NM	15385va		
1900	2000		USA, Voice of America	4930af	4940af	6080af 11975af 13710af 15580af 17895af
1900	2000		USA, Voice of America/Special English	9585va		12020va
1900	2000		USA, WBCQ Monticello ME	5110am	7415am	9955na
1900	2000		USA, WHRI Cypress Creek SC	9840na	15665af	
1900	2000		USA, WINB Red Lion PA	13570ca		
1900	2000		USA, WJHR International Milton FL	15550usb		
1900	2000	vl	USA, WRMI Miami FL	9955ca		
1900	2000		USA, WTJC Newport NC	9370na		
1900	2000		USA, WWCR Nashville TN	9980na	12160na	13845na 15825na
1900	2000		USA, WWRB Manchester TN	9385am		
1900	2000		USA, WYFR/Family Radio Worldwide	3230af	6020af 6915af 7395af 9480af 9480af 9885af 13695na 15115af 17535na 17555na	
1900	2000		Zambia, 1 Africa Radio/CVC	4965af	13590af	
1900	2000		Zambia, ZNBC (Radio Two)	6165do		
1905	1915		Croatia, Croatian Radio	6165va		
1905	1920	Sat	Mali, ORTM Du Mali	5995do		
1905	2000	Mon	South Africa, Amateur Radio Mirror Intl	3215af		
1930	1957		Slovakia, Radio Slovakia International	5915eu		7345eu
1930	1958		Serbia, International Radio of Serbia	6100eu		
1930	2000		Iran, Voice of Islamic Rep. of Iran	6010eu		6040eu 7320eu 9855af 11695af
1930	2000		South Africa, RTE Radio One	6225af		
1930	2000		Turkey, Voice of Turkey	6050eu		
1936	1950	DRM	New Zealand, Radio NZ International	11675pa		
1945	2000	mtwhas	Albania, Radio Tirana	11635eu		
1945	2000	mtwhf	UK, Bible Voice Broadcasting	11830af		
1951	2000	DRM	New Zealand, Radio NZ International	11675pa		

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

2000	2005	Mon	South Africa, Amateur Radio Mirror Intl	3215af		
2000	2025		Turkey, Voice of Turkey	6050eu		
2000	2027		Iran, Voice of Islamic Rep. of Iran	6010eu		6040eu 7320eu 9855af 11695af
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu	13640na	
2000	2030		Egypt, Radio Cairo	11510af		
2000	2030		South Africa, RTE Radio One	6225af		
2000	2030		Swaziland, TWR Swaziland	3200af		
2000	2030		USA, Voice of America	4930af	4940af	6080af 11975af 13710af 15580af
2000	2030		Vatican City State, Vatican Radio	7365af		9755af 11625af
2000	2045	h	Rwanda, Radio Rwanda	6055do		
2000	2045		USA, WYFR/Family Radio Worldwide	5745eu		
2000	2050		New Zealand, Radio NZ International	11725pa		
2000	2050	DRM	New Zealand, Radio NZ International	11675pa		
2000	2057		China, China Radio International	5960eu		5985af 7415va 7285eu 7295eu 9440eu 9600af 11640af 13630af
2000	2057		Netherlands, R Netherlands Worldwide	7425af		11655af 21525af
2000	2100		Anguilla, Worldwide Univ Network	11775am		
2000	2100		Australia, ABC NT Alice Springs	2310do		
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek	2325do		
2000	2100		Australia, Radio Australia	9500as	11650pa	11660pa 11880pa
2000	2100	Sat/Sun	Australia, Radio Australia	6080pa	7240pa	12080pa
2000	2100		Bahrain, Radio Bahrain	6010me	9745al	
2000	2100		Canada, CFRX Toronto ON	6070na		
2000	2100		Canada, CFVP Calgary AB	6030na		
2000	2100		Canada, CKZN St John's NF	6160na		
2000	2100		Canada, CKZU Vancouver BC	6160na		
2000	2100		Equatorial Guinea, Radio Africa	7190af		15190af
2000	2100		Germany, CVC Intl-Christian Vision	17770af		
2000	2100		Germany, Deutsche Welle	9690af	9735af	13780af
2000	2100		Indonesia, Voice of Indonesia	9525va	11785al	
2000	2100		Kuwait, Radio Kuwait	11990va		
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100		Nigeria, Voice of Nigeria/External Service	15120af		
2000	2100		Russia, Voice of Russia	7330af		
2000	2100	fas	Slovakia, IRRS/Euro Gospel Radio	6170va		
2000	2100		Uganda, UBC Radio	4976do		
2000	2100		UK, BBC World Service	3255af	6005af	6190af 9410af 11810af 12095af 15400af
2000	2100		Ukraine, Radio Ukraine International	7510eu		
2000	2100		USA, American Forces Network	4319usb	5446usb 5765usb 6350usb 7812usb 10320usb 12133usb 12759usb 13362usb	
2000	2100		USA, EWTN/WEWN Vandiver AL	15610af		
2000	2100		USA, KJES Vado NM	15385ca		
2000	2100		USA, WBCQ Monticello ME	5110am	7415am	9955na
2000	2100	mtws	USA, WHRI Cypress Creek SC	7520eu		
2000	2100	fas	USA, WHRI Cypress Creek SC	15665af		
2000	2100	Sun	USA, WHRI Cypress Creek SC	9575va		
2000	2100		USA, WINB Red Lion PA	13570ca		
2000	2100		USA, WJHR International Milton FL	15550usb		
2000	2100	vl	USA, WRMI Miami FL	9955ca		
2000	2100		USA, WTJC Newport NC	9370na		
2000	2100		USA, WWCR Nashville TN	9980na	12160na	13845na 15825na
2000	2100		USA, WWRB Manchester TN	9385am		
2000	2100		USA, WYFR/Family Radio Worldwide	6020na	6915eu 9480af 9610af 9630af 15115af 15195na 17535na 17555ca 17575ca	
2000	2100		Zambia, 1 Africa Radio/CVC	4965af	9505af	
2000	2100		Zambia, ZNBC (Radio Two)	6165do		
2000	2105		Uganda, UBC Radio	4976do		
2030	2045		Thailand, Radio Thailand World Service	9535eu		
2030	2100		Cuba, Radio Havana Cuba	11760am		
2030	2100		Sweden, Radio Sweden	9490va		
2030	2100		USA, Voice of America	7405as		
2030	2100	Sat/Sun	USA, Voice of America	4940af		
2030	2100		Vietnam, Voice of Vietnam	7220me	7280eu	9550me 9730eu
2045	2100		India, All India Radio	6180eu	7410eu	9445eu 11620pa 11715pa
2045	2100	DRM	India, All India Radio	9950eu		
2045	2100	DRM	Vatican City State, Vatican Radio	9800am		
2050	2100		Vatican City State, Vatican Radio	4005eu		5885eu 7250eu
2051	2100		New Zealand, Radio NZ International	17675pa		
2051	2200	DRM	New Zealand, Radio NZ International	15720pa		

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

2100	2120		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu		
2100	2127		China, China Radio International			7250af
			11640af	13630af		
2100	2127		Czech Republic, Radio Prague	5930va		9430va
2100	2130	mtwhfa	Albania, Radio Tirana	7430eu		9895eu
2100	2130		Australia, ABC NT Alice Springs			2310do
2100	2130		Australia, ABC NT Alice Springs			2310do
2100	2130		Australia, ABC NT Katherine	2485do		
2100	2130		Australia, ABC NT Tennant Creek			2325do
2100	2130		Austria, AWR Europe	9830af		
2100	2130	Sat	Canada, CBC NQ SW Service	9625na		
2100	2130		Cuba, Radio Havana Cuba	11760am		
2100	2145		USA, WYFR/Family Radio Worldwide			6915na
			15115af	17535na	17555na	
2100	2157		China, China Radio International			5960eu
			6135af	7205eu	7225af	7325af
			7405af	7415af	9600af	
2100	2157		North Korea, Voice of Korea	13760eu		15245eu
2100	2200		Angola, Radio Nacional de Angola			7217do
2100	2200		Anguilla, Worldwide Univ Network			11775am
2100	2200		Australia, Radio Australia	9500as		9660pa
			11695as	12080pa	13630pa	15515pa
2100	2200		Bahrain, Radio Bahrain	6010me		9745al
2100	2200		Belarus, Radio Belarus	6155eu		7360as
			7390eu			
2100	2200		Canada, CFRX Toronto ON	6070na		
2100	2200		Canada, CFVP Calgary AB	6030na		
2100	2200		Canada, CKZN St John's NF	6160na		
2100	2200		Canada, CKZU Vancouver BC	6160na		
2100	2200		Equatorial Guinea, Radio Africa			7190af
			15190af			
2100	2200		Germany, Deutsche Welle	7280af		9545af
			11690af	13780af		
2100	2200		India, All India Radio	11620pa		11715pa
2100	2200	DRM	India, All India Radio	9950eu		
2100	2200		Malaysia, RTM/Traxx FM	7295do		
2100	2200		New Zealand, Radio NZ International			17675pa
2100	2200	f	Slovakia, IRRS/Euro Gospel Radio			6170va
2100	2200		Syria, Radio Damascus	9330eu		12085as
2100	2200	DRM	UK, BBC World Service	3995eu		
2100	2200		UK, BBC World Service	3255af		3915as
			5875as	5965as	6005af	6190af
			6195as	7445af	9410af	9915af
			12095af			
2100	2200		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
2100	2200		USA, EWTN/WEWN Vandiver AL			15610af
2100	2200		USA, Voice of America	6080af		7405as
			15580af			
2100	2200		USA, WBCQ Monticello ME	5110am		7415am
			9955am			
2100	2200	mtwhfa	USA, WHRI Cypress Creek SC	9525va		
2100	2200	fas	USA, WHRI Cypress Creek SC	15665af		
2100	2200		USA, WINB Red Lion PA	9265ca		
2100	2200		USA, WJHR International Milton FL			15550usb
2100	2200	vl	USA, WRMI Miami FL	9955ca		
2100	2200		USA, WTJC Newport NC	9370na		
2100	2200		USA, WWCR Nashville TN	7465na		9980na
			12160na	13845na		
2100	2200		USA, WWRB Manchester TN	3215na		9385am
2100	2200		USA, WYFR/Family Radio Worldwide			5950na
			6240eu	9480af	15115af	15195af
2100	2200		Zambia, 1 Africa Radio/CVC	4965af		9505af
2100	2200		Zambia, ZNBC (Radio Two)	6165do		
2100	2200		Japan, NHK World/ Radio Japan			13640pa
2115	2200		Egypt, Radio Cairo6270eu			
2130	2156		Romania, Radio Romania International			6030eu
			6115na	7380eu	9755na	
2130	2200		Australia, ABC NT Alice Springs			4835do
2130	2200		Australia, ABC NT Katherine	5025do		
2130	2200	mtwhfa	Canada, CBC NQ SW Service	9625na		
2130	2200		China, China Radio International			7365eu
			7415as			
2130	2200		Guam, KSDA/ AWR	9625as		
2130	2200		Sweden, Radio Sweden	7425va		
2130	2200		Turkey, Voice of Turkey	9610va		

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

2200	2205		Zambia, ZNBC (Radio Two)	6165do		
2200	2225		Turkey, Voice of Turkey	9610va		
2200	2228		Serbia, International Radio of Serbia			6100eu
2200	2230	mwf	Guam, KSDA/ AWR	11850as		
2200	2230		India, All India Radio	11620pa		11715pa
2200	2230	DRM	India, All India Radio	9950eu		
2200	2230		South Korea, KBS World Radio			3955eu
2200	2235		New Zealand, Radio NZ International			17625pa
2200	2235	DRM	New Zealand, Radio NZ International			15720pa
2200	2245		Egypt, Radio Cairo6270eu			
2200	2245		USA, WYFR/Family Radio Worldwide			17690af
2200	2257		China, China Radio International			5915na
2200	2300		Anguilla, Worldwide Univ Network			6090am
2200	2300		Australia, ABC NT Alice Springs			4835do
2200	2300		Australia, ABC NT Katherine	5025do		
2200	2300		Australia, HCJB Global	15525as		
2200	2300		Australia, Radio Australia	9660pa		12010as
			12080pa	13630pa	15230pa	15240as
			15515pa	15560pa		
2200	2300		Bahrain, Radio Bahrain	6010me		9745al
2200	2300		Belarus, Radio Belarus	6155eu		7360as
			7390eu			
2200	2300		Bulgaria, Radio Bulgaria	6200eu		7400eu
2200	2300	smtwhf	Canada, CBC NQ SW Service	9625na		
2200	2300		Canada, CFRX Toronto ON	6070na		
2200	2300		Canada, CFVP Calgary AB	6030na		
2200	2300		Canada, CKZN St John's NF	6160na		
2200	2300		Canada, CKZU Vancouver BC	6160na		
2200	2300	DRM	Canada, Radio Canada International			9800na
2200	2300		Equatorial Guinea, Radio Africa			7190af
			15190af			
2200	2300		Malaysia, RTM/Traxx FM	7295do		
2200	2300	Sat/Sun	Spain, Radio Exterior de Espana			6125eu
2200	2300		Uganda, UBC Radio	4976do		
2200	2300		UK, BBC World Service	3915as	5875as	
			5910af	6135as	6195as	9740as
			9915af	12095af		
2200	2300	DRM	UK, BBC World Service	3995eu		
2200	2300		Ukraine, Radio Ukraine International			5830eu
2200	2300		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
2200	2300		USA, EWTN/WEWN Vandiver AL			15610af
2200	2300		USA, Voice of America	5895va		6070va
			7220va	7405as	7425va	7480va
			9490va	11560va		
2200	2300		USA, WBCQ Monticello ME	5110am		7415am
			9955am			
2200	2300		USA, WHRI Cypress Creek SC	9615af		
2200	2300		USA, WINB Red Lion PA	9265ca		
2200	2300		USA, WJHR International Milton FL			15550usb
2200	2300	vl	USA, WRMI Miami FL	9955ca		
2200	2300		USA, WTJC Newport NC	9370na		
2200	2300		USA, WWCR Nashville TN	7465na		9980na
			12160na	13845na		
2200	2300		USA, WWRB Manchester TN	3215na		5050am
			5745af	9385am		
2200	2300		USA, WYFR/Family Radio Worldwide			5950na
			11740na	15440na		
2200	2300		Zambia, 1 Africa Radio/CVC	4965af		
2215	2230		Croatia, Croatian Radio	3985va		
2230	2245	mtwhs	Moldova, (Transnistria) Radio PMR			6240na
2230	2257		Czech Republic, Radio Prague	5930na		7355af
2230	2300		Guam, KSDA/ AWR	15320as		
2230	2300		USA, Voice of America/Special English			5890va
			7230va	9780va		
2236	2300		New Zealand, Radio NZ International			15720pa
2236	2300	DRM	New Zealand, Radio NZ International			17675pa
2245	2300		India, All India Radio	6055as		7305as
			9705as	11645as		

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

2300	0000		Anguilla, Worldwide Univ Network			6090am
2300	0000		Australia, ABC NT Alice Springs			4835do
2300	0000		Australia, ABC NT Katherine	5025do		
2300	0000		Australia, HCJB Global	15525as		
2300	0000		Australia, Radio Australia	9660pa		12010as
			12080pa	13690pa	15230pa	15560pa
			17796pa			
2300	0000		Bahrain, Radio Bahrain	6010me		9745al
2300	0000	DRM	Belgium, TDP Radio	9790na		
2300	0000	smtwhf	Canada, CBC NQ SW Service	9625na		
2300	0000		Canada, CFRX Toronto ON	6070na		
2300	0000		Canada, CFVP Calgary AB	6030na		
2300	0000		Canada, CKZN St John's NF	6160na		
2300	0000		Canada, CKZU Vancouver BC	6160na		
2300	0000		Cuba, Radio Havana Cuba	13790sa		
2300	0000		Egypt, Radio Cairo7580na			

2300	0000		India, All India Radio	6055as	7305as	
			9705as	11645as		
2300	0000		Malaysia, RTM/Traxx FM	7295do		
2300	0000		New Zealand, Radio NZ International	15720pa		
2300	0000	DRM	New Zealand, Radio NZ International	17675pa		
2300	0000		Russia, Voice of Russia	7250na		
2300	0000		UK, BBC World Service	3915as	5875as	
			6135as	6195as	7385as	9740as
			11955as			
2300	0000		USA, American Forces Network			4319usb
			5446va	5765va	6350va	7812va
			10320va	12133va	12759va	13362va
2300	0000		USA, EWTN/WEWN Vandiver AL			15610af
2300	0000		USA, Voice of America	6070va	7220va	
			7265va	7405va	7480va	9490va
			9580va	11560va		
2300	0000		USA, WBCQ Monticello ME	5110am	7415am	
2300	0000		USA, WHRI Cypress Creek SC	5875na		
2300	0000		USA, WINB Red Lion PA	9265ca		
2300	0000		USA, WJHR International Milton FL			15550usb
2300	0000	vl	USA, WRMI Miami FL	9955ca		
2300	0000		USA, WTJC Newport NC	9370na		
2300	0000		USA, WWCR Nashville TN	3230na	5070na	
			9980na	13845na		
2300	0000		USA, WWRB Manchester TN	3215na	5050am	
			5745af	9385am		
2300	0000		USA, WYFR/Family Radio Worldwide			5950na
			9430ca	15400ca	15440na	
2300	0000		Zambia, 1 Africa Radio/CVC	4965af		
2300	2330		Australia, Radio Australia	15240as		
2300	2330		USA, Voice of America/Special English			6180as
			7460va	11840va		
2300	2345		USA, WYFR/Family Radio Worldwide			9430sa
			11740na	15400sa	15440na	
2300	2345	DRM	Vatican City State, Vatican Radio			7370am
2300	2355		Turkey, Voice of Turkey	5960va		
2300	2356		Romania, Radio Romania International			5915as
			6015va	7220eu	7300as	
2300	2357		China, China Radio International			5915as
			5990na	6040na	6145na	7350as
			7415as	9610as	11790va	11970va
2315	2330		Croatia, Croatian Radio	7375va		
2315	2330	mtwhs	Moldova, (Transnistria) Radio PMR	6240na		
2330	0000		Australia, Radio Australia	15415as	17750as	
2330	0000		UK, BBC World Service	6170as		
2330	0000		USA, Voice of America/Special English			6180as
			7460va	11655va	11840va	13640va
2330	0000		Vietnam, Voice of Vietnam	9840as	12020as	
2330	2357		Czech Republic, Radio Prague	5930na	7355af	
2345	0000		Australia, HCJB Global	15400as		

MT SHORTWAVE STATION RESOURCE GUIDE

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

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

Castles and Winter Olympics

There is still time to take advantage of Radio Free Asia's Winter Olympiad QSL card. The 31st QSL card commemorates the 2010 Games for reception reports dated to March 31, 2010. The card shows an adaptation of the graphic of Radio Free Asia's Olympic pin, as created by RFA's Brian Powell, which was originally used for the 2008 Beijing Olympics. This contemporary version adds a winter cap incorporating the Vancouver 2010 color scheme. RFA's current broadcast frequency schedule is available at the *MTXtra* by-hour schedules.

RFA is a private, nonprofit corporation that broadcasts news and information to listeners in Asian countries where full, accurate, and timely news reports are unavailable. All accurate reception reports are confirmed by mailing a QSL card to the listener. RFA welcomes all reception report submissions at **www.techweb.rfa.org/** (follow the QSL REPORTS link) not only from DXers, but also from its general listening audience. Reception reports are also accepted by email at *qsl@rfa.org* Anyone without Internet access can mail reception reports to: Reception Reports, Radio Free Asia, 2025 M. Street NW, Suite 300Washington DC 20036, United States of America.

WCA for hams and shortwave listeners

World Castles Awards (WCA), founded by Russian amateur radio operators under the sponsorship of the International Organization, *Castles on the Air (COTA),* has renewed their popular program. The program goal is to make radio contacts from castles and fortresses from around the world, including monuments and architectural constructions related to fortifications. Ten diplomas and two award plates for contact with hams and shortwave listeners are available. To learn more refer to **www.wcagroup.org/ENG/main.html**

Clandestine address updates

IRIN Radio, a project of the UN Office for the Coordination of Humanitarian Affairs, is being logged on 17680 kHz from 0830-0900/ 0900-0930 UTC. Send details to Louise Turnbridge at *Louise@IRINnews.org*. Web **www.irinnews.org/radio.aspx.**

Reports to Radio Dabanga may be sent to *radiodabanga@yahoo.com* (or) *willems@pressnow.nl* Web: **www.radiodabanga.org**

New dates from Stewart Island DXpedition

Stewart Island (OC -23) is part of the third largest island of New Zealand. The new dates for the IOTA (Island on the Air) are 12-23 March, 2010. Activity will include SSB, CW and RTTY on 160-10 meters. Information and QSLing at: **www.z14pw.oronhosting.net.nz/OC203/si_index.htm** (DX News 425)

Euro-pirate QSLing

Electronic verifications to Euro pirates are being verified from the following stations: **Radio Xanadu** 6309 kHz. Received in one day via Steve West *radiox@rock.com* **Polaris Radio** 3905 kHz. Received in 11 days via DJ Iggy *polarisradio@hotmail.com* (Roberto Pavanello, Italy/playdx) **Challenger Radio** 1566 kHz AM. Received in eight weeks from Maurizio Anselmo *challenger@challenger.it* **Flux Radio** 6325 kHz. Received in three days for email report to: *info@fluxam.nl* (Artur Fernández Llorella, Spain/playdx)

AMATEUR RADIO

Lobos Island AM8IL, AN8L, EH8RDS, 14 MHz SSB. Full data color scenery/antenna card for 2009 DXpedition/IOTA Contest. Received in 68 days for $2.00US. QSL address: EC8AMI-Antonio Candelaria Mendoza, C/. Blas Herrera, 23 -35.330, Teror, Las Palmas, Gran Canaria Island, Canary Islands (Larry Van Horn, NC).

Sultanate of Oman A41LD, 14.222 SSB. (ITU Zone 39/CQZ Zone 21). Full data color desert scenery card signed by W. Zidjali. Received in 82 days for $2.00US and followup report. QSL address: Waleed Al Zidjali, P.O. Box 13, Mina Al Fahal, Code: 116, Muscat, Sultanate of Oman (Van Horn).

CLANDESTINE

Five clandestine stations verified by Ludo Maes via Belgium's Transmitter Documentation Project (TDP). Full data multicolored TDP cards received in 2-1/2 years for postal CD Mp3 report letter. **Radio Sagalee Oromiyaa** 12120 kHz; **Radio Horyaal** 12130 kHz; **Radio Voice of the ENUF (Ethiopian National United Front)** 11840/12120 kHz; Voice of Liberty (Eritrean **Opposition Radio)** 12120; **Tensae Ethiopia (Voice of Unity)** 11900 kHz. QSL address: TDP, c/o Ludo Maes, P.O. Box 1, 2310 Rijkevorsel, Belgium. (Edward Kusalik, Alberta, Canada) Website: **www.airtime.be** *Good to see these stations verified, following my comment in February that TDP does not accept program details older than a month old. New policy ?- GVH*

MEDIUM WAVE

Germany-Hessischer Rundfunk 594 kHz AM. Full data station QSL. Received in two weeks for electronic report to: *hrtechnik@hr-online.de* (Llorella)

Deutschlandfunk 1422 kHz AM. Full data station QSL. Received in five days for electronic report to: *hoererservice@dradio.de* (Llorella).

Deutschelandradio Kultur 990 kHz AM. Full data QSL. Received in six days for electronic report to: *hoererservice@dradio.de* (Llorella).

Russia-Voice of Russia, Oranienburg 693 kHz AM. Full data QSL with transmitter site notation. Received in three weeks for electronic report to: *world@ruvr.ru* (Llorella).

USA-KBNW (*News Radio Central Oregon*) 1340 kHz AM. Verification letter from Keith Shipman-Pres/CEO Horizon BC Group. Mention of station diplexed of KICE tower at 100kW/500kW night. Received in 70 days for a CD report to: 854 N.E. Fourth Street, Bend, OR 97701 USA. (Patrick Martin, Oceanside, CA) ^ Streaming audio **www.newscentraloregon.com/**

KXLJ 1330 kHz AM (*ESPN Radio*). Handwritten folder card from Jacob Caggians-Gen. Manager. Received in 63 days for a CD report. Mentioned this is their first report from North America. Station address: 1330 AM KXLJ Radio, 1105 W. 9th Street, Juneau, AK 99801 USA. Website: **http://kxljradio.com** Alaska QSL # 61 (Martin).

PORTUGAL

Radio Prague via Sines relay 11700 kHz. Full data card with site notation. Received in five weeks for report to: *cr@radio.cz* (Brian Bagwell, St. Louis, MO).

SERBIA

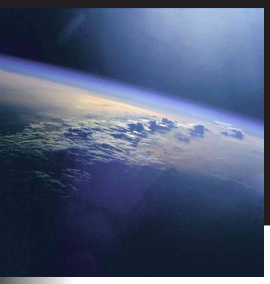
International Radio Serbia 6100/7230 kHz. Full data station QSL card unsigned. Received in nine months for email report to: *radioju@sbb.co.yu* Postal address: Box 200, Hilandrarska 2, 11000 Beograd, Serbia (Bagwell)

UTILITY

Estonian Maritime Communications 3310 khz USB. No data folder card. Received in 11 months for electronic report to: Estonian Maritime Communications Centre, Hobekuuso 8, Tallinn 12111, Estonia. (Andrei Skorodumov via Dario Monferini/playdx) Web: **www.riks.ee** Emails: *info@riks.ee* (or) *tallinnradio@riks.ee*

Japan-JFX Kagoshima Fishing Radio Station 8658 kHz. Full data PDF file with station info in Japanese with station photos. Received in eight days for email report to: *jfx@chime.ocn.ne.jp* Very pleased with QSL for this 1kW station. (Martin Foltz, CA/UDXF)

Royal Air Force Kinloss, Helicopter 125-Kinloss Rescue, 5680 kHz. Verification letter signed by J. Wright-Communication IT Manager for Aeronautical Rescue Coordination. and folder info brochure. Received for a report to: *kinarccl@btconnect.com* (Mauro Giroletti, Italy/playdx) Postal address: Royal Air Force Kinloss, Forres, Moray IV36 3UH United Kingdom. Website: **www.raf.mod.uk/rafkinloss/**



MTXtra
Shortwave Broadcast Guide

PORTUGUESE

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.

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

1200	1230		Brazil, Radio Verdas Florestas	4865do	
1200	1300		Brazil, Novas de Paz	6080do	9515do
			11725do		
1200	1300		Brazil, Radio Alvorada/Londrina		4865do
1200	1300		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
1200	1300		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
1200	1300		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
1200	1300		Brazil, Radio Brasil	4785do	
1200	1300		Brazil, Radio Brasil Central	4985do	11815do
1200	1300		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
1200	1300		Brazil, Radio Capixaba	4935do	
1200	1300		Brazil, Radio Clube do Para	4885do	
1200	1300		Brazil, Radio Congonhas	4775do	
1200	1300		Brazil, Radio Cultura do Para	5045do	
1200	1300		Brazil, Radio Cultura Ondas Tropicais		4845do
1200	1300		Brazil, Radio Cultura Sao Paulo		9615do
			17815do		
1200	1300		Brazil, Radio Cultura/Araraquara		3365do
1200	1300		Brazil, Radio Daqui	4905do	
1200	1300		Brazil, Radio Difusora Acerana		4885do
1200	1300		Brazil, Radio Difusora Caceres	5055do	
1200	1300		Brazil, Radio Difusora de Macapa		4915do
1200	1300		Brazil, Radio Difusora do Amazonas		4805do
1200	1300		Brazil, Radio Difusora Roraima		4875do
1200	1300		Brazil, Radio Difusora/Londrina		4815do
1200	1300		Brazil, Radio Educadora	2380do	
1200	1300		Brazil, Radio Educadora 6 de Agosto		3255do
1200	1300		Brazil, Radio Gaucha	6020do	11915do
1200	1300		Brazil, Radio Gazeta Universitaria		5955do
			9685do	15325al	
1200	1300		Brazil, Radio Globo	6120do	9585do
			11804do		
1200	1300		Brazil, Radio Guaiba	6000do	11785do
1200	1300		Brazil, Radio Guaruja/Florianpolis		5980do
1200	1300		Brazil, Radio Guaruja/Paulista	3235do	9715do
1200	1300		Brazil, Radio Imaculada Conceicao		4755do
1200	1300		Brazil, Radio Inconfidencia	6010do	15190do
1200	1300		Brazil, Radio Itatiaia	5969do	
1200	1300		Brazil, Radio Maria	4885do	
1200	1300		Brazil, Radio Marumby	9665do	11750do
1200	1300		Brazil, Radio Minicipal	3375do	
1200	1300		Brazil, Radio Missoes da Amazonia		4865do
1200	1300		Brazil, Radio Mundial	3325do	
1200	1300		Brazil, Radio Nacional da Amazonia		6185do
			11780do		
1200	1300		Brazil, Radio Nossa Voz	4975do	
1200	1300		Brazil, Radio Nove de Julho	9820do	
1200	1300		Brazil, Radio Novo Tempo	4895do	
1200	1300		Brazil, Radio Record	6150do	9505do
1200	1300		Brazil, Radio Rio Mar	6160do	9695do
1200	1300		Brazil, Radio Rural	4765do	
1200	1300		Brazil, Radio Senado	5990do	
1200	1300		Brazil, Radio Trans Mundial	5964do	9530al
			11735do		
1200	1300		Brazil, Radio Voz Missionaria	9665do	
1200	1300		Brazil, Super Radio Deus e Amour		6060do
			9565do	11765do	
1200	1300		Brazil, Super Rede Boa Vontade		4860do
1200	1300	mtwhf	Portugal, RDP International	9815eu	17745af
			21655af		
1200	1300	Sat/Sun	Portugal, RDP International	11885eu	17590af
			21655af		
1200	1300		USA, WYFR/Family Radio Worldwide		11830sa

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

1300	1330		Brazil, Radio Difusora do Amazonas		4805do
1300	1400		Brazil, Novas de Paz	6080do	9515do
			11725do		
1300	1400		Brazil, Radio Alvorada/Londrina		4865do
1300	1400		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
1300	1400		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
1300	1400		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
1300	1400		Brazil, Radio Brasil	4785do	
1300	1400		Brazil, Radio Brasil Central	4985do	11815do
1300	1400		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
1300	1400		Brazil, Radio Capixaba	4935do	
1300	1400		Brazil, Radio Clube do Para	4885do	
1300	1400		Brazil, Radio Congonhas	4775do	
1300	1400		Brazil, Radio Cultura do Para	5045do	
1300	1400		Brazil, Radio Cultura Ondas Tropicais		4845do
1300	1400		Brazil, Radio Cultura Sao Paulo		9615do
			17815do		
1300	1400		Brazil, Radio Cultura/Araraquara		3365do
1300	1400		Brazil, Radio Daqui	4905do	
1300	1400		Brazil, Radio Difusora Acerana		4885do
1300	1400		Brazil, Radio Difusora Caceres	5055do	
1300	1400		Brazil, Radio Difusora de Macapa		4915do
1300	1400		Brazil, Radio Difusora Roraima		4875do
1300	1400		Brazil, Radio Difusora/Londrina		4815do
1300	1400		Brazil, Radio Educadora	2380do	
1300	1400		Brazil, Radio Educadora 6 de Agosto		3255do
1300	1400		Brazil, Radio Gaucha	6020do	11915do
1300	1400		Brazil, Radio Gazeta Universitaria		5955do
			9685do	15325al	
1300	1400		Brazil, Radio Globo	6120do	9585do
			11804do		
1300	1400		Brazil, Radio Guaiba	6000do	11785do
1300	1400		Brazil, Radio Guaruja/Florianpolis		5980do
1300	1400		Brazil, Radio Guaruja/Paulista	3235do	9715do
1300	1400		Brazil, Radio Imaculada Conceicao		4755do
1300	1400		Brazil, Radio Inconfidencia	6010do	15190do
1300	1400		Brazil, Radio Itatiaia	5969do	
1300	1400		Brazil, Radio Maria	4885do	
1300	1400		Brazil, Radio Marumby	9665do	11750do
1300	1400		Brazil, Radio Missoes da Amazonia		4865do
1300	1400		Brazil, Radio Mundial	3325do	
1300	1400		Brazil, Radio Nacional da Amazonia		6185do
			11780do		
1300	1400		Brazil, Radio Nossa Voz	4975do	
1300	1400		Brazil, Radio Nove de Julho	9820do	
1300	1400		Brazil, Radio Novo Tempo	4895do	
1300	1400		Brazil, Radio Record	6150do	9505do
1300	1400		Brazil, Radio Rio Mar	6160do	9695do
1300	1400		Brazil, Radio Rural	4765do	
1300	1400	mtwhf	Brazil, Radio Senado	5990do	
1300	1400		Brazil, Radio Trans Mundial	5964do	9530al
			11735do		
1300	1400		Brazil, Radio Voz Missionaria	9665do	
1300	1400		Brazil, Super Radio Deus e Amour		6060do
			9565do	11765do	
1300	1400		Brazil, Super Rede Boa Vontade		4860do
1300	1400	mtwhf	Portugal, RDP International	15560na	
1300	1400	Sat/Sun	Portugal, RDP International	11885eu	15560na
			17590af	21655af	
1300	1400		USA, WYFR/Family Radio Worldwide		11530sa

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

1400	1430		Vatican City State, Vatican Radio		7250eu
			9645eu		
1400	1500		Brazil, Novas de Paz	6080do	9515do

			11725do		
1400	1500		Brazil, Radio Alvorada/Londrina		4865do
1400	1500		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
1400	1500		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
1400	1500		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
1400	1500		Brazil, Radio Brasil	4785do	
1400	1500		Brazil, Radio Brasil Central	4985do	11815do
1400	1500		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
1400	1500		Brazil, Radio Capixaba	4935do	
1400	1500		Brazil, Radio Clube do Para	4885do	
1400	1500		Brazil, Radio Congonhas	4775do	
1400	1500		Brazil, Radio Cultura do Para	5045do	
1400	1500		Brazil, Radio Cultura Ondas Tropicais		4845do
1400	1500		Brazil, Radio Cultura Sao Paulo		9615do
			17815do		
1400	1500		Brazil, Radio Daqui	4905do	
1400	1500		Brazil, Radio Difusora Acerana		4885do
1400	1500		Brazil, Radio Difusora de Macapa		4915do
1400	1500		Brazil, Radio Difusora Roraima		4875do
1400	1500		Brazil, Radio Difusora/Londrina		4815do
1400	1500		Brazil, Radio Educadora	2380do	
1400	1500		Brazil, Radio Educadora 6 de Agosto		3255do
1400	1500		Brazil, Radio Gaucha	6020do	11915do
1400	1500		Brazil, Radio Gazeta Universitaria		5955do
			9685do	15325al	
1400	1500		Brazil, Radio Globo	6120do	9585do
			11804do		
1400	1500		Brazil, Radio Guaiba	6000do	11785do
1400	1500		Brazil, Radio Guaruja/Florianpolis		5980do
1400	1500		Brazil, Radio Guaruja/Paulista	3235do	9715do
1400	1500		Brazil, Radio Imaculada Conceicao		4755do
1400	1500		Brazil, Radio Inconfidencia	6010do	15190do
1400	1500		Brazil, Radio Itatiaia	5969do	
1400	1500		Brazil, Radio Maria	4885do	
1400	1500		Brazil, Radio Marumby	9665do	11750do
1400	1500		Brazil, Radio Missoes da Amazonia		4865do
1400	1500		Brazil, Radio Mundial	3325do	
1400	1500		Brazil, Radio Nacional da Amazonia		6185do
			11780do		
1400	1500		Brazil, Radio Nossa Voz	4975do	
1400	1500		Brazil, Radio Nove de Julho	9820do	
1400	1500		Brazil, Radio Novo Tempo	4895do	
1400	1500		Brazil, Radio Rio Mar	6160do	9695do
1400	1500		Brazil, Radio Rural	4765do	
1400	1500	mtwhf	Brazil, Radio Senado	5990do	
1400	1500		Brazil, Radio Trans Mundial	5964do	9530al
			11735do		
1400	1500		Brazil, Radio Voz Missionaria	9665do	
1400	1500		Brazil, Super Radio Deus e Amour		6060do
			9565do	11765do	
1400	1500		Brazil, Super Rede Boa Vontade		4860do
1400	1500	mtwhf	Portugal, RDP International	15560na	15690va
1400	1500	Sat/Sun	Portugal, RDP International	11885eu	15560na
			17590af	21655af	
1400	1500		USA, WYFR/Family Radio Worldwide		15210sa

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

1500	1600		Brazil, Novas de Paz	6080do	9515do
			11725do		
1500	1600		Brazil, Radio Alvorada/Londrina		4865do
1500	1600		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
1500	1600		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
1500	1600		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
1500	1600		Brazil, Radio Brasil	4785do	
1500	1600		Brazil, Radio Brasil Central	4985do	11815do
1500	1600		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
1500	1600		Brazil, Radio Capixaba	4935do	
1500	1600		Brazil, Radio Clube do Para	4885do	
1500	1600		Brazil, Radio Congonhas	4775do	
1500	1600		Brazil, Radio Cultura do Para	5045do	
1500	1600		Brazil, Radio Cultura Ondas Tropicais		4845do
1500	1600		Brazil, Radio Cultura Sao Paulo		9615do
			17815do		
1500	1600		Brazil, Radio Cultura/Araraquara		3365do
1500	1600		Brazil, Radio Daqui	4905do	
1500	1600		Brazil, Radio Difusora Acerana		4885do
1500	1600		Brazil, Radio Difusora de Macapa		4915do
1500	1600		Brazil, Radio Difusora do Amazonas		4805do
1500	1600		Brazil, Radio Difusora Roraima		4875do
1500	1600		Brazil, Radio Difusora/Londrina		4815do
1500	1600		Brazil, Radio Educadora	2380do	
1500	1600		Brazil, Radio Educadora 6 de Agosto		3255do
1500	1600		Brazil, Radio Gaucha	6020do	11915do
1500	1600		Brazil, Radio Gazeta Universitaria		5955do
			9685do	15325al	
1500	1600		Brazil, Radio Globo	6120do	9585do
			11804do		
1500	1600		Brazil, Radio Guaiba	6000do	11785do
1500	1600		Brazil, Radio Guaruja/Florianpolis		5980do
1500	1600		Brazil, Radio Guaruja/Paulista	3235do	9715do
1500	1600		Brazil, Radio Imaculada Conceicao		4755do
1500	1600		Brazil, Radio Inconfidencia	6010do	15190do
1500	1600		Brazil, Radio Itatiaia	5969do	
1500	1600		Brazil, Radio Maria	4885do	
1500	1600		Brazil, Radio Marumby	9665do	11750do
1500	1600		Brazil, Radio Missoes da Amazonia		4865do
1500	1600		Brazil, Radio Mundial	3325do	
1500	1600		Brazil, Radio Nacional da Amazonia		6185do
			11780do		
1500	1600		Brazil, Radio Nossa Voz	4975do	
1500	1600		Brazil, Radio Nove de Julho	9820do	
1500	1600		Brazil, Radio Novo Tempo	4895do	
1500	1600		Brazil, Radio Record	6150do	9505do
1500	1600		Brazil, Radio Rio Mar	6160do	9695do
1500	1600		Brazil, Radio Rural	4765do	
1500	1600	mtwhf	Brazil, Radio Senado	5990do	
1500	1600		Brazil, Radio Voz Missionaria	9665do	
1500	1600		Brazil, Super Radio Deus e Amour		6060do
			9565do	11765do	
1500	1600		Brazil, Super Rede Boa Vontade		4860do
1500	1600		Ecuador, HCJB Global	11705sa	
1500	1600	mtwhf	Portugal, RDP International	15560na	15690va
1500	1600	Sat/Sun	Portugal, RDP International	11635eu	15520af
			15560na	21655af	
1500	1600		USA, WYFR/Family Radio Worldwide		15355sa

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

1600	1700		Brazil, Novas de Paz	6080do	9515do
			11725do		
1600	1700		Brazil, Radio Alvorada/Londrina		4865do
1600	1700		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
1600	1700		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
1600	1700		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
1600	1700		Brazil, Radio Brasil	4785do	
1600	1700		Brazil, Radio Brasil Central	4985do	11815do
1600	1700		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
1600	1700		Brazil, Radio Capixaba	4935do	
1600	1700		Brazil, Radio Clube do Para	4885do	
1600	1700		Brazil, Radio Congonhas	4775do	
1600	1700		Brazil, Radio Cultura do Para	5045do	
1600	1700		Brazil, Radio Cultura Ondas Tropicais		4845do
1600	1700		Brazil, Radio Cultura Sao Paulo		9615do
			17815do		
1600	1700		Brazil, Radio Cultura/Araraquara		3365do
1600	1700		Brazil, Radio Daqui	4905do	
1600	1700		Brazil, Radio Difusora Acerana		4885do
1600	1700		Brazil, Radio Difusora de Macapa		4915do
1600	1700		Brazil, Radio Difusora do Amazonas		4805do
1600	1700		Brazil, Radio Difusora Roraima		4875do
1600	1700		Brazil, Radio Difusora/Londrina		4815do
1600	1700		Brazil, Radio Educadora	2380do	
1600	1700		Brazil, Radio Educadora 6 de Agosto		3255do
1600	1700		Brazil, Radio Gaucha	6020do	11915do
1600	1700		Brazil, Radio Gazeta Universitaria		5955do
			9685do	15325al	
1600	1700		Brazil, Radio Globo	6120do	9585do
			11804do		
1600	1700		Brazil, Radio Guaiba	6000do	11785do
1600	1700		Brazil, Radio Guaruja/Florianpolis		5980do
1600	1700		Brazil, Radio Guaruja/Paulista	3235do	9715do
1600	1700		Brazil, Radio Imaculada Conceicao		4755do
1600	1700		Brazil, Radio Inconfidencia	6010do	15190do
1600	1700		Brazil, Radio Itatiaia	5969do	
1600	1700		Brazil, Radio Maria	4885do	
1600	1700		Brazil, Radio Marumby	9665do	11750do
1600	1700		Brazil, Radio Missoes da Amazonia		4865do
1600	1700		Brazil, Radio Mundial	3325do	
1600	1700		Brazil, Radio Nacional da Amazonia		6185do
			11780do		
1600	1700		Brazil, Radio Nossa Voz	4975do	

1600	1700		Brazil, Radio Nove de Julho	9820do	
1600	1700		Brazil, Radio Novo Tempo	4895do	
1600	1700		Brazil, Radio Record	6150do	9505do
1600	1700		Brazil, Radio Rio Mar	6160do	9695do
1600	1700		Brazil, Radio Rural	4765do	
1600	1700	mtwhf	Brazil, Radio Senado	5990do	
1600	1700		Brazil, Radio Voz Missionaria	9665do	
1600	1700		Brazil, Super Radio Deus e Amour 9565do 11765do		6060do
1600	1700		Brazil, Super Rede Boa Vontade		4860do
1600	1700	DRM	Ecuador, HCJB Global	11705sa	
1600	1700	mtwhf	Portugal, RDP International	15560na	
1600	1700	Sat/Sun	Portugal, RDP International 15560na 21655af	11635eu	15520af

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

1700	1730		USA, Voice of America 21495af	11775af	15545af
1700	1800		Brazil, Novas de Paz 11725do	6080do	9515do
1700	1800		Brazil, Radio Alvorada/Londrina		4865do
1700	1800		Brazil, Radio Aparecida 9630al 11855al	5035do	6135al
1700	1800		Brazil, Radio Boa Vontade 11895do	6160do	9550do
1700	1800		Brazil, Radio Brasil	4785do	
1700	1800		Brazil, Radio Brasil Central	4985do	11815do
1700	1800		Brazil, Radio Cancao Nova 9675do	4825do	6105do
1700	1800		Brazil, Radio Capixaba	4935do	
1700	1800		Brazil, Radio Clube do Para	4885do	
1700	1800		Brazil, Radio Congonhas	4775do	
1700	1800		Brazil, Radio Cultura do Para	5045do	
1700	1800		Brazil, Radio Cultura Ondas Tropicais		4845do
1700	1800		Brazil, Radio Cultura Sao Paulo 17815do		9615do
1700	1800		Brazil, Radio Cultura/Araraquara		3365do
1700	1800		Brazil, Radio Daqui	4905do	
1700	1800		Brazil, Radio Difusora Acerana		4885do
1700	1800		Brazil, Radio Difusora de Macapa		4915do
1700	1800		Brazil, Radio Difusora do Amazonas		4805do
1700	1800		Brazil, Radio Difusora Roraima		4875do
1700	1800		Brazil, Radio Difusora/Londrina		4815do
1700	1800		Brazil, Radio Educadora	2380do	
1700	1800		Brazil, Radio Educadora 6 de Agosto		3255do
1700	1800		Brazil, Radio Gaucha	6020do	11915do
1700	1800		Brazil, Radio Gazeta Universitaria 9685do 15325al		5955do
1700	1800		Brazil, Radio Globo 11804do	6120do	9585do
1700	1800		Brazil, Radio Guaiba	6000do	11785do
1700	1800		Brazil, Radio Guaruja/Florianpolis		5980do
1700	1800		Brazil, Radio Guaruja/Paulista	3235do	9715do
1700	1800		Brazil, Radio Imaculada Conceicao		4755do
1700	1800		Brazil, Radio Inconfidencia	6010do	15190do
1700	1800		Brazil, Radio Itatiaia	5969do	
1700	1800		Brazil, Radio Maria	4885do	
1700	1800		Brazil, Radio Marumby	9665do	11750do
1700	1800		Brazil, Radio Missoes da Amazonia		4865do
1700	1800		Brazil, Radio Mundial	3325do	
1700	1800		Brazil, Radio Nacional da Amazonia 11780do		6185do
1700	1800		Brazil, Radio Nossa Voz	4975do	
1700	1800		Brazil, Radio Nove de Julho	9820do	
1700	1800		Brazil, Radio Novo Tempo	4895do	
1700	1800		Brazil, Radio Record	6150do	9505do
1700	1800		Brazil, Radio Rio Mar	6160do	9695do
1700	1800		Brazil, Radio Rural	4765do	
1700	1800	mtwhf	Brazil, Radio Senado	5990do	
1700	1800		Brazil, Radio Voz Missionaria	9665do	
1700	1800		Brazil, Super Radio Deus e Amour 9565do 11765do		6060do
1700	1800		Brazil, Super Rede Boa Vontade		4860do
1700	1800		France, Radio France Internationale 15530af		11765af
1700	1800	mtwhf	Portugal, RDP International 15465af 17825na	9455eu	13720af
1700	1800	Sat/Sun	Portugal, RDP International 17835na	9455eu	15465af
1700	1800		USA, WYFR/Family Radio Worldwide 17690af		17575sa
1730	1800		Ecuador, HCJB Global	15295sa	
1730	1800		USA, Voice of America 21495af	11775af	15545af

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

1800	1830	mtwhf	Spain, Radio Exterior de Espana		17595sa
1800	1830	mtwhf	USA, Voice of America	11775af	21495af
1800	1830		Vatican City State, Vatican Radio 11625af 13765af		9755af
1800	1900		Brazil, Novas de Paz 11725do	6080do	9515do
1800	1900		Brazil, Radio Alvorada/Londrina		4865do
1800	1900		Brazil, Radio Aparecida 9630al 11855al	5035do	6135al
1800	1900		Brazil, Radio Bandeirantes 11925do	6090do	9645do
1800	1900		Brazil, Radio Boa Vontade 11895do	6160do	9550do
1800	1900		Brazil, Radio Brasil	4785do	
1800	1900		Brazil, Radio Brasil Central	4985do	11815do
1800	1900		Brazil, Radio Cancao Nova 9675do	4825do	6105do
1800	1900		Brazil, Radio Capixaba	4935do	
1800	1900		Brazil, Radio Clube do Para	4885do	
1800	1900		Brazil, Radio Congonhas	4775do	
1800	1900		Brazil, Radio Cultura do Para	5045do	
1800	1900		Brazil, Radio Cultura Ondas Tropicais		4845do
1800	1900		Brazil, Radio Cultura Sao Paulo 17815do		9615do
1800	1900		Brazil, Radio Cultura/Araraquara		3365do
1800	1900		Brazil, Radio Daqui	4905do	
1800	1900		Brazil, Radio Difusora Acerana		4885do
1800	1900		Brazil, Radio Difusora de Macapa		4915do
1800	1900		Brazil, Radio Difusora Roraima		4875do
1800	1900		Brazil, Radio Difusora/Londrina		4815do
1800	1900		Brazil, Radio Educadora	2380do	
1800	1900		Brazil, Radio Educadora 6 de Agosto		3255do
1800	1900		Brazil, Radio Gaucha	6020do	11915do
1800	1900		Brazil, Radio Gazeta Universitaria 9685do 15325al		5955do
1800	1900		Brazil, Radio Globo 11804do	6120do	9585do
1800	1900		Brazil, Radio Guaiba	6000do	11785do
1800	1900		Brazil, Radio Guaruja/Florianpolis		5980do
1800	1900		Brazil, Radio Guaruja/Paulista	3235do	9715do
1800	1900		Brazil, Radio Imaculada Conceicao		4755do
1800	1900		Brazil, Radio Inconfidencia	6010do	15190do
1800	1900		Brazil, Radio Itatiaia	5969do	
1800	1900		Brazil, Radio Maria	4885do	
1800	1900		Brazil, Radio Marumby	9665do	11750do
1800	1900		Brazil, Radio Missoes da Amazonia		4865do
1800	1900		Brazil, Radio Mundial	3325do	
1800	1900		Brazil, Radio Nacional da Amazonia 11780do		6185do
1800	1900		Brazil, Radio Nossa Voz	4975do	
1800	1900		Brazil, Radio Nove de Julho	9820do	
1800	1900		Brazil, Radio Novo Tempo	4895do	
1800	1900		Brazil, Radio Record	6150do	9505do
1800	1900		Brazil, Radio Rio Mar	6160do	9695do
1800	1900		Brazil, Radio Rural	4765do	
1800	1900	mtwhf	Brazil, Radio Senado	5990do	
1800	1900		Brazil, Radio Voz Missionaria	9665do	
1800	1900		Brazil, Super Radio Deus e Amour 9565do 11765do		6060do
1800	1900		Brazil, Super Rede Boa Vontade		4860do
1800	1900		Chile, La Voz Crista	17860sa	
1800	1900		Ecuador, HCJB Global	15295sa	
1800	1900		Portugal, RDP International 15465af 17825na	9455eu	13720af
1800	1900		USA, WYFR/Family Radio Worldwide		17575sa

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

1900	2000		Brazil, Novas de Paz 11725do	6080do	9515do
1900	2000		Brazil, Radio Alvorada/Londrina		4865do
1900	2000		Brazil, Radio Aparecida 9630al 11855al	5035do	6135al
1900	2000		Brazil, Radio Bandeirantes 11925do	6090do	9645do
1900	2000		Brazil, Radio Boa Vontade 11895do	6160do	9550do
1900	2000		Brazil, Radio Brasil	4785do	
1900	2000		Brazil, Radio Brasil Central	4985do	11815do
1900	2000		Brazil, Radio Cancao Nova 9675do	4825do	6105do
1900	2000		Brazil, Radio Capixaba	4935do	
1900	2000		Brazil, Radio Clube do Para	4885do	
1900	2000		Brazil, Radio Congonhas	4775do	

1900	2000		Brazil, Radio Cultura do Para	5045do		
1900	2000		Brazil, Radio Cultura Ondas Tropicais		4845do	
1900	2000		Brazil, Radio Cultura Sao Paulo 17815do		9615do	
1900	2000		Brazil, Radio Cultura/Araraquara		3365do	
1900	2000		Brazil, Radio Daqui	4905do		
1900	2000		Brazil, Radio Difusora Acerana		4885do	
1900	2000		Brazil, Radio Difusora de Macapa		4915do	
1900	2000		Brazil, Radio Difusora Roraima		4875do	
1900	2000		Brazil, Radio Difusora/Londrina		4815do	
1900	2000		Brazil, Radio Educadora	2380do		
1900	2000		Brazil, Radio Educadora 6 de Agosto		3255do	
1900	2000		Brazil, Radio Gaucha	6020do	11915do	
1900	2000		Brazil, Radio Gazeta Universitaria 9685do	15325al	5955do	
1900	2000		Brazil, Radio Globo 11804do	6120do	9585do	
1900	2000		Brazil, Radio Guaiba	6000do	11785do	
1900	2000		Brazil, Radio Guaruja/Florianpolis		5980do	
1900	2000		Brazil, Radio Guaruja/Paulista	3235do	9715do	
1900	2000		Brazil, Radio Imaculada Conceicao		4755do	
1900	2000		Brazil, Radio Inconfidencia	6010do	15190do	
1900	2000		Brazil, Radio Itatiaia	5969do		
1900	2000		Brazil, Radio Maria	4885do		
1900	2000		Brazil, Radio Marumby	9665do	11750do	
1900	2000		Brazil, Radio Missoes da Amazonia		4865do	
1900	2000		Brazil, Radio Mundial	3325do		
1900	2000		Brazil, Radio Nacional da Amazonia 11780do		6185do	
1900	2000		Brazil, Radio Nossa Voz	4975do		
1900	2000		Brazil, Radio Nove de Julho	9820do		
1900	2000		Brazil, Radio Novo Tempo	4895do		
1900	2000		Brazil, Radio Record	6150do	9505do	
1900	2000		Brazil, Radio Rio Mar	6160do	9695do	
1900	2000		Brazil, Radio Rural	4765do		
1900	2000	mtwhf	Brazil, Radio Senado	5990do		
1900	2000		Brazil, Radio Voz Missionaria	9665do		
1900	2000		Brazil, Super Radio Deus e Amour 9565do	11765do	6060do	
1900	2000		Brazil, Super Rede Boa Vontade		4860do	
1900	2000		Chile, La Voz Crista	17860sa		
1900	2000		China, China Radio International 7335eu 9710sa	7405af 9765af	9535af	5985af 9560sa
1900	2000		Ecuador, HCJB Global	15295sa		
1900	2000	mtwhf	Portugal, RDP International 13790af	15465af	9455eu	12040na
1900	2000	Sat/Sun	Portugal, RDP International 15465af		12040na	13720af
1900	2000		South Africa, Channel Africa	3345af		
1900	2000		USA, WYFR/Family Radio Worldwide 6100af	17575sa		3955af
1930	2000		China, China Radio International			13630af
1930	2000		Germany, Deutsche Welle	9735af		13780af

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

2000	2029	fas	Canada, Radio Canada International 17765sa			15305sa
2000	2030		Cuba, Radio Havana Cuba	11770sa		
2000	2100		Brazil, Novas de Paz 11725do	6080do	9515do	
2000	2100		Brazil, Radio Alvorada/Londrina		4865do	
2000	2100		Brazil, Radio Aparecida 9630al	5035do	6135al 11855al	
2000	2100		Brazil, Radio Bandeirantes 11925do	6090do	9645do	
2000	2100		Brazil, Radio Boa Vontade 11895do	6160do	9550do	
2000	2100		Brazil, Radio Brasil	4785do		
2000	2100		Brazil, Radio Brasil Central	4985do	11815do	
2000	2100		Brazil, Radio Cancao Nova 9675do	4825do	6105do	
2000	2100		Brazil, Radio Capixaba	4935do		
2000	2100		Brazil, Radio Clube do Para	4885do		
2000	2100		Brazil, Radio Congonhas	4775do		
2000	2100		Brazil, Radio Cultura do Para	5045do		
2000	2100		Brazil, Radio Cultura Ondas Tropicais		4845do	
2000	2100		Brazil, Radio Cultura Sao Paulo 17815do		9615do	
2000	2100		Brazil, Radio Cultura/Araraquara		3365do	
2000	2100		Brazil, Radio Daqui	4905do		
2000	2100		Brazil, Radio Difusora Acerana		4885do	
2000	2100		Brazil, Radio Difusora de Macapa		4915do	
2000	2100		Brazil, Radio Difusora do Amazonas		4805do	
2000	2100		Brazil, Radio Difusora Roraima		4875do	
2000	2100		Brazil, Radio Difusora/Londrina		4815do	
2000	2100		Brazil, Radio Educadora	2380do		
2000	2100		Brazil, Radio Educadora 6 de Agosto		3255do	
2000	2100		Brazil, Radio Gaucha	6020do	11915do	
2000	2100		Brazil, Radio Gazeta Universitaria 9685do	15325al	5955do	
2000	2100		Brazil, Radio Globo 11804do	6120do	9585do	
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2000	2100		Brazil, Radio Inconfidencia	6010do	15190do	
2000	2100		Brazil, Radio Itatiaia	5969do		
2000	2100		Brazil, Radio Maria	4885do		
2000	2100		Brazil, Radio Marumby	9665do	11750do	
2000	2100		Brazil, Radio Missoes da Amazonia		4865do	
2000	2100		Brazil, Radio Mundial	3325do		
2000	2100		Brazil, Radio Nacional da Amazonia 11780do		6185do	
2000	2100		Brazil, Radio Nossa Voz	4975do		
2000	2100		Brazil, Radio Nove de Julho	9820do		
2000	2100		Brazil, Radio Novo Tempo	4895do		
2000	2100		Brazil, Radio Record	6150do	9505do	
2000	2100		Brazil, Radio Rio Mar	6160do	9695do	
2000	2100		Brazil, Radio Rural	4765do		
2000	2100	mtwhf	Brazil, Radio Senado	5990do		
2000	2100		Brazil, Radio Voz Missionaria	9665do		
2000	2100		Brazil, Super Radio Deus e Amour 9565do	11765do	6060do	
2000	2100		Brazil, Super Rede Boa Vontade		4860do	
2000	2100	mtwhf	Portugal, RDP International	12040na		
2000	2100		Portugal, RDP International 11825af		9795eu	11960af
2000	2100	Sat/Sun	Portugal, RDP International 15465af		9455eu	12040na
2000	2100		Portugal, RDP International	9795eu	11825af	
2030	2059	fas	Canada, Radio Canada International 17765sa			15305sa
2030	2100	mtwhf	UK, BBC World Service 6135af	7260af	13745af	3380af 6065af 15105af

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

2100	2129	fas	Canada, Radio Canada International 17765sa			15305sa
2100	2145		USA, WYFR/Family Radio Worldwide			11565eu
2100	2200		Brazil, Novas de Paz 11725do	6080do	9515do	
2100	2200		Brazil, Radio Alvorada/Londrina		4865do	
2100	2200		Brazil, Radio Aparecida 9630al	5035do	6135al 11855al	
2100	2200		Brazil, Radio Bandeirantes 11925do	6090do	9645do	
2100	2200		Brazil, Radio Boa Vontade 11895do	6160do	9550do	
2100	2200		Brazil, Radio Brasil	4785do		
2100	2200		Brazil, Radio Brasil Central	4985do	11815do	
2100	2200		Brazil, Radio Cancao Nova 9675do	4825do	6105do	
2100	2200		Brazil, Radio Capixaba	4935do		
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2100	2200		Brazil, Radio Cultura/Araraquara		3365do	
2100	2200		Brazil, Radio Daqui	4905do		
2100	2200		Brazil, Radio Difusora Acerana		4885do	
2100	2200		Brazil, Radio Difusora de Macapa		4915do	
2100	2200		Brazil, Radio Difusora do Amazonas		4805do	
2100	2200		Brazil, Radio Difusora Roraima		4875do	
2100	2200		Brazil, Radio Difusora/Londrina		4815do	
2100	2200		Brazil, Radio Educadora	2380do		
2100	2200		Brazil, Radio Gaucha	6020do	11915do	

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PULSARS

❖ The Discovery

Jocelyn Bell and Anthony Hewish accidentally discovered the extraordinary celestial objects know as "Pulsars" in 1967, while they were searching for twinkling sources of radio radiation. The word "pulsar" is a contraction of "pulsating star" and first appeared in print in 1968:

Antony Hewish became the first astronomer to be awarded the Nobel Prize in physics. Considerable controversy is associated with the fact that Professor Hewish was awarded the prize, while Bell, who made the initial discovery while she was his Ph.D student, was not.

The explanation for the rapid radio pulses Bell and Hewish observed proved the existence of neutron stars, incredibly dense remains of massive collapsed stars. Neutron stars were predicted in the 1930s by several visionary astronomers and physicists.

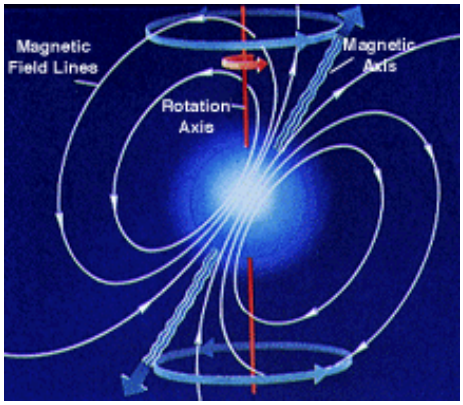
Initially baffled as to the seemingly unnatural regularity of its emissions, they dubbed their discovery LGM-1, for "little green men." The hypothesis that pulsars were beacons from extraterrestrial civilizations was never serious, but some discussed the far-reaching implications if it turned out to be true. Their pulsar was later dubbed CP 1919, and is now known by a number of designators including PSR 1919+21, PSR B1919+21 and PSR J1921+2153.

❖ Pulsar Theory

Pulsars are highly magnetized, rotating neutron stars that emit a beam of electromagnetic radiation. The observed periods of their pulses range from 1.4 milliseconds to 8.5 seconds.[1] The radiation can only be observed when the beam of emission is pointing towards the Earth. This is called the lighthouse effect, and it gives rise to the pulsed nature that gives pulsars their name.

Because neutron stars are very dense objects, the rotation period and thus the interval between observed pulses is very regular. For some pulsars, the regularity of pulsation is as precise as an atomic clock.[2] A few pulsars are known to have planets orbiting them, as in the case of PSR B1257+12.

Werner Becker of the Max Planck Institute for Extraterrestrial Physics said in 2006, "The theory of how pulsars emit their radiation is still in its infancy, even after nearly forty years of work. Although Pulsars emit in radio wavelengths, pulsars have subsequently been found to emit in visible light, X-ray, and/or gamma ray wavelengths."



A diagram of a pulsar showing its rotation axis, its magnetic axis and, magnetic field. (NASA)

❖ Gamma-Ray Pulsars

Pulsars are the original gamma-ray astronomy point sources. A few years after the discovery of pulsars by radio astronomers, the Crab and Vela pulsars were detected at gamma-ray energies. Pulsars accelerate particles to tremendous energies in their magnetospheres. These particles are ultimately responsible for the gamma-ray emission seen from pulsars.

By the end of 2004 there were about 1500 pulsars known through radio detections, but only seven had been detected in the gamma-rays. Gamma-ray telescopes preferentially detect young, nearby pulsars. These pulsars tend to have large magnetic fields and to be spinning rapidly. It is the loss of the pulsar's spin energy which eventually appears as radiation across the electromagnetic spectrum, including gamma-rays. Both observations and models indicate that pulsars eventually lose the ability to emit gamma-rays as the pulsar slowly takes longer and longer to rotate.

❖ X-ray Pulsars

Although all pulsars are neutron stars, not all pulsars shine in the same way. X-ray pulsars in particular illustrate several ways in which pulsar emission can originate:

Magnetosphere Emission: Like gamma-ray pulsars, X-ray pulsars can be produced when high-energy electrons interact in the magnetic field regions above the neutron star magnetic poles. Pulsars seen this way, whether in the radio, optical, X-ray, or gamma-ray, are often referred to as "spin-powered pulsars," because the ultimate source of energy comes from the neutron star rotation. The loss of rotational energy results in a slowing of the pulsar spin period.

Cooling Neutron Stars: When a neutron star is first formed in a supernova, its surface is extremely hot (more than 1,000,000,000 degrees). Over time, the surface cools. While the surface is still hot enough, it can be seen with X-ray telescopes. If some parts of the neutron star are hotter than others (such as the magnetic poles), then pulses of thermal X-rays from the neutron star surface can be seen as the hot spots pass through our line of sight. Some pulsars show both thermal and magnetospheric pulses.

Accretion: If a neutron star is in a binary system with a normal star, the powerful gravitational field of the neutron star can pull material from the surface of the normal star. As this material spirals around the neutron star, it is funneled by the magnetic field toward the neutron star magnetic poles. In the process, the material is heated until it becomes hot enough to radiate X-rays.

As the neutron star spins, these hot regions pass through the line of sight from the Earth and X-ray telescopes see these as X-ray pulsars. Because the gravitational pull on the material is the basic source of energy for this emission, these are often called "accretion powered pulsars."

http://imagine.gsfc.nasa.gov/docs/science/know_l2/pulsars.html
http://en.wikipedia.org/wiki/Pulsar
http://www.cv.nrao.edu/course/astr534/Pulsars.html

❖ Amateur Efforts

As far back as the 1970s, radio amateurs were fascinated by this new object. An Advanced Amateur and Engineer, Robert M. Sickels, made the first amateur detection of a Pulsar using a small dish and home made radio telescope (612 MHz.) at his Fort Lauderdale home.

In addition, James Van Prooyen, N8PQK, Software Designer for Dorner Works, an Engineering Firm in Grand Rapids, MI, has done over 10 years research into Pulsar detection. Jim has graciously agreed to tell us about some of his work in pulsar detection in his own words.

❖ A Low Cost Pulsar Machine

A pulsar machine (or pulsar detection system) is used at many of the large radio observatories around the world. Some of these

pulsar machines are well known for the work that has been done, such as the Penn State Pulsar Machine at Arecibo. Others are just coming on line, such as PuMa, located in the Netherlands.

Why would any one want to study pulsars? They are, for the most part, very distant objects that can be seen only with large telescopes (radio or optical). What effect could these possibly have on us? These are questions I am often asked.

A pulsar, for its size, around 10 to 20 km in diameter (6 to 12 miles), is one of the most energetic objects in the universe. …Now let's apply this to one of our most pressing problems today – clean, efficient, low cost energy. The study of these objects could lead us to a much more efficient source of power. Maybe a tiny pulsar in a shoe box could power your car and never need refueling, but it would be so strong that, when your car wears out, you just unplug it and put it in your new car.

Speculation? Yes it is, but we will never find these new sources unless we look, and I believe that pulsars may be the right place to look.

❖ Pulsar Machines

A radio telescope has several parts: The antenna, which collects the signal, a low noise amplifier (LNA) that amplifies the signal, the receiver (or converter) that converts the signal to a lower (or intermediate) frequency, and finally, the backend which converts the intermediate frequency to some type of audio signal. A pulsar machine (or pulsar backend) is an additional piece of equipment that attaches to the radio telescope and provides additional processing to allow the detection of pulsars. A pulsar machine may generally be defined as hardware and/or software that allows for the detection of pulsars.

Pulsar machines have been developed at Pennsylvania Statue University as well as Berkeley Caltech for almost 30 years. They are deployed at the major observatories around the world. One of newest is the PuMa Westerbrook Synthesis Radio Telescope in the Netherlands. There are also major Pulsar Machines at Green Bank and Arecibo.

There have been several efforts by amateur radio astronomers to build such machines. For some of us, the detection of pulsars is the "Quest for the Holy Grail" of amateur radio astronomy.

There are a number of notable efforts:

James C. Carroll (*A Post Detector Pulsar Extractor – SARA Paper*)

Robert M. Sickels (*Pulse Catcher – SARA Paper*) and *Amateur Radio Astronomers Handbook*

Current Amateur Radio Astronomy Pulsars efforts (including the author):

P. Ibelings and M. Wheatley at the PARI Observatory.

Jim Van Prooyen and Rich Nagel at the Grand Rapids Radio Observatory.

❖ The Low Cost Pulsar Machine

The design of the pulsar machine involved a number of design trade-offs to arrive at a system that was low cost and usable with a small radio telescope. The parameters that were studied in the design included: Observation frequency, Analog vs. Digital electronics, Band width, Dispersion issues, Algorithms for processing the data, Filter design, Search methods, and Low Cost Processing Technologies.

Observation Frequency - The selection of an observation frequency presents a unique set of problems for the amateur radio astronomers. The issues include:

More signal to work with at the lower frequencies.

Less distortion of the signal at higher frequencies.

Equipment costs are less at the lower frequencies.

Much more gain for a given size dish antenna at higher frequencies.

There is no one good choice, as pulsars have been observed at frequencies from a few megahertz to the high gigahertz.

Analog vs. Digital - The first pulsar machines had a large number of analog signal processing elements. Today most of this is done using digital technology. In general a digital system will have a lower cost of acquisition than analog systems.

Wide Band vs. Narrow Band - Many pulsar machines use wide bands, and it makes sense from a systems view. The more signal you can put into the system, the greater the sensitivity. Some are as wide as 100 MHz. But there are problems here, such as, how you are going to digitize a wide signal band and keep the cost under control? The other problem is interference from other sources, when you are not observing in a radio quiet zone. We use a narrow band approach to the problem. This allows us to keep the cost very low and it keeps out the local radio and TV stations. However, this has a cost in that we need to observe for a long period of time before we see a detection. Generally, one hour of observation is used to make sure we have the data needed for detection.

The Dispersion Issue - The narrow band approach means that dispersion is not an issue. We use a bandwidth of 75 kHz. We are currently studying bandwidths of only 30 kHz for the next generation receiver. This receiver front end will be built by Radio Astronomy Supplies some time in the near future.

Fast Folding Algorithm (FFA) - This is a computer algorithm that is the heart of the system. It allows for the detection of periodic events within time series data. The algorithm was developed by David H. Staelin in 1969. References 4 and 5 have additional information on the development of the FFA.

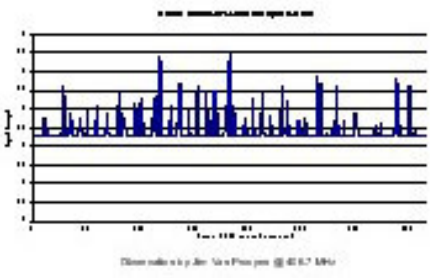
Filter Design - The pulsar machine has a filter that processes data after the FFA. The filter is unique to this pulsar engine. It is called a Jakeway filter, named to honor Jarry Jakeway, who was my mentor during its design in 2002/2003. This is an efficient recursive filter for use with noisy data sets.

Search Methods - The pulsar machine supports two search methods, targeted and non-targeted. The targeted search has been fully developed and is optional. The non-targeted processing of the pulsar machine will be the subject of future papers. It will use a Parameter Space Search Algorithm (PSSA) that is still under development. This version of the Pulsar engine will require the use of advanced computer technologies that are now available, such as Beowulf, GPU's, and other Parallel Processor technologies.

Deployment of the Pulsar Engine - One of the major issues has been how to deploy the Pulsar Engine. Due to the fact that it is still under almost continuous development and the regulations on use of such technology (ITAR), we have arrived at the following model for its use:

Individuals or members of educational or radio astronomy organizations may send observations to an FTP server for processing by the Pulsar Engine. Data sent to the FTP server must be in one of the supported data formats.

Processing produces histograms, using of MS Excel or JPG files and will be posted to the FTP server for downloading. This processing may take anywhere from 24 to 48 hours for turnaround. The following is an example of the output from the Pulsar Engine:



Summary of the observation histogram of pulsar B0031-07 pictured above: This is a pulsar with a period of 0.9429509945998 seconds. This pulsar has three modes of drifting sub pulses. This can be seen between index 95, and 103, (on the x-axis) and again between 161, and 172. It also produces giant pulses approximately once in 800 periods (~ 754.3608 seconds). Due to the folding of the data over an observation period of 3600 seconds, there should be several giant pulses visible in the plot; this is supported by the data at index 118 and 183 (on the x-axis).

❖ Conclusion

The study of pulsars is fascinating and do-able for the amateur astronomer. And, being incredible energy-producers for their size, they may have implications for energy production on our own planet in the future. In this paper, the reader has been brought up-to-date with current work and given a glimpse of the future in the study of Pulsars. If you have a radio telescope and would like to be part of the project, please send an e-mail to *jeff@radioastronomysupplies.com*, who will forward all email to me (Jim Van Prooyen).

REFERENCES:

1 Neutron Star Description / what a pulsar is. **http://en.wikipedia.org/wiki/Neutron_star**

2 *Handbook of Pulsar Astronomy*, the best book on pulsar astronomy I have ever seen, it also talks about many of the detection methods: ISBN0-521-82823-6 **www.jb.man.ac.uk/pulsarhandbook**

3 *Back-Ends* - J. R. Fisher, a good paper on pulsar back end at several of the major observatories around the world. **http://articles.adsabs.harvard.edu/full/2002ASPC..278..113F**

4 David H. Staelin. Fast Folding Algorithm for Detection of Periodic Pulse Trains. *Proceedings of the* IEEE, 57 (1969).

5 R. V. E. Lovelace, J. M. Sutton and E. E. Salpeter. Digital Search Methods for Pulsars. *Nature* 222, 231-233 (1969).

6 Web Pages related to Amateur Pulsar work: Amateur Pulsar Observation of P. Ibelings and M. Wheatley **http://www.moetronix.com/pulsar/index.htm**

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Larry Van Horn, N5FPW
larryvanhorn@monitoringtimes.com
http://mt-milcom.blogspot.com

Military Demonstration Teams 2010 Performance Schedule

These are the schedules that were available at presstime for the various U.S. military aero demonstration and parachute teams that perform at air shows and other civilian events. More are still to be released, and you can keep up with the latest schedules, changes, additions, cancellations and updates on our *Milcom Monitoring Post* Blog at **http://mt-milcom.blogspot.com/**

If security levels increase in a base to Threat Condition "Bravo" or above, many military installations will not have public air shows. Consequently, demonstration schedules dates listed below are subject to change or cancellation without notice.

Demonstration Group Abbreviations:
BA .... US Navy Blue Angels
BD .... US Army Black Daggers
GK.... US Army Golden Knights
LF ..... US Navy Leap Frogs
SB..... Canadian Forces Snowbirds
SW.... US Army Silver Wings
TB..... US Air Force Thunderbirds

Abbreviations
AFB ..... Air Force Base
ARB ..... Air Reserve Base
CFB..... Canadian Forces Base
MCAS.... Marine Corps Air Station
NAF..... Naval Air Facility
NAS..... Naval Air Station

Dates	Group: Locations Website
March 13	**BA/BD:** NAF El Centro Airshow - NAF El Centro, CA **www.marines.mil/community/Pages/EventDetails.aspx?EventID=29228**
March 16-19	**GK**: Panama City, FL/South Padres Island, TX
March 20-21	**BA:** MacDill Airfest - MacDill AFB, FL **www.macdill.af.mil/** **TB:** Aerospace and Arizona Days - Davis Monthan AFB, AZ **www.dm.af.mil/**
March 27-28	**BA**: Wings Over South Texas Air Show - NAS Kingsville, TX **www.cnic.navy.mil/Kingsville/index.htm** **TB:** Maxwell-Gunter Open House & Airshow - Maxwell AFB, AL **www.maxwell.af.mil/** **GK:** Open
April 3-4	**GK:** Easter Weekend
April 10-11	**BA**: NAS Key West, FL **www.cnic.navy.mil/keywest/index.htm** **TB:** Eglin AFB Open House and Air Show - Eglin AFB, FL **www.eglin.af.mil/airshow2010.asp** **GK:** Maxwell AFB, AL
April 17	**BA:** Charleston Air Expo 2010 - Charleston AFB, SC **www.charlestonairexpo.com/**
April 17-18	**TB:** Sun'n Fun Fly-In - Lakeland, FL **www.sun-n-fun.org/** **GK:** Open
April 24	**SB:** Final Practice
April 24-25	**BA:** Vidalia Onion Festival Air Show - Vidalia Regional Airport, GA **www.vidaliaonionfestival.com/** **TB:** Barksdale AFB Open House and Air Show - Barksdale AFB, LA **www.barksdaleairshow.org/** **GK:** Air Lauderdale Beachfest - Ft. Lauderdale, FL **www.airlauderdale.com/ and Galena, IL**
April 28	**SB:** Acceptance Show
May 01	**TB:** Dyess AFB Open House & Air Show - Dyess AFB, TX **www.dyess.af.mil/**
May 02	**TB:** Altus AFB Airshow - Altus AFB, OK **www.altus.af.mil/**
May 01-02	**BA:** Sound of Speed Airshow - Rosecrans Memorial Airport, St. Joseph, MO **www.airshownetwork.com/show.php?id=86** **SB:** Canadian Aviation Expo - John C. Munro Hamilton International Airport, ON **www.canadianaviationexpo.com/** **GK:** Open
May 08-09	**BA/GK:** Tusacaloosa Air Show - Tuscaloosa Regional Airport, AL http://tuscaloosa.schultzairshows.com/
	TB/GK: Shaw Fest '10 - Shaw AFB, SC **www.shaw.af.mil/**
May 08-09	**SB:** Thunder Over Niagara - Niagara Falls International Airport, NY **www.thunderoverniagara.com/**
May 13	**SB:** MasterCard Memorial Cup - Brandon, MB http://mastercardmemorialcup.com/
May 15-16	**BA/GK:** Andrews AFB Joint Service Open House - Andrews AFB, MD **www.andrews.af.mil/** **TB:** Columbus AFB, MS **www.columbus.af.mil/** **SB:** Neepawa Air Show 2010 - Neepawa Airport, MB
May 22	**TB:** Thunder Over the River - Grand Forks AFB, ND **www.grandforks.af.mil/**
May 22-23	**BA:** MCAS Cherry Point Air Show - MCAS Cherry Point, NC **www.cherrypointairshow.com/** **GK**: Open
May 26	**BA**: USNA, Annapolis, MD **www.usna.com** **TB**: US Air Force Academy, CO **www.usafa.af.mil/**
May 28	**BA:** USNA, **www.usna.com**
May 29-30	**BA/GK:** Bethpage Federal Credit Union New York Air Show at Jones Beach - Wantagh, NY (Jones Beach) **www.jonesbeachairshow.com/** **TB/GK:** Southern Wisconsin Air Fest - Janesville, WI **www.swairfest.org/**
June 05-06	**BA:** Chippewa Valley Air Show - Chippew Valley Regional Airport, Eau Claire, WI **www.chippewavalleyairshow.com/** **TB/LF:** OC Air Show 2010 - Ocean City, MD http://ocairshow.com/ Listen to live coverage of the show streamed on WQMR 101.1 at **www.wqmr.com/** **SB**: Borden Canadian Forces Day - CFB Borden, ON **www** **GK**: Florence, SC
June 12	**SB**: Victoria Navy, BC
June 12-13	**BA/GK:** Milwaukee Air and Water Show - Lakefront Milwaukee, WI **www.milwaukeeairshow.com/** **TB**: Québec International Air Show - Québec City, QC Canada
June 19-20	**BA/GK:** Cape Girardeau Regional Air Festival - Cape Girardeau, MO **www.capeairfestival.com/** **TB**: Star Spangled Salute - Tinker AFB, OK **www.starspangledsalute.com/** **SB**: Waterloo Aviation Expo & Airshow - Kitchener, ON **www.waterlooairshow.ca/**
June 24	**SB:** St George, NB
June 26	**SB:** Charlo Airport, NB
June 26-27	**BA:** Great Minnesota Air Show - St. Cloud, MN **www.greatminnesotaairshow.com/** **TB**: Rhode Island Open House and Air Show - North Kingston, RI **www.riairshow.com/** **GK**: Findlay, OH
June 29	**SB:** Halifax Navy, NS
July 01	**SB:** Canada Day
July 03	**GK:** Madison, WI/Dubuque, IA
July 03-04	**BA:** National Cherry Festival Air Show - West Arm of Grand Traverse Bay, Traverse City, MI **www.cherryfestival.org/events/airshow/blue_airshow.php**
July 04	**SB**: Vintage Wings of Canada - Gatineau-Ottawa Executive Airport, QC **www.vintagewings.ca/** **GK**: Fort Bragg, NC
July 09	**SB:** Calgary Stampede - Calgary, AB
July 10	**BA:** Pensacola Beach Air Show - Pensacola Beach, FL **www.visitpensacolabeach.com/what/airshow.asp**
July 10-11	**TB/GK**: Gary's South Shore Air Show - Gary, IN **www.garyairshow.com/**
July 13-26	**GK**: Mid-season break

July 17-18 **BA**: Dayton Air Show - Dayton International Airport, OH
www.usats.org/
TB/BD: Duluth Air & Aviation Expo - Duluth, MN
www.duluthairshow.com/2010/index.html
July 21 **TB:** Cheyenne Frontier Days - Cheyenne, WY
www.cfdrodeo.com/
SB: Dawson Creek Airshow - Dawson Creek Airport, BC
www.tourismdawsoncreek.com/event_airshow.php
July 24 **SB:** Yellowknife International Airshow - Yellowknife Airport, NT
July 24-25 **BA**: Idaho Falls Air Show - Idaho Falls, ID
TB: Fairchild AFB Air Show - Fairchild AFB, WA
www.fairchild.af.mil/
July 31-Aug 01 **BA/SB:** Arctic Thunder Air Show 2010 - Elmendorf AFB, AK
www.alaskaairshow.org/
TB/GK: Rockford Airfest 2010 - Rockford, IL
www
GK: Johnstown, PA
August 04 **SB:** Wings Over Whitecourt Airshow - Whitecourt, AB
August 07-08 **BA:** Seafair 2010 Air Show - Seattle, WA
www.seafair.com/
TB: Moffett Field Air Show - Moffett Field, CA
SB: Wetaskiwin Air Show - Wetaskiwin, AB
www.westaskiwinairshow.com/
GK: Open
August 13-15 **SB:** Abbotsford International Airshow - Abbotsford, BC
www.abbotsfordairshow.com/
August 14-15 **BA/GK:** Chicago Air and Water Show - Chicago, IL
www.explorechicago.org/city/en/things_see_do/event_landing/special_events/mose/chicago_air___water.html
TB: Abbotsford International Airshow - Abbotsford, Canada
www.abbotsfordairshow.com/
August 21-22 **TB:** W Airshow - W Air National Guard Base Open House), MA
www.barnesairport.com/news/

SB: Windsor International Air Show - Windsor, ON
GK: Kansas City, MO
August 25 **TB/GK:** Atlantic City Air Show - Thunder over the Boardwalk - Atlantic City, NJ
www.atlanticcitynj.com/acairshow.aspx
SB: Bagotville Airshow 2010 - Bagotville, QC
August 28-29 **BA/GK:** Wings of Hope 2010 - Portsmouth, NH
www.peaseairshow.com/
TB/GK: Coney Island Air Show - Brooklyn (Coney Island), NY
SB: Val d'Or International Airshow - Val d'Or, QC
September 01 **SB:** Brantford Airshow 1010 - Brantford, ON
www.brantfordairshow.com/
September 04-05 **TB/GK**: Thunder over the Blue Ridge Airshow - Martinsburg, WV
www.martinsburgairshow.com/
September 04-06 **BA/GK:** Cleveland National Air Show - Cleveland, OH
www.clevelandairshow.com/
SB: Canadian International Airshow - Toronto, ON
www.cias.org/
September 07 **SB:** VandenBos Airshow - Ontario
September 11 **SB:** Nova Scotia International Air Show - Shearwater, NS
www.nsairshow.ca/
September 11-12 **BA/GK:** Airpower over the Midwest - Scott AFB, IL
www.scott.af.mil/
TB/GK: Wings Over Pittsburgh - Coraopolis (Pittsburgh), PA
www.wingsoverpittsburgh.com/
September 18-19 **BA:** NAS Oceana Air Show - NAS Oceana, VA
www.oceanaairshow.com/
TB/GK: Wings over Whiteman - Whiteman AFB, MO
www.wingsoverwhiteman.com/
SB: US National Championship Air Races - Stead Field Reno, NV
www.airrace.org/
September 25-26 **BA:** Blues on the Bay - MCAS Kaneohe Bay, HI
www.bluesonthebay.org/
TB: McConnell AFB Open House 2010 - McConnell AFB, KS
www.mcconnell.af.mil/
SB: Chico Air Show 2010 - Chico, CA
www.chicoairshow.org/
GK: Open
October 01-03 **BA/SB/GK:** MCAS Miramar Air Show - MCAS Miramar, CA
www.miramarairshow.com/
October 02-03 **TB:** California International Airshow - Salinas, CA
www.salinasairshow.com/
October 09-10 **BA:** San Francisco Fleet Week Air Show - San Francisco, CA
TB/GK: Airpower Arkansas - Little Rock AFB, AR
www.littlerock.af.mil/
SB: Daytona, FL
October 16-17 **BA/SB/GK:** Wings Over Marietta - Dobbins AFB, GA
www.dobbins.afrc.af.mil/
TB: Amigo Airsho - El Paso, TX
www.amigoairsho.org/

Photo credit: Kevin Burke

October 22-23 **SB:** Year End/40th Gala
October 23-24 **BA:** NAS Jacksonville Air Show - NAS Jacksonville, FL http://airshow.jacksonville.com/
TB: Wings Over Houston Air Show - Houston, TX
www.wingsoverhouston.com/
GK: US Army Ten-Miler - Washington, DC
www.armytenmiler.com/
October 30-31 **BA/GK:** Fort Worth Alliance Air Show - Ft. Worth Alliance, TX
www.allianceairshow.com/
TB: Cocoa Beach Air Show - Cocoa Beach, FL
www.cocoabeachairshow.com/
November 06-07 **BA:** Wings Over Homestead - Homestead AFB, FL
www.wingsoverhomestead.com/
TB: Lackland AirFest '10 - Lackland AFB, TX
www.lackland.af.mil/airshow/index.asp
GK: Open
November 11-14 **GK:** Fort Bragg NC
November 12-13 **BA:** Blue Angels Homecoming Air Show - NAS Pensacola Open House - NAS Pensacola (Sherman Field), FL
www.naspairshow.com/
November 13-14 **TB**: Aviation Nation 2010 - Las Vegas Air Show - Nellis AFB, NV
www.nellis.af.mil/
BD: VNA Airshow - Stuart, FL http://
www.vnaairshow.com/
December 04-05 **GK:** Army-Navy Game - Philadelphia, PA

MT AIR SHOW RESOURCE GUIDE

For the latest schedule (updates, additions and changes) and equipment suppliers, check the individual links below.

Canadian Forces Snowbird Schedule - **http://mt-milcom.blogspot.com/2010/01/15-wing-moose-jaw-saskatchewan-canadian.html**
Canadian Forces Skyhawks Parachute Team - **www.army.forces.gc.ca/land-terre/skyhawks/index-eng.asp**
Comtek Communications Gear Bandplan - **www.comtek.com/download/ATfrequency_chart.pdf**
Grove Enterprises - **www.grove-ent.com**
Milcom Monitoring Post - **http://mt.milcom.blogspot.com/**
Monitoring Times website **- www.monitoringtimes.com**
Universal Radio **- www.universal-radio.com**
US Air Force Air Combat Command Aerial Events - **www.acc.af.mil/aerialevents/**
Note: ACC currently has six demonstration (demo) teams: A-10 East from Moody AFB, A-10 West from Davis-Monthan AFB, F-15E East Strike Eagle from Seymour Johnson AFB, Viper (F-16) East from Shaw AFB, Viper (F-16) West from Hill AFB, and F-22 Raptor East from Langley AFB.
US Air Force Thunderbirds - **http://thunderbirds.airforce.com/**
US Air Force Thunderbirds Schedule - **http://mt-milcom.blogspot.com/2009/12/usaf-thunderbirds-2010-official-show.html**
US Army Aviation Heritage Flight - **www.armyav.org/**
Note: The AAVH consist of the Sky Soldiers Demo Team, Cobra Demo Team, and the Huey Ride Program/
US Army Black Daggers - **http://news.soc.mil/blkdgrslg/daggerhome.htm**
US Army Golden Knights - **www.usarec.army.mil/hq/goldenknights/**
US Army Golden Knights Schedule - **http://mt-milcom.blogspot.com/2009/12/us-army-golden-knights-2010-schedule.html**
US Army Silver Wings - **https://www.benning.army.mil/silverwings/**
US Navy Aerial Event Support - **http://www.navy.mil/navco/display.asp?page=aviation.html**
Note: US Navy Tactical Demonstration units consist of the F-18C East, F-18F East, F-18C West, and F-18F West aircraft.
US Navy Blue Angels - **www.blueangels.navy.mil/index.htm**
US Navy Blue Angels Schedule - **http://mt-milcom.blogspot.com/2009/12/us-navy-blue-angels-2010-2011-schedule.html**
US Navy Leap Frogs - **www.leapfrogs.navy.mil/**

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FED FILES

GOVERNMENT COMMUNICATIONS

Chris Parris
chrisparris@monitoringtimes.com
www.mt-fedfiles.blogspot.com

Chipping Through the ICE

As members of our hobby know, change in federal communications is a constant. New frequencies become active, old frequencies go silent, but sometimes old, silent frequencies become active again. This is especially true when you have new government entities formed from other agencies. What do they do for communications frequencies when they start their existence?

One such agency, whose communications systems have been difficult to track down, has been Immigrations and Customs Enforcement (ICE). With the formation of the Department of Homeland Security (DHS) in 2002, ICE was constructed using components of the old Immigration and Naturalization Service (INS) and investigative and intelligence components of the US Customs Service.

U.S. Immigration and Customs Enforcement

ICE tends to be involved in behind-the-scenes investigations and undercover work, so a very general rule of thumb is that, if they are wearing a uniform and driving marked vehicles, it's Customs and Border Protection (CBP). If they are undercover and unmarked, it's probably ICE. At one time ICE operated the air and marine interdiction units, but since October of 2004, those are back under Customs and Border Protection.

Once ICE began operations, it was unclear at to what they were going to do for radio communications. They often continued to use frequency allocations that were used by the INS, which were frequencies shared with the Border Patrol. But as things began to change, it appeared that some of the INS roots in the Justice Department began to show up as new frequencies previously assigned to the DOJ.

One mystery surrounding ICE radio operations is that they don't seem to have a nationwide frequency or channel plan, as some agencies do. And despite what Wikipedia shows about ICE, I do not believe that they currently have a nationwide radio communications system of their own. They do have access to, and often utilize the CBP Customs legacy nationwide radio network, operated out of the CBP National Law Enforcement Communication Center in Orlando, Florida.

After 8 years of the agency's existence, some of the ICE radio networks are beginning to take shape. All ICE operations appear to be using APCO P-25 digital mode, but it appears that these networks are not yet linked to a nationwide dispatch center. They are apparently connected to regional and local area ICE offices. These regional networks are also showing that there is not yet a standard channel plan for all of the United States and that each region gets assigned frequencies on an as-needed basis.

New England

First, let's start in the northeast part of the US: New England. Here are some identified ICE repeaters and presumed locations. And additions, corrections or clarifications would be appreciated.

163.6500, N305 – Bolton, CT
163.6750, N319 – Boston, MA (Logan Airport)
163.6750, N296 – Manchester, NH
163.7000, N301 – Providence, RI
163.7500, N289 – Boston, MA
163.7500, N300 – Ledyard, CT
163.7750, N303 – Mt. Washington Observatory, NH
165.7375, N291 – Boston, MA
166.2750, N296 – Greenfield, MA
167.5375, N297 – Avon, CT
172.7750, N294 – Worcester, MA

As you can see from this list, ICE is using frequencies from its former assignments as INS and new assignments that have come from the Justice Department allocations and even Customs assignments. You will also note that ICE does not use a single, common P-25 Network Access Code (NAC) value, but is assigning a whole range of them.

163.6500, N385 – Philadelphia, PA
163.7375, N382 – Trenton, NJ
169.8000, N389 – Pittsburgh, PA
170.7250, N388 – Harrisburg, PA

These repeaters are part of a Tri-State ICE network (PA, DE, WV), all sharing 162.9000 MHz as the common input frequency.

Los Angeles

Now let's move out to the Los Angeles area and some known ICE operations there.

163.7500, N109
163.8250, N111
165.9250, N112
168.8250, N104
168.8250, N108
168.8500, N110
168.9250, N115 – LAX Airport
168.9750, N106
170.6250, N114
170.6750, N113

Again, as in New England, ICE is using many of the old INS/Border Patrol allocations, but no common NAC usage.

Florida

Now down to the state of Florida. I have only spotty information on ICE operations there, but here is what has been monitored. Most of these frequencies have been heard along the western coast and Florida panhandle area:

164.9250, N200
165.8500, P-25 (No NAC info yet) – Central Florida Coast (Melbourne?)
171.3250, N200
171.6625, N200
171.7625, N200

The frequencies using the NAC of 200 seem to be all linked and used along the Florida panhandle and into Mississippi and Alabama, from listener reports.

Texas

And finally, a brief note about ICE operations in the Houston, Texas area. It seems that the ICE agents were conducting a surveillance operation on 170.6750 MHz, N051. The problem is that this has been a long-time US Marshals repeater in Houston.

After some time, someone from the Marshals office came on the air and asked who was using this channel. During the conversation between agents, it was determined that this repeater was in the ICE radios as channel B1. Houston listeners have already identified 168.8250 MHz, N052 as channel B4, and it has been heard with ICE operations in the past.

❖ Mystery Systems Explained

Back in the November *Fed Files,* I reported on a group of UHF frequencies that had federal monitors flummoxed. The frequencies heard were 408.2250, 408.2750, 408.4625, 408.5250, 408.5375, 408.6250, 409.0500, 417.2750, 417.4625 and 417.5250 MHz.

Listeners thought they appeared to be part of a digital trunked system, but all the channels appeared to be keyed up full time with a digital format that no one could decode. There were many suggestions as to what super-secret federal or military agency this system belonged to and what they were up to.

Well, often the truth is simpler than what you might think. I have received information that

these frequencies are, in fact, part of the National Parks Service radio network serving Shenandoah National Park. These mystery UHF frequencies are links carrying multiplexed voice and control data to the VHF repeater sites located around the area. Since they are located in high, mountainous areas, they can be received at great distances. Although they are digital, they are not in the APCO Project 25 format that scanners can receive.

Here is a rundown of the UHF data links and where they are located, along with the VHF voice frequencies that can be heard using your digital scanner:

National Parks Service Shenandoah National Park
http://www.nps.gov/shen/index.htm

Hogback Mountain, VA - control point
171.7000 MHz, N4F9
408.2250 - Data link to Loft Mountain
408.2750 - Data link to Piney Hill
408.4625 - Data link to Fork Mountain
408.5250 - Data link to Massanutten Mountain
408.6250 - Data link to Buck Elbow Mountain

Loft Mountain, VA
166.9000 MHz, N4F9
417.2250 - Data link to Hogback Mountain

Piney Hill - Luray, VA
173.6750 MHz, N4F9
417.2750 - Data link to Hogback Mountain

Fork Mountain, near Banco, VA
172.6750 MHz, N4F9
417.4625 - Data link to Hogback Mountain

Massanutten Mountain, "Big Mountain" near Newport, VA
173.7625 MHz, N4F9
417.5250 - Data link to Hogback Mountain

Bucks Elbow Mountain, near Crozet, VA
172.6500 MHz, NF9
417.6250 - Data link to Hogback Mountain

In addition to these links used by Shenandoah National Park, the Chesapeake & Ohio Canal National Historical Park is utilizing UHF links as well:

Chesapeake & Ohio Canal National Historical Park, DC/MD/WV
http://www.nps.gov/choh/index.htm

Lambs Knoll, Boonsboro, MD
170.3625 MHz, N4C5
408.5375 - Data link to Great Falls
409.0500 - Data link to Cacapon Mountain

Great Falls, MD
169.6875 MHz, N4C5
415.0250 data to Lambs Knoll

Cacapon Mountain, near Omps, WV
166.3500 MHz, N4C5
417.9750 data to Lambs Knoll

In the same column, I noted that some of these same types of digital transmissions have been heard in the area north of Denver, Colorado. The frequencies heard there were 407.4250, 407.4750, 407.5000, 416.4250, 416.4500 and 416.5000 MHz.

I would now strongly suspect that these are also digital links, most likely associated with the Rocky Mountain National Park operations. I have not seen any confirmation of this from local listeners yet, but would welcome any updates.

❖ UHF Allocations

As the year 2009 drew to a close, there were more changes noted to some federal UHF radio systems across the country. In some cases, these changes appeared to be related to the new federal channel plan for the 406 to 420 MHz band.

For many years this band had no standard frequency offset for repeater pairs as other bands have. Input and output frequencies were assigned with available frequencies as needed. But the National Telecommunications and Information Administration (NTIA) is re-organizing the federal UHF land mobile band to standardize the repeater pairing.

One place where you can keep track of these changes is in the NTIA *Manual of Regulations & Procedures For Federal Radio Frequency Management* or just simply, the "Red Book." You can download your own copy of the NTIA Red Book at the NTIA web site, **www.ntia.doc.gov/osmhome/redbook/redbook.html**.

In addition to the Red Book, there are a number of other items that are available for downloading. These resources are a great asset to federal listeners in helping lay out the federal bands and how the frequencies are allocated. In this instance, you can read more about the federal UHF allocations in Chapter 4D.

The new channel plan calls for 9 MHz pairs as standard, so a repeater with an output frequency of 408 MHz should have an input 9 MHz higher, or 418 MHz. However, some older UHF trunked systems were assigned frequencies that cannot be paired properly with a 9 MHz repeater offset. Some systems have repeater outputs in the 411, 412 or 413 MHz range, which would put the paired frequency outside the federal UHF frequency range.

Several UHF trunked systems have recently undergone some changes or will be changing soon to meet these new requirements. A couple of years ago there appeared to be some major re-organizing of the UHF federal channels in the Las Vegas area, which is home to two large UHF government trunked systems, the National Nuclear Security Administration and the Nevada Test and Training Range.

In November of 2009, a new UHF trunked system came on line at the Federal Detention Center in Houston, Texas. They had been using a UHF trunked system for quite a while at the Houston FDC, but the system used frequencies that were not compatible with the 9 MHz repeater offset. The old system was using 408.1000, 409.6500, 410.0250, 412.4250 and 414.3000. But instead of re-channeling the old system, they simply put a whole new system on line. The new trunked system information looks like this:

System ID – e726
Base – 407.0000 MHz
Step – 12.5 kHz
Offset – 380
407.0125
407.4125
408.4500
409.4125
410.2125

In addition to the Houston FDC, other federal prison systems may be undergoing frequency changes as well. As I write this column, I have received word of a possible new UHF trunked system in South Florida that might be replacing one of the Bureau of Prisons UHF systems down there. I'll have more information on that in a future *Fed Files* column.

Another UHF trunked system that might be the next victim of re-channeling is the so-called "federal" trunked system in New York City. For many years this system has been operating at less than peak capacity, at least when I have been monitoring it.

This system was originally assumed to be a catch-all trunked system for multiple federal agencies in New York City. But, after being on the air for some time, it became apparent that the only agency using this system was the US Postal Service. There were some suggestions that the Customs Service was utilizing some part of this system, but I am fairly certain that it was the Postal Inspection Service that people were hearing.

In recent years this system has had a fairly light traffic load, and sometime in mid-2009, it appeared to go into what is called "fail-soft" mode. The control channel data was no longer heard and the frequency that would have carried the data channel was heard transmitting a "beep" every few seconds, warning that it had gone into a failure mode. This was still the case through the end of 2009, so I would anticipate that this system will leave the air at some point in 2010.

This UHF trunked system used 413.7000, 415.1000, 415.5500, 415.9500, 416.9500 and 418.3500 MHz. Attempting to use a 9 MHz repeater input on these frequencies would result in some channels being outside the federal assignments.

Why not just change the frequencies on this existing system? In many cases, these older trunked systems are utilizing hardware no longer supported by the manufacturer, so it's simpler to replace the system entirely.

That's all for this installment of the *Fed Files*. We'll be back in May with a wrap up of communications events at Super Bowl XLIV in Miami.

Ernest Robl
ernestrobl@monitoringtimes.com

In the Dispatcher's Seat with ATCS Monitor

Last time, I looked at how modern computer-assisted dispatching had opened the possibility of viewing the dispatcher's track display from multiple locations. No longer do you have to physically stand at the hard-wired dispatching console to see what the dispatcher is doing.

Not only is this view of set-up routes and meets available to railroad personnel at multiple locations (or even multiple railroads, in the case of shared trackage or junctions), but you too can view a simplified version of the dispatcher's console display, showing what routes are set up and where the trains are – or at least which track segments are occupied.

This is thanks to a data communications standard called ATCS (for American Train Control System) adopted by the Association of American Railroads (AAR), the major North American railroad trade association.

Also previously, I mentioned that where there were once poles with multiple "code lines" along railroad main lines, those lines are mostly gone now. Signal information is sent to field locations and back from them in broadcast data packets, which are relayed up and down the line, from control point to control point.

Each control point has a unique address to which instructions are sent and from which equipment status and track occupancy is reported back. In railroad parlance, control points are locations where switches allow trains to take different routes (the entrances into sidings or spurs, or junctions) or where tracks cross at grade and conflicting movements have to be avoided. While control points can be locally managed by personnel in the field, most often this term refers to a location remotely controlled by a dispatcher who can authorize routes and then set the signals that allow trains to travel on those routes.

(In dispatcher-controlled signal systems, the route always has to be set first – assuming there is no active previously existing conflicting route that prevents the new route from being set – and, once the switches are all lined and locked, then the signals are set to authorize the movement.)

Control points can be identified either by a name – "Selma Junction," "Sullivan," or "Saylor" – or simply a milepost number (with its associated line prefix, which makes that milepost location different from any similar milepost location on another line of the same railroad).

❖ Monitoring ATCS

Well, just as you can listen in on voice communications of the railroads, you can also listen in on the data packets sent up and down the line by ATCS.

Of course, the data packets don't do much for you, even if you know the type of instruction or status report being sent, unless you know what the numeric addresses of the control points mean. And even that data does little for you unless you are able to translate the information into at least a basic map that shows you the general layout of the line and the relative positions of the control points.

Railfans and radio enthusiasts can monitor this data traffic two ways with the help of a free program called ATCS Monitor (ATCSM, to distinguish it from ATCS, the basic protocol):

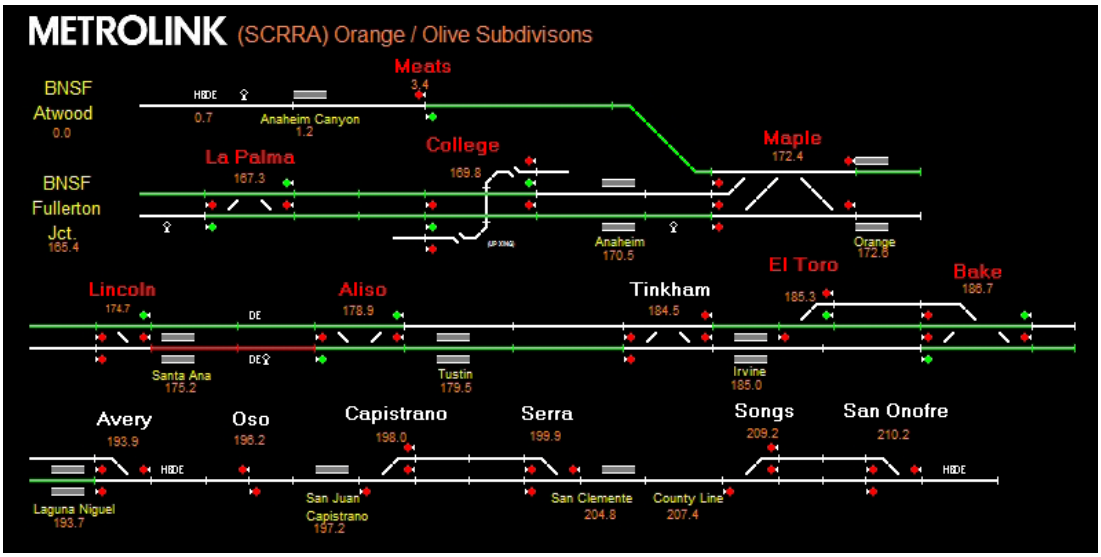
- In the field, you can feed input from a scanner into a laptop computer
- At home, or from any fixed position, you can log into a server that collects data from an entire line

If you are listening in while in the field, you will get information for only a short segment of the line, typically 20-30 miles, depending on terrain. That's because data packets are relayed from control point for only a short distance, to and from a master control point, which communicates directly with the railroad's dispatching system via some type of landline or microwave link.

Of course, if you are at trackside or traveling on a train, you are most interested in what is going on with the line immediately around you.

But, if you want to see what is happening on a much larger line segment, you need to log onto one of the servers maintained by ATCS Monitor supporters.

You can do this from the field, too, if you have mobile broadband access for your portable computer. But, be careful if you pay for this service based on data received, as this program can send a lot of data to your computer over time.



Screen capture of the "dispatcher view" screen for the California Metrolink system: When viewed in color, green lines (and signals) show set up routes; red segments show track occupancy. Some of the ATCSM-mapped display screens are far more complex, but this default screen is a good way to get started in gaining an understanding of how ATCSM works. Traffic on the depicted lines is heaviest during the morning and evening rush hours when most of the commuter trains run.

❖ It's not complicated

Installing the initial program and supporting files on your computer is not difficult.

Access to this data is available through a Yahoo! discussion group. You need to join the group to get access to

the files. And, to join, you have to provide a small amount of information about yourself. The group's home page is at **http://finance.groups.yahoo.com/group/ATCS_Monitor/**. The group has over 5,000 members!

If you do not already participate in other Yahoo discussion groups, you will also need to register with Yahoo.

An independent descriptive site at **www.atcsmon.com/index.htm** also provides basic information about ATCSM. That site provides links to files on the Yahoo site (for which you have to be a group member).

When you download the main program and default supporting files, you get access to dispatching data for the Metrolink lines in California. (These lines have extremely good ATCSM coverage, so you can see the full potential of the ATCSM program.) If you want to access data on other lines, then things get a little more interesting.

First, you need to know that the line you want to monitor is using ATCS. A substantial amount of the signaled lines in the U.S. *do* use ATCS, particularly lines where signals have been newly installed or substantially upgraded in the last two decades. But, there are also major railroad lines that have signals that do not use ATCS, with the dispatchers communicating with control points entirely by other links, such as fiber optic cable.

There's a map showing most of ATCS use in the U.S. at **www.atcsmon.com/whatswhere.html**. However, you need to be aware that this map does not include all lines with ATCS, particularly lines where signals have been added in the last few years. To find out whether there's ATCS coverage on a particular line – and whether the ATCSM group has mapped this line and produced the necessary data files that are needed to interpret the data packets that are sent to and from control points, you need to go into the ATCS Monitor group's database.

Simply because a railroad uses ATCS does not mean that you can monitor this line. If you are sufficiently well versed in computer use and live along the line in question, you can help build ATCS Monitor coverage. The ATCSM group needs listening stations all along the line to pick up the packets and to send them to an aggregating server that then lets participants view data for the entire line. It's the aggregating server that you actually log into to view activity on the line.

Once you've determined you want to monitor a line other than the one provided as a default with the program, you need to download the supporting files for that line – and, you need to configure the program to connect to the appropriate server or servers. (If a line includes a junction between two lines, you may want to monitor servers for both lines, so that you can see trains approaching and going through the junction.)

The ATCSM group has considerable documentation on installing and running the program. And, you can also ask for help on the discussion list or directly from someone you know who is already using ATCSM.

❖ What you see

Okay, you download the program and start it up. You have the requisite internet connection to connect to the server and the connection is active. (A dial-up connection will work fine.) What do you see?

You get two screens, the first of which has lots of scrolling reports on where data packets are being received from and what these data packets contain. Though this screen is useful, it's the other screen that's of interest to most ATCSM users. That screen shows a schematic map of the line – the "dispatcher's view."

On this second screen, provided the line has been mapped and has ATCSM coverage, you will see

- Routes set up by the dispatcher
- Signal indications authorizing movement on these routes
- Switch positions at control points
- Track occupancy

(By mapped, I mean that not only has a schematic map been developed, capable of displaying the status information, but that supporting data files contain lists of control points and track segments.)

The first time you see a meet taking place – the first train enters the siding; the mainline route is set up past the siding; and the second train moves past the first, and then the first train gets its signal to leave the siding – it's almost as good as watching a meet take place in the field. Particularly fascinating is watching switches being lined and locked as routes are set up.

It's important to note that the signal indications shown on the dispatcher screen are only either red (for no movement authorized beyond this point) or green. You do not see the more complex signal aspects seen by the crew on the train, which tell it to slow down or to expect to take a diverging route miles ahead.

You will also not see identification of the trains you see moving along the map. On the real dispatching systems, train symbols are assigned to trains as they enter the dispatching system, and that identification stays with the train as it moves through the system. That's handled at the dispatching center by the computers there. The train identification doesn't go out with the data packets that set up routes in the field.

But, if you know a little about operations on a line, you can usually identify at least some of the trains, particularly passenger trains, if you know the schedules and whether the trains are running on time.

❖ Still need to listen

ATCSM is not a substitute for listening to trains on your scanner. Each form of monitoring gives you different types of information and different insights into railroad operations. The voice communications among crews and with the dispatcher provide an additional dimension to the movements you see on the dispatcher view screen.

So, even if you are able to monitor ATCSM in the field, with one scanner feeding data to your computer, you would still want a second scanner to monitor the voice frequencies.

At this point, I also need to point out that running ATCSM in the field is not as simple as just running a cable between the scanner and the computer. Many scanners need some modification to bypass the existing audio (earphone) output, because scanners are designed to filter out data and pass voice communications. In most cases, these modifications are not very complex, simply involving soldering two additional internal connections and installing a second output port in the case.

The ATCSM group has a long list of scanners that can be used to receive ATCS data – and what the necessary modifications are. (Some older scanners may not be able to receive all the frequencies used for ATCSM data.)

❖ Personal experience

I had heard about ATCSM for some time, but it took an invitation to a meeting of a local radio club, where an ATCSM participant gave a demonstration, to really spark my interest. I'm still getting familiar with the system.

The Norfolk Southern line closest to where I live in North Carolina uses ATCS, but ATCSM mapping is still in progress. Yes, there's a dispatcher view screen for the line, but right now there are only a few listening points feeding the server. So, there are a few line segments on which I can see routes, signal indications, and track occupancy – but on much of the map no status information is displayed. As trains leave one of the monitored segments, they disappear off the screen.

I won't go into all the information needed to decode information on these screens; there's online documentation available from the ATCSM group. But, it's worth noting that for segments from which no data is available, the ATCSM dispatcher screen shows all signals as red. So, you get the situation of a train disappearing past a red signal. That simply means that the train has reached the limits of ATCSM coverage for that segment.

I've included a screen capture of an ATCSM map with this text. But, as most of the information on the screen is conveyed by color, you lose a lot by viewing it in black and white in the print version of the magazine, though MTXpress readers have the advantage of seeing the screen in color. A sample static screen is shown at **www.atcsmon.com/screen.html**.

❖ A huge effort

It took a huge effort on the part of many participants to make ATCSM available. I'll look at some of its history and report on some of my further experiences in the future.

But, in conclusion, it's important to emphasize that ATCSM is a read-only application. It does not include any of verification protocols used by equipment in the field to determine if a command it has received is really an authorized command.

If you already have a computer and are interested in trains, ATCSM is worth a look, particularly if there is coverage for an area you are interested in – whether that area is physically close to you or not. If you have the time and skills, you may even be able to help map additional routes or at least set up an additional listening post.

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
kevincarey@monitoringtimes.com

Detecting Sudden Ionospheric Disturbances

Welcome to radio's basement band! This month, we'll explore more natural radio topics, bring you up to date on some experimental work, and present reader loggings of beacon stations.

An article by Jon Wallace titled *Amateur Radio Astronomy Projects*, appeared in the January/February 2010 issue of *QEX*, the experimental-themed publication of the ARRL. In his article, Mr. Wallace describes his participation during the International Year of Astronomy (IYA) in 2009.

Wallace is a science teacher who set out to explore the *non-visual* aspects of astronomy, such as radio astronomy, and the radio effects of Sudden Ionospheric Disturbances (SIDs) caused by solar flares. The article discusses the simple Gyrator II VLF receiver (**www.aavso.org/observing/programs/solar/sid.shtml**) that can be built mostly from Radio Shack parts. (From this web page, simply follow the links for **SID Equipment** to see construction information on this, and other projects.)

The **www.aavso.org** website also contains a wealth of information about SID monitoring and discusses ways of capturing data on a PC for submission to their ongoing studies of SID events. There is also a helpful list of VLF stations (sub-30 kHz) which can monitored for SID events.

SID Monitoring: A Field Report

MT reader Jim Pedersen (Concord, CA) wrote with an interesting report of his SID monitoring activities near San Francisco. He writes: "I have been experimenting in the 0 to 24 kHz spectrum for a number of years looking for Earthquake precursors. A great deal of time was spent searching in the 0 to 45 Hz spectrum for anything that might be related to Earthquakes with little success.

"I decided to move up in frequency and have a listen to the submarine communications between 19.8 kHz and 24.0 kHz using Spectrum Lab software. (My sound card will only let me receive carriers up to 24.0 kHz.) From the San Francisco Bay area, I am able to receive 21.4 kHz (Lualualei, HI), using Spectrum Lab. I have been monitoring this frequency for several months, and all the recordings for each day were virtually identical until 12/18/2009 at approximately 10:50 am. At this moment in time the signal from this station jumped up an additional 8 dB!

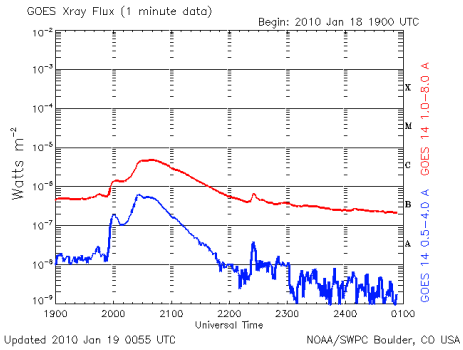
"For the next 20 to 30 minutes the signal slowly faded back to its typical receive level for the day. To help confirm my observation, I went to the website at: **www.solarcycle24.com/index2.htm** and looked at the 'X-Ray Flux' charts, and to my surprise there had been a Solar Flare at 10:50 am – the same time I saw the increase in signal! (*A similar, but later chart from Jim is shown in Figure 1 - K.C.*) I also caught a second Solar Flare on 12/22/2009 at 12:25 pm, but this was a much smaller one.

"To receive the 21.4 kHz signal from Lualualei, Hawaii, I made a 12" coil with 120 turns of wire using telephone quad wire. This 12" coil is connected directly to the mic input of my PC. It was exciting to indirectly detect a Solar Flare with such a simple setup.

"What would it take to have several of your readers from around the world set themselves up to monitor these submarine frequencies and remotely report when they detect a sharp increase in signal strength?"

Thanks for writing, Jim, and for your detailed monitoring reports. SID monitoring is an excellent way to indirectly observe solar activity, and your results correlate with what the "pros" now tell us – that Solar Cycle 24 *finally* appears to be on the rise. This is great news for the HF DXing crowd, who have been waiting a few years for signs of an uptick.

A coordinated monitoring activity is an excellent idea. How about it, *MT* readers? Is this something you would like to participate in? Drop a line to me with your thoughts and ideas for how this data could be collected, compiled and displayed for worldwide viewing.



Winter SWL Fest

Ham operators have the famed destination of Dayton, OH; we have Kulpsville, PA! This town, just outside of Philadelphia, is the location of the annual *Winter SWL Fest* held every year in late winter. This year's event is being held on March 5th and 6th at the Inn at Towamencin in Kulpsville. If you are within traveling distance of Kulpsville, I encourage you to check out this fine event.

There will be forums on many aspects of radio, exhibits, a swap meet, silent auction, and a chance to interact with your fellow hobbyists. There are many options for registration, depending on how long you want to stay and what activities you'd like to attend. Full information on the event is available online at **www.swlfest.com/**. I look forward to seeing many of you at the Fest!

Loggings

Our loggings this month are courtesy of Russ Hill in Oak Park, MI. Russ uses a Kenwood R5000 receiver with a Datong FL-3 filter. His antenna is a Palomar loop. Russ notes that his logging of PBK/363 kHz is most likely a new ID or mis-keying of PBC-365, in Mt. Pleasant, TN, which he hears nightly.

Table 1. Selected NDB Loggings (From MI)

FREQ	ID	ST/PR/ITU	CITY
245	UDG	SC	Darlington
251	PRO	IA	Perry
284	IDL	MS	Indianola
332	DKA	NC	Kenansville
332	FFL	IA	Fairfield
334	LH	IL	Bloomington
344	YC	AB	Calgary
344	ZIY	CYM	Georgetown
350	RB	NU	Resolute Bay
353	DV	IA	Davenport
356	GR	WI	Green Bay
356	HIX	KY	Hopkinsville
356	XE	SK	Saskatoon
359	YQZ	BC	Quesnel
363	PBK	??	*Unidentified*
368	ZP	BC	Sandspit
370	OUN	OK	Norman
375	YZG	QC	Salluit
378	UX	NU	Hall Beach
385	GAI	MD	Gaithersburg
385	QV	SK	Yorkton
385	WL	BC	Williams Lake
387	SPP	CLM	San Andres Island
407	OOC	LA	Natchitoches
526	OJ	KS	Olathe

What the Others are Saying

RDFs Revisited: From time to time we've covered the intrigue of Radio Direction Finding (RDF) receivers, which were once commonly used on boats of all sizes. The website at **www.angelfire.com/space/proto57/rdf.html** remains an excellent place to learn more about these units and to see photos of many classic

models. One of my favorites on the site is the Sperry three band RDF, which reminds me of something out of the *Jetson's* spacecraft.

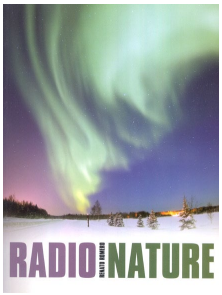
New subscriber Jeff Miller, N2AWA (Victor, NY) wrote to *Below 500 kHz* with a link to an interesting video on RDF receivers. The video shows a Ray Jefferson 660 RDF being put through its paces. What makes this particular receiver unique? Well, for starters, it has an automatically rotated antenna – a rare feature on RDFs. The video shows the antenna in operation, automatically finding a null, and pointing toward the beacon. You can see the video at: **www.youtube.com/watch?v=pW0xBvsSrms**.

Through-Ground Update: James "J.B." Young, KJ4JAE (KY), wrote with an update to his Through-Ground Radio experiments which we profiled in the December '09 issue. He reports that the article sparked quite a bit of interest in through-ground radio, and he has since started a new thread on QRZ forums at **http://forums.qrz.com/forumdisplay.php?f=32**.

J.B. reports that he has also learned about an early experimenter in through-ground radio, Mr. John Taylor (GOAKN), who is considered the modern "father" of this activity. Although Taylor is now a silent key, his work is discussed at length online at **www.g0akn.aerthgroup.org.uk/page10.html**, including the details of an amazing 250-kilometer experiment conducted in 1998!

New Book: Radio Nature

The Radio Society of Great Britain (RSGB) has published a new book by Renato Romero, IK1QFK, titled *Radio Nature*. It takes an in-depth look at the reception and study of naturally occurring radio signals. The book discusses the types of signals that can be heard, obstacles to their reception, types of receivers used, recording and analysis techniques, coordinated listening efforts, seismic precursors, antenna systems, and a host of reference works useful for further study.



Radio Nature is available from many sources, including Universal Radio, 6830 Americana Parkway, Reynoldsburg, OH 43068 (Tel. 614-866-4267), or online from Universal's website at **www.universal-radio.com**. In addition to authoring this new book, Renato Romero maintains a VLF radio website at **www.vlf.it** which is well worth visiting for any longwave enthusiast.

SAQ (17.2 kHz) Broadcast

On December 24th, 2009, the Swedish electro-mechanical alternator station SAQ (17.2 kHz) took to the air for its annual Christmas Eve broadcast. The transmission was started at 0800 UTC. No North American intercepts were reported this time around, according to a preliminary report issued by Station Manager Lars Kalland. However, the station's CW signals were heard very well in many parts of Europe. Full information on SAQ and future transmissions can be found at **www.alexander.n.se/**. (Be sure to click the British flag for the English language version of the website.)

LORAN-C Final QRT

After much discussion and a reprieve given last year, the Coast Guard published a Federal Register notice on Jan. 7, 2010, regarding its intention to terminate transmission of the LORAN-C signal on Feb. 8, 2010. If all has gone as planned (no further reprieves), the clickety-clack signals we've heard for decades at 100 kHz should be gone in most areas by the time you read this. (Some areas operating in conjunction with other countries will continue to operate for the time being.)

The land-based LORAN-C system offered impressive 1/4 mile accuracy, but had been largely outmoded by the development of GPS in recent years, and few navigators used the system anymore. Complete information on the shutdown can be found at the Coast Guard's website at **www.navcen.uscg.gov/Loran/default.htm**.

See you next month!

ANTENNA TOPICS

BUYING, BUILDING AND UNDERSTANDING ANTENNAS

Mike Frye
mikefrye@monitoringtimes.com

Build this UHF omni Satcom Antenna: Part 1

Part 1 will cover UHF satellite communiation basics and antenna design criteria. Part 2 in the June issue will focus on construction and use of the "MT Omni X-wing."

Snagging military comms is one of my favorite hobbies and nothing piques my interest more than signals traveling over 23,000 miles from space to reach my antenna. UHF satellite is a primary mode of communication for US and allied military forces with typical radios having a transmit power around 20 Watts. Some newer handheld transceivers are being pressed into Satcom service with only 5W of transmit power and the antenna is a key part of the system and crucial for reliable communications.

As of this writing, I know of no affordable off the shelf UHF satcom antennas for the hobby market, and checking my favorite auction sites reveals the prices of rare surplus military satcom antennas are at an all time high. What's a satcom hungry monitor enthusiast to do? Well, first we need to learn a few things about UHF satcom reception and see what's required.

Let's take a look at some common antennas used for the military UHF satcom service. The picture below shows several directional types, ranging from a large crossed Yagi for fixed station use to smaller and more portable versions for manpack and hand-held use. There is also a hemispheric omni shown which is used on some vehicles and commo shelters and a vehicular" X-wing" that is of particular interest.

The large crossed Yagi to the far left has considerable gain over most models, which comes in handy when pointing low on the horizon and to better close the satellite link when other stations are using low power or smaller antennas. This particular model is a Dorne & Margolin DM C122 with a maximum gain of 14dBic. (The "ic" references to a circular polarized isotropic antenna.)

The next two antennas to the right are fairly common manpack antennas: Dorne & Margolin, model DM C120, and Trivec-Avant, model AV 2040. These are specified at 6 and 7dBic gain respectively and the Trivec-Avant has an optional snap-on director element set (not shown) that brings the gain up to 11dBic. Centered between these to the right is a very compact (and covert) cross Yagi from Dorne & Margolin rated at 5dBic gain.

All antennas mentioned so far do a good job of receiving UHF satcom when mated with a sensitive police scanner or communications receiver that covers 225-400MHz in narrow FM mode. The drawback so far is that you may need to point these antennas at multiple satellites, depending on your location.

The dome antenna at the right rear is omni directional and is intended for vehicles and commo shelters that must remain in contact despite location or motion. The gain is not so impressive at 2dBic, but it does have a radiation pattern that covers nearly horizon to horizon with fairly consistent performance.

There are usually tradeoffs in antenna design and this one gives up gain for very wide coverage. This antenna is typically used with a 200W amplifier and receive preamplifier to make up for the low gain.

Finally, we get to the magnetic mount X-wing at the bottom right, which is a recent addition to the military antenna arsenal and is primarily used for mobile "satellite on the move" (SOTM). This antenna is rated at 8dBic gain – quite high for an omni.

However, looking at the X-wing with the popular antenna modeling program EZNEC, we find most of this gain is pointed straight up in a wide lobe, and performance drops off as look angles get below about 30 degrees off the horizon. Otherwise, the X-wing works very well and I have used it on the roof of my vehicle while traveling with a hand held scanner listening to Brazilians pirating US satellites. This antenna was an inspiration for our project, and we'll come back to it later in this article.

❖ Reception Requirements

Let's cover some basic antenna requirements for UHF satcom reception. Frequency range for downlink spans from about 243MHz to 270MHz: that's a fairly broad spectrum but manageable. Next is the polarization, which is Right Hand Circular. With some of the linear polarity designs like a basic Yagi you will lose about 3dB of your receive signal right up front due to polarization mismatch. We should strive for a Right Hand Circular antenna.

Searching the Internet reveals many home brew directional UHF satcom antennas such as Axial Mode Helices, Crossed Yagis and a few omni types like the Quadrifiler Helix and Eggbeater. Building most of these requires sharp mechanical skills, scaling dimensions from amateur frequency ranges, finding odd impedance coax for matching or using expensive test equipment to tune various parts of the antenna.

I want to keep this project simple, so many of these designs were ruled out. Another hurdle is where to point some of these antennas once they are built, so an omnidirectional like the X-wing is sounding better as we progress.

I find conflicting information on where the US military UHF satellites live, but there seem to be four major orbital locations which cover the entire globe. Two closely spaced slots sit over the equator roughly inline with the center of the US at 100° W and 105° W, one is centered over the Atlantic Ocean around 22.5° W, one is over the Indian Ocean at 72° E, and the fourth includes three slots over the Pacific Ocean at 177° W, 172° W and 172° E.

Other countries have fleets of UHF satellites and there are many other orbital locations in use besides those listed here. For additional information on satellite locations and frequency information, you might check this excellent site: **www.uhf-satcom.com**.

With the 100° W and 105° W orbital slots being roughly in line with the center of the US, the maximum elevation needed anywhere within the continental US (CONUS) would be about 60 degrees off the horizon when viewed from the southernmost central point in the US near Brownsville, TX. Most other locations in the US will point at lower elevations, especially when looking at orbital slots over the Atlantic or Pacific Oceans.

This brings us back to the X-wing antenna, which works very well for satellites overhead but starts to lose performance as you get very low on horizon. Let's see if we can make our own version with some improvements tailored for the US, Europe and other regions that share a similar longitude.

❖ Our Antenna Project

The commercially made X-wing is basically a set of two cross dipoles fed 90 degrees out of phase to create the desired circular polarity. The dipole elements sit approximately 1/4 wavelength above a reflector (vehicle roof, hood, etc.) to achieve the desired pattern, as verified with the popular antenna modeling program

PARTS LIST

Qty	Description	Notes
1	Aluminum flat stock 1 1/2" X 1/16" X 48"	1/8" thick can be used.
1	3" ABS pipe, 24" long	Available in 10ft lengths for around $5.
2	3" ABS pipe cap	Make sure they have a flat top face.
2	Chassis mount female F connector	See note 1 below
1	Type F all female "Tee" adapter	L-Com BA132 or equivalent.
4	Type F male connector for RG-6	Radio Shack 278-223
1	Adapter, type F male to Type N female	SO-239 or BNC to F adapter as option.
1	RG-6 coax, foam type dielectric, 24"	See note 2 below
1	Hardware cloth or chicken wire 48" X 48"	
3	Wooden 2 X 4, 8ft long	
6	6-32 X 1/2" Phillips screws, stainless steel	
6	6-32 hex nuts, stainless steel	
2	Ring lug, 3/8" hole, #12-14 wire	Radio Shack 64-3040
2	Ring lug, #8 hole, #12-14 wire	Radio Shack 64-3117
1	#14 bare copper wire, 6" long	

Note 1: Look for one with a threaded barrel at least 1/2" long. Radio Shack part # 278-0212 is short, but will work with a few extra assembly steps.

Note 2: If cable specifications are available, choose a velocity factor of 80% +/- 2%. I used Carol brand coax from Home Depot.

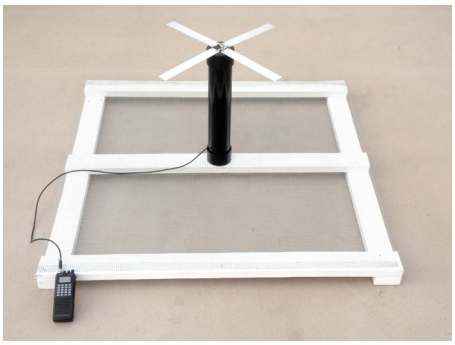
EZNEC.

At 1/4 wave above a reflector, the dipole impedance is not far from 50-ohms. The wide elements are partially responsible for the broad bandwidth, or the full 225 to 400MHz band coverage, for this commercially made antenna. A 50-ohm, 90-degree hybrid divider provides the necessary phase shift between dipoles to create circular polarity and non critical lengths of 50-ohm cables would be used to feed the dipoles

Using EZNEC, we find that moving the dipole elements up near 1/2 wavelength produces a null straight up, but brings the main lobe down to about 40 degrees off the horizon. This lobe is wide enough to cover a more suitable 20 to 60 degrees off the horizon for use in the Continental US and other regions that share a similar longitude. We'll use this dipole height for our project antenna.

We also need to house and feed the dipoles properly to create Right Hand Circular Polarity and to match our 50 ohm feedline to the receiver. A commercially made 90-degree hybrid is out of the question for this project, and a simple coax Tee with critical lengths of coax will be used to feed the dipoles and create circular polarization. At near 1/2 wavelength above a reflector, the dipoles are closer to 75 ohms and would require an odd impedance phasing harness, so here is our first compromise. We'll use 75-ohm RG-6 TV coax for the phasing harness.

For the dipole support, I chose 3-inch ABS



pipe and caps to allow ample room inside for the phasing harness and connectors. The elements are made from 1-1/2-inch wide by 1/16-inch thick aluminum stock, which is readily available at many home improvement centers. These wide elements will provide ample bandwidth.

The antenna needs to sit above an adequate reflector around 48-inch square (or round) and I used 1/4-inch mesh galvanized "hardware cloth" stapled to a wooden 2 X 4 frame with an extra center member to affix the ABS pipe support.

So far, my prototype antenna is pulling in signals equal to or up to 2dB better (measured on spectrum analyzer) than the commercial X-wing antenna depending on satellite location. That's not bad for a few hours' work and less than 1/100 the cost of a commercial version.

I'll cover the detailed assembly instructions and user options in the next installment in June. Above is a parts list so you can start gathering items to build your own *MT Omni X-wing Antenna*. Stay tuned!

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

Marc Ellis, N9EWJ
marcellis@monitoringtimes.com

The BC-344 Restoration Continues

❖ BC-344 Progress to Date

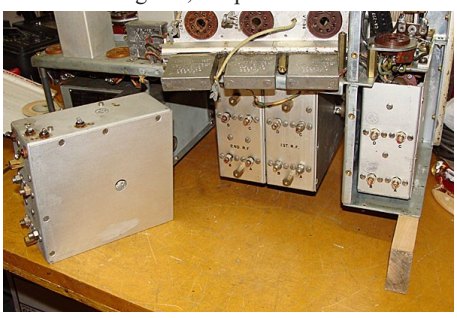
In the last issue, we took a break from the ongoing BC-344 restoration because the work done up to that time hadn't generated enough information for a full column. So, having stopped to catch our breath, so to speak, let's look back at what has been accomplished so far before going on.

The BC-344 is a low frequency (150-1500 kHz) military receiver of late 1930s design. Built like a tank, it is almost an exact twin, physically, to its better-known companion HF (1500-18000 kHz) receiver, the BC-342. Both receivers are a.c.-powered, but were also available as dynamotor-powered d.c. versions (BC-314 and BC-312, respectively) for vehicular use. These sets were used extensively during World War II.

Our BC-344 restoration began in the November, 2009 issue, when we had our first peek at the set, discussing its design and front-panel layout. In December, the tech manuals available for the BC-344 and BC-342 were discussed and we took a look inside the radio for the first time. We also removed a lot of the heavy metal shielding that was blocking access to the electronic components. Finally, we checked the tubes and found all to be ok.

In January we began the removal and replacement of all the set's paper capacitors – especially the rectangular black Micamold units. The chances of those being leaky or shorted some 70 years after installation are very good indeed. This work began at the front end of the receiver.

The first order of business would be to remove and recap each of the cans containing tuned circuits for the first r.f., second r.f. and first detector stages. Each can contains one segment of the receiver's bandswitch. All movable segment contacts are rotated simultaneously by a flat actuating rod, coupled to the bandswitch control, that passes through a slot in each segment. This rod obviously needed to be withdrawn before any can could be removed.



Here the last front-end can is buttoned up and ready to reinstall in its slot. The front-end tube shelf, above, has been dismounted and tilted aside to access the can connections. Note the three rectangular metal-cased capacitors.

The withdrawal turned out to be quite easy, requiring only the removal of one special setscrew to free the rod. Once that was done, it would be possible to drop out the cans after disconnecting all connections to them. But in order to get at some of those connections, it was necessary to dismount the shelf holding the tubes for these three stages and tilt it out of the way.

By the end of this work session, the can for the second r.f. stage had been removed, recapped and replaced. More details on how this was accomplished are in the following discussion of the work session for March.

❖ The First r.f. and First Detector Cans

I had originally intended to disconnect and remove all of the cans at once, remove and replace the offending Micamold capacitors, then reinstall the cans en masse. One look at the confusion of the wiring connections and interconnections to the cans convinced me that this would be a poor idea. The chances of my making wrong hookups on reinstallation would be vastly increased even if were to make reference photographs of the wiring, which I eventually did anyway.

So I decided to take the coward's way out – beginning with the second r.f. can tackled in the January column and continuing, separately with the first r.f. and first detector cans. Removing the connections to the cans was not an easy thing. Not only had the wire ends been wrapped around the connection lugs, but the lugs had been crimped over the wires after the latter had been wrapped.

We can be proud of the care with which we assembled this equipment for use by our World War II GIs – even though it might cause frustration for the 21st century restorer! In some cases, I was able to use desoldering braid and careful manipulation by long-nose pliers to undo a connection. But mostly I found it would be less destructive to simply clip the wires as close to the lugs as possible – especially since the solder seems to have a melting point significantly higher than we are use to today.

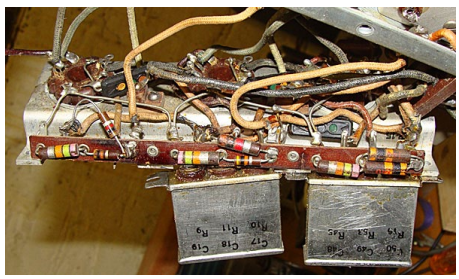
The flat bandswitch actuating rod is visible at top of picture. It is partway along in its journey downward through the switch segments in the three front-end cans.

After I had my first can open (during the January session) and saw how the Micamolds had been installed, I wondered how I could ever remove and replace them! In the end I had to disconnect the capacitors, abandon them in place, and pull a couple of tricks to wire the new units around them. This is fully described in the January column.

After dealing with the problem in January, it became much easier to recap the other two cans in this session. Like the Second r.f. stage can done in March, the First r.f. stage can also contained two Micamolds. But I got a break with the first detector stage can, which had only one.

Complicating the can reconnection process is the fact that there was very little slack built into the wires. And if I didn't have enough room to use my wire stripper, exposing a new bare end became a matter of picking away, little by little, at the tough cotton insulation with cutters and long-nose pliers. Then, too, rarely was the wire long enough for the freshly-stripped end to be wrapped around its intended terminal lug. Instead, it had to be laid over the lug and "pasted" in place with solder.

I have to admit, this is a very poor technique to employ in the restoration of a nice radio. But I was *extremely* careful and thorough about the soldering. And while I doubt that my rehabbed set would be able, any longer, to withstand a bombardment from German artillery, it should be more than reliable enough for civilian SWL use.



The first tube shelf capacitor has been removed and the second pried up to make room for the hacksaw.

❖ The Last Front-End Micamold

With the all cans reinstalled and wired in, it was time to reinsert the bandswitch rod. I had left the bottom covers off of the three cans so that, if necessary, I could observe the progress of the rod and guide it through the slot in each switch segment. But I needn't have worried. The rod lined up perfectly with each slot on its way in and slid through it without requiring any persuasion from me.

The only tricky part of the rod installation was the re-insertion of the special retaining screw. This small screw is located in a hard-to-reach spot and, if lost, would be impossible to replace without junking another set. I positioned the radio so that the screw could be dropped straight down into its socket and in such a way that, if dropped, it would fall onto the bench and not on the floor. After a little manipulation by the trusty long-nose, the screw dropped into position and the threads were re-engaged.

The last Micamold that I know of in the front end of the set was in the oscillator compartment. I had exposed it early on by removing the heavy metal shield that had essentially sealed off the right half of the receiver (as seen from the rear). This shielding was there to prevent the enemy from discovering the radio's position by homing in on radiation from the oscillator – but that's another story.

The capacitor was completely in the clear, and it was a delightfully simple matter to clip and replace it. With that accomplished, I could now replace the shield and the myriad of tiny flat-head screws holding it in place. I could also now reinstall the three bottom covers on the front-end cans.

❖ More Capacitors!

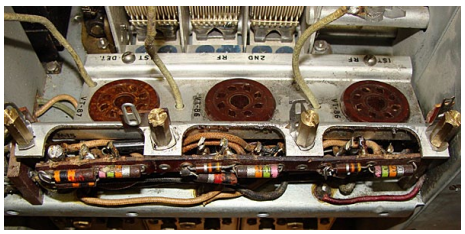
Although I had replaced all of the Micamolds, I still had more front-end capacitors to deal with. These took the form of three oil-filled units at the back of the tube shelf, each containing three 0.1 uF paper caps, the same specification as the Micamolds.

I had my fingers crossed about these – hoping that they would be ok. There is not much more than an inch of clearance at the bottom of the tube shelf when it is fastened in place and the wiring there is extremely dense. It's especially tangled around the capacitor lugs and most of these had multiple connections.

Disconnecting all this would indeed be a nightmare – as would maintaining the correct lead dress when reconnecting replacements. On top of that, I would have to work out an entirely different way of mounting the individual replacement caps and grounding their free ends. (The metal case is the ground on the original capacitors).

With great difficulty I managed to disconnect the leads from one of these nine caps so that I could connect it to my capacitor checker. And I was disappointed to find that the leakage was unacceptably high. What to do?

After giving the situation some thought, I realized that (a) there would be no way to disconnect all capacitors for checking without getting myself in deep trouble, and (b) I didn't want to take a chance on wasting all my work so far by



With the three multiple capacitors cut loose, the reinstalled tube shelf awaits its individual replacement units.

leaving a bad capacitor in place, so (c) I would have to find a way to replace all nine capacitors without disconnecting the wiring from their solder lugs.

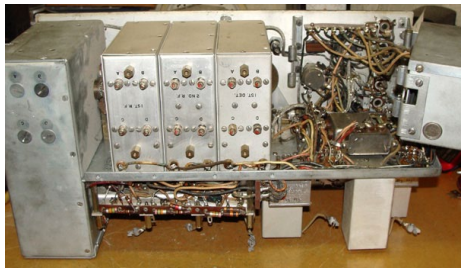
What I finally decided to do seems to have worked out very well so far. Removing the mounting screws from the three cans, I pried each one up to get clearance for my mini hacksaw. Then I cut through each lug just where it enters the can, freeing it up without disturbing the wiring to it. When I was finished, all three cans had been removed, leaving the connecting lugs exposed with all wiring to them still intact.

One lead of each of the replacement 0.1 uF tubular caps will be soldered to an original connecting lug and the cap positioned vertically above it. The free end of each replacement cap will be soldered to a ground bus running horizontally above the row of replacement caps. This bus will be grounded at several points by heavy vertical wires running up from solder lugs that I've installed under the old capacitor mounting hardware.

With the old caps cut off and the new ground lugs mounted, I was now able to place the tube mounting shelf in its proper position and screw it down. But I'm fresh out of new 0.1 uf capacitors, so will have to wait until next time to show you the finished installation.

❖ What's Next

Since I have to send in an order for all the remaining caps needed for this project, I decided to have a look at the other stages of the receiver – mainly the i.f. and audio channels. The wiring for these stages is blocked by the a.c. power supply unit – but the designers of this radio have thoughtfully provided a means of access. Removal of a couple of screws and spacers frees up the power supply so that it can be swung out of the way on a heavy hinge, leaving its connections to the receiver intact.



With the radio upside down and the power supply unit (at right) swung aside, we take a preliminary look at the radio's i.f. and audio circuitry.

And I'm pleased to report that no Micamolds are in evidence. In fact, there are very few paper capacitors to be seen at all. There are a few metal-cased multiple caps, but their connections are quite accessible for testing and possible replacement. So it looks like we are almost home free in the recapping of this receiver.

However, I recall from working on a BC-312 long ago that I will probably find one or more paper capacitors inside the i.f. cans. I hope to check this out in the next work session.

I've often found that even a very complex set will work first crack out of the box after recapping, providing the work is done with great care. I'm hoping that this one will, also, in spite of the various "kluged" fixes I've had to employ. If the BC-344 does pass a smoke test scheduled tentatively for the April issue, we should be able to carry out a realignment and a listening test in May.

See you next month!

"Sky-Wires & Inhalers"
Part 6: Transformers

By Walter Lindenbach

"Okay! Here I am! Let's go!" Chuck sang out as he came into Bill's place.

"Okay, okay, don't push."

Last time, Chuck had convinced Bill that they should make a broad-band high-frequency transformer that would produce a more efficient match from his little 12-foot random wire antenna to a 50 ohm coax lead-in, even though he agreed with Bill that he really didn't need it. A signal increase with no improvement in signal-to-noise ratio would not improve the performance of his radio.

"But," argued Chuck, "with other kinds of antennas, transformers may be needed." And Bill agreed.

They had just finished all the calculations when it was time for Chuck to go home. That pleased him not at all. Hence, his enthusiasm to get going. Now, he pulled a sheet of paper out of his notes folder.

"Just see if I have this right, Bill, will you? We want a transformer that will present an 800-ohm load to my antenna and a 50-ohm source to my co-ax lead-in, and it should have a nice, flat, minimum-loss response from 1 MHz to 30 MHz.

"You suggested we use a ferrite toroid from a company called Amidon, type number FT50-43. The primary: 800 ohms, 320 µH, 24 turns. The secondary: 50 ohms, 20 µH, 6 turns.

"That means that there must be 30 turns of wire, and I calculated the wire size that would fit the 'donut hole' to be No. 16. Then you committed 'veto', saying that No. 16 was much too stiff and that the ferrite toroid characteristics would be changed by the pressure of the wire during winding.

"That was very frustrating. But then you pulled out some plastic-covered multi-colored stranded wire that was 50 mils in diameter, which is about the diameter of No. 16 wire, which would let us wind 30 turns on the toroid.

"That's when your clock got me, and you chased me out."

"Well, that's a bit strong," commented Bill, "but it *was* too late to start winding the toroid. You're saying you think we should start now?"

"You're very perceptive," Chuck groused.

"Okay, this is not the wire we looked at last time. Five strands of No. 16 wire gets a lot thicker when it is twisted, so we have to use something that is thinner. After you left last time, I tried some other wire sizes, and concluded that No. 26 enamel-insulated magnet wire, which is 15.9 mils thick, will do very well."

The wire Bill chose is shown in Figure 1.

❖ Bifilarizing and De-confusulating

"Before we can begin winding, we have to prepare the wires to make a 'bifilar' – actually 'multi-filar' – winding."

"Oh goodie! That's a nice word. Bill, what ever does 'bifilar' – or the other thing – mean?"

"Heh, heh! You'll like this. It means 'twisted'!"

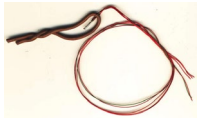
"For Pete's sake, why didn't you say so?"

"Because twisting wires is how to get that way. But the word 'bifilar' refers to the results also. It is the means to reduce leakage inductance.

"So, let's go. First, how long are the wires? The length per turn for this toroid is 0.595 inches, so 6 times 0.595 inches is 3.57 inches. Then leads – we'll say 5 inches long each. Total length – rounding off – 14 inches.

"Now, twisting. The guy who writes this thing – Walt, y'know – told me he found out the effect of twisting the wires loosely or tightly. He made a transformer with wires twisted 3 turns per inch, and then one with wires twisted 8 turns per inch. He said that there was no significant difference.

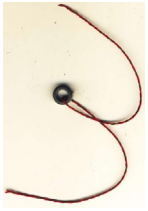
"This is how I twist the wires." Bill took out a variable-speed hand drill and a piece of rubber-covered wire in the shape of a loop with the ends twisted together. He put the twisted ends into the drill chuck and tightened it. Then he took the wires, stripped one end, soldered all five together, and pushed them through the loop. They are shown in Figure 2.



"With the wire loop in the drill chuck, we'll let the drill run *slowly* until the wires are twisted to about 4 turns per inch."

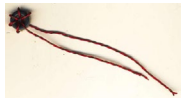
"But Bill, why not just put the soldered end into the drill chuck?"

"Sure, with wire like this. But with No. 30 magnet wire, which is much thinner, it is more convenient with the extra loop, and I thought you should see how that's done, too."



Bill took the wires and toroid, and showed Chuck how to begin winding. It is Figure 4.

"When winding, push as much as you pull. The ferrite material is very hard and the edges are sharp. If you pull hard on the wire, installation will scrape off. And notice the spacing – it's even around the toroid. That arrangement optimizes performance."



Bill finished winding 6 turns and held it up to admire. It Is Figure 5.

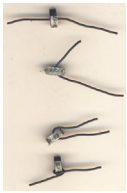
"There! Beautiful, huh?"

"Um – well – yeah, sure," replied Chuck, "but you said six turns. Why only five?"

❖ What's a Turn?

"Don't count so good, huh Sonny? Do you know what a turn is?"

"Well of cour… are you teasing again, Bill?"



"Only a little bit. Have a look at these." Bill took four toroids, and placed bits of wire through them. They are in Figure 6.

"Okay, which is a turn?"

"Humm. Is this a trick question?"

"Nope. But I'll spare you the trouble of guessing. *They all are!* Current in each of those wires passes *through the toroid*. That means it is a turn."

"Oh, so leads passing through the toroid are one turn even if they don't go all the way around, yes?"

"Exactly right," replied Bill, "now let's finish our transformer.

"Next, we have to choose and identify one winding as the primary. Then we have to identify each of the other windings, and connect them together for the secondary."

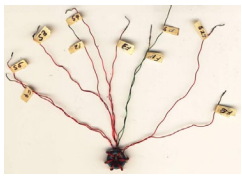
"You said something about colors being useful. Now I see why. I suppose we could use an ohmmeter and label each winding."

"That's the idea," replied Bill.

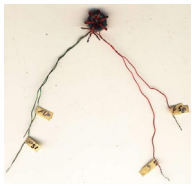
They unwound all 10 leads, one from the other, tinned the ends, stuck bits of masking tape on each and labeled one side S1, S2, S3 (for "start"), and so on, and the other side F1, F2, F3 (for "finish"), and so on, finding the ends of each winding with the ohmmeter.

Bill marked the winding S1-F1, "P" for "primary" at both ends. Then he marked the winding end labeled S2, "S" for "secondary." Then he found the end labeled F2, and twisted it around the end labeled S3. Next, the end labeled F3 was twisted around the end labeled S4, then the end labeled F4 was twisted around the end labeled S5, and finally, the end labeled

F5 was marked "S". The result is shown in Figure 7.



Now the twisted pairs were shortened and soldered together. Bill put a little copper clip on the twisted pair to be soldered, between the solder area and the core, to keep the heat from the core. Now, the transformer-to-be looked like Figure 8.



Finally, Bill put little pieces of spaghetti tubing on the soldered winding-ends and on the primary and secondary pairs. Then he coated them with rubber cement.

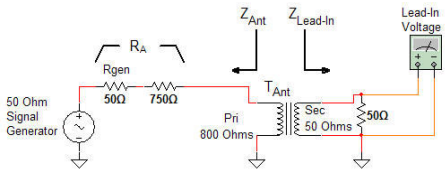
"Notice," he said to Chuck, "I'm using rubber cement. Don't use anything harder on ferrite cores. Two-part epoxy will change the magnetic characteristics of the core. And, I untwisted the primary and secondary pairs at the core, because this is the point where the voltage across a winding is highest, and where any capacitance can cause unwanted resonances.

"Okay! Thar she be. Your new antenna transformer." It's shown in Figure 9.

❖ Proof of the Pudding

"Oh wonderful!" chirped Chuck, "Now, shall we see what it does?"

"You betcha,'" replied Bill. "Here's the setup." And he took a paper pad and drew it. It's Figure 10.



"We have to simulate the antenna as a voltage source as nearly as we can, so the generator has two resistors in series with it. The 50-ohm resistor represents the source impedance of the generator, and, if we add 750 ohms, we have an 800-ohm voltage source which represents the antenna with an 800-ohm source impedance.

"Then, our transformer converts that source impedance into 50 ohms, which reduces the voltage by a factor of 4, which is the turns ratio. Now we want to see if your nice, shiny, new transformer will do that, and if it will do it over the whole HF band.

"One more detail: The absolute maximum efficiency for coupling between a generator and a load is 50%. It occurs when the internal impedance of the generator is equal to the impedance of the load. If these impedances contain reactance as well as resistance, the reactances must be related to each other as conjugates. That simply means that if, for example, the generator internal impedance consists of resistance and inductance, the load impedance must consist of resistance and capacitance, and the inductive and capacitive reactances must be equal at the frequency of operation."

"Yes," Chuck interjected, "but the antenna has a source impedance which is mostly capacitive, and the resistance is certainly not 800 ohms. The lead-in impedance should be 50 ohms – if we can put a nice 50-ohm termination on the receiver end – but that certainly is not a perfect match. What happens now?"

"Pessimist! But you're absolutely right. Remember, we decided on an 800-ohm primary, only because it is difficult to make a transformer that has a flat response over the whole HF band with a higher winding impedance. So, what happens now? We take what we get!"

"Thank you. And what do we get?"

"Well, we'll know that by measuring the transformer frequency response."

At Bill's workbench, they arranged the generator, transformer, and RF voltmeter according to Figure 10, and got these results:

f MHz.	V_{SEC} dBv
1	- 11.8
10	- 12
23	- 12.8
25	- 14
33	- 13
65	- 14
80	- 15
85	- 17
130	- 18

Bill explained that, since the generator was not terminated in 50 ohms, setting it at an output of "0 dBm" meant that it would apply very nearly 0.447V – that's twice the 'terminated' voltage – to the R_A-transformer primary series circuit. Then, with a 50-ohm load on the transformer secondary, the transformer primary impedance would be 800 ohms and the voltage across it would be half the generator voltage, or 0.224 V.

If there is no loss in the transformer, the secondary voltage would be the primary voltage divided by the turns ratio, which is 4, so the secondary voltage would be 55.9 mV, and that is 12 dB lower than the transformer primary voltage.

"Wow!" Chuck exulted, "That's wonderful! So the highest loss in the HF band is 2 dB at 25 MHz, and it will go all the way up to 130 MHz with only 6 dB loss. That's a pretty good transformer! Now, what's the signal strength gain over a direct connection?"

"I said last time," replied Bill, "12 dB. Nope! More good news! The truth is the theoretical improvement is at least 23 dB – that's about 4 S-units! But just remember, that's signal strength only, not signal-to-noise. And now you have to look out for signal overload with strong stations."

"Yes, yes, I understand." Chuck was radiant. "But oh man, just wait until I try it out! Now I have to figure out how to mount and connect it."

"Next time. But –"

"Sure, I know, time to go home. Thanks heaps, Bill! G'nite."

"G'nite."

Walter Lindenbach can be reached at lindenbachw@shaw.ca. If you have questions about making transformers, send me a note. I will reply.

MFJ-8322 Hand-Held Scanner

By Bob Grove, W8JHD

For many years, General Radio and Electronics (GRE) has released products under their own label as well as private-labeled their electronics items, such as Radio Shack© scanners, for the consumer market. Now, a prominent supplier of electronics products for amateur radio, MFJ Enterprises, is marketing some of these scanners under their own brand.

The new MFJ-8322 hand-held scanner is such a product. Sharp-eyed hobbyists will notice the remarkable similarity of this model to the GRE PRS-300. They should; it's identical.

With wide-frequency coverage 25-54, 108-174, 216-512, 764-960 (less cellular), and 1240-1300 MHz, the 8322 is ready for virtually any VHF/UHF communications. Three major trunking systems – Motorola types I and II (Smartnet and Privacy Plus), and analog hybrid systems from GE-Ericsson (EDACS) and EF Johnson (LTR) – are fully supported.

Note that the frequency range includes the new public safety portion of the 700 MHz VHF band, retired from service by the FCC with the refarming of digital TV channels.

The wide frequency range of the 8322 provides comprehensive coverage of U.S. VHF/UHF mobile communications in the aircraft, public safety, business, marine, government, military, weather, emergency, and ham radio services.

The package includes a 62 page manual, rubber duckie antenna, belt clip, adapter for rechargeable batteries, and an AC wall adapter which not only powers the scanner, but will recharge NiMH batteries while in the radio

The radio is powered by either four AA alkaline or rechargeable NiMH cells (not included) or by the 120VAC/9VDC wall adapter.

The multiband rubber duckie antenna does a good job of reception over the radio's wide spectrum; a BNC connector allows the use of a base or mobile antenna when desired.

A word about trunking

For those listening enthusiasts who are just cutting their teeth on trunking, a brief introduction is in order. Older radio systems simply applied for a license and operated on the specific frequencies allocated by the Federal Communications Commission (FCC).

Busy licensees made efficient use of these frequencies, but many authorized frequencies found rare implementation by licensees with little need for them. This was especially noticeable in metropolitan areas, where a law enforcement channel often became overcrowded, while infrequent users like the tax collection department rarely came on the air.

Trunking reduces or even eliminates this disparity by sharing all the frequencies. When a departmental agency applies to the FCC for a trunked system, the users are awarded a pool of frequencies. The police, fire department, dog catcher, road department, and many other departments all utilize the same group of frequencies. When one of the radios is keyed up, an unused frequency from the pool is automatically chosen.

In the early days of trunking, scanner hobbyists were bewildered when they heard a police chase on a specific frequency, then, moments later, they would hear a dump truck on the same frequency! The urgent traffic was hopping back and forth through the frequency pool with each transmission to select a different unused frequency.

New, smart scanners are capable of tracking specific "talk groups" (departments) in the trunked system as they rotate frequencies, so that important two-way transmissions aren't missed.

Spectrum sweeper

One of the handiest functions to be added to scanners in recent times is the ability to continuously sweep the spectrum, listening for unknown transmission frequencies, and monitoring them as well as displaying their frequencies. Once found, these frequencies may be entered into the scanner's memory bank.

This feature comes in handy when driving in an unfamiliar area. The Spectrum Sweeper will capture and identify nearby transmissions with one second from any signal in its frequency range.

In order to prevent the unit from constantly stopping on paging transmissions, NOAA weather broadcasts, and other unwanted signals, the user may elect to remove factory-entered frequencies or lock out discrete frequencies of his own.

Squelch decoder

In radio congested areas, licensees will frequently program their two-way radios with either a continuous sub-audible tone (CTCSS) or a digital code (DCS). This prevents their radios from receiving transmissions from co-channel users, only responding to those signals which contain the inaudible encoding for their own units.

The 8322 may be programmed to do the same thing, receiving only those signals on any particular channel that are encoded for desired reception.

Preprogrammed search ranges

The factory has selected several common services for signal searching: marine, CB, FRS/GMRS/MURS, public safety, aircraft, amateur, and railroad; additionally, one range may be customized by the user. This feature is quite handy, since it allows much faster signal acquisition of communications of interest, rather than having to wait for the scanner to search through its entire spectrum.

Specifications

The 8322 sports a four-row, back lit, high contrast, alphanumeric LCD which displays 16 characters and spaces on each row, showing not only numeric frequency/channel information, but identifying the name of the licensee on that channel as well. The appropriate information is entered by pressing the multi-function keypad buttons.

Up to 1000 separate frequencies may be stored in memory (10 banks of 100 channels each), accommodating up to 10 trunked systems, and 1500 talk groups (10 banks of 5 sub-banks, 30 memory IDs each).

The standard analog AM and FM modes are received, and automatically chosen for the appropriate bands. AM is selected for CB and aircraft, FM for the rest. A mode switch allows manual selection if desired. Digital modes such as the rapidly-emerging APCO P25, widely encountered on federal government channels, are not receivable on the 8322.

FM Sensitivity is average for scanners: 0.3 uV at VHF and 0.5-0.7 uV at UHF (the higher the frequency, the less sensitive the radio). AM sen-

sitivity is 1-3 uV for the same frequency ranges. Since the squelch threshold is 0.15 uV, virtually any readable signal will trigger the squelch, so that the receiver remains silent in the absence of a signal.

IF selectivity – the ability to discriminate between adjacent-channel signals – is good, with -6 dB and -50 dB skirts down +/- 4 and 6 kHz respectively for FM, and 8 and 17 kHz for AM.

Triple-conversion design (380.8, 21.4, and 455 kHz intermediate frequencies) provide excellent image rejection of 60-100 dB depending upon frequency range.

Scan and search speeds are an appreciable 60 and 78 channels per second – much faster than many expensive wide-coverage hand-helds that feature shortwave frequency coverage (10-20 channels per second), but not quite as fast as the competitive Uniden products (100-200 channels per second).

❖ Weather warning radio

The 8322 has a full-function weather radio, allowing the standard FIPS (Federal Information Processing Standard) code entry for your county, and responding with National Weather Service SAME (Specific Area Message Encoding) severe weather bulletins, both in voice and text messages on the LCD screen.

❖ Free upgrades

As enhancements for this model become available, the user may download the upgrades from the GRE website: **www.greamerica.com**. A 3.5mm (1/8") cloning interface is provided

for downloads to and from a PC. An optional computer cable is available as the MFJ-5432 for $29.95.

❖ Final thoughts

While the scanner is larger than some pocket models, the considerable list of functions and features justifies its size. The scanner is roughly 6 inches high, 2-1/2 inches wide and 1-5/8 inches deep, and weighs about a pound with its whip and batteries.

The little 1-3/8-inch speaker provides crisp, room-filling audio with minimal distortion. For listening privacy or unusually noisy environments, a 3.5 mm (1/8") jack is provided for a user's earphone or headset.

The 60-78 channels-per-second scan/search speeds are quite good; obviously, the faster the scanner can acquire a signal, the more likely you'll hear the transmission before it goes off the air. While it would seem logical to command the microprocessor to go as fast as it possibly can, the problem is allowing time for the related circuitry to come up to optimal performance.

The keypad offers tactile response, and the sharp, high contrast LCD provides clear information in sunlight, as well as in darkness, when the display and all the keys are backlit.

Modern scanners have far more programming sophistication than the good old days when all you did was poke the numeric keys to enter a frequency, but we must accommodate the new modes and their requirements, and GRE has done this in their new line of scanners as exemplified by the MFJ-8322.

All in all, the MFJ-8322 hand-held scanner offers excellent performance at a modest price.

MFJ-8322 is $199.95 from MFJ Enterprises, Inc., 30 Industrial park Rd., Starkville, MS 39759. For further information, call toll-free (800) 647-1800, or visit their website at ***www.mfjenterprises****, com.*

GLOBALNET

Exploring the World of Internet Radio and Television

Loyd Van Horn, W4LVH
loydvanhorn@monitoringtimes.com

Internet Radio Caught in Royalty Debate

You would think that sometimes it is just better to walk away when you make a deal, but Internet radio folks don't seem to get that message.

Fresh off a compromise to reduce the royalties that U.S. Internet radio stations have to pay, some in the Web-radio community are jumping into the fight that could force terrestrial radio stations to pay additional royalty fees.

The fight centers on legislation currently before the U.S. Congress that has now passed both Senate and House Judiciary Committees. This legislation would force terrestrial radio stations to pay royalties to the artists of the music they play. Currently, they only pay the songwriter and publishers of the music royalties, leaving the actual artists out of the loop in many cases.

There has already been considerable debate over the issue, with the recording industry and the broadcasting industry rallying the troops on their respective sides. But now, Web-based radio broadcasters are jumping in on the side of the recording industry, saying traditional broadcasters need to pay up.

Tim Westergren, founder of the popular Pandora service, is crying foul to terrestrial radio's seemingly minuscule royalty rates, at least when compared to the rates shelled out by Internet radio stations. He points to his own company's numbers as evidence. Westergren says his company stands to earn $40 million annually, but has to pay out $30 million annually in royalty fees, which is a hefty percentage when compared to the percentages paid by terrestrial radio stations.

A deal was struck last summer to reduce the rates paid by Internet stations, but since Internet stations have to pay both the artist and the publisher, they feel terrestrial stations should have to do this as well.

The bill that is currently before Congress is facing stiff competition, especially in an election year. But with Internet radio stations now jumping on board with the artists, it may just be a matter of time before terrestrial stations start paying more money for their music.

❖ PURE-ly Amazing Radios

As Internet radio continues to grow in popularity and market share of audience, developers and manufacturers are going to be releasing an increasingly advanced array of WiFi-ready radios for pulling in radio stations across the globe.

If you have been reading my column for the past year or so, you have likely seen mention of UK-based WiFi radio developer PURE and their stunning line of Internet radio products. They were being hailed in the U.K. for their innovative designs and practical list of features. Unfortunately for those of us in the U.S., PURE had not yet released their radios in the states. Thankfully, that is no longer the case.

At this past January's CES convention in Las Vegas, PURE announced they were releasing some of their more popular models in the United States. PURE is entering the U.S. market with five models: the Sensia, the Evoke Flow, the Siesta Flow, the Oasis Flow and the Sirocco 550.

Each model brings a different set of features and muscle to the table, from a reinvented basic alarm clock, to a room-filling stereo system with Internet radio at the forefront.

Let's begin with the headliner: the **Sensia**. From all indications, the Sensia was one of the hits of CES 2010, due primarily to its attractive appearance and touch-screen interface. However, it also sports a relatively unique feature: access to applications such as Facebook and Twitter directly from the radio.

This feature is not totally unknown in the U.S. market: Logitech's Squeezebox Radio and Squeezebox Touch have already incorporated application functionality into a WiFi radio. The Squeezebox Radio was released late in 2009, with the Touch now slated for a February release.

But the Sensia is the first radio in the U.S. to put it all together: touch screen interface, application functionality, Internet radio and stereo sound. (The Squeezebox Touch has no speakers and requires users to route audio through external speakers.)

The Sensia won't come cheap, with a suggested retail of $349. However, if you are looking for a modern, sleek centerpiece for your digital home, the Sensia is a great option that combines both functionality with style.

Next up is PURE's **Evoke Flow**, an award-winner and one of the first truly portable WiFi radios to hit the market. As with all of PURE's products, the Evoke Flow is easy on the eyes, with a high-gloss finish and metallic highlights. Its user interface is simple, which makes it perfect for WiFi radio on-the-go. A bit more modestly priced than the Sensia, the Evoke Flow carries a suggested retail price of $229.

If you are just wanting to dabble your toes into the WiFi waters, or maybe are just looking for a reliable Internet radio alarm clock, then PURE has a radio for you, too: the **Siesta Flow**.

The Siesta carries a feature list that any tech-savvy person would find impressive. In addition to its basic functions as a bedside Internet radio, it also has a USB port so you can charge USB powered devices without having to use another wall outlet. (Anyone with an iPhone or iPod Touch will find this useful.)

Don't like waking up to the same thing everyday? Adding an auxiliary input for iPods/mp3 players gives users more options for falling asleep or waking. Or the Siesta Flow also comes pre-programmed with 365 different alarm sounds. Why be jarred out of bed, when the sound of birds can bring you out of your slumber?

At a suggested retail of $139, the Siesta

Flow is not only a great entry-level WiFi radio for the curious, but a great bedside option for the more experienced Internet radio enthusiast.

For those who want an all-weather option for entertaining, to have poolside or just for a rugged WiFi portable option, PURE presents the **Oasis Flow**.

The weatherproof casing and sturdy design make the Oasis Flow a great option to take the beach or just have playing background music during a family barbecue. The stylish, retro look of the Oasis Flow is a nice change from the techno-centric designs most developers are throwing out these days. The Oasis Flow has a suggested retail of $249.

Finally, we come to what for me is the most intriguing product in the PURE-U.S. Line. The **Sirocco 550** combines the audio quality of a small bookshelf stereo system with the functionality of an iPod docking station and Internet radio.

The system retails for a hefty $450, but there is plenty of punch for the price. It has the aforementioned iPod/iPhone docking station, a CD player (for those not ready to ditch their collection of discs yet), an FM radio, auxiliary input, ability to stream audio files from your home computer, Internet radio, and two satellite speakers to pump out plenty of audio goodness – in stereo.

I envision this as being a fantastic option for those looking for an office WiFi radio in their home office or even at work.

All of these radios will be released at various points of the year. I personally am hoping PURE will add the **Avanti Flow** to their U.S. product list. It incorporates an iPod docking station for a sticker price much lower than that of the Sirocco.

❖ The Much-Hailed Apple Tablet

In the stone ages, cavemen drew images on slate tablets. It seems that in the technologically advanced 21st century, we are returning to our caveman roots, in a way.

By the time you are reading this, Apple should have announced the release of their long-awaited tablet computer. I am anxiously anticipating details of the design, features and sticker price on a product that could really revolutionize personal computing. Looking like a larger iPhone (or smaller MacBook, depending on your perspective), the Apple tablet computer will open the door for applications and truly mobile computing to an even larger cross-section of consumers.

As a member of the iPhone-nation, I am practically frothing at the mouth at what an "iPad" will bring to the table. There is already speculation that the tablet would run on Verizon's 3G network to access the Internet (geez, I just switched to AT&T), but could also do so from a WiFi hotspot.

What will it hold for Internet radio enthusiasts? The iPad will almost definitely have an earphone jack, but speakers like those found on the iPhone would also be nice. Likely, Internet streaming will be done on the tablet much like on the iTouch and iPhone, through the use of third-party apps. I am hoping that the iPad – being a device used for productivity, not just serving as a bigger iPod – will also allow for these apps to be run in the background. That way you could continue working on whatever you want while your favorite Internet radio station streams in the background.

Rumors as of press time have the iTablet running around $499. This places it considerably below the cost of a MacBook, but should allow much of the same functionality. (There are rumors it will be running at least some form of the Mac OS, which would be fantastic, especially if it is still compatible with Windows-based laptops.)

❖ What CES 2010 Taught Us

All of the new technology and products coming online in 2010 and beyond have one thing in common: interconnectivity. For those who were afraid of the day that your gadgets and devices would be able to talk to each other, you may want to find yourself a digital-free place to hide.

Your TV and computer are going to be linked. Your cell phone and your car are going to be connectable. Everything is going to be wired to the Internet, and all of it is going to have Internet radio compatibility.

The new televisions that will be released in coming years are going to have apps that allow for Internet radio streaming. So when you fork over half of your annual income for a 3D television, at least you will also be able to listen to Internet radio, too.

Your automobile will also be Internet ready, with automakers like Ford announcing they are turning your vehicle into a WiFi hotspot so that you can stream Internet radio in your car without having to use your cell phone (which is pretty much how it works today).

Your cell phone will become an increasingly important component of your digital life, and Internet radio is going to be right there along with it.

In the 1980s, MTV revolutionized the way we listened to and viewed music. In 2010, Pandora is doing the same thing, as much of these new technological advances are going to involve Pandora as their primary music outlet.

There is talk of all of your household appliances eventually being online-ready. Many new refrigerators are already coming Internet-ready, but how about an oven that can download cooking times for various recipes while playing your favorite Pandora station? How about a web-cam built into your television so you can video chat with friends all over the world? How about a water-proof panel in your shower or on your bathroom mirror so that you can listen to the radio or watch the news while you get ready for work?

All of these are either in the works or are rumored to be in the works for the coming years. Some are even already on the market today. Your home is going to be completely wired and digital, and components are going to be connected to each other.

For Internet radio enthusiasts, what this means is that tuning in any radio station on the Internet will be as easy as it is now for you to tune in your favorite local radio station – no matter where you are.

GlobalNet Links:

Radio royalty debate continues in Congress - **www.forbes.com/2010/01/08/radio-internet-royalties-business-beltway-radio.html**

Sensia review - **www.pcworld.com/article/185987/sensia_internet_radio_gets_colorful_new_face.html**

PURE U.S. division - **http://pure.com/us/**

3D televisions to include Pandora support - **www.mercurynews.com/top-stories/ci_14137147?nclick_check=1**

CES Shows Internet of the future - **www.cnn.com/2010/TECH/01/11/mashable.ces.wrapup/**

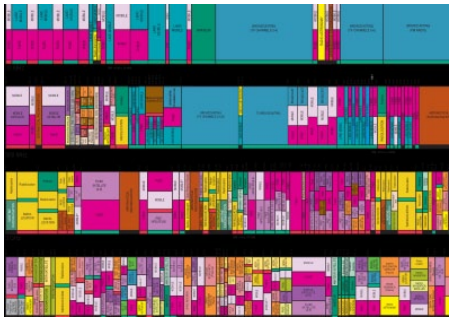
What's NEW

Tell them you saw it in Monitoring Times

Need Frequency Allocations Information? There's an App for that!

If you own an iPod Touch or iPhone and you need to have the latest RF Radio Spectrum allocations at your fingertips, there is an application for that at the iTunes Store.

Allocations, an iPhone and iPod touch application, is your pocket guide to radio frequency spectrum allocations for all generations of the iPhone and iPod Touch (requires OS 3.1 or later). This app is fully functional online or off and has the entire Table of Frequency Allocations (all allocated frequency bands 9 kHz - 275 GHz) available for query.



This app also provides footnotes for each service in each band and presents the full text of the footnotes that are relevant (and only those footnotes). No more flipping back and forth through hundreds of pages in allocations documents to get the information you need!

The *Allocations* app presently contains allocation data for the United States (Federal and non-Federal) and all three International Telecommunication Union (ITU) regions (Regions 1, 2 and 3). It displays both primary and secondary allocations.

Allocations is useful for anyone interested in radio emissions, including satellite communications engineers, regulatory agency workers (FCC, NTIA, ITU, NSF), telecommunications consultants, telecommunications lawyers, amateur radio operators (hams), shortwave and scanner listeners, wireless telecommunications workers and others. Allocations v1.0.6 sells for $6.99 through iTunes Store.

This is an interesting app for the radio hobbyist who wants to be well informed about the radio spectrum and it is a good first start. I would like to see some additional frequency allocation information and frequencies (such as ham bandplans, marine and aeronautical bandplans, etc) in future updates.

Allocations . . . the entire Table of Frequency Allocations at your fingertips.

NCVEC Releases New Technician Class Question Pool

The Question Pool Committee (QPC) of the National Conference of Volunteer Examiner Coordinators (NCVEC) released the new Technician class (Element 2) question pool on January 4. This new question pool will become effective for all examinations administered on or after July 1, 2010; it will remain valid until June 30, 2014.

The current Technician question pool that became effective July 1, 2006, will expire June 30, 2010. The new Technician pool contains approximately 400 questions, from which 35 are selected for an Element 2 examination; it will contain graphics and diagrams, something new for this element.

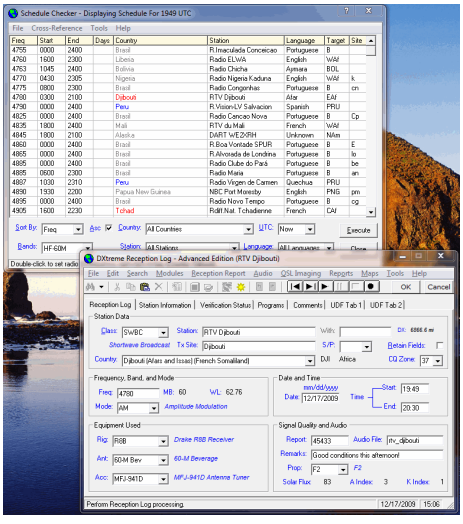
The current General class question pool was effective July 1, 2007, and is valid through June 30, 2011. The current Amateur Extra class pool was effective July 1, 2008, and is valid until June 30, 2012.

New Version of Popular Logging Program

DXtreme Software™ has released a new version of its popular logging program for radio monitoring enthusiasts: *DXtreme Reception Log – Advanced Edition*™ version 6.0.

Reception Log lets you log all kinds of stations – radio stations, television stations, broadcast stations, utility stations, amateur radio stations, and more! And it lets you log stations across the entire radio spectrum – from long wave, to medium wave, to shortwave, and beyond!

Reception Log's Transmitter Sites module comes populated with coordinate information for hundreds of transmitter sites around the world. When you enter a log entry for such a site, Reception Log calculates the distance between the station you monitored and your QTH (if your latitude and longitude are specified in preferences) and displays that distance in the DX field on the Reception Log tab (in the unit of measure specified in Preferences). When new transmitter sites register with the ITU, you can easily add them to the transmitter sites module.



DXtreme Reception Log also provides 22 fields that you define for whatever purpose you desire. These user-defined fields (UDFs) are spread across two tabs that you can also define. Log entries can be searched by UDF and each UDF is the subject of a performance and stations report.

Like other logging programs, DXtreme Reception Log lets listeners and DXers log the stations they've heard. But unlike other logging programs, Reception Log provides multimedia and advanced functions that can add a new dimension to logging activities.

One of the more interesting features of this program is the Schedule Checker™ facility. This feature lets users import schedules from the EiBi Web site and display schedule data according to the filter criteria they specify. Users can filter schedule information by band (LF, MF, and HF), country, station, time, and language. They can also sort schedule information by frequency, time, day, country, station, language, target, and site.

For each schedule item, the Schedule Checker checks the Reception Log database and lets users know by means of user-configurable display color whether the station is needed to log or verify a new country.

The Schedule Checker also lets users:

- Tune their radios to the schedule frequency by double-clicking a schedule item. (Rig control features are provided through integration with Afreet Omni-Rig or Simon Brown's Ham Radio Deluxe.)
- Start a log entry for a scheduled station by right-clicking the schedule item and clicking Log Scheduled Station on the shortcut menu. The main Reception Log window appears with logging information pre-filled.

The schedule checker has a separate options dialog box that lets users indicate whether verification status should be based on QSLs only, the presence of audio files they've recorded, or both. Plus, it lets users specify color attributes for country status indication.

Another interesting feature of this logging program is the multimedia function. This program features an embedded audio facility that lets users create and maintain an audio archive of stations heard.

The program also features an integrated QSL imaging™ facility, which lets users scan the physical QSL cards they receive from postal mail and also capture the electronic QSLs they receive over the Internet. Reception Log saves both types of QSLs as digital images that users can view at any time.

The program also includes the following more advanced functions:

- Creates customized reception reports that users

can send to stations by post and e-mail.
- Obtains and saves the solar flux, A-index, and K-index values in effect at the time of reception. Users can run reports on this information later.
- Integrates with Afreet Omni-Rig (**www.dxatlas.com/OmniRig/)** and Simon Brown's Ham Radio Deluxe (**www.ham-radio-deluxe.com/**) – both free-for-amateur-use rig control programs available on the net – to retrieve and set the frequency and mode between Reception Log and supported radios.
- Produces reports that track the performance of the user's monitoring station, and can FTP those reports to user-provided Web space. FTPing reports to the web enables users or their friends to access stats remotely.
- Backs up database, QSL imaging, and audio files to two locations automatically whenever users close the program.
- Provides support for monitoring amateur radio operators:
- Reception Log retrieves call sign and address information for monitored amateur radio operators from the optional Buckmaster™, HamCall™, or HamCall.Net™ service.
- Sends automatic eQSL requests to monitored amateur radio operators via the popular eQSL.cc Web site.
- Includes templates and scripts for producing amateur-specific reception reports to be sent by post or e-mail.

The DXtreme Reception Log - Advanced Edition - includes two help systems:
- Embedded HTML procedural help
- Context-sensitive *What's This*? Help

It also provides access to the Internet-based DXtreme Reception Log Information Center for late-breaking news and instructions.

DXtreme Reception Log - Advanced Edition runs in 32- and 64-bit versions of Microsoft Windows® 7, Windows Vista®, and Windows XP. It retails for $79.95 USD worldwide for electronic distribution. Pricing for CD versions and upgrading users is available on their website. All prices include lifetime product support by Internet e-mail.

For more information about DXtreme Reception Log - Advanced Edition V6.0, visit **www.dxtreme.com**.

DXtreme Software is based in Nashua, New Hampshire. The company produces powerful and easy-to-use logging applications for all kinds of radio enthusiasts from LF, MF, HF, VHF, and UHF DXers (and listeners) to amateur radio operators. Contact Bob Raymond, NE1I at *bobraymond@dxtreme.com* for more information.

Swift's Weather Defender 1.1 Alerts Give Weather Enthusiasts an "Edge"

With the spring severe weather on the horizon, you might want to beef up your ability to stay informed of your current weather conditions. SWIFT Weather's new easy-to-use weather software – Weather Defender 1.1 – allows users to track weather threats in real-time and better prepare for whatever conditions Mother Nature can throw at you.

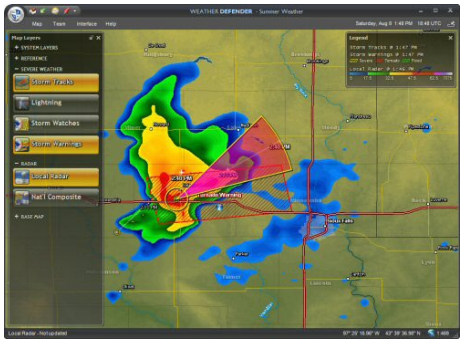
Weather Defender 1.1 provides immediate customized severe weather alerts for users' specified geographic areas through an on-screen computer monitor display, an audible alarm, e-mail message, or by SMS text to any mobile handheld device.

Several products can inform people of changing weather conditions. However, few provide the type of advanced notice, robust customization options, and life and money-saving features that SWIFT Weather's latest product, Weather Defender 1.1, can offer.

With Weather Defender's innovative Alert Perimeter technology, you'll be the first to know when severe weather threatens your home, business, or community, giving you time to prepare before it's too late. Alert Perimeters can be easily customized to target your specified locations, as well as the types of weather that interest you, from heavy rain and lightning to tornadoes and winter storms.

You also control whether you'll receive your customized weather alerts through an on-screen display on your computer monitor, or with an audible alarm, e-mail message, or SMS text to your PDA or cell phone.

Weather Defender combines remote alerting with unique first-person visuals, all in one software application. Log in any time of day or night to see the weather situation for yourself with detailed weather graphics and state-of-the-art tracking features. Weather Defender connects your home computer to a powerful national network of radar stations and weather satellites. You'll have access to the latest technology to protect you and your family from hazardous weather.



This software has a wide variety of industry- and activity-specific weather maps. You can load alternate weather maps to monitor different kinds of weather for different activities. Weather Defender comes pre-packaged with summer weather and winter weather maps:
- Summer Weather – Default standard map with radar, satellite, lightning, severe storm warnings, and other layers designed to keep you in-tune with rapidly changing summer-time weather threats.
- Winter Weather – A map designed for tracking winter-time weather threats including combined rain/sleet/snow radar imagery, blizzard and ice warnings, snowfall measurements and more.

Additional maps may be downloaded after purchasing, including these:
- Pilot Weather – A map with aviation-oriented layers such as airports, METARs, flight rules, visibility and weather fronts.
- Marine Weather – A map with nautical layers like sea buoy stations, wind speeds, wave height and water temperature.
- Ranger Weather – A map with unique layers such as national parks, wildfires and forest fire detections, and earthquakes.
- High Contrast Weather – An alternate version of the default Summer Weather map, but in high-contrast colors for easier viewing.
- Radio Weather – For the radio hobbyist or professional, this map integrates weather with Amateur Radio data, like repeater towers, APRS positions and local storm reports.

Weather Defender 1.1 is compatible with Windows 2000/XP/Vista/7 operating systems. The Residential Edition is $29.95 per month plus activation. The Commercial Edition is $49.95 per month plus activation. For more information and a free 7-day trial of Weather Defender 1.1, visit: **www.weatherdefender.com/**

Iridium Unveils Smaller, Lower-cost Satellite Data Transceiver

The Iridium 9602 is a full-duplex short-burst data (SBD) transceiver designed for embedded applications in the rapidly growing market for remote asset tracking and monitoring solutions. The product, which is the culmination of a two-year R&D program, has completed prototype testing, and Iridium expects to begin commercial deliveries in June.

"The smaller, lower-cost Iridium 9602 will serve as the data communication engine for a wide range of portable tracking and monitoring devices, leveraging Iridium's global coverage and low-latency, two-way data links," said Don Thoma, executive vice president for marketing at Iridium. "Our service partners are already testing prototypes in their Iridium 9602-based solutions for applications such as tracking soldiers and military vehicles in the field, telemetry from unattended sensors, fleet management, enterprise logistics and supply-chain visibility, as well as personal two-way navigation and mapping devices."

"The matchbox-sized Iridium 9602 is 69 percent smaller, 74 percent lighter and considerably less expensive than the first-generation Iridium 9601 SBD modem, which we designed the Iridium 9602 to replace," said Thoma. "The very small form factor and low power consumption will offer greater flexibility to value-added manufacturers (VAM) and resellers (VAR) embedding the Iridium 9602 into their products."

A unique feature of the Iridium 9602 is its built-in GPS input/output ports which will permit system integrators to interface with an external GPS receiver, using a single dual-mode L-Band antenna for GPS and Iridium SBD, saving the cost of an antenna in their applications.

The duplex data links provided by the Iridium 9602 will permit two-way communications to and from the remote devices, allowing users to reprogram the unit, adjust its reporting intervals and send on-demand queries for specific data updates. It will also enable first responders and search-and-rescue authorities to respond to emergency distress signals from personal location and tracking devices.

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, *larryvanhorn@monitoringtimes.com*.

When ordering or inquiring about the products mentioned in this column, be sure to tell them that you saw it in the pages of *Monitoring Times* magazine.

LETTERS

editor@monitoringtimes.com

Shortwave Coverage in MT

MT's Frequency Manager Gayle Van Horn, wrote the following letter to Joe Wood, who was distressed at the cancellation of the *Global Forum* column and the *Broadcast Logs.*

"Joe, after our last *MT* Readers Survey, it was obvious that readers' favorites had shifted once again, and as always, *MT* listens to their readers.

"In doing so, we decided to drop the *Broadcast Logs* column and devote additional room for the English SW Guide, as well as including a sampling of pages from the *MT Extra*, which covers all non-English broadcast schedules. The complete version is available by electronic subscription. I am the Frequency Manager for both guides, and the expanded coverage has been a tremendous success, and increased our readership.

"In place of the *Broadcast Logs* column, I now post those logs as Blog Logs, to my Shortwave Central blog **http://mt-shortwave.blogspot.com/**. My blog includes pirate news and QSLs, logs and the latest in shortwave news. It is, by the way, fully searchable, and it is updated daily.

"My *QSL Report* column has remained monthly, plus I post additional QSL news and updates I have had to cut for space constraints in the magazine, to the blog…

"Thank you for your letter, Joe. I have always appreciated your correspondence and contributions over the years…"

Gayle Van Horn, W4GVH

Contrary to rumors, *Monitoring Times* has NOT decreased its shortwave coverage. We did cancel a column which simply repeated information already provided free in nearly every club bulletin, on the air, and over the internet. However, in its place, we are now printing selected foreign-language schedules which are now harder to get with the loss of *Passport to World Band Radio*. And unique to *Monitoring Times* is our massive, nearly comprehensive, monthly-updated compilation of all shortwave broadcasts, which is available for download along with *MT Express* for only $19.95 (or $11.95 if you want to retain a print subscription as well).

Reader Craig Poff is glad he made the switch: "I was more interested in the *MTExtra*… If I am working the dials and come across an unidentified station, especially in another language …, I used *Passport's Blue Pages* to quickly track it down (or at least narrow the possible choices). *MTExtra* will do this, too [in PDF]. If I run across a signal at 6150, for instance, I can just 'search' 6150 in Adobe which highlights all occurrences, then it's an easy to cross reference it to the time of day. It can replace the Blue Pages of *Passport*, with the benefit that it's updated monthly..."

While it is true the number of feature articles devoted to SW broadcasting has dwindled during this sunspot minimum, our new features editor, Ken Reitz, is endeavoring to turn this trend around.

MT caters to hobbyists who find radio signals fascinating, including broadcasting (international, domestic, pirate, and clandestine), communications (business, amateur radio, aeronautical, maritime, government and military), and more. We fully intend to continue covering all these topics.

It's a tall order, and we regret it whenever we fail to meet the needs of specific hobbyists, or when we cannot cover every topic every month.

Rachel Baughn

The End of Pirate Coverage?

Mary Villano, KI6OMJ, explained her fascination with the discontinued *Outer Limits* column:

"… my bent is toward the weird, the illegal and the clandestine. …I have heard only two pirate broadcasts myself, but found it thrilling when I heard them! One of them was that Kentucky white supremacist (Anderson?) who hid out in the woods and was finally captured.

"I'm a new ham…I'm not an electronics whiz. I don't monitor aircraft, I don't restore old radios, I find longwave beacons incredibly boring, and I'm not into the minutiae of digital modes. But I love *Monitoring Times*, and I've been a subscriber for years. I like the equipment reviews. Mostly, I like the fact that *MT* covers the entire spectrum of DC to daylight.

"I've never looked for the pirate info on the net – I'm sure there's plenty out there, but I don't have time to search it out. I still think you should include it in your magazine."

Hey, *MT* has always had a soft spot for the weird and quirky. Mary admitted that frequency and time details would be helpful, and recognized that a lot more could be done with the topic: "I would have liked to have read interviews of pirate broadcasters and some info on the history of pirate broadcasting. How about an interview with someone on the other side – an FCC officer charged with tracking down this stuff? Or even more fascinating, how about a nuts 'n bolts discussion of the equipment used in such an operation? How much power is required? What kinds of antennas? (With the disclaimer, of course, that this is an illegal activity and such discussion should not be construed as an endorsement…). A skilled writer could pack a lot of content into one or two paragraphs."

So, if you have news on pirate radio or a weird radio event, send it in and you may see it appear in *Communications*. If you get a pirate or clandestine QSL, send it in and you'll see it in the *QSL Report*. If you dig up a really meaty story, let us know if you're willing to write it up as a feature. There's still room for pirate radio in *MT*.

EDITOR'S SOAPBOX

Seeing is Believing

Recently the rumor mill has been working overtime regarding the direction in which *Monitoring Times* is headed – like the rumor that we have dropped coverage of shortwave broadcasting and pirate radio, that we are becoming a ham radio magazine, and that we are being inundated with complaints and subscription cancellations. None of these is true.

It is the goal in *MT* that each column provides information that isn't already widely available, is of interest to at least a third of our readers, is of practical value to hobbyists, and is well written and easy to understand. It doesn't make sense to continue columns with outdated news, stale formats, lackluster writing style, or little immediately applicable information. We continue to tweak the magazine and conduct periodic surveys in order to best serve our readers.

The last survey garnered excellent response from our readers, and encouraged us to try a few new approaches, but we have no intention of discontinuing coverage of *any* field of radio listening.

We welcome your letters and your feedback, and especially your interaction with our columnists to help them maintain our high standard of service to the radio community.

Rachel Baughn
MT Managing Editor

By the way, if you're just getting interested in pirate and clandestine radio, let me refer you to two excellent guides written by Gayle Van Horn in the 2007 October (*The Bizarre World of Pirate Radio*) and November (*Clandestine Radio*) issues. Call 1-800-438-8155 or email *order@grove-ent.com* on options for acquiring these back issues.

Tick Tock

"Ken, I really enjoyed your 'Shortwave Listening and Art' article (as well as many others!) in the January *Getting Started* column in *Monitoring Times*. I wonder if you've ever heard the minute-long 'Commercial Version of WWV' produced by Douglas Jaffe of LowNoise Productions? If not, you can check it out at **www.mindspring.com/~lownoise/audio/wwv.mp3**

"Quasi-artistic, and not *really* based on WWV sample, but rather hilarious to those of us who've spent decades listening to that familiar station (I've found that I can keep track of seconds *very* accurately due to the mental WWV soundtrack that I can recall at will!)."

Allen Lutins KC2KLC

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

Happy monitoring!
Rachel Baughn, Editor

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Columnist Blogs and Web Sites

These blogs and web pages were created by some of our columnists to better serve their readers. While we highly recommend these resources, they are not official instruments of Monitoring Times.

AMERICAN BANDSCAN
http://americanbandscan.blogspot.com/ - by Doug Smith

FED FILES
http://mt-fedfiles.blogspot.com/ - by Chris Parris

MILCOM
http://mt-milcom.blogspot.com/ - by Larry Van Horn

LARRY'S MONITORING POST
http://monitor-post.blogspot.com/ - by Larry Van Horn

SCANNING REPORT
http://www.signalharbor.com/ - by Dan Veeneman

SHORTWAVE
http://mt-shortwave.blogspot.com/- by Gayle Van Horn

UTILITY WORLD
http://mt-utility.blogspot.com/- by Hugh Stegman
www.ominous-valve.com/uteworld.html

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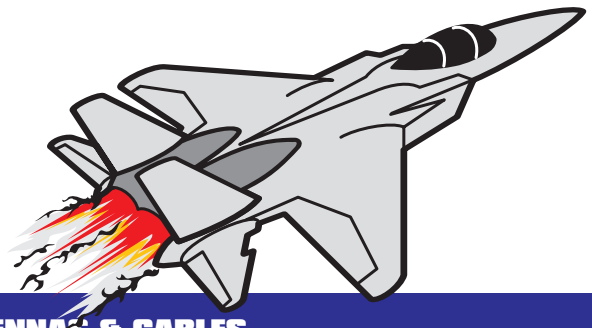

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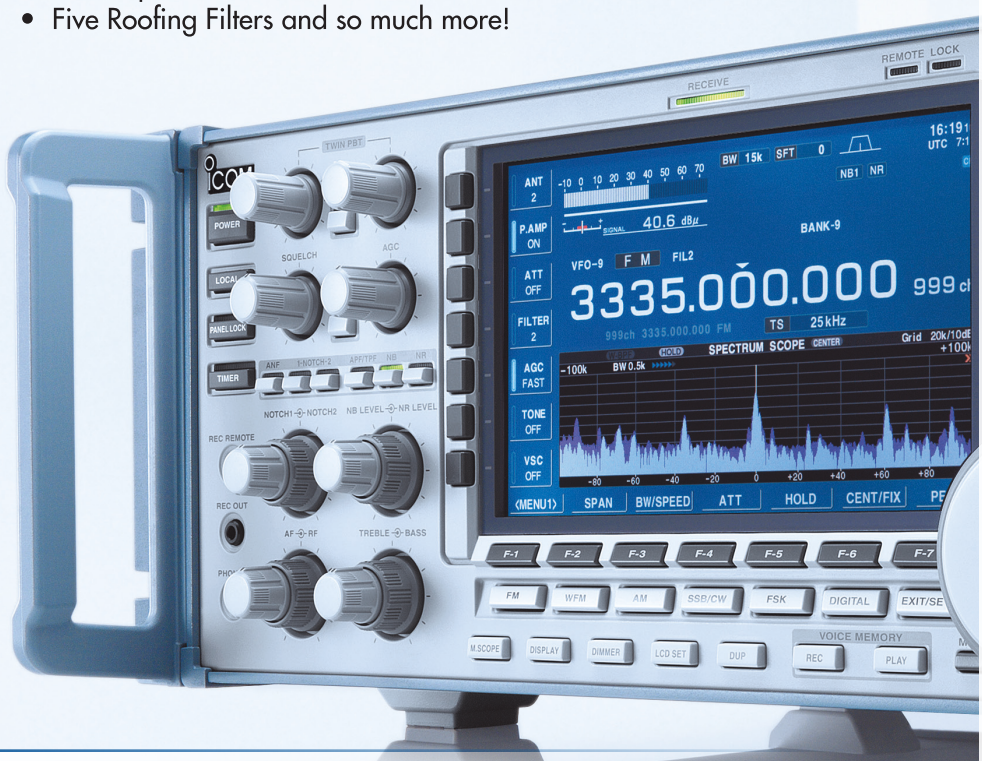

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