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

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THE FUTURE IS DIGITAL

Also in this issue:

- Military Comms on UHF Satellite
- Shortwave Broadcasters Shift to Satellites
- Tuning the International Space Station
- Beginners Guide to Digital Utilities
- Feds Slow Move to Digital

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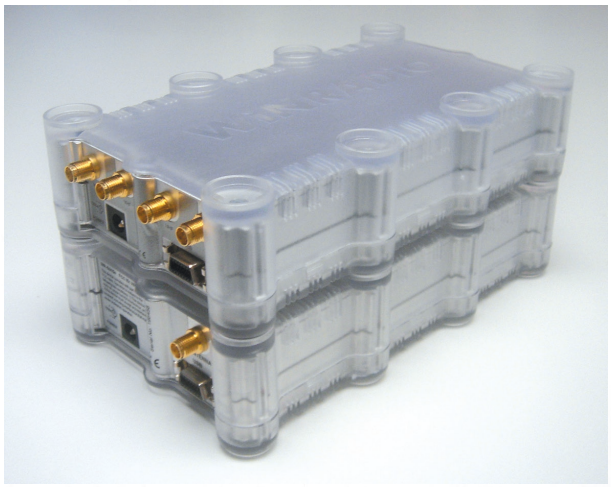
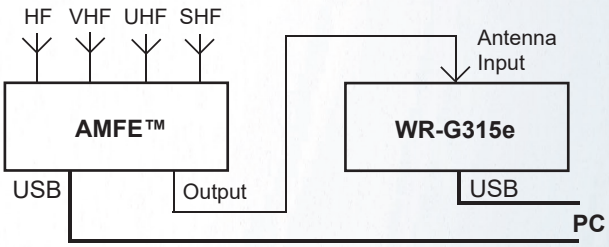


WiNRADiO WR-G315e receiver enhanced with WR-AMFE-3500

The WR-AMFE™ adds additional antenna inputs - and more.



Our latest WiNRADiO accessory redefines the definition of "DC to daylight", yet again. And while it is perfect for the WiNRADiO WR-G315 series of receivers, it can be used to extend the frequency range of almost any VHF/UHF receiver.

The frequency range of the WR-G315 receiver can now be extended up to 8.599 GHz using the "AMFE" option (Antenna Multiplexer and Frequency Extender). This is the first time a receiver of such affordable price range can go that high in frequency.

And you also get an antenna multiplexer thrown in, making it possible to connect four antennas for different frequency bands directly to your receiver: No more hassles with antenna switching!

- Input frequency range up to 8599 MHz
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- Simple installation
- Integrates with WR-G315e and WR-G315i receivers
- Suitable for any third-party receivers (AMFE-8600 only)
- Low-noise linear power supply included
- Application software included
- Programmers' API included to support third-party development

The AMFE™ unit interfaces neatly with the WiNRADiO WR-G315e or WR-G315i receiver. The receiver's application software is able to recognize the AMFE™ unit and expand the ranges of the frequency input and display automatically. Switching between the antennas and tuning the local oscillator for the downconversion is accomplished automatically and fully transparently to the user. The AMFE™ enclosure is similar to that of the WR-G315e receiver and stacks neatly on top or under it.

Two models are available: WR-AMFE-3500 (DC to 3500 MHz) and WR-AMFE-8600 (DC to 8599 MHz). The AMFE™ units are USB controlled, supplied with application software and a linear AC/DC power adapter. The WR-AMFE-8600 model can be also used with third-party receivers, and can be optionally fitted with an OCXO for enhanced stability of 0.01 ppm, to suit the most demanding monitoring and surveillance applications.

Monitoring Times

Vol. 28 No. 1 January 2009

Monitoring the UHF Military Satellites

By Larry Van Horn

Can't find your favorite utility targets to monitor? This how-to-guide for listening to the Milsats will clue you in as to where some of the communications have gone. You might just be surprised at what (or who) can occasionally be heard in the clear on the satellites in voice or digital mode.

On the other hand, unless the satellite is geostationary, satellite monitoring can be a challenge. Each one may require you to use different software and hardware, and a way to follow a moving target. But if you want to follow military communications to their new platforms, satellite monitoring is the way to go. Our lead feature article gives you all the tools you need to get started. The story starts on page 10.

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CHANGE!

The communications and broadcasting world is changing, and if we are to stay connected, those of us who enjoy monitoring are forced to change with them. Whether your favorite listening targets have moved to satellites or still transmit over earthbound antennas, most are moving to new, more efficient digital modes and narrower bandwidths. Others are streaming over the internet. In most cases, you can still listen to them, but it may require some new equipment or software.

Monitoring Times is dedicating 2009 to helping you cope with the new requirements. In this January issue, you'll find a lot of help from our columnists to get you started, but we'd like to hear from us as well. What are your questions? Where can we best help? Do you have newfound knowledge to share? Welcome to the new digital world!

Reviews

At the other end of the spectrum from the professional Collins receiver mentioned above, it is impressive what manufacturers can now build into under-$100 portable radios. The surprisingly sensitive Grundig G6 Aviator is a case in point. Check it out on page 68. It's a perfect traveler's radio for all bands.

This month we continue our look at RadioCom 6 -- the software that does everything including radio control and digital decoding! This time we put it to the test by receiving and decoding a weather facsimile chart. (See page 72.)

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Receives AM Band
Receives FM Band
Receives Shortwave Band
Alarm Clock
Headphone Jack

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WORLD RADIO TV HANDBOOK

WRTH 2009

We are delighted to announce the publication of the 2009 edition of *World Radio TV Handbook*, the best-selling directory of global broadcasting on LW, MW, SW & FM

The Features section has a stimulating introduction to the art of FM DXing, reviews of the latest equipment, and a fascinating account of visits to five All India Radio stations.

The remaining pages are, as usual, full of information on:

- National and International broadcasts and broadcasters by country with frequencies, powers, languages, station addresses, email, web, phone and fax, leading personnel, QSL policy, and more
- Clandestine and other target broadcasters
- MW frequency listings by region
- International and domestic SW frequency listings as well as DRM listings
- International SW broadcasts in English, French, German, Portuguese & Spanish, listed by UTC
- Equipment reviews, *Digital Update* and more
- A further revision of TV by country
- Reference section with Transmitter Site Location Table, Standard Time & Frequency Transmissions, DX clubs, Internet Resources, and much more

Available December 2008

SOME COMMENTS ON WRTH 2008

WRTH 2008 continues to set radio hobby standards. It remains the most respected and authorative radio reference book in the world, and should be in every hobbyist listening post. The dedicated staff at WRTH have once again provided the radio listener with the ultimate guide – *Gayle Van Horn W4GVH, Monitoring Times*

The 2008 edition, the 62nd, is once again the best and most comprehensive ever . . . we highly recommend it – *Radio Netherlands Media Network*

Authoritative information for everyone involved in international broadcasting – *Communications Africa*

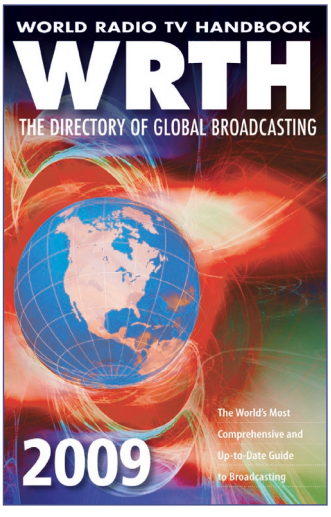
WRTH 2008 remains the best and most comprehensive shortwave guide. No other guide is as detailed. A must for every listener's and amateur's shack – *Hannes Grünsteidl*, Austria

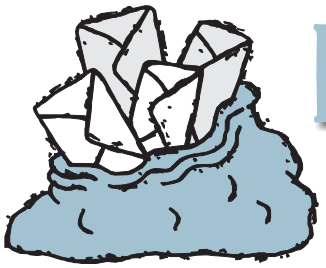
I am very impressed with the *WRTH* these days and the updates are absolutely outstanding – *Hans Johnson, Cumbre DX*

I find *WRTH* to be my radio reference of choice – *Bentley Chan*, Hong Kong

I have never seen such a wonderful informative book, it's like a bible for DXers – *Imran Mehr, Unique Radio Listeners' Club,* Pakistan

I congratulate you on producing such an excellent reference book – *P M Youds*, UK





LETTERS TO THE EDITOR

Happy New Year!

I know many of us view the approach of 2009 with mixed emotions, especially with regard to the economy. I think few will disagree, however, that some of the required adjustments are long overdue. We all need to learn to do more with less. This is not an unfamiliar concept in the radio hobby world: From its earliest history, avid radio listeners were building radios out of whatever they could scavenge, and doing more with less is still an honored tradition in amateur radio operation.

Doing more with less is also the primary goal of the current shift in radio communications and broadcasting toward digital modes: to be able to perform more functions with greater flexibility and interoperability and to serve more users while using less spectrum space. *Monitoring Times* is dedicating 2009 to helping us all become more familiar with receiving and decoding these modes as our world of radio undergoes some major changes.

It's a new world, but it doesn't have to be an unfriendly one. In fact, many are excited to discover there is as much traffic, if not more, to be found on the old familiar radio waves. At least *they* haven't been "digitized"!

A Life-Long Hobby

"I wish you continued success with your magazine. It is the best I have come across. Your magazine has so many articles to try. I never get tired of searching frequency charts you have published and finding success in many. It is rewarding to hear a frequency come alive when entering a number.

"Winters in Colorado are long and cold, so it gives me something to do in retirement. I enjoy remembering just how long I have enjoyed the hobby. A hobby that costs so little to do, but is so rewarding at the end of the day. I average 21 countries a day with limited equipment, even with solar conditions so poor at times.

"My best wishes to you in your search to improve an already superb magazine. And best wishes in these tough times our country is going through."

Willy Wilfong, Longmont, CO

Memories of Mort WB2ZWI

With reference to the *Below 500 kHz* obituary of Howard Mortimer WB2ZWI:

"I'm a long time friend of Mort ... he gave me the desire to go into amateur radio when I was a teenager in high school back in the late '70s. We'd go to many different hamfests together and he'd help me out with my ham radio problems whenever he could, be it 2m mobile antenna or QRM. He even constructed a 2 meter 1/4 wave ground plane antenna for me that I still use 'til this very day, made of welding rods from when he used to work at Crucile Steel back in '85."

David Moon N2RGU, Baldwinsville, NY

On the 'Net

Loyd,

"Your October column on the BBC I found enjoyable and useful. I have long been a shortwave listener but I believe we must change with technology to be able to learn from other countries in the world.

"Not being a football fan (sports is everywhere, why here also?) I did not care for November's column. Looking forward to your future columns."

Robert Swan in MD

Finding Big Band Music

Hi, Ken-

"Just received the November 2008 issue of *Monitoring Times* and took a great interest (as I always do!) in your latest column. For Ken Hunt (K1KWH) who moved and was trying to find ways to tune in Big Band radio stations, one option that you didn't happen to mention was the WiFi radio and computer.

"If Ken has a computer connection in his home, he can listen to literally hundreds of radio stations either on his computer or through a WiFi radio. Currently there are eleven 'Big Band' music stations you can receive through the website: **reciva.com**, and all of these stations can either be played through your computer or through a WiFi radio (two of which are advertised on pages 21 and 23 of the November *Monitoring Times*.

"With the advent of the internet and especially audio on the internet, we no longer need to rely solely on the airwaves to listen to our favorite genres of music!"

Kevin Dilworth, S.J., KD6VNK

"Good advice, Kevin, thanks for the tip. Of course, we'll keep hoping that royalty issues will be resolved; that internet access continues to be unfettered; that stations streaming all this great audio can continue to do so for free and that some sweet day the rest of this country will also have access to high speed internet connections at a reasonable price. Surely all that's not too much to ask?"

Ken Reitz

Radio Comparison

Dear Ken,

"I'm an SWLer and I was reading your article in October issue of *Monitoring Times* regarding the receive section of a Kenwood HF transceiver. I have wondered how the receive sections of ham radios stack up against the top table top HF receivers? I have a Satellit 800 and an AOR3030A using a 60ft sloper Par End FedZ and G5RV. Thanks and have a great day."

Linz via email

"Thanks for writing! Without having used either of the two radios you listed, though I've read a good deal about them in various reviews, I would have to give the edge to your radios for several reasons. High-end SWL radios, designed specifically for listening, typically have wider bandwidth audio that take advantage of what audio fidelity there is and shortwave. That is truly missing from ham transceivers capable of tuning the international broadcast band (my TS-140s has a 2" speaker with no treble/bass or wideband audio position).

"Second, they typically have more memory channels for saved frequencies and you can't have enough for SWLing (my TS-140s has only 31 presets).

"Third, most offer direct keypad tuning that lets you jump all over the place for tuning (my old TS-140s tunes only by band – ham bands, that is – and it's a time-consuming effort to tune the international broadcast frequencies).

"Fourth, features such as clock timer and sleep mode aren't usually found on ham transceivers (but I'd like to see them).

"Of course, no radio performs well without a good antenna and you're using two very good ones. My guess is that you'd be hard pressed to improve the listening post you have, congratulations!"

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

COMMUNICATIONS

by Ken Reitz

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

SHORTWAVE/AMATEUR RADIO

ARRL to FCC: NIX DRM on 40

After discovering that experimental station license WE2XRH was issued to Digital Aurora Radio Technologies of Delta Junction, Alaska, to operate a DRM station in that state on several bands, including parts of the 40 meter ham band, the ARRL fired off a petition to the FCC to re-examine the terms of the license.

At issue were plans for WE2XRH to include operations from 7.10 to 7.60 MHz. The League noted the potential of the 20 kHz wide digital emission and output power of up to 100 kW for causing "unacceptable interference to amateur radio operations" in that band. The FCC agreed and issued an amended license to exclude operations in the 40 meter ham band. The new license allows transmissions to take place from 4.4 to 5.1 MHz, 7.3 to 7.6 MHz and 9.25 to 9.95 MHz.

City Forced to Buy BPL System

What had seemed in 2002 as a link to the future of high-speed internet in Manassas, Virginia, has become a financial nightmare for all involved. Touted at the time by then FCC Chairman Michael Powell and the fledgling Broadband over Power Line (BPL) industry as a viable way to bring high-speed internet to any household connected to the power grid, Manassas took the bait and invested taxpayer funds into its development. According to the ARRL, over the next six years a series of companies attempted to make a go of the system, but last October the city ended up taking over the service. With nearly three quarters of a million taxpayer dollars invested in a system serving only 675 customers, Manassas is uncertain what to do next.

Kitty High Jinks on 40 Meters

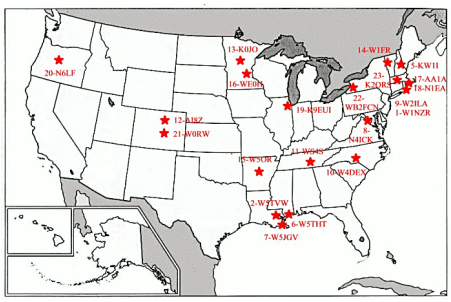
The ARRL reported the details of the mystery of the continuous string of "dits" on 7.0574 MHz, known to CW ops as the "ditters." They were also heard by hams in North Carolina who decided to do something about the interference. Enlisting the aid of the local FCC direction finding station, they were told the source appeared to be coming from a town north of Columbus, Ohio.

The ARRL's Ohio Section Official Observer Coordinator (OOC) then enlisted the help of a team of official observers to pinpoint the location of the offending signal. But, it would sometimes disappear. When it appeared again, two members, OOC Rick Swain KK8O and ARRL Assistant Section Manager Bill Carpenter AA8EY, armed with a list of the 172 hams living in the target area and a portable HF receiver and antenna, sought to track down the source.

Traveling around, they found that the signal peaked to 30 over S9 at one point. Even with a 30 dB attenuator engaged, the signal was soon 20 over S9 and they knew they were at the right place. After locating the ham homeowner at his workplace, the pair was able to gain access to the house and found a large cat lounging near the transmitter and figured the cat had somehow engaged the transmitter and keyer. The ditters disappeared. But, will the cat QSL?

Action on 600 Meters

In a late October press release, the ARRL has asked for reception reports of its 600 meter experimental stations. According to the report, there are more than 20 active 500 kHz experimenters allowed to operate under special FCC-granted experimental licenses from 501 to 505.2 kHz. Operating frequencies are 505.2-510 kHz (WD2XSH), 505-515 kHz (WE2XGR), 501-504 kHz (United Kingdom), and 505-505.2 kHz (Sweden, Germany and the Czech Republic).



U.S. amateur radio stations licensed to operate experimentally on 500 kHz. (Courtesy: ARRL)

Modes currently used by the stations include CW, QRSS (very slow CW) and PSK-31 (a very narrowband digital mode). More information is available on the ARRL web site (**www.arrl.org/news/stories/2006/11/10/101**). Listeners are asked to file their reports at **www.500kc.com** though, as of this writing, the 500kc site had been experiencing difficulties with its server.

SWLers may want to use digital software to help decode the 500 kHz operating modes. A lengthy description of QRSS is found here: **www.qrss.thersgb.net/Receiving-QRSS.html**. A good (and free) program for CW and BPSK31decoding is found here: **www.qsl.net/hamscope**.

DXpedition to Desecheo Island OK'd

Desecheo Island (IOTA NA-095), an uninhabited island covering 360 acres of rocky, arid terrain, lies 14 miles off the western coast of Puerto Rico and is one of the most sought after DXCC entity prefixes (KP5). The island is under control of the U.S. National Fish and Wildlife Service (FWS) and is administered by the Caribbean National Wildlife Refuge complex (CNWR). The FWS has long banned access to Desecheo, because over the decades the island's flora, including the endangered higo chumbo cactus, has been "severely degraded by introduced rats, goats and monkeys."

After years of persistent lobbying of FWS and Congress to allow a DXpedition, the KP1-5 Project has announced that a group of hams, led by veteran DXpeditioners Bob Allphin W4UEE and Glenn Johnson W0GJ, will undertake the task of running the DXpedition. It will only be allowed to operate for 14 days and will take place sometime between January 15 and March 30. Details on this DXpedition may be found at **www.kp1-5.com**. This could be the only chance for hams to work Desecheo for many years.

PUBLIC SERVICE

The Case of the Rolling Helicopter

An article in the Edmonton (Canada) *Intelligencer* told of an Emergency Locator Transmitter (ELT) being monitored by high-flying aircraft and relayed to air traffic controllers in Edmonton. Trouble was that the ELT appeared to be on the ground, which could indicate a downed aircraft. A C-130 Hercules from Winnipeg was enlisted to help find the ELT.

It wasn't long before they noticed that the ELT was moving! Turns out the distress beacon was coming from a Bell H-47 light helicopter being transported on a flatbed truck. Somehow the helicopter's ELT was triggered at the factory just before being loaded for transport.

CHP v. Cell Phone Ops Revisited

Last July 1st a new California law went into effect banning the use of a hand-held cell phone while driving. During the ensuing three months, according to a report from Associated Press, California Highway Patrol (CHP) wrote more than 20,000 tickets. Drivers apparently didn't take the law all that seriously. According to the Insurance Information Network of California, the base fine for the first offense is $20 and $50 for subsequent fines. Additional penalty assessments could increase the amount to $76 for the first offense and $190 for additional offenses. The new law is also seen as a windfall for California attorneys who found themselves suddenly with 20,000 new clients.

Cell Phone Aids Boat Rescue

A report in the Washington *Post* detailed the rescue of five people whose boat had become disabled and was drifting somewhere south of the Chesapeake Bay Bridge. With apparently no on-board GPS or maritime VHF gear, someone on the 28 foot craft managed to make a 911call that reached the local Coast Guard office. The

Coast Guard asked for assistance from the cell phone service provider which was able to track the signal. A rescue craft was dispatched and all ended well.

BROADCASTING

KGO-AM Goes Solar

According to a station press release, KGO-AM 810 San Francisco became "the first major commercial broadcast media outlet in California to reach its listeners by harnessing the power of the sun and reducing its use of the power grid." The station threw the switch on the new system (see photo) during a special broadcast on the morning of October 30 that featured U.S. Speaker of the House Nancy Pelosi.

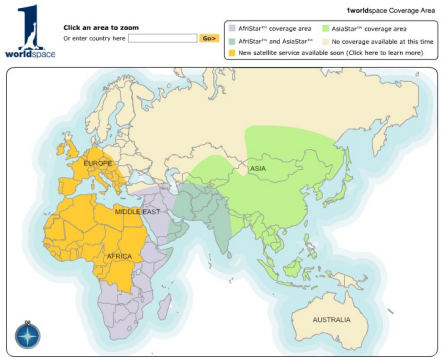
San Francisco's KGO-AM gets help from the sun with its 12 KW solar installation, the first of what the station hopes will be "many new green initiatives." (Courtesy: KGO-AM)

The station said the new solar array was the "first of many new green initiatives by KGO Radio." The solar installation was done as a partnership with KGO, PG&E and SolFocus, a California-based solar power company specializing in photovoltaic installations, and took eight months to complete. The solar power plant, which develops 12 kW of power, is located at KGO's transmitter site beside a major commuter route and is said to be viewed by some 80,000 commuters daily.

WorldSpace in Chapter 11

WorldSpace, the world's first digital satellite radio service, filed for Chapter 11 bankruptcy in late October after it found itself awash in debt, unable to pay even its core workers. According to numerous media reports, the Washington, D.C.-based company was on a long downward spiral leading to the bankruptcy filing that included delisting of its stock from the NASDAQ exchange. The company listed assets of some $300 million, but showed debts of over $2 billion.

Founded more than 10 years before XM or Sirius satellite radio first went on the air, WorldSpace, now known as 1WorldSpace, provided the first digital satellite radio service to Africa, Asia, the Middle East and Western Europe through L-band spot beams on its two geosynchronous satellites. The satellite radio pioneer offered 62 channels, of which much programming originated from studios in Washington, D.C., Bangalore, India and Nairobi, Kenya. Four of those channels had been re-transmitted on XM.



1WorldSpace coverage map, but for how long? (Courtesy: 1WorldSpace)

At a time of iPods, 3G phones and internet radio streaming, 1WorldSpace's Tongshi receiver ($229) and a one-year subscription to programming ($120) has proven a hard sell in the Third World. Even at its current combo-sale price of $250, it's just not attracting listeners.

The difficulties of 1WorldSpace have many considering the future of the U.S.'s own satellite radio monopoly Sirius/XM. With more than $1.1 billion in debt, a continuously shrinking stock price (22 cents/share down from $3.94/share), a moribund auto industry (which makes up the majority of its 19 million subscribers) and a dramatically slowing economy, things look bleak. To help offset the company's crumbling finances, Sirius/XM is said to have shed 50-80 jobs in October and CEO Mel Karmazin is trying to engineer a 2 for 1 reverse stock split and round up investment bankers to try to stay afloat through the economic crises.

Great White Hope

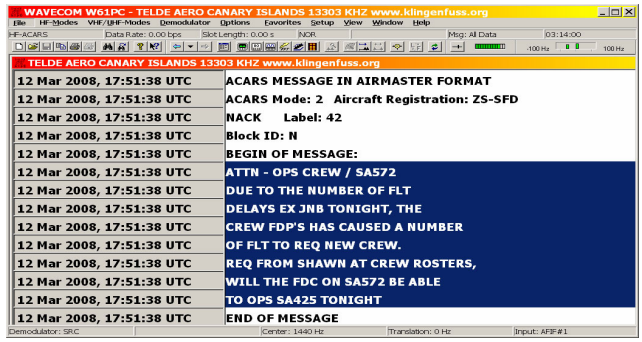
The space between over-the-air digital TV channels, called "white space," was declared by the FCC on November 4, in a rare 5-0 decision, as open territory for unlicensed wireless devices. [Cue images of the Oklahoma land rush.] The potential for entrepreneurial excitement has had hype artists hyperventilating at the prospects for unfettered fortunes to be made. The Google boys, Master-of-the-Universe Bill Gates, and no doubt the geniuses of Apple have had to hire extra staff just to mop the drool from their chins as they contemplate their future prospects.

But, there's a problem. Well, several problems. 1. The economy is in the tank. 2. Consumers are thinking twice about spending on anything. 3. The entire broadcast industry (with their army of Gucci-clad lawyers and lobbyists) opposed this move because they fear such unlicensed devices could interfere with already difficult digital over-the-air TV reception. And the move is also opposed, oddly enough, by churches whose preachers, singers and others make extensive use of wireless microphones which are currently allowed in these spaces.

Touted as "the next big thing," the TV band white space (frequencies between over-the-air TV stations) hopes to be the home to countless new, exciting and, as of now, totally non-existent wireless devices. You could die of old age before you own one. (Courtesy: The Future)

The fight has brought together some interesting bedfellows, including religious heavyweights such as Saddleback Church Pastor Rick Warren and Lakewood Church Pastor Joel Osteen; recording stars such as The Dixie Chicks, Guns 'N' Roses; the NFL, NASCAR, the Walt Disney Company, and Republicans for Choice, among dozens of others including 50 members of Congress. The whole lot will no doubt hold their noses while somehow also holding hands to fight the decision in court.

HF Communication Today
Worldwide Broadcast and Utility Radio Stations



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Monitoring the UHF Military Satellites

A How-to-Guide for Listening to the Milsats

By Larry Van Horn, N5FPW

Imagine digging through the static and noise in the HF radio spectrum to dig out the signal of a military aircraft reporting its position in some far flung point on the globe. Or how about monitoring the communications from a carrier strike group as they conduct operations off the east or west coast of the United States?

There is a large segment of the radio hobby for whom chasing military communications across the radio spectrum is a full time radio adventure. But, there are even bigger, better and higher things than that to monitor in the radio spectrum. For the military monitor, intercepting communications from an orbiting military satellite ("milsat") is equivalent to finding the Holy Grail.

For some radio hobbyists, the mere mention of monitoring the frequencies transmitted from space by any orbiting satellite evokes a certain level of trepidation. Others regularly enjoy filling their speakers with all sorts of exotic communications and unique communications from quite a number of military satellites. As I have written in past pages in *Monitoring Times* and in our defunct sister publication, *Satellite Times*, "if satellite reception was easy, then everyone would be doing it."

So, this aspect of the radio hobby is not easy or for the faint of heart. It will require some study on your part, the purchase of some good quality receiving equipment, and in some cases, even designing and building your own antennas for the various military satellite bands you want to monitor. Depending on the equipment and antennas you have at hand right now, satellite monitoring can be either a snap, or for some, a "mission impossible."

Milsat Monitoring 101

Unlike conventional scanner monitoring – where all you need to do to receive signals across the entire tuning range of your scanner is to put up a wideband type antenna – satellite monitoring isn't quite as straightforward.

Two factors are in play that have a direct relation on monitoring any satellite signals. First, the satellite *downlink* frequencies (signals transmitted from the satellite back to earth) have weaker transmit powers than their terrestrial counterparts in the VHF/UHF spectrum. This requires some sort of gain antenna and/or pre-amplifier to pull in these weaker signals. If we use a gain antenna, that usually equates to a directional antenna that will have to be aimed properly at the satellite we want to receive in order to hear signals from that platform.

Second, satellites are always on the move as they orbit above the earth's surface. Fortunately, most military satellites we are interested in monitoring are in geostationary orbits (GEO) above the equator. From a ground observer's point of view, these geostationary satellites appear to be stationary at one point in the sky, so aiming our directional antenna at them will be easy. We can use a satellite tracking computer program such as Obitron (see resource guide) to work out the angles to point to any of the known U.S. milsats in geostationary orbit.

If it is a non-geostationary satellite, then things can get a bit more complicated. Usually reception of these birds requires an antenna with a bit higher gain. Higher gain antennas have narrower frequency response and narrower antenna beam widths. So we are going to have to steer the antenna and track the satellite for proper reception. This is especially critical on faster moving, lower earth orbiting satellites. You are going to have to accurately point the antenna array at the satellite as it moves across the sky to get a quality signal to the receiver.

Of course, once we start moving the antenna to follow a non-geo bird, the cost and complexity of our monitoring station goes up. And if we want to monitor different bands, more antennas and preamps for those bands will be required as well.

The bottom line here is that one satellite monitoring setup does not fit all. You will have to have a different antenna and possibly a separate receiver/external amplification setup for each satellite band you want to monitor.

A Relatively Simple Setup

I am a firm believer in the KISS (Keep it Simple Stupid) method of radio listening and I really enjoy a challenge. Yes, I could spent hundreds of dollars and purchase a top of the line shack that could hear anything and everything, but what fun would that be? So let's look at a simple, inexpensive, but effective setup that you might be able to put together.

The first piece of equipment for any milsat monitoring post is the receiver. I highly recommend a multi-mode VHF/UHF receiver such as an Icom R7000/R7100, AOR AR5000, etc. This is one area you don't want to short change. You may be able to hear some signals with a general marketplace scanner, but the best approach is to use a multi-mode tabletop receiver.

The next component purchase for your receiving system should be a low noise preamplifier. I highly recommend you look at products offered from Down East Microwave. This is a very reputable company, and they offer quality products for monitors interested in weak signal VHF/UHF communications.

I recently chatted with one of their technical specialists and he said they can pretty much custom build a low noise amplifier (LNA) for any portion of the spectrum you are interested in. For milsat work they can build you a custom preamp for between $75 to $100 depending on whether you want a standard indoor model or an outdoor mast-mounted weatherproof box (recommended). These preamps have about a .6 dB noise figure and provide 17 dB gain. You will have to provide a dc voltage of 10-13 vdc for the operation of these preamps, but they will greatly improve your reception of milsat signals. You can get more information or order one from DEM using the contact information in our resource guide. Be sure to tell them that *MT* sent you.

Another area where you do not want to scrimp is in the coaxial feedline between the antenna and the receiver. This sort of monitoring does not lend itself to using RG-8X from Radio Shack. Get the best low loss coax you can afford and work with. You will find some interesting background information on coax choices online at the Grove Enterprises website on the *Ask Bob* website pages (see resource guide).

Finally we need an antenna. Yes, you can

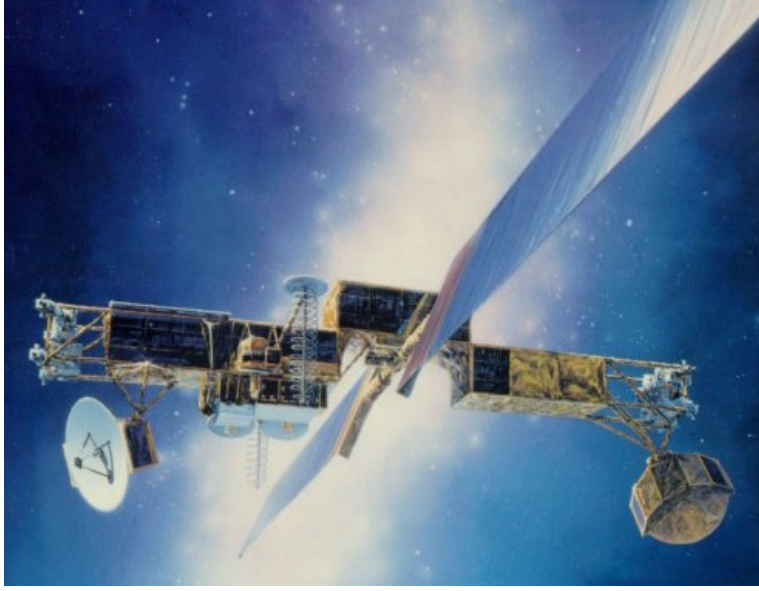
use an omni-directional antenna, such as a ground plane, discone or Scantenna, but you will get a much stronger signal from the birds if you use a directional antenna. I have used several directional antennas over the years and the simplest and best off-the-shelf antenna you can purchase is the Grove Scanner Beam (ANT18). In fact, quite a few of the scanner antennas listed on the Grove Enterprises scanner antenna webpage will work very well also.

If you want to try your hand at rolling your own, check out the plans for a four element Yagi cut for 260 MHz on the German *Satellite World* website (see resource guide for the link).

What's Out There to Hear?

First, let me add a caveat that there is not nearly as much clear voice as there was several years ago. But from time to time, I still run across clear communications on various milsat downlinks.

For instance, as I type this article, the Kennedy Space Center is preparing to launch another space shuttle to the International Space Station. I monitored some of the Eastern Test Range search and rescue units ("Herky 642/643" and the "Wolfden") setting up clear communications on 261.575 MHz using narrowband FM. These transmissions are probably being downlinked by the FLTSATCOM 8/USA-46 located at 15.5 deg west using the Fleetsat Bravo bandplan. This is one of several frequencies in the 225-400 MHz range that have been used over the last few years for this purpose. When not involved with space shuttle launch communications, I have heard other encrypted voice communications on this FLTSATCOM Bravo, channel 6 downlink.



Another FLTSATCOM 8 downlink transponder that has occasional clear comms is 261.450 MHz (Bravo channel 1). Not only have space shuttle launch support comms been monitored on this one, but also clear comms in support of an overseas trip to Europe from the President of the United States (POTUS). Other clear channel comms have been monitored on the following FLTSATCOM - AFSATCOM wideband channels: 260.425 260.475 260.625 261.500 261.525 261.675 261.775 261.850 261.875 261.925 261.950 262.075 MHz.

The Milstar satellites transmit an interesting spread spectrum digital mode nicknamed the "waterdripper." Select the USB mode and dial up 243.785 and 243.825 MHz to hear these unusual transmissions.

There is a lot more to monitor than what I have indicated above. Mixed in with the occasional clear voice communications, you will hear a wide variety of encrypted and data signals transmitting from these orbiting platforms.

TABLE ONE

Military Satellites with known or possible UHF downlinks

GEO Milsats

156.4° West	UFO F3/USA 104 – Bandplan: Quebec orbit inclined 5.7 degrees
150.3° West	MILSTAR 1-F2/USA 115 orbit inclined 6.8 degrees
145.4° West	DSP F14/USA 39 orbit inclined 11 degrees
144.4° West	SDS 3-F3/USA 162 Aquila orbit inclined 2.5 degrees
135.2° West	DSCS 3-F11/USA 148
130.3° West	DSCS 3-F10/USA 135 orbit inclined 2.5 degrees
105.6° West	UFO F6/USA 114 – Banplan: Oscar orbit inclined 4.1 degrees
99.2° West	UFO F5/USA 111 – Bandplan November orbit inclined 4.65 degrees
90.0° West	MILSTAR 2-F6/USA 169
53.1° West	DSCS 3-F14/USA 170 (AOR-W)
49.6° West	DSP F17/USA 105 orbit inclined 9 degrees
39.1° West	MILSTAR 1-F1/USA 99 orbit inclined 5.9 degrees
38.6° West	DSP F16/USA 75 orbit inclined 10.8 degrees
34.1° West	UK Skynet 4F
22.0° West	UFO F7/USA 127 – Bandplan: Papa (AOR-W)
17.7° West	UK Skynet 5C
15.6° West	FltSatCom 8/USA 46 – Bandplan: Bravo (AOR-W) orbit inclined 8.6 degrees
12.9° West	DSCS 3-F12/USA 153 (AOR-E)
10.1° West	SDS 3-F2/USA 155
01.1° West	UK Skynet 5A
06.0° East	UK Skynet 4C (inactive)
09.8° East	DSP F23/USA 197 orbit inclined 3 degrees
11.8° East	Italian SICRAL 1B
16.2° East	Italian SICRAL 1
28.7° East	UFO F2/USA 95 – Bandplan: November (IOR)
29.6° East	MILSTAR 2-F5/USA 164
35.7° East	NATO 4B/USA 98
44.5° East	Russian Raduga 1-5
52.7° East	UK Skynet 5B
53.3° East	UK Skynet 4E
56.6° East	DSCS 3-F8/USA 97 orbit inclined 4.5 degrees
59.8° East	DSCS 3-F13/USA 167 (IOR)
69.3° East	DSP F21/USA 159 orbit inclined 3.6 degrees
70.2° East	Russian Raduga 1M-1
71.1° East	UFO F11/USA 174 – Bandplan: November or Quebec
72.6° East	UFO F10/USA 146 – Bandplan: November or Quebec
75.0° East	SDS 3-F3/USA 162
89.0° East	Advanced Orion 3/USA 171 orbit inclined 3.2 degrees
103.0° East	DSP F22/USA 176 orbit inclined 1.4 degrees
135.0° East	UFO F9/USA 140 Bandplan – Oscar orbit inclined 2.8 degrees

HEO Milsats (Satellite Data System or SDS)

SSC#	Name(s)
25148	SDS 3-F1/USA 137 Capricorn/ NROL 5
28384	SDS 3-F4/USA 179 Nemesis/NROL 1
32378	SDS 3-F5/USA 198 Scorpius/NROL 24 – Bandplan: Delta

Note 1: Skynet 4A (20401), Skynet 4B (19687), Skynet 4D (25134), and NATO 4A (21047) have all been boosted to the geostationary graveyard and are no longer operational.

Note 2: More information is needed on Milstar 4/USA 157 (26715)

TABLE 2

Known Milsats UHF Downlinks and Bandplans

Bernie 3/USA 81 - 258.150 MHz
Italian Sircal - 252.200-252.350 MHz; 258.150-258.300 MHz; 267.100-267.250 MHz
Milstar "Waterdripper" - 243.785 243.825 MHz spread spectrum signal
Milstar - 253.400 253.425 MHz
NATO - 4B 253.950 257.450 MHz 25 kHz bw
Navy NOSS - 250.150 MHz
SDS Bandplan Delta - 243.695-243.760 MHz 12-5 kHz channels
SDS Banplan Echo - 243.855-243.920 MHz 12-5 kHz channels
SDS/DSP - 250.075 250.200 250.225 251.275 251.300 251.325 251.700 252.675 256.375 256.475 257.825 258.775 258.800 260.950 262.675 263.225 263.250 263.375 267.550 267.575 267.800 267.825 268.675 268.700 268.925 268.950 MHz
UK Skynet 4C - 254.200 257.325 MHz
UK Skynet 4E - 254.050 254.150 257.550 257.650 MHz
UK Skynet 5A - 245.800 257.700 261.200 MHz 25 kHz bw
249.480 249.530 249.850 250.130 250.300 10 kHz bw
UK Skynet 5B - 245.200 249.950 253.980 254.8295 257.900 261.100 262.500 MHz 35 kHz bw
249.4395 249.460 249.4995 249.5095 250.1795 MHz 8 kHz bw
UK Skynet 5C - 245.900 249.500 249.550 249.880 249.900 250.100 254.730 256.600 261.100 MHz
Unknown satellites - 248.825 254.950 261.400 261.425 261.975 262.950 267.925 MHz

TABLE 3

FLTSATCOM Bandplan Bravo (downlink/uplink in MHz)

Fleet Broadcast (25-kHz bandwidth)
Channel 1 250.550/SHF

Note: The Fleet Satellite Broadcast Subsystem has 15 subchannels of encrypted message traffic at an input data rate of 75 bps per channel. These subchannels are time-division multiplexed and transmitted in a one-way RF transmission at 1200 bps. The shore-based terminal transmits this data on a direct sequence spread-spectrum SHF signal to the UHF satellites, where the signal is translated to UHF and down-linked to the subscribers. The queued and/or channelized message traffic for Fleet Satellite Broadcast transmission is encrypted and inputted to a time-division multiplexer, where it becomes a 1200-bps data stream and is passed to the transmitter. The structure of the Fleet Satellite Broadcast transmission allows 15 subchannels: eleven 75-bps subchannels for general-service message traffic, two 75-bps subchannels for special-intelligence message traffic, and two 75-bps subchannels for Fleet weather data. A sixteenth subchannel in the Fleet Satellite Broadcast transmission is used for frame synchronization.

Navy Fleet Relay (25-kHz bandwidth)

2	252.050/293.050
3	253.750/294.750
4	255.450/296.450
5	257.050/298.050
6	258.550/299.550
7	265.450/306.450
8	266.950/307.950
9	268.350/309.350
10	269.850/310.850

Air Force AFSATCOM (5-kHz bandwidth)

11	244.045/317.145
12	244.055/317.155
13	244.060/317.160
14	244.065/317.165
15	244.070/317.170
16	244.075/317.175
17	244.080/317.180
18	244.085/317.185
19	244.090/317.190
20	244.095/317.195
21	244.100/317.200
22	244.110/317.210

Note: AFSATCOM 5-kHz channels 11-17 are regenerative, which means that the uplink RF signal at 317-MHz containing 75 bps messages, is converted to baseband; the message bits are amplified, reshaped, and remodulated and transmitted on the downlink at 243 MHz. Processing limits the signal to 75 bps and requires a special radio. AFSATCOM 5-kHz channels 18-22 are non-regenerative as there is no processing done other than the conversion. AFSATCOM is specifically designed for emergency action message (EAM) dissemination, force direction, force report back and Commander-in-Chief (CINC) internetting. The AFSATCOM terminal segment consists of all Air Force airborne and ground communication equipment, required interfaces, and related terminal equipment.

500-kHz Wideband Transponder

23*	261.700/295.300

Wideband Channel 23 Breakout*

23-1	261.450/295.050
23-2	261.475/295.075
23-3	261.500/295.100
23-4	261.525/295.125
23-5	261.550/295.150
23-6	261.575/295.175
23-7	261.600/295.200
23-8	261.625/295.225
23-9	261.650/295.250
23-10	261.675/295.275
23-11	261.700/295.300
23-12	261.725/295.325
23-13	261.750/295.350
23-14	261.775/295.375
23-15	261.800/295.400
23-16	261.825/295.425
23-17	261.850/295.450
23-18	261.875/295.475
23-19	261.900/295.500
23-20	261.925/295.525
23-21	261.950/295.550

Note: Two operating modes are used on these UHF channels. The narrowband mode is limited to a 5-kHz bandwidth (a single 5-kHz channel, or a 5-kHz bandwidth on a 25-kHz or 500-kHz channel). The wideband mode is limited to a 25-kHz bandwidth (a single 25-kHz channel, or a 25-kHz bandwidth on a 25-kHz or 500-kHz channel).

TABLE 4

UFO Bandplans-Frequencies

Fleet Broadcast Service

	November	Oscar	Papa	Quebec
Channel 1	250.350/SHF	250.450/SHF	250.550/SHF	250.650/SHF
Channel 1 Alt	250.400/SHF	250.500/SHF	250.600/SHF	250.700/SHF

Navy Fleet Relay (25 kHz) channels (41 MHz offset)

	November	Oscar	Papa	Quebec
Channel 2	251.850/292.850	251.950/292.950	252.050/293.050	252.150/293.150
Channel 3	253.550/294.550	253.650/294.650	253.750/294.750	253.850/294.850
Channel 4	255.250/296.250	255.350/296.350	255.450/296.450	255.550/296.550
Channel 5	256.850/297.850	256.950/296.950	257.050/298.050	257.150/298.150
Channel 6	258.350/299.350	258.450/299.450	258.550/299.550	258.650/299.650
Channel 7	265.250/306.250	265.350/306.350	265.450/306.450	265.550/306.550
Channel 8	266.750/307.750	266.850/307.850	266.950/307.950	267.050/308.050
Channel 9	268.150/309.150	268.250/309.250	268.350/309.350	268.450/309.450
Channel 10	269.650/310.650	269.750/310.750	269.850/310.850	269.950/310.950
Channel 11	260.375/293.975	260.575/294.175	260.425/294.025	260.625/294.225
Channel 12	260.475/294.075	260.675/294.275	260.525/294.125	260.725/294.325
Channel 13	261.575/295.175	262.075/295.675	261.625/295.225	262.125/295.725
Channel 14	261.675/295.275	262.175/295.775	261.725/295.325	262.225/295.825
Channel 15	261.775/295.375	262.275/295.875	261.825/295.425	262.325/295.925
Channel 16	261.875/295.475	262.375/295.975	261.925/295.525	262.425/296.025
Channel 17	263.575/297.175	263.775/297.375	263.625/297.225	263.825/297.425
Channel 18	263.675/297.275	263.875/297.475	263.725/297.325	263.925/297.525

UFO 5 kHz Non Processed Channels

	November	Oscar	Papa	Quebec
Channel 19	243.915/317.015	243.995/317.095	244.075/317.175	244.155/317.255
Channel 20	243.925/317.025	244.005/317.105	244.085/317.185	244.165/317.265
Channel 21	243.935/317.035	244.015/317.115	244.095/317.195	244.175/317.275
Channel 22	243.945/317.045	244.025/317.125	244.105/317.205	244.185/317.285
Channel 23	243.955/317.055	244.035/317.135	244.115/317.215	244.195/317.295
Channel 24	243.965/317.065	244.045/317.145	244.125/317.225	244.205/317.305
Channel 25	243.975/317.075	244.055/317.155	244.135/317.235	244.215/317.315
Channel 26	243.985/317.085	244.065/317.165	244.145/317.245	244.225/317.325

Note: Non Processed Channel is a satellite transponder in which the received signal is amplified and frequency-translated, but the digital data is not reconstituted before retransmission.

UFO 5 kHz Channels

	November	Oscar	Papa	Quebec
Channel 27	248.845/302.445	248.975/302.575	249.105/302.705	249.235/302.835
Channel 28	248.855/302.455	248.985/302.585	249.115/302.715	249.245/302.845
Channel 29	248.865/302.465	248.995/302.595	249.125/302.725	249.255/302.855
Channel 30	248.875/302.475	249.005/302.605	249.135/302.735	249.265/302.865
Channel 31	248.885/302.485	249.015/302.615	249.145/302.745	249.275/302.875
Channel 32	248.895/302.495	249.025/302.625	249.155/302.755	249.285/302.885
Channel 33	248.905/302.505	249.035.302.635	249.165/302.765	249.295/302.895
Channel 34	248.915/302.515	249.045/302.645	249.175/302.775	249.305/302.905
Channel 35	248.925/302.525	249.055/302.655	249.185/302.785	249.315/302.915
Channel 36	248.935/302.535	249.065.302.665	249.195/302.795	249.325/302.925
Channel 37	248.945/302.545	249.075/302.675	249.205/302.805	249.335/302.935
Channel 38	248.955/302.555	249.085/302.685	249.215/302.815	249.345/302.945
Channel 39	248.965/302.565	249.095/302.695	249.225/302.825	249.355/302.955

Where are all the satellites located?

There are quite a few military satellites in GEO/High Elliptical Orbit (HEO) that have UHF downlinks. Your first task is to locate them so you can accurately point your directional antennas. Our Table 1 lists the latest intelligence on which birds are in orbit/active and where they are located.

One of the easiest ways to verify which FLTSATCOM/UFO (UHF Follow-On) milsat bandplan is visible at your location is to check the fleet broadcast downlink channels that are operational 24/7. I use the following fleet broadcast channels as beacons for antenna and equipment alignment: 250.350 250.450 250.550 250.650 MHz.

You should correlate any of the fleet broadcast frequencies you receive above with the Fleet/UFO bandplans included with this article. This will help you to locate additional frequencies to monitor from your location.

You will find a list of miscellaneous milsat downlinks in Table 2. These downlinks offer you an opportunity to monitor transmissions from a wide variety of orbiting communications platform form the United States, NATO, and other European countries. If you need the current bandplans for the last operational FLTSATCOM and the UFO milsats, check out Tables 3 and 4.

Finally ...

Give milsat listening a try and be sure to drop us a report of what you hear from your location. If you have a multi-mode VHF/UHF receiver, a decent preamp, coax, and antenna system, you may be surprised at some of the satellites and communications coming from them that you can monitor.

There are a lot of military communications audible to the radio hobbyist throughout the HF/VHF/UHF spectrum. By adding the capability to monitor the UHF milsats, you will not only get a deeper appreciation for the sheer amount of military traffic that takes place throughout the entire radio spectrum, but you may also discover you are filling in the gaps in what you hear from the other portions of the radio spectrum.

So, if you like to experiment with other forms of radio listening, consider giving milsat monitoring a try. It can provide you with a truly out-of-this world listening experience.

MILSAT MONITORING RESOURCE GUIDE

Ask Bob (Grove Enterprises) - www.grove-ent.com/askbob.htm

Down East Microwave - www.downeastmicrowave.com
Phone: 386-364-5529; 19519 78th Ter., Live Oak, FL 32060

Scanner Antennas (Grove Enteprises) - www.grove-ent.com/scannerantennas.html
Phone: 828-389-9200; 7540 Hwy 64 W, Brasstown, NC 28902

Hearsat.org - www.hearsat.org/

Homebrew 4-element Yagi for 260 MHz (German) - www.satellitenwelt.de/yagi260mhz.htm

Mike McCants' Satellite Tracking TLE Zip Files - www.io.com/~mmccants/tles/index.html

NORAD Two-Line Element Set Format - http://celestrak.com/NORAD/documentation/tle-fmt.asp

Orbitron Satellite Tracking Software - www.stoff.pl/

Satellite Orbit Determination - www.coastalbend.edu/acdem/math/sats/

Satellitenwelt (German) (Satellite World) - www.satellitenwelt.de/

Satellitenwelt (German) Frequency List - www.satellitenwelt.de/freqlisten.htm
www.satellitenwelt.de/UHF_MilSat_Bands.pdf

Robert Christy's Zarya - www.zarya.info/FrequenciesFrequenciesAll.php

STSPlus Software - http://celestrak.com/software/dransom/stsplus.html

UHF Milsat GEO/HEO frequencies - www.satellitenwelt.de/UHF_MilSat.pdf

UHF-Satcom.com - www.uhf-satcom.com/

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TEN-TEC

NEW WAVE SHORTWAVE:

International Broadcasters' Quiet Transition to Satellite

By Ken Reitz

Recent years have seen the outright loss or severe cut back of shortwave programming to North America from a number of longtime international broadcasters. Among these have been Radio Canada International (RCI), BBC World Service (BBCWS) and Radio Netherlands Worldwide (RNW). Reasons given usually relate to escalating costs of equipment and electric utility charges; the accessibility of their broadcasts for free via the internet either through live streaming or on-demand podcasts; lucrative distribution contracts with satellite radio services (Sirius/XM), radio networks such as National Public Radio (NPR) and individual domestic FM broadcasters.

HF broadcasters tout the quality of the audio through these other outlets compared to shortwave. But, they neglect to mention that most listeners, even in North America, don't have access to the high-speed internet connections required for satisfactory listening and that their servers have extremely limited capacity compared to HF broadcasting. They also fail to note that Sirius/XM satellite radio retransmissions may not be available in the long run and that NPR and individual FM stations typically broadcast only news summaries or a few select programs, not their entire program line-up.

Listeners who have patiently waited for Digital Radio Mondiale (DRM), the HF equivalent of HD Radio heralded by some as the digital savior of HF broadcasting, wonder why the years continue to drag by with only a handful of broadcasters opting to try DRM.

Fig 1: Deutsche Welle, longtime HF operator, has made their three main services available via satellite for many years. (Courtesy: Deutsche Welle World)

But, DRM is not without its own set of headaches. For broadcasters, DRM represents a large and extra expense at a time of financial uncertainty that, in the end, simply delivers a digital version of their analog shortwave broadcasts to an even smaller, non-paying audience. For listeners, there's the question of why there are still so few radios equipped to receive DRM broadcasts.

The Satellite Solution

A few forward thinking, traditional HF broadcasters -- notably Deutsche Welle (DW) and RNW -- have been relaying their services via domestic U.S. C-band satellite for many years. The advent of the Digital Video Broadcast (DVB) standard, which allows up to ten individual digital channels to use a single satellite transponder, and the availability of very cheap DVB receiving systems to tune in those signals, has made it possible for a number of international broadcasters to migrate to satellite as a means of intercontinental distribution.

All of these DVB (also known as MPEG2) services transmit in Free-To-Air (FTA) mode, meaning the services are not encrypted. The area covered by a typical C-band transponder is quite impressive (see DW chart). While looking at the coverage area, remember also that the high fidelity and even stereo signal is perfect 24 hours/day seven days a week and is not affected by atmospheric activity, seasonal propagation, or subject to the vagaries of the solar cycle.

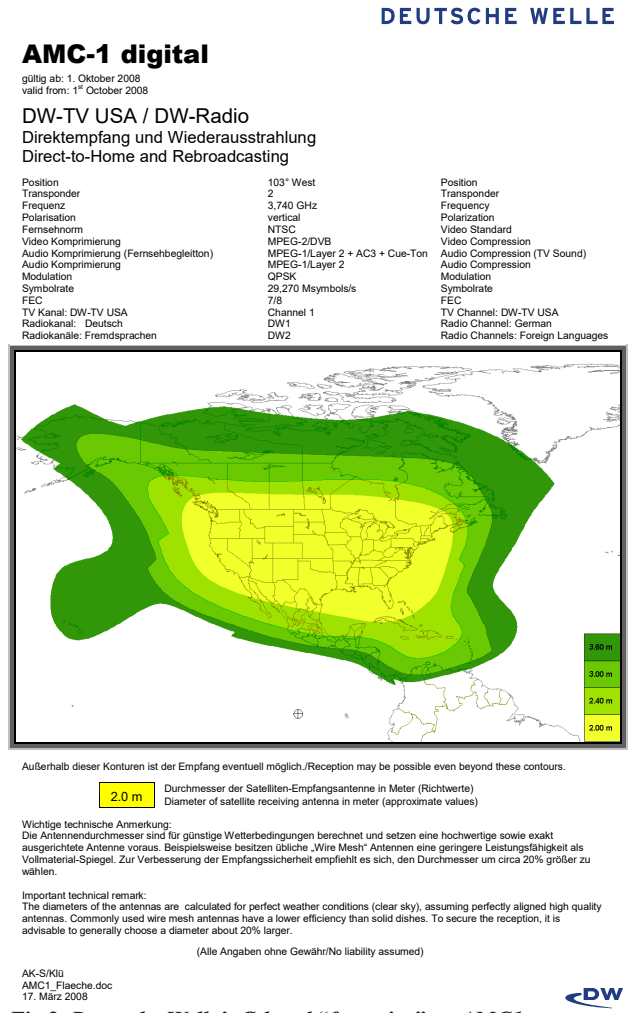

Fig 2: Deutsche Welle's C-band "footprint" on AMC1 covers nearly all of North America and the Caribbean with flawless audio regardless of sunspot activity, seasonal propagation or atmospherics. (Courtesy: DW-TV)

Of course, along with these international radio stations there are many TV stations from all over the world which are available on these satellites as well. Many satellite TV dealers in the U.S., situated in pockets of various ethnic groups, make good money installing Ku-band FTA systems to the local populace. Such systems sell particularly well because they can be installed on balconies or on small terrace patios or apartment house rooftops

Fig 3: Skyvision has a wide range of stand-alone Ku-band systems, with or without dish movers. This 85 cm dish comes with an LNBF and wall-mount for $120 plus shipping. (Courtesy: Skyvision)

and are easily moved. They fall conveniently within the parameters set out by the FCC to be exempt from tight rules enforced by Home Owners Associations (HOA) and other areas with restrictive covenants.

What You Need to Tune In

The chart below shows the international broadcasters that use either C-band or Ku-band. All current DVB FTA receivers can receive both C and Ku-band transmissions, reception parameters of which are set up through easy-to-use, on-screen menus. It's the dish and LNBF mount that determine whether or not you can receive C-band or Ku-band or both. C-band reception requires a larger dish, typically 6 feet to 10 feet in diameter (the larger the better) and the installation of a C-band LNBF, the low noise down converter which electronically switches polarity, amplifies the signal and sends that signal to the receiver.

Ku-band reception is much easier because it requires a much smaller dish, typically three feet in diameter, and usually comes with a Ku-band LNBF. Installing the C-band dish is more complicated, requires a substantial mounting pole secured in concrete, and is more useful with an actuator motor (dish mover) attached. The Ku-band dish can be installed on a rooftop as with a DBS satellite TV system and can be outfitted with a small motor to rotate the dish.

Buying a new big dish system is not

Fig 4: This Traxis DBS3500 FTA receiver tunes C-band and Ku-band channels and costs $130 plus shipping from Skyvision. Use with a big dish for C-band or a small dish for Ku-band. (Courtesy: Skyvision)

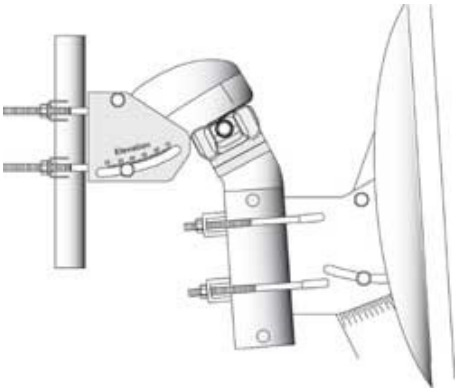

Fig 5: SG-2100 horizon-to-horizon motor from Skyvision is for Ku-band dishes up to 120 cm ($120 plus shipping). (Courtesy: Skyvision)

cheap, typically $800-$1,500. But, if you look around your area closely, you might find a complete system for free. Many who no longer use such systems may be happy for you to remove it and others may even pay you to do so. But, there are liabilities to acquiring a dormant big dish system: the dish driver may not be functional; the dish itself may be warped or have missing panels, LNB or other necessary parts. Buying a new big dish system is preferable because the parts will be functional and under warranty.

A complete Ku-band system is relatively cheap, typically under $200, and easy to install (complete instructions are included). While the available international broadcasters are relatively limited on Ku-band, a system set up on AMC4 with a second LNBF on the same dish set for Galaxy 25 (just 4 degrees

Fig 6: This 4-way switch lets you link up to four Ku-band satellite dishes, each pointed at a different satellite for FTA reception without using a motor ($40 plus shipping). (Courtesy: Skyvision)

apart) would bring in RCI, RNW, and WRN's complete line-up of international broadcasters. If you can't find something to listen to among those three services, you're too hard to please.

Finally, check with your local satellite dealer who may have complete used systems available that are substantially reduced in price compared to a new system, but ask for a 30 or 60 day warranty.

What You'll Hear

The list in the chart below is by no means all of the radio stations you can hear with either a C or Ku-band system. I've listed only those that have a presence on the shortwave bands. There are actually hundreds of radio

INTERNATIONAL BROADCASTERS VIA SATELLITE

Satellite	Position (°W)	Transponder	Polarity/ Freq (MHz)	Symbol Rate	Content
C-Band					
NSS806	40.5	14 R	3.980	17,800	Voice of America, VoA Music Mix, VoA News Now
		17 R	4.143	4,800	Radio Martí
Intelsat1R	45	19 H	4.096	8,102	Radio Nacional del Perú
Intelsat 805	55.5	23 H	3.936	3,255	BBCWS Americas/Caribbean English and Arabic Services
Intelsat 805		16 V	4.080	4,340	RTP International (Portugal)
Intelsat 9	58	6 H	3.805	3,428	China Radio International (separate feeds in different languages)
Intelsat 9		8 H	3.840	27,690	Radio France International (French service)
Galaxy17	91	11 H	3.920	26,000	EWTN Global Catholic Radio
Galaxy 16	99	15 H	4.000	26,400	World Harvest Radio (feeds in different languages)
AMC1	103	2 V	3.740	29,270	Deutsche Welle Radio 1, 2, 7 (English, Spanish, German)
Galaxy 23	121	10 V	3.900	27,684	Radio Nacional Exterior (Spain), RNE Radio 3, RNE Radio 5, Radio Exterior de España
Ku-Band					
Galaxy 25	97	8 H	11.874		Vatican Radio
		15 V	11.991	22,000	Radio Sénégal International
		19 V	12.053	22,000	Radio France Internationale (French service)
		125 V	2.146	22,000	Sudanese Radio, Qatar Radio, Republic of Iraq Radio
		27 V	12.177	23,000	World Radio Network1, 2, 3 (English, Multilingual, French)
AMC 4	101	V 27	11.655	30,000	Radio Canada International Radio Netherlands World Wide 1, 2, 3 Radio Vlaanderen International (Flemish language)
		16 H	12.033	3003	RDP International (Portuguese)
		21 V	12.120	30,000	Radio Canada International, RNW 1, 2, 3

Fig 7: Ku-band LNBF with adaptor can be mounted on a multi-feed holder to receive two Ku-band satellites on one dish. (Courtesy: global-cm.net)

stations in dozens of languages to be found on many C and Ku-band satellites. Stations range from AM broadcasters such as ZNS, the Bahamas and KSL, Salt Lake City, to services from Taiwan, Thailand, and the Philippines. There are nearly innumerable religious broadcasters and conservative talk radio networks, as well as stations from the mid-east, Southeast Asia, and more on both C and Ku-band satellites.

One thing you'll notice, when listening to FTA broadcasts via satellite, is the outstanding audio quality. Depending on the digital parameters by which the signals are transmitted, MPEG2 audio can sound as good as any full-quieting FM stereo signal. Digital satellite space is sold by bandwidth and the less bandwidth, the cheaper the cost and, consequently, the poorer the audio quality. Here's another tip: To enhance your listening, always route the stereo audio output of your MPEG2 FTA receiver through your home stereo. You'll be amazed at the quality of the audio.

Where to Shop

There are many places that sell DVB MPEG2 FTA satellite systems and pricing varies widely. Skyvision, a longtime advertiser in *MT,* is the only remaining mail order satellite

Fig 8: 85 cm Patriot dish from Global Communications is available with a twin LNBF mount for receiving two Ku-band satellites on the same dish and costs around $140 plus shipping. (Courtesy: global-cm.net)

Fig 9: This motorized Ku-band dish system includes 31" dish, motor, mount and LNBF and is available from Sadoun Satellite Sales for about $145 plus shipping. (Courtesy: Sadoun Satellite Sales)

TV business still printing and mailing out a catalog of regular and hard-to-find satellite TV gear. You can call them for a free catalog at 800-500-9275. Their web site, **www.skyvision.com**, has many more items including on-line specials, open-box, discontinued and returned catalog items sold at substantial price reduction. Skyvision prices are sometimes higher than other web-related sellers, but their service, technical support and warranty policies have always been tops in the business.

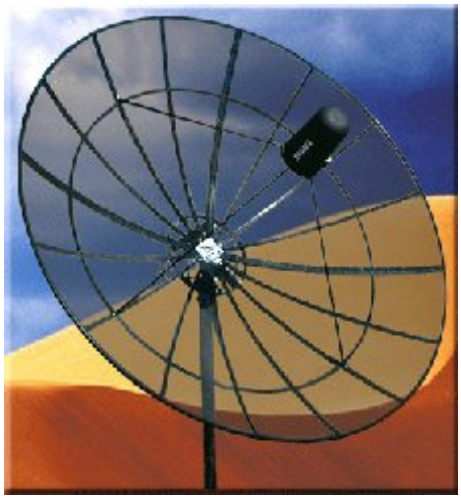

Fig 10: Last of the big dishes: Skyvision's SI-10' black mesh dish costs about $900, needs an 8' steel pole 4.5" in diameter to support it. (Courtesy: Skyvision)

There are many more satellite dealers on the web as a quick Google search will reveal. One is Saudon Satellite TV (**www.saudon.com** 888-519-9595) which carries a number of items not found at Skyvision and another is Global Communications (**www.global-cm.net** 608-546-2523) which specializes in MPEG2 FTA systems including multi-feed set-ups (see photos).

A Few Things to Note

C and Ku-band satellite signals can't penetrate buildings and hills. Even leaves on trees can severely attenuate such signals. In the winter, when the leaves fall off, you may notice improved reception on satellites blocked by trees. Other factors may determine whether or not you can actually see a satellite. For instance, those on the East Coast may have a harder time seeing satellites as far west as

Fig 11: This 6' mesh dish from Skyvision costs a little over $500 and may be big enough for C-band reception in the center of the U.S. where the signal is the strongest but won't be big enough on the coasts or in Florida.

Galaxy 10R (123°W) and conversely, those on the West Coast may have a harder time seeing satellites as far east as AMC9 (83°W). Some on the West Coast, with a clear view to the east, can easily view Intelsat 9 (58°W), but other satellites further east may be out of reach.

To be able to receive satellites as far east as 40.5°W (NSS806), it will be helpful to have an actuator motor with a 36" arm and a dish at least 10' in diameter. However, depending on your location in North America, you can use an arm as short as 18"; you only have to adjust the western-most limit to accommodate NSS806. For example, most big dish systems are set up to track between AMC6 (72°W) and AMC7 (137°W), a span of some 65 degrees. By setting your system up so that it can move as far east as 45°W, you would set 110°W as your westernmost location.

Another thing to know about NSS806: it's an "international" satellite that uses circular polarization (right hand and left hand circular polarity) as opposed to "linear" polarization used on domestic C and Ku-band satellites (vertical and horizontal polarity). Best reception on NSS806 is achieved using an LNBF that can do both polarization formats. These are fairly expensive, about $50 more than a regular C/Ku feed horn. But you can "trick" your feed horn into "seeing" circular polarity by inserting a small block of Teflon, called a dielectric insert, into the throat of the feed horn that converts the polarity. Skyvision sells the necessary Teflon block for $16 (plus shipping).

Things change: for instance, Deutsche Welle recently discontinued its service on Panamsat 9 which covered both North and South America. However, full DW coverage across North America continues on AMC 1. While many of the broadcasters listed in the chart have been transmitting on those satellites in FTA for some years, others have only just started. There could be more in the near future, and those who are currently transmitting FTA may decide to encrypt or move. It keeps you on your toes!

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

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AOR AR8200 Mark IIIB Wide Band handheld scanner	$594.95
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Scancat Gold For Windows Software	$99.95
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Compact professional handheld TrunkTracker III scanner featuring Close Call and Dynamically Allocated Channel Memory (up to 2,500 channels), SAME Weather Alert, CTCSS/DCS, Alpha Tagging. Size: 2.72" Wide x 1.26" Deep x 4.6" High

Frequency Coverage:

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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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A Classic That's Still A Contender
The Collins 51S-1 Receiver

By R.W. Parker, KB2DMD
Photos by Heidi A. Parker, KB3OGL

Back in the early '80s, I fell in love with high-tech Japanese radios – and not for the reasons you might suspect. It was because droves of hams were dying to own those new whiz-bang wonder boxes from the Orient, and they were financing them by dumping their Collins gear for pennies on the dollar. Twenty years earlier, only doctors and lawyers owned Collins. Now, a kid earning a couple of hundred dollars a week could afford the finest equipment that was ever offered to the radio amateur.

In those days, the hamfests were packed with boat anchors manufactured by every great American name that you could imagine. Radios built by National, Hammarlund, Hallicrafters and Drake were in abundance, along with some of the more esoteric professional gear from manufacturers like Technical Materials Corporation, Racal, and R.F. Communications. Since I spent much of my youth immersed in boxes of dank-smelling, digest sized *QST*'s, drooling over the Page 2 Collins Radio advertisements, you could probably guess which brand I was combing the 'fests for.

In practically no time I had assembled a beautiful collection of Collins equipment. Being an SWL, general coverage HF receivers were my primary interest. Large racks in my room held R-388, R-390 and R-390A receivers. There was even an R-389 LF receiver and an R-391 "Autotune" model (complete with the PP-629 rack-mount power supply required to run the Autotune motors). But, no matter how hard I searched, there was one Collins receiver that constantly eluded me – the 51S-1.

The Collins 51S-1 receiver (or R-1122/GR) was produced from 1959 to as late as 1982 –depending on who you ask. It covered from .2 to 30 "megacycles" in thirty 1 MHz bands (the bandswitch of the 51S-1 was marked "megacycles" throughout its production, which spanned the accepted change to "megahertz"). Again, depending on who you ask, it is estimated that 8,500 to 12,000 of these receivers were produced in six minor variations (not counting the rare G133F produced by LTV Temco).

However, while hams were bailing out of their A-lines, 51-J's, R-390s, KWM-2s and S-Line gear for bargain basement prices, no one was dumping any 51S-1s. Perhaps this was because there weren't many in circulation to begin with. Aside from the relatively low production numbers, a street price of nearly $2600 in 1975 meant that this was a receiver primarily marketed to military and professional customers. It's a safe bet that not a whole lot of hams owned a 51S-1.

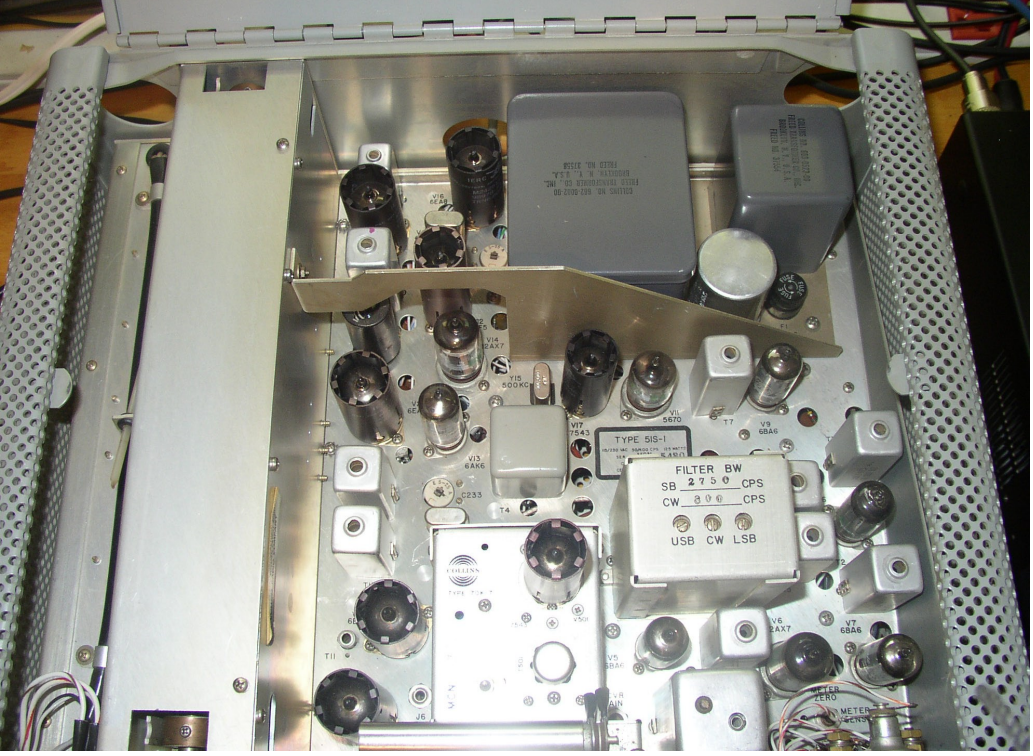
Old Radios in Modern Times

Fast forward to the year 2005, and the wonder of eBay. Some people love eBay, others hate it, and both can offer reasonable arguments to bolster their claim. I'm neither for or against it – if I can find a decent value on eBay, then I buy. So when a very clean, late-model 51S-1 receiver showed up for auction there, my interest was aroused.

Not surprisingly, there wasn't a lot of bidding activity on this receiver. It was offered with the caveat "missing power cord, no way to test, sold as-is." So, before I bid on the radio, I called the maestro of Collins restoration – my old friend, Mr. Dennis Brothers WA0CBK. I needed to know one thing: was there any component of a 51S-1 that, if completely torched, he couldn't replace with a brand new Collins part?

Dennis thought for a minute, and finally answered "No, Rich – I've got everything for those radios, including the iron." That was all I needed to hear. I won the auction, and as soon as I received the radio it was immediately repacked and shipped off to Mr. Brothers for his expert attention. You see, when Dennis Brothers restores a KWM-2 or a piece of S-line gear for you, it's not merely set up "to factory specs." When he returns your set, it's as if one of Collins' top technicians (which Dennis was for many years) took a piece of new gear that was ready to ship, put it on the bench, and then *maximized* every aspect of that radio – perfection plus!

After replacing 17 capacitors and 3 resistors that either



needed to be test-selected or upgraded to his standards, plus 4 coils and 6 tubes, and then giving the radio a world-class "antenna input to loudspeaker" alignment and tweaking, Dennis Brothers returned to me an HF receiver that could only be described by one word: breathtaking. But, I'm getting ahead of myself...

Love at First Sight

Glancing at the controls of the 51S-1 might cause the uninitiated to wonder what all the fuss is about. This receiver is definitely not what you'd call a knob-twister's delight: front panel "bells and whistles" are conspicuously absent. In fact, so are some controls that SWLs have taken for granted for the last 50 years or so. Basically, all you have is an on/off/standby switch, 100 kHz crystal calibrator, zero set, bandswitch, VFO, mode selector, AF/RF gain, and a notch filter.

"All the fuss," however, is over what's happening *inside* this receiver. With a triple conversion superheterodyne (double conversion above 7 MHz), the 51S-1 is quite a performer even by today's standards. Test results indicate SSB numbers of 120dBm for 12dB SINAD, from 2 to 30 MHz -- no slouch in the sensitivity department. AM sensitivity is a fairly consistent 111dBm over this range, using a 60% modulation depth at 1 kHz. The 51S-1 also offers incredible phase noise performance and dynamic range.

But instead of rattling off strings of test measurement figures, I'd rather provide my perceptions of the 51S-1 from a user's viewpoint. For those interested in seeing just how well this 30+ year old radio's numbers stack up against modern gear (as well as its contemporaries), I'd suggest looking at Robert Sherwood's table of test results at **www.sherweng.com/table.html.**

Real World Operation

Tuning a particular frequency on the 51S-1 is accomplished by first selecting one of the thirty 1 MHz bands, which are displayed on the left side of the mechanical digital readout. The "megacycles" selector drives a marvel of mechanical engineering – one of the features that Collins Radio was famous for. It is coupled to a long shaft, onto which twelve individual turret discs are mounted. Each disc carries the RF section's required capacitors, crystals, trimmers and coils. As the "megacycles" control is rotated through its thirty positions, these discs connect the components required for that particular band into the circuit. While it may sound somewhat "Rube Goldberg," the execution of this system is not only brilliant, but it makes servicing incredibly easy.

Next, the main tuning knob is rotated for a kilohertz reading of 0 to 100. The kHz display revolves ten turns per MHz range, and as each 100 kHz point is passed, it is recorded incrementally on the right hand portion of the digital counter. The VFO is the famous Collins permeability tuned oscillator (PTO), providing outstanding accuracy and linearity. While calibration points are provided every 100 kHz, it is seldom necessary to use them. On my particular radio, dial error is well under 200 Hz over the PTO's entire 1 MHz range.

Selectable modes of operation include AM, USB, LSB and CW. Bandwidths are tied to mode selection – the 800 Hz (CW) and 2.75 kHz (SSB) bandwidths are provided by a pair of Collins mechanical filters. Optionally, narrower 2.4 kHz filters were also available.

The 5 kHz AM bandwidth is provided by critically coupled transformers, although a 6 kHz mechanical filter was available as an option. For program listening, I find that the 5 kHz AM bandwidth in my 51S-1 is quite enjoyable. It provides full bodied audio characteristics that, to my ear, are very similar to the "8 kHz" mechanical filter in my R-390A (really 11 kHz).

Real World Performance

When my restored 51S-1 arrived, I wasn't sure how capable it would be for "down and dirty" DXing under adverse conditions. I prefer receivers that offer a high degree of manual control, and the lack of front panel selectable QRM-fighters on the 51S-1 didn't exactly inspire confidence. However, I quickly realized that this radio is every bit as capable as many solid-state "dream machines," especially for ECSS (exalted carrier selectable sideband) work.

When DXing the 60-meter tropical band, the 2.75kHz SSB bandwidths proved ideal for weak signal reception in ECSS mode. They provide a combination of very intelligible audio, with steep skirts acting as veritable brick walls to adjacent interference. Within the first few months, I was able to log many new Latin American domestic broadcasters.

Having satisfied myself with the radio's performance on 60 meters, I decided to see how it could separate signals on battlegrounds like 31, 41, and 49 meters. Admittedly, I've become spoiled over the years by the R-390A's suite of

four mechanical filters when listening under crowed band conditions, but the 51S-1 had an ace up its sleeve: an incredibly effective notch filter.

Labeled "Rejection Tuning," this Q-multiplier type notch filter is specified in the manual to have a depth of "not less than 40dB." After tweaking my radio, Mr. Brothers told me that the actual depth is in the neighborhood of 90dB! And, since the notch is before the I.F., adjacent signals are eliminated prior to amplification and they can't wreak havoc with the AGC detector.

Using the notch to separate IRIB Teheran's 40dB signal on 7225 from Radio Slovakia's 90dB piledriver on adjacent 7230 was child's play. It's been so long since I've owned a radio with an effective notch filter that I had forgotten the joys of using one to wipe out adjacent channel interference and heterodynes.

Also absent from the front panel of the 51S-1 is a means of varying the AGC characteristics; it is essentially "one size fits all." Attack time is 5ms, with a decay of roughly 1.5s. Although I can't understand why, some users find this objectionable and modify the AGC in their radios. I think it is excellent the way it is, for both SSB and AM.

I vastly prefer an analog signal strength meter over the modern "bar graph" types, as peaks are more clearly defined when adjusting a preselector or antenna tuner. The 51S-1 doesn't disappoint here: it employs a Honeywell precision DC ammeter that is calibrated in dB over 1 microvolt with a 0 to 100 scale. An audio level scale from -10 to +6 dBm is selected via a front panel switch. The illuminated meter face has a pleasing amber tint. This was apparently changed from the brilliant white face of earlier models because military users complained that it was too bright.

While the front panel of the 51S-1 is somewhat stark, the rear of the radio is bristling with activity. Eleven phono jacks and a barrier strip provide various inputs and outputs for RF, audio, sidetone input from a CW transmitter, and remote gain control. On the chassis, J6 provides for an external VFO.

Accessories

According to the Collins manual, "The 51S-1 is basically a 2.0 to 30.0 MHz receiver with a built-in low-frequency converter," the .2 to 2.0 MHz range being provided for "laboratory applications." Due to design, the receiver's gain diminishes by about 10dB below 2MHz. Not long after the 51S-1 had been introduced, the factory began to receive inquiries about improving the receiver's performance on mediumwave. Collins engineer Jerry Vonderheide, W0NGL, came up with an idea for a preselector that would connect across the radio's antenna input and tune 200 kHz to 2MHz in two bands. Along with a 4-ohm loudspeaker, it would be mounted in a 312B-3 speaker cabinet. The Collins 55G-1 Low Frequency Tuner was born.

If you think that the Collins 51S-1 receiver is a rare bird, the 55G-1 LF Tuner accessory is a pterodactyl! Various sources estimate that Collins produced anywhere from 100 to 1250 of these tuners, and they are so collectable today that their value can exceed that of a 51S-1 receiver. (Mr. Vonderheide claims that less that ten "55G-2" units were also produced, allowing the 51S-1 to operate at frequencies below 200 kHz. If one of these units ever turned up for auction, it would most likely be on a velvet pillow at Christie's and surrounded by armed guards!)

While Mr. Brothers was overhauling my 51S-1, I started to poke around for a suitable speaker to use with it. A matching 312B-3 unit would have been nice, but those have gotten a bit salty lately. After purchasing the 51S-1 and having it restored, I was starting to have to watch my pennies. Then, quite by accident, I stumbled across a web site for a UK based company called Advanced Optics. The bulk of their wares consisted of astronomy equipment, but, tucked away on one of their web pages were photos of beautiful, exact reproductions of Collins S-Line accessories. These included a 55G-1 LF tuner, and the price was only 1/4th that of an original – this was definitely for me!

Obviously produced as a labor of love, the Advanced Optics "Collins" 55G-1 is a reproduction so faithful that it could almost be construed as a counterfeit. Not only did their 55G-1 unit look and sound great with my receiver, I noticed an enormous increase in sensitivity on the .2 to 1.0 MHz and 1.0 to 2.0 MHz ranges.

A Timeless Classic

The Collins 51S-1 receiver was one of the longest lived models produced by the esteemed Cedar Rapids firm. It was "right" from the very beginning, and incorporated only minor circuit changes throughout its 20+ year history. Seldom advertised to the amateur or SWL, a good portion of the production output was likely absorbed by the U.S. government.

In its day, the 51S-1 was a heck of a lot of HF receiver in a small package. Conveniently tucked away in a nondescript Samsonite suitcase along with a coiled up dipole (try THAT with an R-390!), the 51S-1 was uniquely suited for certain "diplomatic" applications. If these radios could talk, you can bet that the intelligence community would have some of them slapped with a gag order!

In the 21st century, the venerable Collins 51S-1 still provides unparalleled joy of ownership on many levels. It conjures up romantic Cold War-era images of adventure and intrigue.

TIPS FOR PURCHASING A COLLINS 51S-1 RECEIVER

By R.W. Parker

51S-1 receivers can be found in a variety of flavors. They range from dirty and damaged to pristine. A radio that's been frequently run is often preferable to a "low hours" set that's been mothballed, as some components atrophy from disuse.

Purchasing any used gear can be a crapshoot, particularly at a hamfest. So, if you're prowling the 'fests in search of a 51S-1, here are some tips to bear in mind:

1) Look for a clean radio that is devoid of any obvious modifications (holes drilled, switches added, etc.). Also, pass on any set that shows evidence of rough handling. (If you notice a spot of discolored paint on the lid just over V12, don't be alarmed – that 6BF5 runs a bit warm!)

2) TEST IT! Unless you're a whiz at repairing these radios, you'll want to hear it play. The seller of a 51S-1 in top condition will be eager to demonstrate it. Of course, he'll also want top dollar for the radio, because he knows it's worth it. Beware of the seller who says "I forgot to bring the power cord," or is reluctant to power the set up. He might be trying to mask a fault in the radio.

3) Like any high-performance receiver, the 51S-1 likes a good antenna. Your test antenna at the hamfest will most likely be less than optimum. Since it will probably be daytime, tune around the19, 22 or 25 meter bands. With the current sunspot ebb, even a "hot" 51S-1 won't always show its true colors in a hamfest-test situation, but you should still hear a fair number of stations.

4) Some indoor 'fests are held in buildings that attenuate HF signals. Whether indoors or out, a useful "no antenna" test can be performed by setting the VFO to any 100 kHz point ("0"), selecting USB or LSB, switching on the calibrator, and then turning the bandswitch through its thirty positions. A strong beat-note (40dB or better) should be heard on *each* range. On a cold receiver (less than an hour warm-up), you may have to rock the dial a kHz or two on either side of the "0" mark, but be wary of a dial error that is beyond the range of the "zero set" control.

5) The 51S-1 does not have a built-in speaker. You'll need to bring or borrow a pair of headphones or a small speaker.

6) Don't be in a rush to buy, and don't assume that you will find a bargain. A good 51S-1 can realize between $2000-3000 and, while anything's possible, it's unlikely that you'll stumble upon a seller who doesn't know what these radios are worth.

Additional Notes:

Dennis Brothers says that the 51S-1 performs best with good dipole antennas. I've found this to be true in my shack; it loves the 75 meter balanced doublet that I use with a tuner. Obviously, the better your antennas and location, the more you will hear.

Also bear in mind that these radios were designed for 115VAC operation. If the voltage in your area is high, you should run the set from a Variac or other voltage reducing device. During operation, check the power transformer occasionally – it should never get too hot to touch.

If your 51S-1 ever requires alignment or repair, there are several technicians who specialize in these radios. Their contact information can be found by visiting the Collins collectors' web sites. (**www.collinsmuseum.com/vendor.html** is one list of links.)

It is a reminder of a time when the United States set the pace in technology and craftsmanship. And, remarkably, this is one tube-type receiver that can still hold its own alongside of today's "modern marvels"!

About the Author

R.W. Parker is a General Class Amateur and Shortwave DXer. A Master Gunsmith and Class "A" Toolmaker, he is the President of Parker Arms & Tool Works (a world famous shop devoted to precision Gunsmithing). His wife Heidi (KB3OGL) and he reside in historic Upper Bucks County, Pennsylvania, along with Rip and Bullet – their two gun dogs.

This article also appeared in the October issue of the NASWA Journal.

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Beginner's Guide to Tuning the International Space Station

This past October Richard Garriott W5KWQ, son of former U.S. astronaut Owen Garriott, joined the Expedition 17 crew aboard the International Space Station (ISS). The younger Garriott, a multi-millionaire video game developer, was not an astronaut but a paid rider under agreement with the Russian Federal Space Agency, to which he paid a reported $30 million for his adventure. He arrived on the ISS aboard a Russian Soyuz spacecraft and enjoyed a 10 day mission in support of amateur radio. The mission ended with a successful landing in the steppes of Kazakhstan.

When he arrived at the ISS, Garriott brought along a Kenwood VC-H1 Slow Scan TV (SSTV) camera to beam pictures from space to hams and Short Wave Listeners (SWL). For several years Amateur Radio aboard the ISS (ARISS) has been downlinking a stream of SSTV images on disc using the onboard 2 meter gear. But for the duration of Garriott's visit, the ISS would send live SSTV images for the rest of us Earth-bound space enthusiasts.

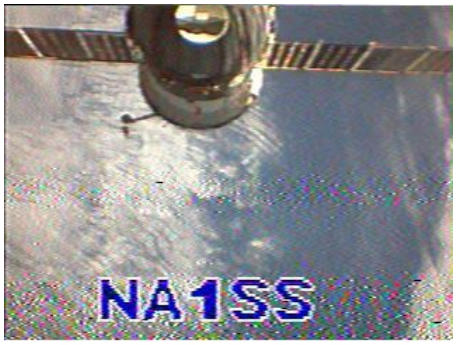
Kenwood VC-H1 SSTV camera, used on the ISS, is no longer in production. But, it's being put to good use while it lasts. (Courtesy: Kenwood U.S.A.)

When he wasn't transmitting TV pictures, Garriott was making hundreds of voice contacts with eager hams around the world and talking with students at various schools worldwide on previously arranged schedules. I thought I'd try monitoring his mission. too, and what I discovered was that this activity was not only easy but also quite rewarding.

While Garriott has long since landed, the ARISS program continues on several fronts. Ongoing activities include SSTV image downlinks, voice contacts, digi-peating and cross-band voice mode (see chart below for frequencies).

❖ What You Need to Tune ISS SSTV

You may be surprised to find out that you already have the gear you need to be able to downlink images from the ISS; you just have to put it all together. First, you'll need a receiver.



This live SSTV image, taken with the Kenwood VC-H1 SSTV camera through a window on the ISS, shows a view of Earth over North America. Note the docked Soyuz spacecraft at the top of the frame ready to take Garriott back to Earth. (Courtesy: Author via NA1SS using MMSSTV software, Kenwood TM-261 2 meter FM transceiver, 4 element CushCraft beam at 25 feet.)

If you're a ham you likely have a 2 meter FM handi-talkie (HT) or mobile unit that covers the target frequency (145.800 MHz). If you're not a ham, you probably have a scanner (hand-held or base unit) that can receive that frequency.

Next, you'll need a computer with a sound card that can turn the data signals you'll be receiving on your scanner/HT into images. SSTV technology is so low tech that virtually any computer will do the job.

Now all you need is the software and a connecting cable. There are a number of SSTV programs that will work well. I use MMSSTV because it's free, easily downloadable, and versatile. My deep appreciation goes to Makoto Mori JE3HHT for developing this software and making it available to everyone in a show of true ham spirit. If you don't already have this software program, go to **http://mmhamsoft.amateur-radio.ca/mmsstv** and follow the directions.

Finally, find a mini-to-mini audio cable and plug one end into the speaker output of your scanner/HT and the other end into the input of your computer's soundcard. That's all there is to the gear.

While you're waiting for the next ISS pass, I recommend going to the HF SSTV frequencies (14.230 MHz +/-) to get used to how the program works and to get some experience receiving SSTV pictures. The buffer only holds so many images, after which it erases the first ones, but you can build a library of images you've

Live interior shot of the ISS shows the laptop used for ISS SSTV transmissions. (Courtesy: Author via NA1SS SSTV)

received for later retrieval. Again, familiarity with the software will get you up to speed on this aspect.

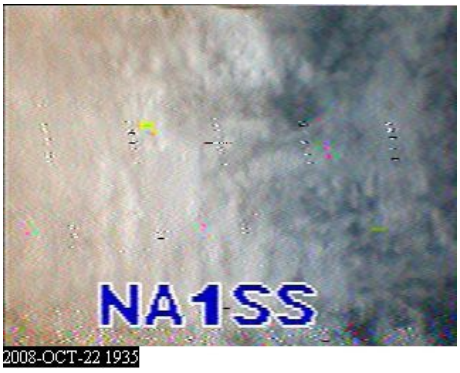
Tuning in the images from the ISS will actually be easier than on HF. Since the signal is locked on 145.800 MHz FM, there's no guessing about whether or not you're a little off frequency. When the ISS footprint starts to cover your location you may see a flicker on the signal meter of your scanner or 2 meter rig. Then, if you're right in the path of the ISS, a few signal bars will soon appear and suddenly it will be full-quieting with a full scale signal. The SSTV software will detect the tone and start copying the image. As the craft zooms overhead you'll see the picture developing. With luck, you can get more than one or two images before the pass is over.

You don't have to worry about tuning your transceiver or scanner to compensate for Doppler shift (frequency drifting due to the rapidly moving transmitter aboard ISS relative to your location). Because your scanner/transceiver has such wide bandwidth it will keep the signal tuned throughout the 10 minute pass.

❖ ISS Where Are You?

Receiving images from the ISS is easy, but you've got to know when it will be close enough to your location to be able to copy the transmissions. The ISS travels in an orbit roughly 360 kilometers (about 220 miles) above the Earth. At more than 17,000 mph it only takes about 90 minutes for the ISS to circle the globe. That means that when it's near your location you've only got about 10 minutes to copy the signal. If you miss it, you'll have to wait for the next pass.

There are several ways to know where the



Broken clouds over North America as the ISS streaks across the continent at 17,500 mph. Sometimes this is all you might get in an orbital pass. (Courtesy: Author via NA1SS SSTV)

ISS is. One is to log on to NASA's website which is specifically set up to display the current ISS track: **http://spaceflight.nasa.gov/realdata/tracking**. Heavy use caused this site to be unavailable during the height of video downlinking last October, but you shouldn't have any trouble logging in today. When you see the ISS icon on the plotted path across the globe, you'll notice a red oblong circle around the ISS. This circle indicates the "footprint" of the craft. Any location within the red circle will have a chance of receiving transmissions from the ISS, depending on antenna and receiver capabilities.

If you have a big dish satellite TV system and an MPEG2 FTA receiver, you can watch NASA-TV on C-band transponder 17 of AMC6 at 72°W in the FTA mode (frequency 4.040 GHz, Symbol Rate 26665, vertical polarity). West Coast readers may have a better shot at AMC7 at 137°W C-band transponder 18 (frequency 4.060 GHz, SR 26665, vertical polarity). NASA maintains three 24/7 channels (Public, Media and Education) on these two C-band satellites.

If you don't have a big dish, you can access all three channels on-line at: **www.nasa.gov/multimedia/nasatv**. The current position of the ISS is often shown on the screen. In addition, you can also hear mission control updates on the audio channel of NASA-TV. These audio updates might alert you to downlinks on the ARISS system.

❖ Working the ISS on 2 Meter Voice

Actually making voice contact with the ISS is as simple as downlinking SSTV images -- with one little exception: There will be thousands of other hams trying to talk to the ISS at the same time, creating a monumental pile-up that's almost impossible to break. The first thing to know about working the ISS via voice is that they're operating "split" or duplex. That means the astronaut will be calling CQ on 145.800 MHz FM and you will be answering on 144.490 MHz FM, which can be done on any 2 meter ham transceiver.

However, many such transceivers don't allow this odd split. Most are programmed for a 600 kHz split (which is how 2 meter repeaters are set up). Some transceivers have procedures in the manual for setting odd split frequencies, so check out your manual to learn how to configure the transmit/receive to accommodate this.

Even if your transceiver doesn't allow odd splits, you can set it up to transmit simplex (no split) on 144.490, and set the next channel up to receive on 145.800. Simply key the mike on 144.490; unkey the mike and turn the VFO to 145.800 and listen. It's not as quick as an electronic frequency switch, but it does the job.

Most 2 meter base/mobile transceivers have multiple power output settings. My Kenwood TM-261 ranges from 5, 10 to 50 watts; others may have different output ranges. It's quite easy to be heard on the ISS using the 5 watt range. Remember that 2 meter FM is "line of sight" -- if you are in the footprint you can be heard. It's considered good satellite operating practice (as it is on all bands) to use the minimum power necessary to complete the QSO.

When the ISS is not being used by the astronauts for SSTV, school contacts, or random QSOs, it's sometimes turned into a repeater in

Richard Garriott W5KWQ aboard the ISS and transmitting via NA1SS, the amateur radio station on board. (Courtesy: ARISS SSTV Gallery)

the sky. In this case ARISS is configured for "cross-band" operation known as "mode B" (see chart below). You won't be talking with anyone onboard, but instead with other hams in North America, taking advantage of the pass to work each other. You have to admit it would be pretty neat to have worked all states via ISS!

❖ Antenna Considerations

More important than power output is antenna gain. You can use a 2 meter J-pole, groundplane or similar omni-directional antenna to work the ISS or downlink SSTV images, though best ISS reception will be had by mounting the antenna outside and in the clear. Serious mode B users will need a complete 70 cm/144 MHz combined satellite antenna on a rotator.

CushCraft's 124WB 4 element 2 meter beam is ideal for working the ISS and your local repeaters. It weighs just 3 pounds and costs $100 from Universal Radio. (Courtesy: Universal Radio)

For SSTV purposes, strength of signal will be greatly improved using a multi-element beam antenna. I use a CushCraft 124WB, 2 meter, 4 element beam which has more than 10 dB gain, and because it weighs just three pounds, it's ideal for mounting on a TV antenna mast. You'll have to rotate the antenna throughout the pass to maintain the strongest signal. When you're not trying to work the ISS, you can use the antenna to work the 2 meter repeaters in a 50 mile radius of your home.

If you capture some SSTV images from the ISS, pass them along and I'll share them with the rest of us earthbound space travelers.

ISS FREQUENCIES:

Digital/APRS:
Worldwide packet uplink: 145.825 MHz FM
Worldwide packet downlink: 145.825 MHz FM

Voice:
Region 2 (the Americas) uplink: 144.490 MHz FM
Worldwide downlink: 145.800 MHz FM

Crossband Repeater:
Repeater Uplink: 437.800 MHz FM
Repeater Downlink: 145.800 MHz FM

SSTV Robot 36:
Downlink: 145.800 MHz FM

Links to ISS Ham Radio Activities

View ISS SSTV images from the Garriott mission:
http://ariss-sstv.ssl.berkeley.edu/SSTV
Track the ISS:
http://spaceflight.nasa.gov/realdata/tracking
ARISS Status Report is found here:
www.amsat.org/amsat-new/ariss/ariss_news.php
Amateur Stations Heard through ISS:
www.ariss.net
ISS APRS packet operation FAQ:
http://web.usna.navy.mil/~bruninga/iss-faq.html
How to use ISS as a repeater in cross-band mode:
www.southgatearc.org/news/february2008/iss_repeater_tips.htm

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Loyd Van Horn, W4LVH
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The search for something worth hearing

Is it too early to already be feeling winter doldrums? Apparently not, because I recently found myself searching aimlessly for something to entertain me.

You know the routine: "Man, there is nothing good on."

I flipped through hundreds of television channels, but nothing captured my attention.

I turned on my radio to tune around, but conditions were horrific.

I fired up my scanner hoping to find breaking news or at least a good laugh. Apparently, nothing happens in my neighborhood outside of the occasional noise complaint and routine traffic accidents.

Boredom began to set in. Even basic Internet radio streams weren't doing it for me. I wanted something exciting. I wanted something new. I wanted to be in the middle of some action. When I stumbled upon a plethora of Web controlled, online receivers, I found what I wanted.

I admit to not having played much with the online receivers that have popped up in recent years. For some reason, I just didn't make the mental connection that I could DX from various parts of the world without having to go through the trouble and expense of planning a DXpedition.

I was blown away by the amount of things you could hear online through other peoples' radios – from public safety transmissions, to utilities – even VLF "Earth Radio" has found an online home. Trust me, I shouldn't have to lament any longer at the lack of something to keep me entertained.

❖ I can do what?

I am sure I am not the only one who has at some point during a late night DX session wondered: "What it would sound like to tune into this frequency from, say, Bemidji?"

During my more ambitious times as a hardcore AM DXer, I found myself doing this a lot. I would be chasing after certain stations – trying my best to glean from the static those magic call letters from a new state – and all the while wondering what the radio would sound like if I were a little bit closer to my target station.

Imagine sitting in the Southeastern U.S. and tuning in a small local station in Maine. Imagine sitting in London and being able to in just about anything on the West Coast of the States. Ahhh, the stuff of daydreaming, right? Not anymore.

I decided to test out what was available for me to tune in without leaving my South Carolina living room. The most extensive listing I found for various online receivers was at DXZone: **www.dxzone.com/catalog/Internet_and_Radio/Online_Receivers.** I decided to try out some of the choices there and immediately was intrigued.

My first destination took me to the popular Global Tuners site: **www.globaltuners.com/home.php**. After a brief registration process, I had access to a number of Web controlled receivers in various parts of the world.

For security reasons, during your first two weeks of having an account, you will be limited in the number of tuners you will have access to. But fear not: there should be plenty here to keep you interested for quite some time. The evening I was looking to tune someone else's dials, I found streams open in Sweden, Italy, Austria and the Netherlands. I was able to listen in to medium wave DX through much of Europe and even into the Middle East.

Another good source was OE3MZC's site at **www.qsl.net/oe3mzc/receivers.html#table%20of%20receivers**. A good variety of U.S. and European tuners were available here as well that were capable of tuning in various bands and modes.

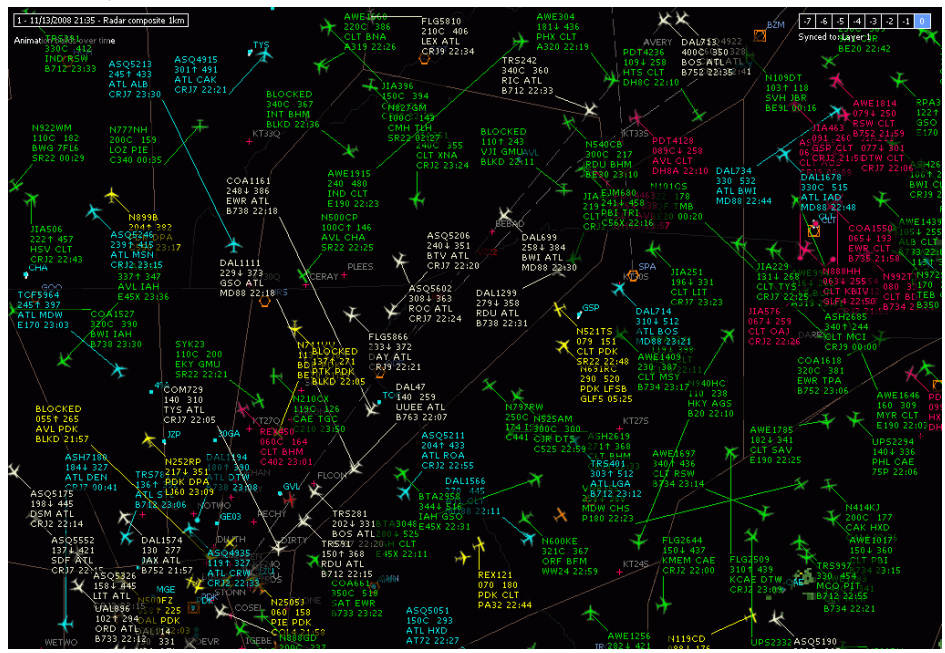
❖ Scanners on line

For the VHF/UHF fanatic, don't fret, HF is not the only communication medium that can be found online. There is plenty available to keep even the most experienced scanner "geek" on the edge of his seat.

Many air traffic enthusiasts are already quite familiar with popular air traffic control streaming sites like **www.liveatc.net** and the highly interactive **www.atcmonitor.com**. LiveATC gives visitors a chance to choose which tower they will be listening to from a very impressive list of international airports. ATC Monitor is a bit more narrow in its focus, specializing on approach and tower communications from Atlanta's Hartsfield Jackson Airport, especially the Northeast Approach Corridor, the busiest en route air traffic corridor in the world. Not only is there a heaping helping of tower communications available, but a screen overlay shows actual flights within the watchful eye of the staff in Atlanta.

Public safety fans will find a wide range of streaming products available. Once again, DXZone – **www.dxzone.com/catalog/Internet_and_Radio/Police_Scanners** – provides a pretty extensive listing of some of the scanner streams available for various major cities across the United States. As with some of the other receiver streams, some sites will require a user to register, but the majority of them are free and completing the process is fairly easy.

One word of caution, though. Several of the streams I found used a .pls file format which



A screen overlay within ATC Monitor shows actual flights within the watchful eye of the staff in Atlanta.

can sometimes be tricky to use with Windows if you are unfamiliar with the format. Essentially, a .pls file is a playlist created in a media player program, like Winamp. I was able to play the .pls files using iTunes, but the first time you have to tell Windows which program you want to play the .pls file. After that, Windows can remember which program you prefer. The Windows Media Player has trouble with .pls files, so I recommend you try another media player like Winamp or iTunes for smoother operation.

I began my own tour of public safety transmissions in San Diego through **www.scansandiego.net**. I then proceeded up the Pacific Coast to Los Angeles before heading eastward. In Miami and Boston I had a front row seat to news happening before my very ears. Then I landed in New York and spent the rest of the evening listening to the New York Police Department patrol the city streets.

❖ You, too, can be part of the fun!

The only way we are able to enjoy listening to radio communications from receivers located across the globe is because someone has volunteered to provide a virtual seat in his or her radio room. Without these volunteers, there would be no online receivers.

So how can you help broaden the availability of online receivers? Well, first you will need a receiver that can be computer controlled. You will also need a constant Internet connection, special software (widely available from a variety of sources on the Web), and your receiver's computer control hardware.

Many of the online receiver sites outline in detail what is required to share a spare receiver in your shack with the world. For an idea of what is involved, check out GlobalTuners' instructions at **www.globaltuners.com/info/setup**

Here's a personal request from a medium wave enthusiast: I would love to see someone with a Beverage antenna put their receiver online. Or, better yet, the next time someone plans a large DXpedition (no matter the mode/band), how about providing an extra receiver just for online listeners to tune? We can be your DX spotters!

❖ More paths to great audio

Little did I know that an answer for streaming Internet radio through my home theater system was already a part of the system! Those of you who have Windows Media Center extenders already in your home theater setup (or, like me, an Xbox 360 video game console) will be pleased to know that there is an application add-in that is available for Internet radio streaming.

The popular Internet radio hub RadioTime now has developed an application that allows Media Center users to stream Internet radio through Media Center. In addition, the application will allow users to tune in local FM radio on your PC (with the proper hardware installed).

All that is required is a download of the RadioTime Media Center plug-in at **http://radiotime.com/partners/mediacenter.aspx**. It is a good idea to register with RadioTime as well, as this will give you the opportunity to create a list of station presets with all of your favorite Internet streams. The registration is free and painless and seamlessly integrates from the RadioTime Web site to your Media Center experience.

As I am typing this, I am using the RadioTime Media Center plug-in to listen to my old college radio station (**http://wwcufm.com**) and reminiscing about my days as a program director and crazy morning show host.

Even if you don't have a Media Center Extender in your home, but have Media Center on your PC (it comes installed on Premium editions of Windows Vista), you can still use this application as a one-stop location for almost all of your favorite streaming stations. The only downside I have found so far is that stations using Real Audio streams (like the BBC, for instance), will not be accessible from the RadioTime application. So keep this in mind.

Another option for routing music through your existing music system is a "music bridge" like the Linksys Music Bridge (model number WMB54G, $31.35 from Amazon.com). The Linksys Music Bridge includes outputs for RCA and optical cables to connect to whatever stereo or home theater setup you wish to connect it to.

Because a music bridge will route any audio playing through your sound card to the devices connected to it, a music bridge is even a great way for radio hobbyists running radio control software on their PCs to use a more sophisticated external speaker, if so inclined. Hm-m-m, amateur radio contesting in surround sound? Overkill, maybe, but fun to play with.

There are various models of music bridges available for a variety of platforms and configurations. Do your research to find the one that would best suit your situation.

❖ The Write stuff

I have already received a few pieces of mail since taking over the column in November. If you have anything to offer, especially if you have any news or something you want to see featured, feel free to write to my email address in the column masthead. 73, Loyd.

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New Scanners for a New Year

A flurry of new scanner announcements over the past few months make 2009 a year to consider additional capability for your listening shack. These new models provide features that can save you time and make your listening more enjoyable and informative.

❖ New Scanners

Two new scanners have hit the market and at least two more are expected to become available soon.

Radio Shack has begun selling two new digital scanners made by GRE. Although GRE made a big splash last year with the introduction of six new scanners marketed directly to the public (see **www.greamerica.com** for more information), they continue their long history of providing models for sale through Radio Shack's retail and Internet stores.

The **PRO-197** is a mobile/base unit that is nearly identical to the GRE PSR-600. This mobile/base model holds the equivalent of 1,800 channels in operating memory and the 21 V-scanner ("virtual scanner") memories gives it a total capacity of more than 39,000 channels. It can track the "big three" trunked systems, specifically Motorola, EDACS (Enhanced Digital Access Communications System) and LTR (Logic Trunked Radio) and is also able to monitor digital APCO Project

25 systems, both conventional and trunked.

Early reports indicate that the digital sound is clearer and more understandable than earlier models, along with very good signal sensitivity and a bright, sharp display.

The **PRO-106** is a handheld scanner that is functionally identical to the GRE PSR-500. It can track and monitor APCO Project 25 digital systems as well as analog Motorola, EDACS and LTR trunked systems. Frequency coverage runs from 25 MHz up to 1300 MHz, with the usual cellular telephone blocks in the 800 MHz band as well as gaps between 54 MHz and 108 MHz, 174 MHz to 216 MHz, 512 MHz to 764 MHz, and 960 MHz to 1240 MHz.

Both scanners are equipped with displays that the user can program to turn a certain color when a talkgroup, frequency or system becomes active. There are also three keypad buttons under the display (called *softkeys*) that can be programmed to perform certain functions. This ability to customize the display and keypad can make scanning multiple systems much easier and simpler to follow.

Each scanner is also able to decode the Network Access Code (NAC), a system identifier broadcast from P25 systems. This allows the scanner to only break squelch when it receives the proper NAC in a conventional (non-trunked) P25 system.

Both of these scanners (and the corresponding GRE models) use "object oriented" memory management rather than the classic bank and channel arrangement. Users create "scannable objects" that can be frequencies, talkgroups, search ranges, and other elements of scanning activity. These objects have attributes that provide the scanner with parameters related to the object.

Each object can be included in one or more "scan lists," each of which may be set as enabled, disabled, or locked out. The scanner moves through each active scan list, performing the appropriate activity for each object in the list.

For those of us used to the simple bank/channel and talkgroup lists, it is a much different way of thinking. Reading (and re-reading) the manual will help clarify these concepts and eventually things will begin to make sense.

Fortunately, software is available to help program the PRO-106 and the PRO-197, which makes the process much easier and more straightforward. Because they use the same control software and computer interface cables as their GRE counterparts, the following packages that automate much of the entry and programming also work with the PSR-500 and PSR-600:

Package	Website
ARC500	www.butel.nl
PSREdit500	www.psredit.com
Win500	www.starrsoft.com/software/win500

For the more technically minded, a software package called Pro96Com (found at **www.psredit.com/pro96com/**) can decode a P25 control channel. It works with the following scanners:

GRE PSR-500 and PSR-600
Radio Shack PRO-96 and PRO-2096
Radio Shack PRO-106 and PRO-197

As with any scanner, to get the most out of ownership I recommend joining the appropriate Yahoo! Group for your model. These groups offer a wealth of information and tips that will greatly enhance the usefulness of your scanner and provide a resource of knowledgeable users who are typically quite willing to answer any questions you might have. Each group also has a "Files" section where you can download documents and frequencies related to your scanner and location.

Scanner	Yahoo! Group
PRO-106	groups.yahoo.com/group/RadioShackPRO-106/
PRO-197	groups.yahoo.com/group/PRO-197/

Although the list price of these scanners hovers around $500, look for store sales and coupons that can save you 25% or more. Messages in the interest groups can clue you in on when such discounts are available and how to get them.

❖ Upcoming Scanners

Uniden has announced two new scanners that are scheduled to be available in the near future.

The **BC346XT** is intended to replace the BC246T. It is a handheld capable of storing 9,000 channels and can track analog activity on Motorola, EDACS, and LTR trunked systems. Enhancements over the BC246T include support for EDACS System Key (ESK) support, output of control channel data to an external computer, a band scope for graphical display of spectrum activity, and volume settings for individual channels.

The **BCD396XT** will track the big three analog systems as well as APCO Project 25 and can store as many as 25,000 channels.

Many of the new features for these two Uniden scanners match up to GRE and Radio Shack models. Both of these new scanners support NAC decoding, as do the GRE and new Radio Shack scanners described above. Displays on all of these models can be programmed to change color and flash according to channel activity. The EDACS System Key support is now common on these models, either natively or via firmware upgrades.

Uniden has included two features that are useful for organizations that provide scanners on behalf of end users. First is a "Key Safe Mode" that prevents a user from accidently changing or deleting programming information. This is very useful for industries that program scanners for their employees, such as news organizations, and will hopefully prevent the terminally curious (what we used to call "the smiling menace") from needing perpetual support to correct self-induced problems.

The second feature is called "Private Systems" and is intended to protect confidential system information from being read or copied by a personal computer.

Although these two new scanner models are not yet on the market, Yahoo! Groups have already been established for each of them:

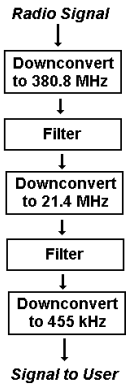
Scanner Yahoo! Group

BC346XT	groups.yahoo.com/group/BC346XT
BCD396XT	groups.yahoo.com/group/BCD396XT

❖ Intermediate Frequencies

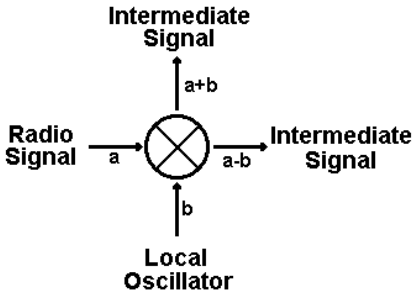
One unusual feature mentioned in the Uniden press release is something they call "IF Exchange," described as the scanner being able to use an alternate intermediate frequency (IF) in order to avoid interference issues. If this feature lives up to the description, it could be a very useful tool to minimize the effects of a long-standing problem.

Although modern scanners can cover a very broad range of frequencies, from 25 MHz up to 1300 MHz, internally they are designed to perform their work at a single, fixed frequency. By bringing all of the signals down to this common frequency, the scanner designers can optimize the filtering and other signal processing functions that are necessary to provide a clean and consistent result.



Triple Conversion in the PRO-96

When a scanner receives a radio signal, it performs a series of actions to bring the incoming radio signal down to the internal fixed frequency. You may have heard the term "triple conversion," referring to the three conversion steps a signal takes to get from the radio frequency to the internal frequency.



For example, in the Radio Shack PRO-96 the three steps are as follows:

1. Convert the incoming radio signal to 380.8 MHz, identified as IF 1.
2. After filtering, convert the signal at IF 1 from 380.8 MHz down to 21.4 MHz (IF 2).
3. After filtering again, convert the signal at IF 2 from 21.4 MHz down to 455 kHz.

The scanner then processes the signal at the third intermediate frequency of 455 kHz.

In order to perform each of these conversions, most receivers use a device called a mixer. As discovered more than a hundred years ago, when two signals are mixed together they produce two new signals. These new signals are the sum and the difference of the original input signals.

For the first step of the conversion in the PRO-96, the incoming radio signal is mixed with an internally generated signal to produce the signal at the first intermediate frequency of 380.8 MHz. (The other output from the mixer is filtered out and ignored.) The internally generated signal comes from a device called a *local oscillator* (abbreviated as "L.O."). When you tune the scanner you are actually changing the frequency of the local oscillator, which results in the conversion of a new signal down to the first intermediate frequency.

The second and third conversion steps typically use a fixed local oscillator to bring the signal down to the third intermediate frequency. Filtering between each of these steps removes unwanted signals that are adjacent to the desired signal.

❖ Interference

A problem arises when interference, either from a nearby signal or from somewhere inside the scanner itself, ends up in the conversion process on top of the desired signal. Besides the radio frequency local oscillators, modern scanners have microprocessors with their own CPU clock oscillators. Each of these has the potential of being a source of interference, and each may also have harmonics, which are additional oscillations at a multiple of the original oscillator frequency. These interference sources can generate phantom radio signals that are sometimes called "birdies" or, more technically, "intermodulation."

However, the interference is generated, the end result is that the desired signal is lost because the scanner cannot separate the desired signal from the birdies. Since the intermediate frequencies cannot be changed once it leaves the factory, most receivers have no way of recovering such lost signals.

Based on the wording of their announcement, it appears Uniden intends to offer a way for scanner listeners to avoid these birdies by allowing the use of an alternate intermediate frequency. This might be done by having two operating frequencies for the second and third stage local oscillators, or by selecting either the sum or the difference from the output of the third stage mixer. However it is achieved, the elimination of birdies would be a nice improvement in scanner performance.

MT READERS ONLY

To access the restricted website for the month of January, go to www.monitoringtimes.com, click on the key, and when prompted, enter "mtreader" under the user name. Your password for January is "fltsatcom" – Check in each month for new and archival material, as our thanks for your loyal support!

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❖ Location-Based Scanning

Probably the most significant unique feature of the Uniden scanners is their Global Positioning System (GPS) capability.

Although current Uniden scanners BCD996T and BCT15 are already on the market with GPS capability, the BC346XT will be the first handheld that can be connected to a GPS receiver and provide "location-based scanning." The idea here is to automatically enable and disable systems based on the geographic location of the scanner. Given a latitude and longitude along with a distance value, the unit will scan systems that fall within the "circle of coverage."

Having knowledge of geographic location allows the scanner to provide additional features to the user including the display of "Dangerous Roads" and "Dangerous Crossings" as well as "Points of Interest." These alerts, although not directly related to scanning radio systems, can improve the safety and enjoyment of a traveling listener.

❖ GPS Message Format

Many years ago the National Marine Electronics Association (NMEA) developed a specification that describes how various pieces of marine electronic devices should communicate with each other. This specification, identified as NMEA-0183, describes data messages containing information sent from these electronic devices. Global Positioning System receivers are included in NMEA-0183, and the GPS-capable Uniden scanners require this format.

The specification describes a complete message as a "sentence" made up of readable characters (what computer people would call *ASCII text*). Each sentence starts with a dollar sign ('$'), ends with a carriage return/line feed combination, and is no more than 80 characters in length. There is a checksum at the end of the message, immediately following an asterisk, that allows the receiver to confirm that the message was received without error.

$ [prefix] [message-id] [data] * [checksum] CR LF

A two-letter prefix identifies the device sending the message. GPS receivers have a prefix of 'GP'. The next three characters identify the individual message. The prefix and the identifier together determine how the rest of the message should be interpreted.

Data within the message are separated by commas into fields. If a field doesn't have a value, it can be left blank (that is, it will have no characters).

One common identifier from GPS receivers that provides position fix information is 'GGA'. An example position fix message looks like this:

$GPGGA,153404,3910.5217,N,07640.1002,W,1,04,1.4,44.5,M,16.9,M,,*FF CR LF

The contents of the message are broken down into fields like this:

Value	Description
$GPGGA	GPS Position Fix sentence
153404	Universal Time Coordinated, in hhmmss format
3910.5217	Latitude
N	North/South Latitude indicator
07640.1002	Longitude
W	East/West Longitude indicator
1	Validity indicator (1 = Valid, 0 = Not Valid)
04	GPS Satellites used (0 to 12)
1.4	Horizontal Dilution of Precision (HDOP)
44.5	Altitude
M	Unit of measure for Altitude (M = meters)
16.9	Geoid separation
M	Unit of measure for Geoid separation
<blank>	Seconds since last DGPS update
<blank>	DGPS Station Identifer
*FF	Checksum

So, this message indicates that the time of the fix is 15:34:04 UTC and the location of the receiver is 39 degrees 10.5217 minutes North latitude, 76 degrees 40.1002 minutes West longitude, and is 44.5 meters above mean sea level. Because the Validity indicator is 1, we know the position information is valid to use, placing the receiver on the tarmac at Baltimore-Washington International Airport in Maryland.

Other fields in the sentence are not strictly necessary for knowing the receiver position, but provide additional information about the fix. (The DGPS fields, left blank in the example, are used when a Differential GPS signal is available for the receiver and used to correct the errors inherent in the standard GPS satellite signal.)

The GPS hardware interface is typically an RS-232 serial port operating at either 4800 or 9600 bits per second. By using HyperTerm or another terminal emulator software package on your personal computer, you can see the output of your GPS receiver. This is a quick way to confirm the operation of your receiver and can be an interesting activity by itself, especially if you're outdoors with a laptop.

❖ Cost Savings

Even if you're not in the market for a brand new scanner, the availability of these new models usually means a lower, close-out price on the previous generation of scanners, in this case the PRO-96 handheld and PRO-2096 base/mobile. Although these models lack many of the features of the new scanners, they are still capable and useful for many listeners.

❖ Aerostats

Significant natural or manmade disasters can threaten the smooth operation of communications systems, often by damaging equipment and facilities. One emerging option for providing temporary radio coverage is via

aerostats, which are basically a tethered blimp equipped with transmitting and receiving equipment.

Last September officials from Ohio's Multi-Agency Radio Communications System (MARCS) tested an aerostat as a way of restoring wide area emergency radio coverage. A 75-foot Army blimp was launched near Sandusky and floated to an altitude of 1,000 feet. From there it demonstrated cellular telephone coverage in an 11-mile diameter area and the ability to link to a ground-based repeater about 50 miles away. A weatherproof repeater assembly on the underside of the aerostat housed the radio and control equipment.

The cellular signal was able to provide Internet data connectivity as well as regular voice telephone calls for ground users within the coverage area. The aerostat could have easily been flown at a higher altitude, which would have resulted in a larger geographic service area.

Aerostats have been used by the federal government for years in the Caribbean and along the U.S. southern border, mainly to provide radar and visual observation of potential drug smuggling.

There are some risks with such a platform, of course. Tethering an aerostat in rough weather and high winds can be difficult, and could turn deadly if it broke free and eventually crashed. This would make operation over populated areas unlikely. At high enough altitude they could also be a hazard to other aircraft.

The more practical difficulty is money. The aerostat and associated ground equipment can run upwards of $500,000, along with another quarter million dollars worth of repeater and control equipment. This puts it outside the budget of most local and state emergency management agencies.

As technical work continues on these airborne platforms, planning efforts are underway to identify additional missions that could help cover purchase and operational costs. Such missions may include police surveillance and environmental monitoring.

So, if you're monitoring signals and you can't locate the repeater site on the ground, you might try looking up!

That's all for this month. As always, I welcome your e-mail at *danveeneman@monitoringtimes.com*. You can also find more radio-related information on my web site at **www.signalharbor.com**. Until next month, Happy New Year and keep scanning!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Q. *How many FM broadcasters are there within 100 miles of where I live, and do any of them have the call sign KXUG? (Bill Fair, N5UXG, Bentonville, AR)*

A. The FCC maintains an Internet site which allows you to do a search of stations (**www.fcc.gov/mb/audio/index.html**). According to that site, there are approximately 150 FM broadcasters, high and low power, in a 100 mile radius of Bentonville, AR. None has the call sign KXUG (or KUXG in case you wondered if one shared your ham call sign).

Q. *I have a collection of aluminum tubing from scrapped antennas. How can I calculate the lengths I need for scanner listening? (Sam Britell, Lakeview, OR)*

A. If you would like to make vertical half-wave dipoles, you would use 135 inches (67.5 inches each side of the insulator) for the 30-50 MHz low band, 36-inches (18 inches each side of the insulator) for the 144-174 MHz high band, 14 inches (7 inches each side) for 406-512 MHz UHF, and 8 inches (4 inches + 4 inches) for the 806-960 MHz band.

You'd connect the coax shield to the lower element and the center conductor to the upper element. It really doesn't matter which gets connected to which, but most people feel better when the "hot" center wire is connected to the upper element!

If you wanted to make mobile antennas and had a magnetic mobile mount, just use the upper element lengths for these bands; the car roof supplies the missing metal for the lower element.

The basic formula for calculating the length in inches of a half-wave dipole is to divide 5616 by the frequency in MHz.

Q. *I have been unable to find any information on how tapering a whip antenna affects its resonance or signal. Vertical base antennas as well gradually taper smaller toward the top. What is the relationship of the length and diameter of an antenna element? (Jim Smith, Houston, TX)*

A. The gradual tapering of a whip antenna has very little bearing on its resonant characteristics or bandwidth; it is only a means of providing flexibility at the distal end in mobile applications where it's likely to strike something overhead. In vertical HF base antennas, it simply makes more sense from a weight/leverage perspective to make the telescoping sections gradually smaller toward the top than at the bottom. Base VHF and UHF antenna elements are rarely, if ever, tapered.

While a case could made that the thinner ends of tapered elements have higher RF resistance, compounded by the skin effect, in actual practice, the resistive difference is vanishingly small.

The *ARRL Antenna Book* does address the general effects of length vs. diameter, but not with the taper. I doubt that it is ever taken into consideration in antenna design, due to its small influence. Perhaps some of our readers have additional insight into this interesting question.

Q. *After accidentally leaving my car headlights on too long, the battery died. I tried jump-starting with a freshly-charged battery, but with the dead battery still connected – or even disconnected – the engine barely turned. Do jumper cables really add that much resistance? (Mark Burns, Terre Haute, IN)*

A. Yep, you guessed it. The starter motor on a vehicle takes quite a current – several hundred amps – to crank. Let's do the math with Ohm's law: E=IR (volts = amps X ohms).

If our theoretical car battery must deliver 300 amps cranking current from its 12 volt battery, that means that the total resistance of the auto's starter motor and cabling is only 0.04 ohms! If those long jumper cables have even a fraction of an ohm, the drop from the booster battery is considerable. I just measured the total resistance of the two conductors on my own copper-wire jumper cables – 1 ohm!

Now you know why a jump start turns the motor so slowly, and why the battery cables in your car are so short and thick! It's always a good idea to let the jumper battery charge the car battery for a minute or two, so both batteries can try starting the engine. And it's also helpful to have the engine running in the car with the booster battery so its alternator (generator) can add power to the jumper system.

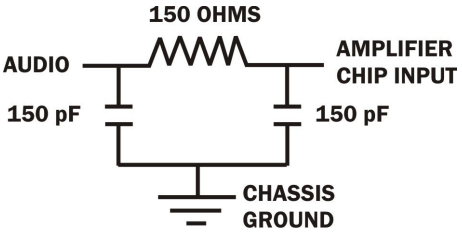
Q. *We have two hams or CBers on either side of our home, and their muffled voices can be heard on our telephones and on our sleep machines which generate white noise. How can we eliminate the interference? (Rich Dixson, email)*

A. Yes, the wiring is picking up the single-sideband signals (SSB) and detecting the audio, which then is amplified by the phone and white noise generator. The telephone problem is quickly solved with a radio-frequency interference (RFI) filter. If you can't find them at Radio Shack or Wal-Mart, you can find these on line at:

www.smithgear.com/rf1400.html
www.getyourtech.com/servlet/the-3616/Radio-Interference-Filter/Detail
www.ablackhorse.com/productcart/pc/viewPrd.asp?idproduct=73857 (least expensive)

It is a little trickier to deal with the white-noise generator without knowing what you're doing, because you have to modify the circuitry to do the filtering at the input to the amplifier chip. You may be able to get by with a shunt capacitance to ground at that point (maybe 0.01 uF or so – experiment).

A sure-fire filter is also quite simple if you know where that amplifier input is:



Q. *I have my Grunding Satellit 800 Millennium grounded with a 5/8 copper ground rod 5 ft. ground rod and an antenna going out my window, but the static is still there. Would I have better reception using an active antenna and an artificial ground? (Preston Clark, email)*

A. I doubt that a ground is going to solve anything. Try taking the ground off the radio while listening to a weak station and see if the interference gets worse on the station. If not, then a ground isn't the answer.

Without actually hearing it myself, I can't diagnose the source of the interference. If it's static "crashes" during storm season, it's distant/local lightning. If it's a continuous buzzing sound, it's AC lines or AC-associated appliances.

Try running a length of coaxial cable (any kind) from the radio out to a tree and throw a wire up into the tree, connecting the center of the coax to the wire, to see if that helps. Be sure the coax shield is connected to the radio as well; it doesn't have to be connected to a ground near the antenna.

If reception improves, the electrical interference is most likely coming from your dwelling, and any antenna near the building will suffer the same interference.

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

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Digital Utilities: The Absolute Beginner's Guide

"There's nothing left to hear on the utility bands!"

We hear this every day, but it's a half-truth. There's as much to hear as ever, but more of it is weak-signal digital communication. Signals are weaker because we've lost nearly all of the old, commercial super-stations with three-letter calls and miles of ultra-high-gain antennas. Signals are digital because that's what's happening in communication technology everywhere.

The good news is that weak digital signals are easier to dig out of noise than weak analog signals like upper sideband (USB) or amplitude modulation (AM). The even better news is that if you have a radio, a computer, and an audio cable, that's all the equipment you'll need.

❖ What is Digital?

On its most basic level, digital radio is simply anything that passes information by means of binary ones and zeroes (called bits). This is in contrast to the more traditional analog waveforms, which use a continuously variable modulation. Analog systems are simple and reliable, but not always the best solutions on bad HF channels.

The information can be text, pictures, sound, or anything else that software can process into bits. It's all the same to the equipment.

Every digital mode consists of an encoder, a modulator, a channel, a demodulator, and a decoder. All communication uses these, but in digital they're more visible. It makes sense to combine the modulator and demodulator, and that's where we get "modem." Every digital mode has a hardware or software modem in it somewhere.

❖ On-Off Keying

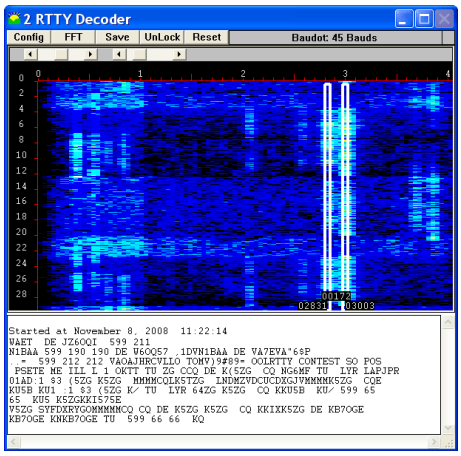
Everyone's heard of the oldest digital mode: It's plain old Morse code. A telegraph key is either all the way down or all the way up. The radio signal thus produced is called OOK (On-Off Keying), or CW (Continuous Wave).

While Samuel Morse had no idea he was inventing a digital mode, his first system in 1837 was just that. It used mechanical tape printers, but their operators quickly learned to pull the low-speed messages out of the clacking noises by ear. 170 years later, people are still way smarter than machines, though we're also slower. The gradual evolution of technology has finally led to all the funny noises now being heard on the radio.

One of these funny noises is another OOK mode, given the rather cool-sounding name of Hellschreiber. This means "shiny writing" in German, and it also refers to the inventor, one Doctor Hell (no, really). This pixel-based mode speeds things up a bit and brings back the tape printer. It was used a lot in World War II, and a virtual computer version is making a comeback among hams.

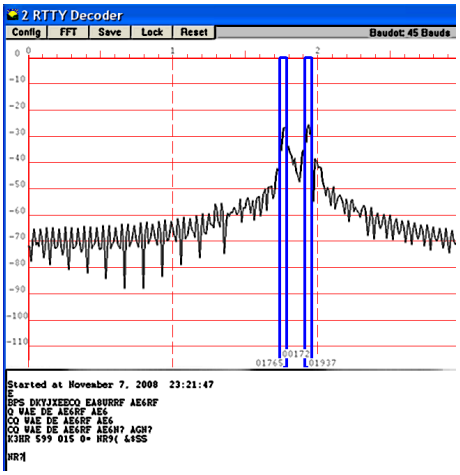
❖ FSK Modes

The next step after plain old Morse was landline teleprinting, which evolved into what's now generally known as radio teletype (RTTY or RATT). "Teletype" is actually a trade name owned by the now-defunct Teletype Corporation, but it stuck.



Standard RTTY is also called Baudot, after the inventor of a precursor in the 1870s. Note that this is also where we get "baud," a somewhat misunderstood unit of digital symbol rate.

RTTY and similar teleprinting schemes use Frequency-Shift Keying (FSK). Instead of turning a carrier wave on and off, FSK shifts it rapidly between two frequencies (usually called mark and space in the jargon). These correspond to the two digital states.



FSK is what gives RTTY its chattery, warbling sound that is very common on the HF bands. It is still used a lot, though the strongest signals are usually encrypted military traffic. The best unencrypted signals come from weather offices, some French Navy bases, and ham radio stations.

RTTY uses sequences of five bits to represent a simple character set called International Telegraph Alphabet #2 (ITA2). Each character is "framed" with one start and two stop bits (or a pause of similar length). ITA2 provided the core of subsequent "asynchronous" character sets, including the one used in your personal computer.

RTTY evolved into hundreds of subsequent standards, using different types of FSK. One improvement led to Simplex Telex Over Radio (SITOR). It added a few more characters, a slightly higher speed, and a rudimentary error check not present in straight Baudot.

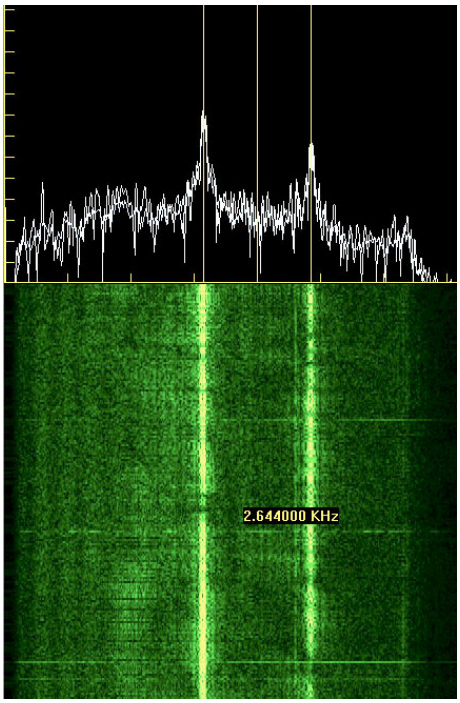
SITOR has two sub-modes: Automatic Repeat Request (ARQ or mode A), which goes chirp chirp chirp; and Forward Error Correction (FEC or Mode B), which produces a steady trilling sound. The old Telex network is pretty much gone, but both modes are still used worldwide in the maritime radio service.

A more advanced FSK variant is Multiple-Frequency-Shift Keying (MFSK). One early, multi-tone version is called Piccolo, from its high, trilling sound. Versions with fewer tones often sound bubbly. Note that MFSK is not the same as MSK, Minimum-Shift Keying, a more complex mode used for Differential Global Positioning System (DGPS) beacons on the medium wave band.

❖ PSK Modes

PSK stands for Phase-Shift Keying. It's a hot area for innovation right now, and again there are probably hundreds of variations. There is no single PSK sound on the air, though most versions sound like warbles (low speed) or hisses (high speed). In general, the more information that is crammed into a PSK channel, the more it sounds like noise.

As the name implies, PSK shifts the phase of the signal instead of the frequency. The simplest variant, with two states, is binary PSK (BPSK). From there, you get into quaternary (4PSK), 8-ary (8PSK), and so on. The additional states allow encoding of multiple bits for a higher speed, with a sacrifice of bandwidth economy and robustness.



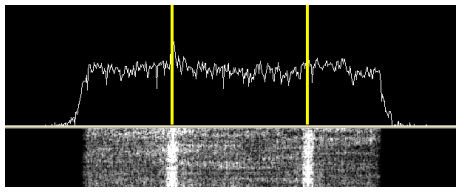
A typical commercial use of PSK is the High-Frequency Data Link (HFDL) mode used for air-to-ground traffic. A typical military use is STANAG 4285, a wideband whooshing sound defined in a Standardization Agreement for members of NATO (North Atlantic Treaty Organization). Both systems can change PSK variants, and therefore speeds, to suit a particular channel.

Hams have really gone to town with PSK. There are new modes yearly, mostly using direct keyboard to keyboard communication. Tuning to 14070 kHz any time the band is open will produce multiple warbling sounds often sounding like a plague of locusts. This is PSK31, a slow, very narrowband mode well suited for casual conversation using personal computers.

❖ Packet Modes

"Packet Radio" is not a modulation scheme. It's a protocol for passing data between a sending and receiving station. Instead of sending one or a few characters at a time, it assembles them into larger, consecutively numbered, error-checked, data units called packets.

In most packet protocols, the receiving station either acknowledges valid packets or asks that



they be sent again. Bad channel conditions simply cause more retries. This makes HF packet very error-free, but potentially also very, very slow.

An interesting commercial system aimed at combining packet's robustness with the better HF performance of SITOR is called PACTOR. This can stand for Packet Teleprinting Over Radio, though its European inventors say it refers to a Latin word for "the mediator."

The slowest version, PACTOR-I, uses 100 or 200 baud FSK with a long packet length and (for the first time) data compression. It's now found in most free and cheap multimode decoding programs. Unfortunately, it's hardly ever used anymore, except for calling.

Most real-world users have shelled out for the expensive and extremely sophisticated PACTOR-II, and its firmware upgrade called PACTOR-III. These can choose between a truly remarkable number of FSK and PSK schemes, adapting in real time to channel conditions. It's available only from the SCS company and its licensees.

Most HF e-mail systems use PACTOR-II or one of its custom variations. Some computer programs and modems can indeed receive these, but at a cost far beyond the means of most hobbyists.

❖ ALE

ALE is not what you get at the local pub. It's Automatic Link Establishment, a complex system used by most of the world's militaries. It's designed to make HF as easy to use as other radio bands, by automating much of the grunt work of picking frequencies, finding the best ones for different participating units, and adapting to continuously changing propagation conditions. Hams are also experimenting with ALE, with equipment modified for its fast channel hopping.

ALE has done a lot to put military units in the field back onto HF, giving that part of the hobby a new lease on life. It's amazing what can be heard "sounding" (sending identifying beacon transmissions for propagation evaluation).

A good introductory program, if you can get it to work, is Charles Brain's old PC-ALE for Windows up to XP (not Vista). His web site has gone away, but various people are still maintaining different versions of this one. ALE is also included in most multimode packages, though usually without PC-ALE's ability to scan channels using instructions given over the serial port.

❖ So Let's Get Started

As we've noted, if you have a radio and a computer, you're most of the way there. You don't need an interface -- that's for transmitting. You need to connect the earphone or recording output of the radio to the input of the computer sound card. In most cases, that's it.

Of course, you'll also need software. There are hundreds of downloads, ranging from great to wretched, though most are in the middle somewhere. Most are for Windows, though there are a few for Mac and Linux.

Windows users have an additional issue with Vista, which completely changed the way the operating system handles the sound card. A lot of older ham radio software works unpredictably, if at all, with Vista.

One truly impressive download for Windows (including Vista) is called MultiPSK. Most of its features work in the free version. The user interface is improved slightly in version 4.10. It's fast and effective, but certainly not pretty. What's pretty is the way it produces nice clean decodes of many PSK and non-PSK modes.

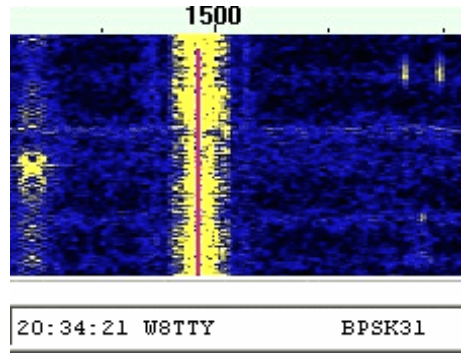
There are too many other free or low-priced multimode programs to list here without leaving out worthy software. One popular medium-priced package is SkySweeper (**www.skysweep.com**). While some modules work better than others, it provides a very full set of linkable decoders, analyzers, filters, and other goodies that are great fun to hook together and tinker with.

For Mac, there's always Chris Smolinski's MultiMode for OS-X. This program's been around forever, and it does a lot of nice things for the price ($89 US from Smolinski's site, **www.blackcatsystems.com**).

Any of these programs will have enough bells and whistles to keep you experimenting for months. Since you have a computer, use it and Google to find more software and tips on how to use what you have. There's no such thing as knowing it all.

❖ Good Frequencies

W1AW is the well-equipped headquarters station of the American Radio Relay League, a large ham radio association. It broadcasts a full schedule of bulletins in Morse, RTTY, American Standard Code for Information Interchange (ASCII, a 7-bit descendent of ITA2), and AMTOR (Amateur Teleprinting Over Radio, received same as SITOR). Times and frequencies are available at **www.arrl.org/w1aw.html** .



14070 kHz nearly always has at least one PSK31 contact going during daytime hours. For other PSK modes start at 14070 kHz and move higher in frequency. Going higher yet, RTTY and packet radio can be heard all the way up to 14105. At night, some PSK31 may be heard on 7070 kHz.

Hamburg Radio, the German meteorological station, broadcasts continuous RTTY, which is heard worldwide. Assigned frequencies are 4583, 7646, 10100.8, 11039, and 14467 kHz, though RTTY dial frequencies can vary up to 2 kHz either way.

CFH, the Canadian Forces meteo station, sends weather faxes on the hour and fills in the rest of the time with RTTY weather. Assigned frequencies are 4271, 6496.4, 10536, and 13510 kHz.

SITOR-B is still available from the world's coast guards. Mediumwave fans will want to check the schedules and chase NAVTEX bulletins on 518 kHz. On HF, several powerful US Coast Guard stations use 8416.6, 12579, 16806.5, and 22376 kHz. The full schedule is at **www.weather.gov/om/marine/hfsitor.htm**

The US Air Force has a global network of large stations that use ALE; 9025 kHz is a sure hit, if you wait long enough.

Now, let's log some digital and send it to Utility Logs! See you next month.

UTILITY WORLD

UTILITY LOGS

Hugh Stegman

ABBREVIATIONS USED IN THIS COLUMN

AFB.....Air Force Base
ALE.....Automatic Link Establishment
AM.....Amplitude Modulation
AWACS.....Airborne Warning And Control System
CAMSLANT....Communications Area Master Station, Atlantic
CW.....On-off keyed "Continuous Wave" Morse telegraphy
E06.....Russian Intelligence, 5-figure groups, machine voice
FAX.....Radiofacsimile
FEMA.....US Federal Emergency Management Agency
HF-GCS.....High-Frequency Global Communication System
LSB.....Lower Sideband
M08a.....Cuban 3-msg Morse, ANDUWRIGMT = 1-0
MARS.....Military Affiliate Radio System
RDFT.....Redundant Digital File Transfer
RTTY.....Radio Teletype
SHARES.....Shared Resources, US federal frequency pool
SITOR-B.....Simplex Telex Over Radio, mode B
SK01.....Generic for Cuban numbers in ham digital modes
UK.....United Kingdom
Unid.....Unidentified
US.....United States
USAF.....US Air Force
USCG.....US Coast Guard
V02a.....Cuban "Atencion" Spanish numbers, 3-msg format
XPA.....Russian Intelligence 20-tone multi-frequency shift keying

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 ().

2187.5 5BJF2-Cyprus-registry Container Ship *MCP Athens*, Digital Selective Calling safety test with Bilbao, Spain, at 1949. (MPJ-UK)
2971.0 Gander Radio-Air route control, Canada, calling Navy RL 589, a US Navy P-3D, at 0240. (Allan Stern-FL)
3292.0 Cuban AM Spanish "female" (V02a), callup 50351 83882 32622 and messages, at 0202. (Tom Sevart-KS)
3449.8 "OK"-Unlicensed CW experimental beacon, OK, at 0957. (Chris Smolinski-MD)
3450.0 "OK"-Same CW beacon as 3449.8, at 2120. (Sevart-KS)
4039.0 India Whiskey-Possible US Navy, air defense net with Bravo, Echo, Oscar, and Kilo, also on 4372, at 0055. (Mark Cleary-SC)
4069.1 "WT"-CW beacon, weak at 0048. (Smolinski-MD)
4077.4 "MO"-CW beacon, OK, at 0046. (Smolinski-MD)
4094.6 "PA"-CW beacon, AR, at 1002. (Smolinski-MD)
4096.3 Unid-CW beacon, CA, 1-second beeps, at 1006. (Smolinski-MD)
4096.6 Unid-CW beacon, CA, 2-second beeps, at 1009. (Smolinski-MD)
4097.6 "TMP79"-CW temperature beacon, CA, at 0955. (Smolinski-MD)
4152.5 DHJ59-German Navy, Wilhelmshaven, working unid station at 0603. (Michel Lacroix-France)
4271.0 CFH-Canadian Forces meteo, Halifax, coded RTTY weather observations at 0128. (Sevart-KS)
4520.0 KYAASF-Kentucky National Guard Army Aviation Support Facility, Frankfort, KY; ALE sounding, also on 4882.5, 5306.5, 5880.0, and 6911.5, at 1617. (Jack Metcalfe-KY) *[Add 10821.0. -Hugh]*
4560.0 TAH-Istanbul Radio, Turkey, SITOR-B weather info in English, at 2003. (MPJ-UK)
5058.5 LR1-US Federal Bureau of Investigation, Little Rock, AR, calling QT2 (Quantico, VA) ALE at 0241. (Cleary-SC)
5157.6 Unid-CW dasher beacon ("Blinky," FL), at 0042. (Smolinski-MD)
5201.0 Unid-Russian Air Defense, formatted time-stamped CW tracking data, at 1925. (MPJ-UK)
5268.0 Unid-Russian military, frequency-shifted Morse message in 5-figure groups, then traffic, at 2019. (MPJ-UK)
5435.0 Unid-Russian Intelligence "English Man" (E06), preamble 296 583/77 and message, some jamming, at 2100. (Mike-West Sussex, UK)
5544.0 B-6058-China Southern A330, HFDL log-on with Muharraq, at 1907. (MPJ-UK)
5598.0 Speedbird 21MA-British Airways, position for New York, handed off to Gander on 5649, at 0201. (Stern-FL)
5678.5 Unid-CW dasher beacon ("Honker," Pike's Peak, CO), at 0034. (Smolinski-MD)
5696.0 Rescue 2003-USCG HC-130J, working CAMSLANT at 1254. (Cleary-SC)
5725.0 "5-I-H"-Unknown military unit in exercise Joint Warrior, tracking net with "P-2-M" and "5-N-P" at 0720. (ALF-Germany)
5732.0 Z13-USCG Sector Key West, calling MFN (Cutter *Knight Island*). ALE at 1840. (Cleary-SC)
5883.0 V02a, 5-figure groups in progress, also on 6786, at 0715. (Sevart-KS)
6532.0 G-VFIT-Virgin Atlantic A340, flight VS0025, HFDL log-on with Shannon, at 1914. (MPJ-UK)
6876.0 Unid-Russian Polytone station (XPA), "numbers" message using tone codes, at 0820. (Mike-UK)
6910.0 NNN0YQB-US Navy Marine Corps MARS, in SHARES Region 6 Net at 1600. (Metcalfe-KY)
6967.5 IGLB-Italian Coast Guard, working ICI 101 in Italian and English, at 0714. (ALF-Germany)
6982.5 KHA946-NASA, LA, went to an unknown frequency, at 1435. (Metcalfe-KY)
8097.0 Cuban CW "Cut Number" station (M08a), 5-figure groups in progress at 1835. (Sevart-KS)
8156.0 Coral Harbour Base-Royal Bahamas Self-Defence Force, traffic at 2257. (Cleary-SC)
8211.8 "OR"-CW experimental beacon, OR, at 0027. (Smolinski-MD)
8294.0 WEJ-International Maritime Ships Agents, Miami, FL, working unknown vessel in Spanish, at 1254. (MDMonitor-MD)
8297.0 Unid-Computer "female" voice with Southern Hemisphere warnings, at 0350. (DL8AAM-Germany)
8400.0 UWJQ-Ukrainian tug *Kapitan Bytko*, status for URV9, Odessa Radio, CW at 1955. (ALF-Germany)
8502.0 NMN-USCG, VA, weather at 1740. (Sevart-KS)
8571.0 UWS3-Kiev Radio, Ukraine, CW traffic and weather at 1939. (MPJ-UK)
8903.0 QFA7519-Qantas flight on Atlas Air, working N'djamena, Chad, at 0458. (Patrice Privat-France)
8912.0 AYL-USCG Cutter *Dolphin*, calling TSC (US Customs, FL), ALE at 1434. (Cleary-SC)
8930.0 Reach 836-US Air Force contract transport, working Stockholm at 0840. (Lacroix-France)
8971.0 Goldenhawk-US Navy, ME, working P-3C Wafer 21 at 2142. (Cleary-SC)
8977.0 F-OHGX-Royal Jordanian A320, flight RJ0146, HFDL log-on with Reykjavik at 1926. (MPJ-UK)
8983.0 CAMSLANT Chesapeake-USCG, working Coast Guard 2113 at 1850. (Sevart-KS)
9007.0 Sentry 61-USAF E-3 AWACS, patch via Trenton Military to Cornerstone (Tinker AFB, OK), at 1723. (Cleary-SC)
9025.0 PLUTO-Mexican Army, calling JUPITER in ALE, at 1300. (MDMonitor-MD)
9073.0 REA4-Russian military, Moscow, frequency-shifted Morse message in 5-figure groups, at 1240. (MPJ-UK)
9106.0 82KNY-National Communications System, KS, ALE sounding at 1430. (MDMonitor-MD)
9120.0 Nightwatch-US military, working Nighthawk 7 at 1526. (Metcalfe-KY)
9122.5 SWT1-US Army Corps of Engineers, OK, ALE sounding at 1415. (MDMonitor-MD)
10536.0 CFH-Canadian Forces meteo, Halifax, NS, FAX weather charts at 1619. (Lacroix-France)
10780.0 Cape Radio-USAF, Cape Canaveral Air Force Station, FL, patching King 64 (USAF HC-130P rescue aircraft) to Patrick AFB for arrival weather, at 2110. (Stern-FL)
11108.0 FC6FEM-FEMA Region 6, TX, calling MO7 (MO State Emergency Operations Center), ALE at 1700. (MDMonitor-MD)
11175.0 Puerto Rico-USAF HF-GCS, patching tanker Gold 11 to Hilda (Air Mobility Command) for arrival weather in Spain, at 2015. (Stern-FL)
11232.0 Trenton Military-Canadian Forces, working CC-130E Atlas 40, at 1530. (Sevart-KS) Sentry 61-USAF E-3 AWACS, patch to Dragnet Weapons at Tinker AFB, OK, at 1643. (Cleary-SC)
11300.0 RAM270-Royal Air Morocco, working Tripoli at 1949. (Lacroix-France)
11494.0 IGY-USCG Tug *Penobscot Bay*, calling Z03, ALE at 1415. (Cleary-SC)
12087.0 R23558-US Army UH-60A, calling T1Z147 (1-147 Aviation), ALE at 1807. (Cleary-SC)
12216.0 WGY906-FEMA Region 6, TX, working WGY908, Region 8, CO, voice and 39-tone data, at 1737. (Metcalfe-KY)
12823.5 CTP-Portuguese Navy, Lisbon, RTTY marker at 1331. (Lacroix-France)
13907.0 Coast Guard 2302-USCG aircraft, working CAMSLANT at 1422. (Cleary-SC)
13927.0 AFA6PF-USAF MARS, CA, patching USAF tanker Chess 23 to Mad Dog, at 1744. (Sevart-KS)
14396.5 AFA3HY-USAF MARS, KS, control of weekly SHARES net with alternate station NNN0VUV (US Navy/ Marine Corps MARS), at 1530. (MDMonitor-MD)
16540.0 Unid-Male operator calling vessel *Radian*, has frequently called "Paricoy" in the past, in English and Tagalog at 2012. (MDMonitor-MD) *[Simplex channel 16E. -Hugh]*
17436.0 Cuban SK01, passed file 76153863.txt in RDFT at 1600, repeated on 16178 at 1630. (Sevart-KS)
17515.0 V02a, callup 71743 25542 35322, came from 17436 after mistaken start there, at 1600. (Sevart-KS)
23337.0 ICZ-USAF, Sigonella, Italy, ALE sounding at 1130. (MPJ-UK)

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More on NATO Encrypted RTTY

Ever had one of those household jobs that gets out of hand? You know, the one where you spot that broken tile in the corner of the bathroom as you stumble in for the morning shave, thinking "I really should fix that" and before you know it, it's 11pm and you're re-doing the whole wall?

November's article about the oft-heard 75bd/850Hz NATO broadcast RTTY stations was a little bit like that. A few days after writing the original article, I happened to answer a posting on the UDXF email list asking the perennial question about the origin of these transmissions.

A few days later I received a private email from a UDXF member "RU" chipping in with some suggestions and noting some more relationships in terms of the parallel broadcasting that is a feature of this network. Well, this spurred me to dig a little deeper to see what more could be found out using the available resources.

❖ Frequencies

To recap, here is the list of frequencies determined for this network so far: 3127, 3133, 5186, 5340, 5345, 7593, 9030, 9085, 9215.2, 10428, 12120, 16122.3 and 16264.5 kHz

Of these channels, with propagation so poor at present, the two within the 16 MHz band were hardly heard, especially not 16122.3 kHz. Also, 5186 kHz may or may not belong to this network, it not having been heard for a number of weeks now.

On the other hand, some of these transmissions, especially 9030, 12120 and 16264.5, are so strong, they make up my propagation "markers" across the shortwave spectrum.

❖ Parallels

Now began the hard work of figuring out which transmissions were in parallel – that is, sending the same traffic on more than one frequency simultaneously.

I first began by making precision baud rate measurements on each of the strongest signals: 3127, 5340, 9030 and 12120 kHz. The Hoka Code300-32 has a special mode that can "fingerprint" signals to within 0.0001bd. After repeating the measurements over a number of days, I soon determined that with the current propagation conditions, this wasn't likely to be a useful approach in spotting identical transmissions.

So, to the low-tech approach: Instead, I parked one of the two receivers at Digital Towers on one channel and the other radio on one of the alternatives, listening to each at the same time.

On days when messages are short, rapid progress was made by simply listening for both channels to complete their messages with reversals before idling or switching off and then returning with the reversals to start the next message. (All of this happening at the same time on both frequencies, of course.) Some channels, however, carry very long messages, making the whole process quite laborious. Nor is this a foolproof method of determining parallel transmissions. We'd need to capture and compare the bit streams to be sure that they were truly identical.

After a few weeks of concentrated listening, here's what was found (// = parallel):

5186 not heard
5345 // 9085 kHz
7593 kHz independent
9030 // 3133 // 3127 kHz
9085 // 5345 kHz
9215.2 independent
16284.5 // 12120 // 10428 // 5340 kHz
16122.3 not strong enough for determination

❖ Locations

We've covered the very useful ITU Monitoring Service publications a few times before (see Resources). This organization is called in to monitor spectrum use (and abuse), and the results of its work are published on the web. If the monitoring stations involved are able to get a sufficiently accurate fix on a signal (reported in the files as "A", "B" or "C" grade bearings), they note the signal bearing, latitude and longitude. Clearly, if two different stations give such measurements, you will be able to determine the location of the signals quite well.

To begin, I downloaded all of the .DBF format database files, combined them into one large file using the free multi-platform OpenOffice software (see Resources), and then converted them into an AppleWorks spreadsheet for quick searching. The PDF versions of the files are also indexed for quick searching, but the spreadsheet provides more flexibility.

Here's what we find by checking the most consistent fixes from the UK station at Baldock (see photo) and the Spanish station at El Casar.

5340, 9030, 9215.2 and 12120 kHz all indicate a southeast coast US location with a bearing of 278 to 280 degrees. Indeed the coordinates for some "A" grade fixes from both the UK and Spain put these transmissions all very close to the USN facility on Saddlebunch Key in Florida (station NAR).

3127, 3133, 5345 and 16122.3 kHz all indicate a more northerly east coast US location with a bearing of between 285 to 292 degrees. While no coordinates were given for these stations, the higher bearings might suggest Cutler, Maine (callsign NAA) as a possible location. However, this station

is no longer operational on HF, making that location unlikely. With no other East Coast HF facilities, these could merely indicate inaccurate bearings for NAR. It could also be possible that the bearing cuts across the US, making it likely that some of these transmissions correspond to the USN facility at Dixon, CA, which uses the callsign NPG.

If you look at the list of frequencies and parallel channels, note that most of the parallel broadcasts come from different locations, which is probably a good validation of these empirical results. I'd welcome any further thoughts from readers. Especially those who can drive to sites with a portable radio for a definitive check!

That's it for this month. Enjoy your digital listening.

DIGITAL BANDSCAN: 13000 - 13500 KHZ

13400.0	???	Russian Mil	MS5 12 Tone HF Modem
13404.0	???	Russian Mil	75bd/200 FSK encrypted
13410.0	???	French Forces	600bd/L STANAG4285 HF modem
13410.0	VEX	Canadian Mil	MIL-188-141A ALE
13411.6	???	UK Mil	1200bd/L STANAG4285 HF modem
13415.0	RIC	US SHARES	MIL-188-141A ALE
13417.0	???	Russian Diplo	CROWD-36
13421.5	???	US Navy	Link-11
13423.5	XSS	UK TASCOMM	MIL-188-141A ALE
13425.6	???	Algerian Diplo	Coquelet-8
13426.0	PR0	UNID	MIL-188-141A ALE
13428.4	???	Algerian MFA	Coquelet-8
13435.0	OWG	Danish AF	MIL-188-141A ALE
13442.0	???	French Forces	600bd/L STANAG4285 HF modem
13445.0	???	Royal Navy	1200bd/L STANAG4285 HF modem
13446.0	???	US FEMA	MIL-188-141A ALE
13446.7	ASP	Pakistani Diplo	100bd TWINPLEX
13449.0	RIW	Russian Navy	CW
13449.0	CGE	Venezuela Army	MIL-188-141A ALE
13457.9	OZU	Danish Diplo	TWINPLEX
13457.0	FAA	US FAA	MIL-188-141A ALE
13465.2	RFFA	French Forces	200bd ARQ-E3

RESOURCES

ITU Monitoring - **www.itu.int/ITU-R/terrestrial/monitoring/index.html**
OpenOffice - **openoffice.org**

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

Poland's Underrated Voice to the World

On November 11, 2008, while we marked Veterans Day in the United States and Remembrance Day in Canada, Poland marked its 90th Independence Day. Poland has had its share of tragedy, cursed by history and geography. Prior to independence, it spent almost two centuries partitioned by the empires of the day. The newly independent nation found itself sandwiched between Germany and the Soviet Union, each of which had designs on its territories.

On September 1, 1939, Hitler launched the Second World War by invading Poland. Tragically the nation was defeated rather quickly. Seventeen days after Germany invaded from the west, the Soviet Union invaded from the east. Despite heroic resistance, the remnants of the Polish armed forces surrendered, or left the country to fight on another day.

Polish resistance symbolically ended when the Warsaw station was finally silenced.

"When pianist Władysław Szpilman resumed his job at Polish Radio in 1945, he did so by carrying on where he left off six years before: poignantly, he opened the first transmission by playing Chopin's Nocturne in C sharp minor (Lento con gran espressione), the same piece he was playing as German bombs hit the studios of Polish Radio, interrupting its broadcast on 23 September 1939.

"In 2002, Roman Polański directed *The Pianist*, which tells of the survival of the pianist from the Holocaust, but Szpilman died before the film was completed." Listen to/view a version being played here: **www.youtube.com/watch?v=dyVm7XXBA7w**

I first became aware of Radio Polonia in the late 1970s. As it is today, it was a difficult station to receive, with occasional exceptions. When you could hear it, Radio Polonia sounded pretty much like the other stations of the Soviet bloc featuring the triumph of socialism and such. I have the notes I took while hearing Radio Polonia on the 19 mB on June 20, 1979. The news was mainly about developments in the SALT II talks on limiting nuclear weapons in Europe, then being negotiated by President Carter and Soviet leader Brezhnev. Poland was in favor of the treaty and Edward Gierek, the Polish premier, sent his congratulations to both men.

In a "Science and Technology" feature, such topics as tramlines, modern filing techniques in the legal system and glue as a conductor of electricity were discussed. Riveting stuff. Looking at an old printed program schedule from the time, the only program that appears to have survived from that era is *Focus*, the culture and arts program (see below).

With the fall of communism, many changes took place at Radio Polonia. Sadly though, it remained a difficult catch at the best of times.

❖ Enhanced Reception Opportunities

In recent years, Radio Polonia has become Polish Radio External Service. And it's been making up for its traditionally poor shortwave signal in a big way, as it, like many other broadcasters, moves much of its output to the internet. It's very easy now to listen to RPES whenever you want.

For instance, the daily output of RPES is available via the World Radio Network. By logging on to the WRN website **www.wrn.org** one can listen to or download daily broadcasts from Poland in English and six other languages (Polish, Hebrew, German, Russian, Ukrainian and Belarussian). Or if you prefer, you can listen online to the WRN English for North America stream (including Sirius Satellite Radio) at 0400-0430 UTC, 1800-1830 UTC and 2100-2130 UTC.

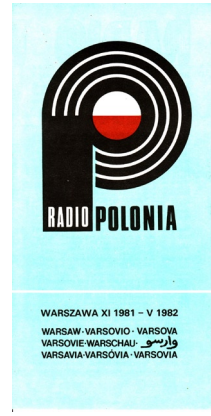
Taking a page from the notebook of other broadcasters in the region, such as Radio Prague and Deutsche Welle, most stories, features and programs are reproduced and archived in text with audio clips on the RPES website. This is particularly handy, to be able to go back and read a story as well as download the audio.

CBC Radio One in Canada carries 30 minutes of RPES programming, weeknights only, at 430a.m. local time, depending on which city you are in. (This would also include the CKZN 6160 kHz shortwave in St. John's, Newfoundland at 0800 UTC).

Speaking of shortwave, the PRES website lists 1300 UTC on 9450 and 7325 kHz, and 1800 UTC on 6015 and 7345 kHz.

Each broadcast opens with the news. News stories are archived on the website, but in text form only.

❖ Polonia Programs



Around Poland –

Presenter Danuta Isler takes the listener each week to a different place significant to Polish history or society. Subjects of the program have included the Jewish Information Center, the health resort of Naleczow, Papal Warsaw and Gdansk, birthplace of Solidarity. **Around Poland** can be heard after *News From Poland*, Wednesdays in the 1300 UTC transmission, and Mondays in the 1800 UTC broadcast.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=0&k=143

Chart Show –

Your chance to hear what's hot on the Polish hit parade. The program has been hosted by either Peter Gentle or John Beauchamp, and is based on the domestic Polish Radio 3 music chart. The Polish charts are no different from those in the west, featuring artists like Amy Whinehouse, Bruce Springsteen, Coldplay and other top acts. However, the program tends to concentrate on the fastest rising or top Polish singles, which is nice. It's an opportunity to hear Polish music and artists who probably wouldn't get airplay in North America, outside of ethnic radio. The **Chart Show** can be heard at the end of the Saturday 1300 UTC broadcast and at the end of the Sunday 1800 UTC broadcast.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=0&k=154

Chat and Serious –

Hosted by Joanna Najfeld, this show reminds me a little bit of Voice of Russia's *Timelines* hosted by Estelle Winters, with one exception. Most of those interviewed by Ms. Najfeld are in fact Poles. Programs have included interviews with Jakub Biernat of the top

selling daily tabloid *Fakt*, on the 5th anniversary of its debut, a panel discussion on how people in Poland are putting into practice the teachings of Pope John Paul II, with three Catholic commentators of the 'generation JP2,' with a Czech student starting school in Poland and with a teacher of English and German as a second language.

Joanna Najfeld has a very pleasant interviewing style, and the subjects are always very interesting. The program airs biweekly at the end of the 1300 and 1800 UTC Monday transmissions, alternating with Talking Jazz. It can also be heard at the end of the 1300 UTC Thursday broadcast.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=224&k=0

Day in the Life –

Like **Chat and Serious** this is also an interview program, hosted by Michal Kubicki. The subject matter is a bit more serious. Mr. Kubicki's interview style has a bit more "gravitas." For example, I listened with rapt attention to an interview he did recently with Pawel Sawicki, the author of a series of radio features on the Nazi concentration camp of Auschwitz entitled *Between Crime and Sanctity*. Mr Sawicki, working for Polish Radio 2, researches the State Museum of Auschwitz's collected recordings of camp survivors. Riveting. Other programs included interviews with an Abbot about the monastic life, and the President of the Polish Music Council. **Day in the Life** can be heard in the 1300 UTC broadcast Tuesdays, and in the 1800 UTC broadcast on Wednesdays.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=0&k=145

Europe East –

All but two of the most recent editions have been about events in the Ukraine. The other two were about Lithuania. The Ukrainian stories were presented by Halyna Pastushuk, "our correspondent in Kyiv." Interesting, but possibly not too popular with their Ukrainian neighbors. Saturdays in the 1800 UTC hour, Sundays in the 1300 UTC hour.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=0&k=141

Focus –

A "weekly look at the Polish cultural scene" hosted by Michal Kubicki. Such topics as the Warsaw Film Festival and Polish-British theatre co-operation are discussed. It airs on Mondays at 1300 and Thursdays at 1300 following *News from Poland* and 1800 Thursdays following **Comment.** It also appears to be the lone holdover from communist Radio Polonia.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=0&k=146

Letter From Poland –

A weekly essay by a member of the PRES staff, most recently presented by Magdalena Jensen. It's generally a talk about some aspect of life in Poland. There is usually some irreverent humor involved. Not quite Alistair Cooke, but close. It can be heard on Tuesdays in the 1800 UTC transmission after *News from Poland*.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=0&k=144

Multimedia -

Presented by Slawek Szefs. Polish radio's long running Media/DX program. It often reports on the Polish media scene, discusses reception reports and other topics. Wednesdays in the final half of the 1800 UTC broadcast.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=0&k=149

News from Poland –

Each transmission from PRES opens with a bulletin of *News About Poland*. Always updated on the website at:

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=0&k=140

Offside! –

Polish Radio's sport program. It gives you lots of information about the Polish sports scene with emphasis on football (soccer) and F1 motor racing. Hosted by Danuta Isler. Fridays in the 1300 UTC broadcast.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=0&k=174

Open Air –

The program tends to present serious in depth looks at events and people in Polish history, and other stories that just don't fit any category. It can be heard at the end of Saturdays' 1800 UTC broadcast.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=248&k=0

Story time –

This is really something unique as, too often, younger listeners are forgotten by major broadcasters. **Story Time** as the name implies features stories translated into English. As one episode was introduced, it is for "younger listeners and those who are young at heart." Very enjoyable fare!

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=0&k=148

Studio 15 –

Like many Polish Radio programs it combines irreverent humor with entertaining features. Peter Gentle and John Beauchamp host the program. They seem to have 'way too much fun! A recent edition featured a number of songs by (I assume) a Polish reggae band. Different indeed! It can be heard at the end of Wednesdays' 1300 UTC broadcast. Also check out their "myspace page" **www.myspace.com/polishradiostudio15**

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=251&k=0

Talking Jazz –

I was saddened to learn of the death of original host (Canadian-born) Bogdan Zaryn. When I first featured this program in *Program Spotlight* in April of this year, I found him to be knowledgeable and enthusiastic about his music. Sadly he died suddenly after surgery in October, leaving a wife and two young children. His co-host and now successor as host of **Talking Jazz**,

Maciej Krzak, talked about his friend Bogdan in a moving tribute on the show which you can hear at: **www.polskieradio.pl/zagranica/news/artykul95025.html** As mentioned before, the program airs biweekly at the end of the 1300 and 1900 UTC Monday transmissions, alternating with **Chat and Serious**. It can also be heard at the end of the 1300 UTC Thursday broadcast.

The Biz –

This program can be heard at the end of each Tuesday broadcast. Hosted by Peter Gentle it looks at topics in the news of a financial nature.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=0&k=173

The Kids! –

This is a youth oriented program, interviewing young people about their lives and activities. Programs have touched on young people's attitudes towards the Olympic Games, the ecology, trends in Education, and the war in Georgia. It is hosted by Krystyna Kolosowska on Sundays during the 1800 UTC broadcast, just before the **Chart Show.**

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=223&k=0

The Krakow Panoptikon –

What an odd name for a program. I had to look it up! "In Internet culture, Participatory Panopticon refers to the proliferation of photographic and video content accessible through the World Wide Web and other Internet sources to the point that it can be utilized as an up-to-date, authoritative source on all human activities." (Wikipedia) The program focuses on all things Krakow. Odd name, interesting content. It's hosted by John Beauchamp. The program is biweekly, alternating with Day in the Life on Tuesdays in the 1300 UTC broadcast and Wednesdays in the 1800 UTC broadcast.

www.polskieradio.pl/zagranica/news/archiwum.aspx?s=252&k=0

❖ An Underrated Gem

Polish Radio External Service offers the listener a wealth of information and entertainment from Central Europe. It combines the serious reportage of Michal Kubicki, the irreverence of Pete Gentle and John Beauchamp and the smooth delivery of long-time PRES broadcaster Slawek Szefs, who I always think of as "the voice of Poland." It's a very entertaining mix, which I encourage you to hear.

PRES is a regular part of my listening experience. And this Canadian listener will miss the contributions of Bogdan Zaryn. Poland's voice to the world is indeed an under appreciated and underrated gem.

GLOBAL FORUM

THE WORLD OF SHORTWAVE BROADCASTING

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Romania Becomes a Major Signal

Radio Romania International completed its transmitter replacement on November 3, as two new 300 kW Continentals at the Tiganesti site were put into service. A new 100 kW at Satfica started Oct 21; two more new ones at Galbeni began already August 4. RRI is back on its full schedule, reports Wolfgang Büschel, Germany.

RRI is now heard with very good modulation and signals, a stark improvement over the weak and distorted senders replaced. Programs are made up of short features on a wide variety of topics, and lots of Romanian folk and classical music. RRI also is big on listener participation with contests, mailbag shows. English broadcasts with four frequencies are to two different targets, but most of them can be heard in North America, as compiled by *DX Mix News*, Bulgaria:

0100-0156	6145 9515
0400-0456	6115 9515 9690 11895
0630-0656	7180 9690 15135 17780
1300-1356	15105 17745
1800-1856	7215 9640
2130-2156	6030 6115 7145 9755
2300-2356	6015 6115 7105 9610

There's even more great folk music on the Romanian language service, such as 1300-1500 on 11940 and 15170, the latter clashing with Spain via Costa Rica. Neighboring Bulgaria competes with its own folk music occupying much of the same two hours on 15700.

AFGHANISTAN [non] In October, R. Solh, US Psyop service, finally changed its music playlist which had been identical day after day for a year at exactly the same times; it's still a different mix of the same lively Afghan and Hindi tunes, great morning entertainment for us on new 13830 via UK at 1200-1500. At 1500-1800 Rampisham moves to 9875 (gh, OK) Also via UAE 0200-0300 5925, 0300-1200 11675 (Dragan Lekic, Serbia, *DX LISTENING DIGEST*)

ALASKA KNLS B-08 English: 0800-0900 7355; 1000-1100 6150; 1200-1300 6150 6915; 1400-1500 6150 (KNLS website) At 10 and 12, 6150 collides with Taiwan and Chinese jamming; seems after all these years KNLS has not learned it must avoid frequencies used in target area. Although same power and azimuth of 270 degrees, 6915 is much weaker here. Some days 6150 is on top at 12, and clear at 14. The station for degraded attention-spans, magazine format of short features, some semi-secular, alternating with music (gh, OK, *WORLD OF RADIO*) see also MADAGASCAR

The building season is short in Alaska so Digital Aurora Radio Technologies was happy to get started in early fall on construction of the antenna field for its DRM shortwave tests. Consultant for the project Don Messer tells me the actual testing will be done next spring (Leslie Stimson, *Radio World*, via Mike Terry)

It will be interesting to see if this project survives since its principal sponsor was Senator Ted Stevens, now a convicted felon. Stevens managed to sneak "earmarking" funding for this project into a DOD appropriation. It would be no surprise to see most of Stevens's earmarks eliminated from the next budget (Harry Helms, W5HLH, TX, *DXLD*)

ALBANIA R. Tirana B-08 English as revised: Mon-Sat 1530-1600 13720; 1945-2000 11645, 7465; 2100-2130 9345 or 7435, 7510; Tue-Sun 0130-0145 7425; 0245-0300 7390; 0330-0400 6110; 0430-0500 6100. Albanian to NAm, daily: 2130-2300 7435, 0000-0130 7425, 6110 (gh)

ARGENTINA R. Nacional at 0811 on 5945v and 5940 in *Panorama Nacional* program about fútbol (Lúcio Otávio Bobrowiec, SP Brasil, *DXLD*) So far reported only from S. America; unexplained. 6060 off-frequency or mixing product? (gh) Also distorted at 2110 covering 10-20 kHz from 5955 // 15345. Another day at 2010 covered 5950-5975, still audible with portable antenna collapsed (Moisés Knochen, Uruguay, *condiglist* yg)

AUSTRALIA A raft of flagship programs have been axed at the same time ABC moves to sack dozens of employees. Missing from the Radio National 2009 line-up are, *The Religion Report, The Media Report,* the long-running documentary *Radio Eye*, while the future of five-minute opinion-makers spot *Perspective* remains under a cloud, as does another religious-based weekly program, *The Ark* (*Sydney Morning Herald* via Dan Say, Mike Terry, Dale Park, *DXLD*) This will affect lots of Radio Australia programming, often a patchcord into Radio National (Dan Say, BC, *swprograms*) My own favorite is *The Ark*, because it offers perspectives on world religions in thoughtful ways without descending into irrational arguments (Richard Cuff, PA, *ibid*.)

BELARUS B-08 of Radio Station Belarus, Minsk: 2100-2300 on 7135, 250 kW, 252 degrees; 7360, 75 kW, 270 degrees; 7390, 150 kW, 246 degrees (*DX Mix News*, Bulgaria) 7135 at 2108 news and sports, poor but improving, // 7360 poor (Harold Sellers, Ont., *DXLD*) 7135 with pop music 2244, ID 2250, some ham QRM, // 7360, continued in Russian at 2300 (Harold Frodge, MI, *ibid*.)

BHUTAN BBS, 6035, heard by long path in several dates in early Nov, from 0010, peaking around 0035 to fadeout 0108, Buddhist chants and other music. No sign of Colombian as of 0045 (Bruce Churchill, CA, *Cumbre DX*) This was right along the grayline, so could easily be short path. Check with unidirectional antenna (gh)

BOLIVIA R. Fides, presumed on 6155.25 in Spanish, Bolivian music at 0050-0100 and 1000-1030, but another day on 6155.30 at 0912-0930 political comments about Santa Cruz; format change? (Chuck Bolland, FL, *DXLD*)

BRAZIL R. Cultura São Paulo renamed R. Cultura Brasil, nominal 9615, but still out of order, wide distorted signal centered on 9611 at 1734 (Marcelo Xavier Vieira, Brasil, *radioescutas* yg) At 2123 much better when demodulated in FM mode, and another day at 1514 it was beautiful in FM, covering 9601 to 9621 (Giuseppe Settimi Cysneiros, *ibid*.)

After a month of silence, Rádio 9 de Julho de São Paulo resumed 9820, heard Nov 7 at 1657, excellent signal like a local, and at 1013, being heard well all over Brazil (Adalberto Marques de Azevedo, Minas Gerais, *ibid*.) But still tough in NAm (gh)

R. Nacional da Amazônia, 11780, 0714 Brazilian songs, plus weaker but plenty strong distorted matching spurs centered at 11721.5 and 11838.5; plus and minus 58.5 kHz. And again at 2223 interfering with R. República (gh, OK, *WORLD OF RADIO*) Also heard the two strong, distorted matching spurs same date at 2215 (Brian Alexander, PA, *DXLD*) And here same date at 2300-2400 (Adalberto Marques de Azevedo, MG, *ibid*.)

CANADA [and non] Reactivated CFRX, Toronto, continued to be a big disappointment, barely modulated, but sometimes capable of making its presence known by producing a SAH on CVC Chile, also on 6070 all night. I counted fades of 210/minute = 3.5 Hz (gh)

CHAD Radiodiffusion Nationale Tchadienne, which had been on 4905 in the mornings and evenings, was no longer heard there from late October (gh, OK) Back on 6165 until 2230* (Tony Rogers, UK, *BDXC-UK*) Blocked by Croatia on 6165 until 2210, then very good (Anker Petersen, Denmark, DSWCI *DX Window*)

CHINA [and non] From the first day of the B-08 season, Firedrake jamming was missing from most of its usual frequencies, replaced by the alternative jamming method, echoing CNR-1 network transmissions (gh) Firedrake still remained in some cases, such as against out-of-band Sound of Hope frequencies like 8000, 9000 (Jari Savolainen, Finland; José Miguel Romero, Spain, *DXLD*) Firedrake totally covering AIR Mandarin at 1130-1315 on 11840 and 15795 (Wolfgang Büschel, *DXLD*)

COLOMBIA Ministry of Communications issued a list of SW stations as of June 2008 (via José Miguel Romero, Spain, *DXLD*) Lots of outdated info including Rdif. Nacional which had been off SW for 15 years. Possibly of interest: a projected 5 kW station on 6105 in Bahía Solano, Chocó, HJAO, with an STL on 318.9 MHz (gh) That's R. María, but nothing yet, probably due to lack of financing (Rafael Rodríguez, Bogotá, *DXLD*) It also claims stations in extended bands have to be on SSB, but the only one which fits, Marfil Estéreo on 5910, certainly is not (gh)

COSTA RICA Three of the REE relay frequencies here had been 1 kHz low since February or March: 5964, 9764 and 11814. Since nothing had been done to rectify this, which caused heterodynes with various other stations on correct frequencies, such as Cuba, Vatican and Japan, we found out the address of the frequency manager in Madrid and notified him about this in late October. Though he never replied, less than a week later, they were all back on frequency (gh)

CROATIA [and non] English segments on V. of Croatia for B-08, daily *u.o.s.*: 2315-2330 and 0300-0315 on 7375 via Germany and 3985v direct; 0700-0703 on 11690 and 9470 via Germany, 6165 direct; 1100-1103 M-F on 9830 direct; 1700-1715(Sun -1705) on 6165 direct; and 1905-1915 M-F, 1905-1910 Sat on 6165 direct (via Dragan Lekic, Serbia, *DXLD*)

All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; sesqui = one and a half; B-08=fall/winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated

CUBA [and non] Radio República, the clandestine which had been using 9515, 9640 and 6100, two hours each between 22 and 04 UT in A-08, disappeared with B-08. However, we noticed among the frequencies unnecessarily jammed at odd hours was 9600, an RHC channel -- and the jamming was even running when RHC was on it! David Yocis in WV heard a República ID at 0350 on 9600, and so did I later at 2329, mixing with RHC. So República had an unpublicized broadcast directly colliding with RHC and causing Cuba to jam their own frequency. However, this was soon replaced by a new schedule of Radio República via RMI via Sackville: 2300-2400 (Sat/Sun 2200-) on 11835; 0000-0200 on 9785; M-F 1100-1200 on 6100. That, of course, meant more interference and jamming on those channels, 9785 which had just been activated by Ukraine to South America; and jamming on 6100 ran prolonged hours, even bothering Radio Tirana at 0430-0500. And Cuba continued to jam itself on 9600 (gh)

CZECHIA [non] A R. Prague relay via Ascension for B-08 in Spanish to SAm, 245 degrees at 0000-0030 was originally planned for 7275, but then shifted to 7420 as monitored. Maybe VTC and/or R. Prague are finally deciding to respect the 40m hamband in the Western Hemisphere! Yet, three weeks into the season, their own schedule at **www.radio.cz/en/frequencies** was still displaying 7275 (gh)

ECUADOR HCJB in Spanish to SAm, on new 11625 for B-08 at 0000-0200 also puts an excellent signal into NAm, noted UT Sunday at 0022 with a *Reportaje* program, ''Ecuador y Estados Unidos -- Amigos y Socios," about all the great things the US Embassy is doing in Ecuador, such as medical aid and scholarships; part of our public diplomacy effort? Automated ID break at 0029:30 had HCJB announcing wrong frequency 9745, and the time as half an hour earlier (gh)

ETHIOPIA [non] Clandestines brokered by Radio Miami International for B-08, all 100 kW via Jülich, Germany at 130 degrees:
9695, 1600-1659 Sun/Tue/Thu, Voice of Oromiyan Liberation Front.
9680, 1700-1730 Saturday, Voice of Oromiya Independence.
9680, 1730-1759 Friday, Radio Oromiyaa Liberation
(DTK and Jeff White, RMI, *WORLD OF RADIO*) Note that the O-word is spelt differently in each case!

More new Ethiopian clandestine broadcasts: 11810, 1700-1759 Wed/Sun, Voice of Oromo Liberation, via Wertachtal, Germany. Heard on a Wednesday from *1700, Oromo ID and talk. 11835, *1700-1720 on a Wednesday, Ethiopians for Democracy, via Nauen, Germany, Amharic (Anker Petersen, Denmark, *playdx* yg)

15195, Addis Dimts Radio, via Samara, Russia, Sunday 1600-1605, Amharic (José Miguel Romero, Spain, *DXLD*)

FRANCE RFI is studying reinforcing its services in Spanish, French, English, Brazilian-Portuguese, Hausa, Swahili; and considering closing due to their small audiences, German, Albanian, Polish, Serbo-Croatian, Turkish and Lao, according to labor union sources (*El Mundo*, Spain, via José Miguel Romero and Arnaldo Slaen, *DXLD*)

GABON The two higher frequencies of Africa No. One, 17630 until 1600 and 15475 at 1600-1900, disappeared Nov 9, and remained unheard the following week (Raúl Saavedra, and gh, *DXLD*) Deutsche Welle via UK had moved in on 17630 and CRI via Mali had been colliding for years. Absence of 15475 also allowed LRA36, Antarctica to be audible during its entire 18-19 M-F broadcast. ANO's other transmitter, 9580 was still heard around 2000, scheduled 0500-2300 (gh, OK)

GERMANY [non] One DW broadcast in English to Africa, also well heard here, is at 0600-0630 via Portugal on 7240. On a Sunday it contained a rather strange program, *Learning by Ear*, with an explicit drama about teen sexual encounters, pregnancy. DW was inviting letters to the program and at 0616 gave website **www.dw-world.de/lbe** It is a general education service, for 12-20-year-olds, claiming an audience of 30 megAfricans, also in Portuguese, French, Swahili, Hausa and Amharic versions (gh) Also heard Sunday at 0900 on 17710, 21840 (Tony Ashar, West Java, Indonesia, *DXLD*)

GREECE ERT habitually registers lots of wooden frequencies, such as both 15650 and 15630 throughout the day, but uses only one of them. In B-08, we find them on 15650 instead of 15630 until 1550. Unfortunately, this collides with the first hour of the Miraya FM, Sudan relay via IRRS via Slovakia back to Sudan at 1500-1800 on 15650.

Another collision: 9420 has been a VOG frequency for a long time; yet as we predicted last month, 1Africa, CVC Zambia moved there, too, producing 5 hours of signal mixing at roughly equal levels. In Maryland, John Babbis found that 9420 was useless until 2200, then perfect with Greece alone. Neither of these had been resolved three weeks into the season (gh)

A B-08 schedule from ERT failed to tell us what we really need to know: times of weekly one-hour music broadcasts presented in English, *Greek In Style*. Fortunately, our monitors soon found them (gh) Sunday 1105-1200 on 9420, 15650 (Erik Koie, Denmark, *WORLD OF RADIO*) And UT Monday 0006-0100, excellent on 9420, 7475 (Harry Brooks, NE England, *ibid*.) It does show the *Filia* hour in English at 0700-0800 on 12105; this is several days a week but not every day (gh)

GUIANA FRENCH [and non] New Voice of Russia relays via Montsinéry represent no less than about a third of all transmissions via this site. And they are also remarkable for being the first transmissions of RM/VOR via transmitters in the western hemisphere since 17 years, if the airtime exchange of Radio Moscow and Radio Habana Cuba stopped in 1991 (Kai Ludwig, Germany, *DXLD*) see RUSSIA
0000-0100 11605 181 degrees in Portuguese
0100-0300 13630 195 degrees in Spanish
0200-0400 7335 318 degrees in Russian
0400-0600 7335 318 degrees in English
(DX Mix News, Bulgaria, corrected by gh, WORLD OF RADIO)

INDONESIA Oct. 08 version of Indonesian monitoring list by "N-1 Tushin," A. Ishida: **http://tinyurl.com/6n69ta** (S. Hasegawa, NDXC, DXLD) 4605, 4790 and 4870 inactive in mid-Nov (Ishida's site)

IRAN IRIB B-08 in English on SW:
1030-1130 15460, 17660 SAs
1530-1630 7330, 6160 SAs
1930-2030 7260, 6010, 7320 Europe; 9855, 11695 South Africa
0130-0230 6120, 7160 North America [''V. of Justice''] (via Jaisakthivel, India, *DXLD*) at 1930 also on 6115 via Lithuania (*DX Mix News,* Bulgaria)

KOREA NORTH [non] Shiokaze/Sea Breeze, B08, via JSR, Yamata, Japan: 1400-1430 5910; 2030-2100 6045 (S. Hasegawa, Japan, NDXC, *WORLD OF RADIO*) Tentative reserve frequencies are 5965, 5985, 6075, 6105, 6110, 6115, 7175, 7195, 7205 (Wolfgang Büschel, *BC-DX*) 5910 replaced 6020; some noise, maybe jamming on 5910. English usually appears on Fridays (Ron Howard, CA) 5910 good and clear here; also hearing English on Fridays but except for canned IDs, heavily accented and hard to follow (gh)

KUWAIT On 11630 at first unID, a station in Arabic with Qur'an at 1430 past 1600 Oct 30. The NDXC/Aoki list showed Kuwait started here Oct 15 (gh, OK) Phone interview at 1625 mentioned Kuwait ID. Still on at 1732 with Kuwait ID. Another Arabic broadcast not on schedules, at 0730 on 11675 (Wolfgang Büschel, Germany, *DXLD*) Also Kuwait, extended to around 0900 (Noel R. Green (NW England), *ibid*.)

LITHUANIA R. Vilnius, B-08 English: NAm at 310 degrees 2330-2358 7325, 0030-0058 9875; WEu at 259 degrees 0930-0958 9710. The same 100 kW transmitter also relays Iran on 49m 1730-2128; and *KBC Radio*, music station from Netherlands, 2130-2228 daily, 259 degrees to WEu on 6055, and UT Sundays 0200-0258, 310 to NAm on 6110 (*DX Mix News*, Bulgaria)

MADAGASCAR "World Christian Broadcasting, which operates KNLS from Alaska, will soon add 30-35 hours a day from its new station here, in Arabic, Spanish, Portuguese; and to India in English instead of Hindi and Bengali. Construction in Madagascar is on schedule" (Charles Caudill, WCB President, *NASB Newsletter*) But no target date specified (gh)

"Latest Construction News -- In Madagascar, a 1-1/2 mile road and 1-1/2 mile of fence has been built and a staff home, guard house, generator building and a few tool buildings have been constructed. The transmitter building which will contain three 100,000 [watt] transmitters is almost completed. Those three will soon be shipped to Madagascar and the diesel-powered generators will send the broadcasts from antennas that are also being built. Towers are up and the wire will begin to be stretched in January 2009" (Nov Church Bulletin, World Christian Broadcasting)

MALDIVES [and non] Remember Minivan Radio, which was on SW a few years ago, via Radio Miami International via Germany, opposing the lengthy rule of Pres. Maumoon Abdul Gayoom, accused of corruption? Its objective was finally achieved in October when Gayoom conceded defeat to a former dissident, Mohamed ''Anni'' Nasheed (Radio Netherlands News via NASB) Minivan Radio was sponsored by a UK-based organization, Friends of Maldives. Dave Hardingham, founder of FOM, told RMI that "it's been a hard battle and you played your part." This shows the power that shortwave can still have in shaping world events (Nov *NASB Newsletter*)

MÉXICO 6104.8v, Candela FM, Mérida / Radio Mérida, was being heard in mid-October, November, distorted at 1100, in the daytime at 2010, and at 2315, Mexican music (Bob Wilkner, FL, *WORLD OF RADIO*)

NETHERLANDS [non] Although Bonaire 17810 eclipses it during the 20 UT hour only, 11655 via Madagascar in English can also be heard in abandoned NAm during the previous two hours. Same programming in the 18 and 20 hours, other repeats at 19-20 (gh)

NIGERIA [non] Aso Radio in Hausa: 1600-1645 M-F on 15180, via TDP via Russian or CIS site (*DX Mix News*, Bulgaria) New clandestine, Nigerian music, drums IS (Anker Petersen, Denmark, *playdx* yg) Not clandestine but a local FM station in Abuja adding this on SW (Jeff White, *DXLD*)

RUSSIA [and non] V. of Russia's B-08 schedule for English to NAm got off to a rough start. A new relay site was added, French Guiana, on 6100 and 6135, but these two lasted only a few days, to be replaced by 7335, blowing away CHU which still had not moved to 7850. Yet the deleted frequencies were left on the VOR website. As of mid-Nov, the true schedule appeared to be, as monitored:
0200-0300 13735 12040 7250 6240
0300-0400 13735 12040 7350 6240 6155
0400-0500 12030 9855 9840 7350 7335 7150 6240 6155
0500-0600 12030 9855 9840 7350 7335 7150
Other non-Russian relay sites are: 7350 Vatican, 7250 Armenia, 6240 Moldova, 6155 Germany (best) (gh) See also GUIANA FRENCH

SERBIA [and non] International Radio Serbia, B-08 English:
0100-0130 6190 BIJ 250 kW/ 310 degrees N/CAm Mon-Sat; rest daily:
0200-0230 6190 BIJ 250 kW/ 325 degrees NAm
1400-1430 7200 BEO 010 kW/ N-D WEu
1930-2000 6100 BIJ 250 kW/ 310 degrees WEu
1930-2000 7200 BEO 010 kW/ N-D WEu
2200-2230 6100 BIJ 250 kW/ 310 degrees WEu
2200-2230 7200 BEO 010 kW/ N-D WEu
BEO = Stubline near Belgrade, Serbia [STUBLINEH]
BIJ = Jabanuša near Bijeljina, Bosnia [YABANUSHA, BEE-YEL-YINA]
Later due to an antenna problem, 325 was changed to 310 degrees
(Dragan Lekic, Serbia, *DXLD*)

SLOVAKIA Radio Slovakia International B-08 English with azimuths: 0100-0130 7230 305, 9440 245; 0700-0730 13715 75, 15460 85; 1730-1800 5915 275, 6055 285; 1930-2000 5915 275, 7345 (via José Miguel Romero, Spain, *WORLD OF RADIO*) Only 7230, invading the 40m hamband is for NAm (gh)

SOUTH AFRICA Channel Africa B-08 English:

0300 0400 3345 100 SAf
0300 0400 7390 500 EAf
0400 0700 7230 100 SAf
0500 0600 9745 500 WAf
0600 0700 15255 250 WAf
0800-1200 9625 100 SAf
1400-1500 9625 100 SAf
1500 1600 17770 500 EAf
9625 100 SAf
1700 1800 15235 500 WAf
2000 2200 3345 100 SAf

(SENTECH via gh and BDXC-UK) 9625 usage is not appreciated by the northern Quebeckers or the southern Usonians (gh)

SPAIN REE is still airing token newscasts in ''co-official'' languages, Catalan, Galician and Basque, M-F at 1340-1355 on several frequencies, best by far in NAm, 17595. The ''Basque'' segment at 1350 was usually in Castilian except for opening and closing, but Nov 10 the first two minutes were really in Basque! Maybe in a few months they will work up to an entire program in Basque. It's fun to find out how much Catalan and Galician one can understand from knowing some Spanish and Portuguese. All three are presented at breakneck speed; what would you do if you only had 5 minutes a weekday to convey all the news of your culture to the world?

Another odd language on REE is Sephardic, or Judeo-Español, *a.k.a.* Ladino. This weekly half-hour is scheduled in B-08:

Monday 1425 15385 ME
Tuesday 0115 11780 SAm
Tuesday 0415 9690 NAm

-- despite their announcing A-08 channels on 16m, 11795 and 9650 respectively! Unfortunately, 15385 is overshadowed here by Habana 15370, and 11780 is blocked by RNA Brasil -- not a good idea to broadcast to an area already occupied by a 250 kW transmitter (gh, OK)

SUDAN [non] Voice of America B-08 in Arabic, Radio Sawa to Sudan-Darfur [*a.k.a. Affia Darfur;* see last month]:

0300-0330	4960 SAO 100 kW / 030 deg,
	9845 IRA 250 kW / 275 deg,
	11855 UDO 250 kW / 276 deg
1800-1830	4960 SAO 100 kW / 030 deg,
	5880 IRA 250 kW / 275 deg,
	9380 BOT 100 kW / 350 deg
1900-1930	5880 BOT 100 kW / 010 deg,
	9380 SAO 100 kW / 076 deg,
	9815 WER 250 kW / 150 deg

(*DX Mix News*, Bulgaria) SAO = São Tomé; IRA = Iranawila, Sri Lanka; UDO = Udorn, Thailand; BOT = Botswana; WER = Wertachtal, Germany

A new radio station launched 15 November, supported by Radio Netherlands Worldwide, Radio Dabanga to the Darfur region, in Sudanese Arabic and local languages at 0429-0527 on 13800 via Madagascar (Andy Sennitt, *Media Network* newsletter) It's daily, also on 7315 via Germany (gh)

SWEDEN [and non] R. Sweden may have dropped morning broadcasts to NAm (see last month), and the remaining evening relays via Canada at 0230 and 0330 on 6010 may skip over northeast America, as Bob Thomas in CT observes, but we find various transmissions to elsewhere audible, if no match for the deleted ones: For Africa, 2030 via Madagascar 9895; 2130 via Madagascar 7395; 1330 on 7465 direct to China (gh, OK) Also 1530 on 9360 direct to Mideast (Harold Sellers, Ont., *DXLD*)

TAJIKISTAN Tajik Radio, Yangiyul on new 4765.02 to 4765.07, ex-4635, 1450-2000* with hum and again from *2258 to 0110, with heavy Tajik rock to wake people up, poetry and folk music, 0100 clear ID (Anker Petersen, Denmark, *playdx* yg) Last day 4635.05 was heard: Oct 25 (Kouji Hashimoto, *Japan Premium*) Like a B-08 shift, though domestic service (gh)

UKRAINE Additional transmitters of RUI from 24 Oct, with kW:

Luch (Nikolaev) 9785 250 SAm 1900-0300
Krasne (Lviv) 15635 600 Au 0600-1400
Luch (Nikolaev) 7285 100 Russia 0300-1500
Luch (Nikolaev) 6020 100 Russia 1500-0200

But there is financing only until Dec 31. The further destiny depends on the budget for 2009 (Alexander Egorov, Ukraine, *"open-dx"* via *RUS-DX* via Wolfgang Büschel) NRCU needed to burn up some money before yearend (Kai Ludwig, Germany, *DXLD*) So 15635 added for English at 0600, 1000, 1100; 9785 at 2000, 2200, 0100 (*DX Mix News*, Bulgaria)

USA Henry Loomis has died at 89; he was VOA director 1958-1965 and started the Spe-cial Eng-lish service; he was also a physicist with scientific accomplishments to his credit. See **www.kimandrewelliott.com/?id=5186** (Wolfgang Büschel, *A-DX*)

[and non] Some VOA changes for B-08: Philippines relay back toward NAm can be very good on new 9345 at 1200-1400, including *Jazz USA*, Sundays after 1300; and 9760 from 1500.

Of all the hours VOA is on 15580 in B-08, only one is from Greenville B, 21-22 UT, 94 degrees, but also putting a huge signal backwards to CNAm. Fortunately, that's for the *Music Mix* string of shows, such as *American Gold* on Mondays, *Classic Rock* on Wednesdays. Earlier, 15580 comes via Botswana, Sao Tomé, Bonaire and UAE. In fact, it's the highest G-B frequency in use this winter. *AfroBeat*, M-F at 20-21, and *Music Time in Africa*, Sat/Sun 20-21, can be heard best via Botswana on 11975.

Spanish in the mornings is rescheduled 1-1/2 hour later, 1230-1400 on 9815, 13715, 15590 (gh) M-F 1400-1415 sports and 2300-2315 news roundup canceled; evenings now 0000-0100 5890, 5940, 9885. Weekends from 1300 instead of 1230 (Dragan Lekic, Serbia, *DXLD*)

Morning service breaks at 1330 between *Enfoque Andino* and *Buenos Días, América* (gh) Evening broadcast contains *Ventana al Caribe* on local Mon, Wed, Thu, Fri; *Hablemos con Wáshington* on Tue; listeners' club weekends at 0030 (Lekic, *ibid.*) This is significant: rather than *Ventana a Cuba* -- thus Cuba will no longer have any reason to jam it and the rest of VOA Spanish or anything else unfortunate enough to be on same frequencies. Yeah, sure!

Haïti has not observed DST since 2006, yet VOA keeps shifting times of all three Kriyol broadcasts one UT hour according to DST in Washington, *e.g.* 2200 instead of 2100 on 15390, 13725, 11895 (gh)

Fascinating 10 minute video about saving VOA Delano which also looks at the historical impact of shortwave from the US:

http://tinyurl.com/5bnltz (Mike Barraclough, England, **DXLD**) But confuses VOA with RFE/RL, SW with MW, claims Bethany is a 'dump' (gh)

Tony Alamo, the radio preacher whose compound in Arkansas was raided, and who was arrested for sexual abuse and child molestation, continued to broadcast on SW as if nothing had happened, via WWCR, WINB, Equatorial Guinea, Sri Lanka, and European Gospel Radio/IRRS, despite being imprisoned as a flight risk prior to his trial delayed until February. The WWCR broadcast is M-F at 1400-1500 on 15825. For the latest on his case, consult **www.tonyalamonews.com/** (gh)

Marion's Attic, the 78-rpm and cylinder record show, changed time on WBCQ 7415 to Saturdays at 2200 UT, since the original time four hours later was no longer propagating. It now matches a similar show on Fridays at 2200, *Behaviour Night* (gh)

In November, to fill a gap at 2030 UT M-F, WBCQ 7415 began playing recently archived editions of *WORLD OF RADIO*, except Wednesday or Thursday when a new edition is first available; in addition to regular times Monday at 2300, UT Friday 0030 on 7415, Saturday 0000 on 5110, and Wednesday 2200 on 15420 (gh)

Someone was not protecting WBCQ's interests at the August HFCC; but there is increasing demand for 7 MHz frequencies. In A-08, WBCQ had 7415 to itself, but in B-08 several other stations are registered, China, Russia, IBB Philippines (gh) And some foreign language blasting in on 7415 at 0415 (Ted Randall, TN, *DXLD*) That's DW in Arabic via Rampisham UK at 0400-0430 only; prompted Ted to move his QSO show earlier UT Sundays on WBCQ (gh)

WRNO was missing again in October, awaiting modified parts for its new ELCOR transmitter; then from Nov 1 for several days came back with 24 hour gospel music tests on 7505; then missing again (gh) Larry Thom, CE of WRNO says modifications are mostly for the 15590 frequency which they will begin using in the daytime (Ron Howard, CA, *DXLD*)

Once the World Harvest Radio online program schedule finally appeared to be updated, showing 5- instead of 4-hour difference between ET and UT, we searched on ''Marie Lamb'' to find all the times for *DXing with Cumbre*. It displayed 16 of them on weekends and 10 on weekdays. Yet we could confirm by monitoring only two of them, Sat 1530 on WHRI 11785, and Sun 0230 on WHRA 5850. Most of the others were not even on the air, and the Angel 4 times (meaning now T8WH Palau instead of KWHR Hawaii) were inaudible. It appears that WHR program schedules are slightly exaggerated (gh) One more time *DWC* actually heard: UT Sat 0430 on 7315, with co-channel (Steve Cross, OK, *DXLD*)

Harmonic heard consistently for two weeks on 4440, country format station; finally got ID as WSRC, 1480, Fair Bluff NC. Came up at 1149 in Oct when they went onto day rig (Mark R. Bradshaw, KJ4WY, Lenoir, NC, *WORLD OF RADIO*)

On 2730, WSBA, York PA at 0024-0049+ with News-Radio 9-10 and WSBA 9-10 IDs, football scores, local ads, 3 x 910 (Harold Frodge, MARE DXpedition, MI, *DXLD*)

Harold Camping overkill during the 20-21 UT hour on 16m: WYFR runs three nearby frequencies in //, 17535, 17555, 17575, which also produce mixing products on 17495, 17515, 17595 (gh, OK)

Contrary to last month's item that KTMI in Lebanon, Oregon, told the FCC it was about to start programming, and got its expiring construction permit extended -- Benjamin Dawson, of Hatfield-Dawson, Consulting Engineers, visited the transmitter site specified in early November. His findings: No change since my last visit: No sign of any construction, and no 3-phase power within at least a couple of kliks. If they alleged to the Commission any actual construction, they are total liars. Photos: nice ratty unmaintained pasture land looking SW from the corner of Totem Pole Road and Mt. Hope Drive (Ben Dawson, WA, *DXLD*)

ZANZIBAR RTZ's only English broadcast is a relay of news from Spice FM at 1800-1810 on 11735; however, several reports have accumulated that on Thursdays only (beginning the Islamic weekend), it's at 2000 instead (gh)

ZIMBABWE [non] SW Radio Africa, from studios in the UK, changed frequency from 12035 to 11745 for B-08 at 1700-1900, still unchanged on 4880 (*Media Network* blog via DXLD) 11745, 152 degrees from Woofferton, heard fairly well with *Newsreel* at 1840, mostly in English, but going in and out of Shona and/or Ndebele too (gh)

Until the Next, Best of DX and 73 de Glenn!

BROADCAST LOGS

NOTEWORTHY LOGS FROM OUR READERS

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

0001 UTC on 5996.26
BOLIVIA: Radio Loyola. Barely audible Spanish audio, although image quite clear on Win Radio. Announcer's comments audible only periodically and just above the noise. Additional Bolivians in Spanish: **Radio Santa Rosa** 6047.22, 0025-0035; **Radio Santa Cruz** 6134.80, 0043-0100, 6134.78, 0935-0945; **Radio Fides** 6155.25 (tentative) 0050-0100, 1000-1030; **Radio Yura** 4716.16, 0940-1000; **Emisoras Pio XII** 5952.49, 2340-2359; **Radio Causauki Coca** 6075, 0900-1045 (Chuck Bolland, Clewiston, FL). **Radio San Miguel Riberalta** 4699.4, 0924-0943 (Scott Barbour, Intervale, NH). 4699.4, 0015-0030 (Bolland).

0222 UTC on 15285
PHILIPPINES: Radio Pilipinas. English program, *Dateline Phiippines* plus numerous IDs: "Radio Pilipinas Overseas Service, the Voice of the Philippines," and "the Philippines, the pearl of the Orient." Signal fair-poor amid Firedrake interference on 15290, though overall good reception on the 19 meter band (Ron Howard, Asilomar Beach, CA). Presumed **Radio Netherlands, Tinang relay** 9475, 2232-2303. Indonesian text to pop music bits and ID in passing (Barbour).

0235 UTC on 7270
EGYPT: Radio Cairo. Announcer's thanks to listeners in eastern North America, followed by Middle Eastern music. Nice to hear a station that values their shortwave listeners and targets an English service to North America. Signal S9-10 (Joe Wood, Greenback, TN). Presumed station on 6290, 0217 + 0251-0302* (Howard). Winter B08 English includes: 0000-0030 6850; 0200-0330 7535; 1215-17835; 1600-1800 12170; 1900-2030 9310; 2115-2245 6255; 2300-0000 6850 - *gvh*.

0318 UTC on 7200
RUSSIA: Radio Rossii via Yakutsk. Various music tunes to Russian ID of fair signal quality. Parallel programming 5935 via Magadan (ex-5940 poor with interference from WWCR). Frequency 6075 via Petropavlovsk-Kamchatka (ex-5920-fair), 7320 via Magadan (fair-poor). Unable to hear 7345. Russia's **Kamchatka Radio** via Petropavlovsk-Kamchatka 6075, 0810-0900. Local programming of news, extended interview session and interview. Local news at 0830 with musical fanfare between items. ID, "this is Kamchatka," to radio drama of fair signal quality (Howard).

1259 UTC on 3995.03
INDONESIA: RRI-Kendari. Station interval signal to Jakarta program, followed by local studio including a possible identification at 1315. Signal better than usual, audible to 1316. Indo monitoring; **RRI Makassar** 4749.95, 1305-1345, 1307-1400+; **RRI Palagkaraya** 3325, 1159-1245, 1251-1315+; Unknown Indo 3578.73, 1238-1320; **RRI Manokwari** 3987.05, 1228-1315, 1249-1400; **RRI Fak Fak** 4790.04, 1230-1400; **RRI** Ternate 3344.96, 1330-1401 (John Wilkins, Wheat Ridge, CO). **Voice of Indonesia** 9525.9, 1300-1315 (Brian Alexander, PA). 9525.88, 1504-1513* 11785.95, 1459-1505* (Howard).

1313 UTC on 15050
INDIA: All India Radio (Delhi/Kingsway). Excellent music vocals with brief Sinhala announcement. Good signal (SINPO 34333) with slight flutter, improving over time (Evans). AIR-Bangalore 9870, 1530-1540. No signal fading or wobbly modulation. Lady announcer hosts Bollywood style music (Bruce Barker, Broomall, PA)

1329 UTC on 5985
MYANMAR: Myanma Radio. Usual station interval signal of music on local instruments. Chimes melody to news by announcer in presumed Burmese, followed by talk or commentary at 1341. Vocal music at 1348, continuing past 1400. Very good signal observed (Wilkins). 9730, 1437-1439.* Mathematical lesson with many equations in vernacular with English terms. Lessons to indigenous music at sign-off, almost fair-except for adjacent splatter (Howard).

1339 UTC on 9335
NORTH KOREA: Voice of Korea (Kujang). Traditional Korean music with a martial edge. Political talk format from announcer duo at 1341. Very strong signal, SINPO 44333, best heard from North Korea in many months (Evans).

1340 UTC on 5860
CHINA: Voice of Jinling. Presumed this station with mellow Chinese vocals. Announcer's brief comments between tunes, followed by possible ID at 1400. Signal fair prior to deteriorating (Wilkins). Chinese **Firedrake** (music jammer) on 5830 at 2318-2330. Jammer continued without break during this period. **China Radio International** 5915, 2331-2345. English service including mentions of "CRI." AOKI lists site as Kashi-Saibagh (Bolland). China's **Sichuan PBS-2**, 7225, 1506-1517.* Chinese service in the clear after VOA 1500.* Noted on // 6060 (fair, 1515*). These two freqs are never in sync for sign-off (Howard).

1417 UTC on 21695
LIBYA: LJBC-Voice of Africa. Discussion on African unity including focus on African Union and United States of Africa. Station ID at 1424-1425 to African pop music. Signal observed with heavy fading (S3-S1) SINPO 34222 // 17725 at 1417, almost equal to 21695 at 1430 (Evans). 17725, *1404-1505. Sign-on to English news between music bridges. Text on Leader of the Revolution into commentary on democracy and the national constitution. Signal initially noted as S9+, ailing by 1500, // 21695 struggling to stay above the noise surface (Barker). VO Africa winter schedule targeted to Africa 1400-1557, 17725, 21695 - *gvh*.

1425 UTC on 15140
OMAN: Radio Sultanate of Oman. Tune-in to pop music to chimes/gong and station identification at 1430. Station theme music and English news at 1431. Back to pop music at 1442. Signal very weak (Alexander).

1500 UTC on 13710
SAUDI ARABIA: BSKSA. Station sign-on with Arabic station announcements. Koran recitations during clear signal. (Barker). BSKSA 1100-1230 on 15250 (Tom Banks, Dallas, TX). 9870, 2013-2018 in Arabic, S9 signal (Wood).

1800 UTC on 11990
KUWAIT: Radio Kuwait. Time tips tone to English ID and national anthem. Opening ID/frequency announcement at 1801. Program on Islamic teachings to lite US pop music 1815. Techno-pop dance music to newscast at 1830. Back to US pops at 1840. Signal very good and strong. (Alexander) 9855, 2008-2013. Arabic text to discussions. Signal S9/good (Wood).

2055 UTC on 15476
ANTARCTICA: LRA36-Radio Nacional Arcángel San Gabriel. Frequently heard as only a carrier on 15476. Subsequently heard as announcers Spanish text at 2056. Signal fell below noise level thereafter, but noted carrier to 2058. Modulation audible using USB. LRA36 heard only once or twice per year at my location (Evans).

2227 UTC on 7255
NIGERIA: Voice of Nigeria. Active program with talk and music. Announcer's Hausa text (per *WRTH*). Typical Middle Eastern music to 2244 Koran recitations. Continued items of local news and mentions of "Lagos" and "Nigeria." Dead air on frequency at 2359 closing with good signal quality (Howard). VON 15120, 2046-2100, "news about Nigeria" (Bolland). Audible 15120, 1835-1850 news on national tribal factions to ID at 1844. PSA routines to ID and indigenous music (Wood). **Radio Nigeria** 6089.85, *0429-0450. Sign-on with drums signal to national ID and anthem (Alexander).

Additional loggings excluded for space constraints are posted as **Blog Logs** on the **Shortwave Central Blog** at the above web address.

Thanks to our contributors – Have you sent in YOUR logs?
Send to Gayle Van Horn, c/o Monitoring Times
English broadcast unless otherwise noted.

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

Tips on Follow-Up Reporting

Receiving a reply this month from *Media Broadcast* reminded me once again of how important follow up reception reports are. Despite a multitude of ploys I have used through the years, there are still a few stations that remain on my QSL Hit-List.

If no reply has been forthcoming within four to six months, and you're left wondering if it was "lost in the mail," perhaps it's time to compose a follow-up reception report. A follow-up report, whether by postal mail or email, should politely mention that no reply was received to your original correspondence, including the date it was mailed, followed by the complete reception report details.

Consider addressing your follow up report to a different office or station official, or to the attention of the QSL Manager if one is present, or to the Chief Engineer. The language service that represents the programming you monitored is a good option, while medium wave DXers regularly send their reports to the Program Director or Manager. Most amateur radio operators also use QSL Managers.

While many shortwave hobbyists address their correspondence to the attention of a Veri-Signer (an individual reported as having verified in the past), be mindful that station personnel change, and I recommend sending correspondence only to those signers that are reported regularly.

If using the postal service, additional enclosures always attract the attention of the receiving station. The list of possibilities is endless, but a few I have used include souvenir postcards, travel brochures, mint and used postage stamps, photographs, business cards, decals and stickers. A newspaper clipping about your country has worked, as well as a question about their country or programming.

Follow-up reporting gives you a chance to refocus on the station. Try to relog the station: Including a second log with the original report may be just the trick to finding a station packet of goodies in your mailbox, and one less station on the QSL Hit-List.

AMATEUR RADIO

Northern Ireland-G10KVQ, 20 meters USB. Full data color card. Received in two years and three months via ARRL bureau. (Larry Van Horn N5FPW, NC)

Norway-LA2Z, 15 meters USB. Full data color card. Received in nine months via ARRL bureau. (Van Horn).

Senegal-6W/PA3GIO, 20 meters USB. Full data photo card in 16 days for two $2.00US direct from Bert van den Berg, Parklaan 38, Netherlands (Van Horn).

GERMANY

Clandestine: Voice of Democratic Eritrea International via Jülich, Germany, 15670 kHz. Full data Media Broadcast eQSL page with two color transmitter site photos, from Michael Puetz. Received in three months after follow up report to Walter Brodowsky, Media Broadcast. Confirmed for total of five years and eight months from my original report to Rüsselsheim, Germany. Station is brokered by Media Broadcast (former T-Systems International) currently active on 9820, 13830 kHz via Wertachtal, Germany. Programming is produced by the Eritrean Liberation Front-Revolutionary Council. Preferred address for email reception reports: *qsl-shortwave@media-broadcast.com*; or Michael Puetz *michael.puetz@media-broadcast.com.* Postal address: Media Broadcast GmbH, OMB Köln, Bastionstrasse 11-19, D-52428 Jülich, Germany. MB website: **www.media-broadcast.com** (Gayle Van Horn, NC)

GREECE

Radiophonikos Stathmos Makedonias, 7430 kHz. Full data folder card signed by Tatiana Tsioli, plus sticker and postcard. Received in five years, two months, ten days for an English report. QSL addressed to my former home address, and the envelope appears to have made two trips between the US and Greece, until it was finally delivered to my current work address! Obviously, the post office did some real searching on this one. Station address: ERT S.A., Subdirection of Technical Support, PB 11312, 541 10 Thessalonika, Greece (or) Angelaki 2, 54636 Thessaloniki, Greece.

Streaming audio **www.ert3.gr** (Joe Wood, Greenback, TN)

MEDIUM WAVE

CHAB 800 AM kHz. *Greatest Hits of All Time.* Electronic verification card with Moose Jaw trivia and local attractions attached from Ken Fisher-Engineering & IT Director. Received in three days for email to: *goldenwestradio.com.* (Tob Wood, Omaha, NE). Postal address: 1704 Main Street N., Moose Jaw, SK Canada S6J 1L4. Website: **www.chabradio.com/**

SLOVAKIA

Miraya FM via Rimavska-Sobota, 15650 kHz. Full data (except site) Miraya FM card from Omerovic Wihada for Mr. Jean -Luc Mootoosamy, Miraya Program Officer. Received in 17 days. QSL address: Hirondelle, Avenue du Temple 19C, Ch-1012 Lausanne, Switzerland. (Wendel Craighead, Prairie Village, KS).

SOUTH AFRICA

IRIN-UN Office for the Coordination of Humanitarian Affairs via Meyerton, South Africa, 7160 kHz. Email reply from Louise Tunbridge notes this was their Somali service and "thank you for your email" reply. Reception report to: *feedback@IRINnews.org* within 24 hours from email follow up, total of six months from original report.

On-demand audio and podcast **www.irinnews.org/radio.aspx** (Edward Kusalik, Alberta, Canada).

USA

Open Radio for North Korea via KWHR Hawaii 9930 kHz. Full data (except tx site) personal letter from Han Gwang Hee, plus program schedule. Letter states they have no QSL cards due to "a temporary printing difficulty, usual cards will resume very soon." QSL address: P.O. box 158, Mapo, Seoul, 121-600, Rep. of Korea (Craighead).

WRNO, 7505 kHz. Partial data station photo card. Received in 16 days for a report and $1.00US, QSL address: P.O. Box 895, Ft. Worth, TX 76101 USA (Wood). At *MT* press time, Larry Thom indicated the station remains inactive, awaiting final modifications to equipment (via *Shortwave Central* blog).

UNITED ARAB EMIRATES

Radio Japan relay via Dhabaya, 13740 kHz. Full data card entitled *Fisherman*, unsigned. Received in 120 days for an English report. Station address: NHK World/Radio Japan, KHK Tokyo 150-8001 Japan (Wood).

Streaming audio and podcast **www.nhk.or.jp/nhkworld/**

UTILITY

NDTH, 6821 kHz USB. USCG Auxiliary Station. Full data plain QSL card, signed by John P. Fullingim. Received in 123 days for an *Armed Forces Day Cross Band Test*. Station address: 5802 Club Oaks, Dallas, TX 75248 USA (Bill Wilkins, Springfield, MO).

Travel Information Station-WQHR783, 1700 kHz AM. Nice package from Carolyn Sigtowicz-Exec, Assistant for the Office of the Mayor. Received info on the city, including a souvenir copper lapel pin of Issaquah. No mention of station's power, but was surprised the signal reached my location. QSL address: City of Issaquah, P.O. Box 1307, Issaquah, WA 98027-1307 USA. (Patrick Martin, Seaside, OR)

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) 3, 4, 5 or 6 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
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Thank You ...

Additional Contributors to This Month's Shortwave Guide:

Rich D' Angelo/*NASWA Flash Sheet*, *NASWA Journal*; Rachel Baughn/*MT*; Aleksandr Diadishev, Ukraine; Alexander Yegorov; Alokesh Gupta, New Delhi, India; Ivo Ivanov; Bulgaria; Leo van der Woude/Bernie O'Shea, Canada; R Netherlands; Gérald Théor t/RCI; Ian Johnson/Australian DX News; Kai Ludwig, Germany; Bob Fraser, ME; Dave Kenny, UK; Arnulf Piontek, Berlin, Germany; Eric Zhou, China; Mrs. Robinson/WTJC; José Miguel Romero; Szefs Slawomir/Polish Radio; Robert Thomas, Bridgeport, CT; Adrian Sainsbury/R NZ Intl; Andy Reid, Peterborough, Ontario, Canada; Daniel Sampson, Ernest Riley/PTSW; Harold Sellers, Canada/*ODXA, DX Listening-In*; Jeff White/WRMI: Robert Saglione, Italy; Jaisakthivel, India; José Miguel Romero, Spain; Richard Whittington/FEBA Radio; Evelyn Marcy/WYFR; Tom Taylor, UK; Wolfgang Büeschel, Germany/*WWDXC* BC DX, *Top News*; AOKI; *Ardic DX Club*; *Cumbre DX*; *DX Asia*; *British DX Club*; EIBI; *HFCC; Hard-Core DX; DX Mix News*; *World DX Club/Contact*; *WRTH*

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

GLENN HAUSER'S WORLD OF RADIO
http://www.worldofradio.com

For the latest DX and programming news, amateur nets, DX program schedules, audio archives and much more!

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

0000	0000		UK, BBC World Service	5970as	6195as	
			7105as	9410as	9740as	15335as
			15360as	17615as		
0000	0005		Canada, R Canada International			9755na
0000	0020		Japan, NHK World Radio Japan			5920eu
			6110na	6120na	6145na	11705na
			13650as	17810as		
0000	0030		Australia, HCJB Global	15525as		
0000	0030		Egypt, Radio Cairo	6850na		
0000	0030		Thailand, Radio Thailand World Svc			9680na
			12095na			
0000	0030		USA, Voice of America	7405as		
0000	0045		India, All India Radio	9705as	9950as	
			11620as	11645as	13605as	
0000	0045		USA, WYFR/Family Radio Worldwide			6085na
0000	0057		Canada, R Canada International			9800as
0000	0057		China, China Radio International			6020na
			6075as	6180as	7130eu	7350eu
			9425as	9570as	11650as	11790as
			11885as			
0000	0057		Germany, Deutsche Welle	7265as		
0000	0058		Germany, Deutsche Welle	9785as		
0000	0100		Anguilla, Worldwide Univ Network			6090am
0000	0100		Australia, ABC NT Alice Springs			2310do
			4835do			
0000	0100		Australia, ABC NT Katherine	5025do		
0000	0100		Australia, ABC NT Tennant Creek			4910do
0000	0100		Australia, Radio Australia	9660as	12080as	
			13690as	15240pa	17715as	17750va
			17775va	17795va		
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		Costa Rica, Worldwide Univ Network			5030va
			6150va	7375va	9725va	
0000	0100		Germany, Deutsche Welle	15595as		
0000	0100		Guyana, Voice of Guyana	3291do		
0000	0100		Malaysia, RTM/Traxx FM	7295as		
0000	0100	DRM	New Zealand, Radio NZ International			17675pa
0000	0100		New Zealand, Radio NZ International			15720pa
0000	0100	vl	Papua New Guinea, Wantok R. Light			7325va
0000	0100		Spain, Radio Exterior Espana	6055na		
0000	0100		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12132usb	13362usb	
0000	0100		USA, WBCQ Monticello ME	5110am		
0000	0100	mtfas	USA, WBCQ Monticello ME	7415am		
0000	0100		USA, WBOH Newport NC	5920am		
0000	0100		USA, WEWN Vandiver AL	11520af		
0000	0100		USA, WHRA Greenbush ME	5850eu		
0000	0100		USA, WHRI Cypress Creek SC			5875na
			7315sa	7385na		
0000	0100		USA, WINB Red Lion PA	9265am		
0000	0100		USA, WRMI Miami FL	9955am		
0000	0100		USA, WTJC Newport NC	9370na		
0000	0100		USA, WWCR Nashville TN	5070na	7465na	
			9980na			
0000	0100		USA, WWRB Manchester TN	3185va	5050na	
			5745va	6890va		
0000	0100		USA, WYFR/Family Radio Worldwide			5950na
			9505na	11720sa	15440am	
0000	0100		Zambia CVC/ The Voice Africa			4965af
0005	0100	Mon	Greece, Voice of Greece	7475eu	9420eu	
0030	0045	Sun	Germany, Pan American BC	9640as		
0030	0058	vl	Lithuania, Radio Vilnius	9875na		
0030	0100		Australia, Radio Australia	15415as		
0030	0100		China, China Radio International			11730as
0030	0100	fas	UK, Bible Voice BC	6030as		
0030	0100		USA, Voice of America	7405va	9325va	
			9620va	9715va	11695va	12005va
			15185va	15205va	15290va	
0030	0100		Uzbekistan, CVC International			7395as

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

0100	0104		Canada, R Canada International			9755na
0100	0127		China, China Radio International			11730as
0100	0127		Czech Rep, Radio Prague	6200na	7345na	
0100	0127		Slovakia, R Slovakia International			7230na
			9440sa			
0100	0128		Vietnam, Voice of Vietnam	6175na		
0100	0130		Australia, Radio Australia	9660as	12080as	
			13690as	15240pa	17715as	17750va
			17775va	17795va		
0100	0130	mtwhfa	Serbia, Intl Raido Serbia	6190na		
0100	0155		Turkey, Voice of Turkey	6165am		
0100	0156		Romania, R Romania International			6145na
			9515na			
0100	0157	DRM	China, China Radio International			6080na
0100	0157		China, China Radio International			6005na
			6020na	6075as	7180as	7350 ey
			9410na	9570na	9580as	11650as
			11885as			
0100	0158	DRM	New Zealand, Radio NZ International			17675pa
0100	0159		Canada, R Canada International			5840va
			6165as	7255as		
0100	0200		Anguilla, Worldwide Univ Network			6090am
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek			4910do
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		Costa Rica, Worldwide Univ Network			5030va
			6150va	7375va	9725va	
0100	0200		Cuba, Radio Havana Cuba	6000na	6140na	
0100	0200		Guyana, Voice of Guyana	3291do		
0100	0200		Malaysia, RTM/Traxx FM	7295as		
0100	0200		New Zealand, Radio NZ International			15720pa
0100	0200		North Korea, Voice of Korea	7140as	9345as	
			9730as	11735am	13760am	15180am
0100	0200	vl	Papua New Guinea, Wantok R. Light			7325va
0100	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0100	0200		Taiwan, R Taiwan International			11875as
0100	0200		UK, BBC World Service	5940va	5970as	
			9410as	7105as	7410me	11750as
			11955as	15310as	15335as	15360as
			17615as			
0100	0200		Ukraine, R Ukraine International			7440na
			9785sa			
0100	0200		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
0100	0200		USA, Voice of America	7325va	9435va	
			11705va			
0100	0200		USA, WBCQ Monticello ME	5110am		
0100	0200		USA, WBCQ Monticello ME	7415am		
0100	0200		USA, WBOH Newport NC	5920am		
0100	0200		USA, WEWN Vandiver AL	11520af		
0100	0200		USA, WHRA Greenbush ME	5850eu		
0100	0200		USA, WHRI Cypress Creek SC			5875na
			7315sa	7385na		
0100	0200		USA, WINB Red Lion PA	9265am		
0100	0200		USA, WRMI Miami FL	9955am		
0100	0200		USA, WTJC Newport NC	9370na		
0100	0200		USA, WWCR Nashville TN	5070na	7465na	
			9980na			
0100	0200		USA, WWRB Manchester TN	3185va	5050na	
			5745va	6890va		
0100	0200		USA, WYFR/Family Radio Worldwide			5950na
			7455na	9505na	15195as	15440am
0100	0200		Uzbekistan, CVC International			7395as
0100	0200		Zambia CVC/ The Voice Africa			4965af
0105	0200	twhfa	Canada, R Canada International			9755na
0130	0145	twhfas	Albania, Radio Tirana	7425na		
0130	0200		Australia, Radio Australia	9660as	12080as	
			13690as	15240pa	15415as	17715as
			17750va	17795va		
0130	0200		Iran, VOIRI/IRIB	6120na	7160na	
0130	0200	twhfa	USA, Voice of America	5960va	7405va	

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

0200	0204	twhfa	Canada, R Canada International			9755na
0200	0227		Czech Rep, Radio Prague	6200na	7345na	
0200	0227		Iran, VOIRI/IRIB	6120na	7160na	
0200	0230		Serbia, Intl Raido Serbia	6190na		
0200	0230		Uzbekistan, CVC International			7395as
0200	0257		China, China Radio International			11770as
			13640as			
0200	0258	Sun	Lithuania, Mighty KBC Radio	6110na		
0200	0300		Anguilla, Worldwide Univ Network			6090am
0200	0300	mtwhf	Argentina, RAE	15345va		
0200	0300		Australia, ABC NT Alice Springs			2310do
			4835do			
0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek			4910do
0200	0300		Australia, Radio Australia	9660as	12080as	
			13690as	15240pa	15415as	15515as
			17750va	21725va		
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		Costa Rica, Worldwide Univ Network	5030va		
			6150va	7375va	9725va	
0200	0300		Cuba, Radio Havana Cuba	6000na	6140na	
0200	0300		Egypt, Radio Cairo	7535na		
0200	0300		Guyana, Voice of Guyana	3291do		
0200	0300		Indonesia, Voice of Indonesia	9526va	11784al	
0200	0300		Malaysia, RTM/Traxx FM	7295as		
0200	0300	DRM	New Zealand, Radio NZ International	17675pa		
0200	0300		New Zealand, Radio NZ International	15720pa		
0200	0300		North Korea, Voice of Korea	13650as	15100as	
0200	0300	vl	Papua New Guinea, Wantok R. Light	7325va		
0200	0300		Philippines, Radio Pilipinas	11880va	15285va	
			15510va			
0200	0300		Russia, Voice of Russia	6100na	6240na	
			7250na	12040na	13735na	
0200	0300		South Korea, KBS World Radio	9580sa		
0200	0300		Sri Lanka, SLBC 6005as	9770as	15745as	
0200	0300		Taiwan, R Taiwan International	5950na		
0200	0300		Thailand, Radio Thailand World Svc	15275na		
0200	0300		UK, BBC World Service	6005af	6195me	
			15310as			
0200	0300		USA, Armed Forces Radio Network	4319usb		
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
0200	0300		USA, KJES Vado NM	7555na		
0200	0300		USA, KJES Vado NM	7555na		
0200	0300	smt	USA, WBCQ Monticello ME	7415am		
0200	0300	m	USA, WBCQ Monticello ME	5110am		
0200	0300		USA, WBOH Newport NC	5920am		
0200	0300		USA, WEWN Vandiver AL	11520af		
0200	0300		USA, WHRA Greenbush ME	5850eu		
0200	0300		USA, WHRI Cypress Creek SC	5875na		
			7315sa	7490na		
0200	0300		USA, WINB Red Lion PA	9265am		
0200	0300		USA, WRMI Miami FL	9955am		
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WWCR Nashville TN	3215na	5070na	
			5890na			
0200	0300		USA, WWRB Manchester TN	3185va	5050na	
			5745va	6890va		
0200	0300		USA, WYFR/Family Radio Worldwide	5985sa		
			7455na	9505na	9525am	11855sa
0215	0230		Nepal, Radio Nepal	5005as		
0230	0257		China, China Radio International	15435me		
0230	0258		Vietnam, Voice of Vietnam	6175ca		
0230	0300		Netherlands, R Netherlands Worldwide	11550as		
0230	0300		South Korea, KBS World Radio	9560na		
0230	0300		Sweden, Radio Sweden	6010na	11550va	
0230	0300		Uzbekistan, CVC International	11650as		
0245	0300	twhfas	Albania, Radio Tirana	7390na		
0245	0300		Myanmar, Myanma Radio	9731do		
0250	0300		Vatican City, Vatican Radio	6040am	7305na	
0255	0300	vl	Rwanda, Radio Rwanda	6055do		

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

0300	0315		Croatia, Voice of Croatia	3985eu	7375va	
0300	0320		Vatican City, Vatican Radio	6040am	7305na	
0300	0330		Egypt, Radio Cairo	7535na		
0300	0330		Myanmar, Myanma Radio	9731do		
0300	0330		Philippines, Radio Pilipinas	11880va	15285va	
			15510va			
0300	0330		Sri Lanka, SLBC 6005as	9770as	15745as	
0300	0330		USA, KJES Vado NM	7555na		
0300	0330		Vatican City, Vatican Radio	7360af	9660af	
0300	0357		China, China Radio International	6190na		
			9460as	9690na	11770as	13620as
			15110as	15120as		
0300	0358		Germany, Deutsche Welle	9800as		
0300	0359		Germany, Deutsche Welle	13810as		
0300	0400		Anguilla, Worldwide Univ Network	6090am		
0300	0400		Australia, ABC NT Alice Springs	2310do		
			4835do			
0300	0400		Australia, ABC NT Katherine	5025do		
0300	0400		Australia, ABC NT Tennant Creek	4910do		
0300	0400		Australia, Radio Australia	9660as	12080as	
			13690as	15240pa	15415as	15515as
			17750va	21725va		
0300	0400		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		Costa Rica, Worldwide Univ Network	5030va		
			6150va	7375va	9725va	
0300	0400		Cuba, Radio Havana Cuba	6000na	6140na	
0300	0400		Guyana, Voice of Guyana	3291do		
0300	0400		Malaysia, RTM/Traxx FM	7295as		
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		North Korea, Voice of Korea	7140as	9345as	
			9730as			
0300	0400		Oman, Radio Oman	15355as		
0300	0400	vl	Papua New Guinea, Wantok R. Light	7325va		
0300	0400		Russia, Voice of Russia	6100na	6155na	
			6240na	7340na	7350na	12040na
			13735na			
0300	0400	vl	Rwanda, Radio Rwanda	6055do		
0300	0400		South Africa, Channel Africa	3345af	7390af	
0300	0400		Taiwan, R Taiwan International	5950na		
			15215sa	15320as		
0300	0400		UK, BBC World Service	3255af	6005af	
			6145af	6190af	6195me	6245af
			7255af	7375af	9410me	9750af
			11760va	15310as	17790as	
0300	0400		USA, Armed Forces Radio Network	4319usb		
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
0300	0400		USA, Voice of America	4930af	6080af	
			9885af	15580af		
0300	0400		USA, WBCQ Monticello ME	7415am		
0300	0400	m	USA, WBCQ Monticello ME	5110am		
0300	0400		USA, WBCQ Monticello ME	9330am		
0300	0400		USA, WBOH Newport NC	5920am		
0300	0400		USA, WEWN Vandiver AL	9455af		
0300	0400		USA, WHRA Greenbush ME	5850eu		
0300	0400		USA, WHRI Cypress Creek SC	5875na		
			7315sa	7385va		
0300	0400		USA, WRMI Miami FL	9955am		
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WWCR Nashville TN	3215na	5070na	
			5890na			
0300	0400		USA, WWRB Manchester TN	3185va	5050na	
			5745va	6890va		
0300	0400		USA, WYFR/Family Radio Worldwide	7455na		
			9505na	9985sa	13615sa	
0300	0400		Uzbekistan, CVC International	11650as		
0300	0400		Zambia CVC/ The Voice Africa	4965af		
0330	0358		Vietnam, Voice of Vietnam	6175ca		
0330	0400	twhfas	Albania, Radio Tirana	6110na		
0330	0400		Sweden, Radio Sweden	6010na		
0330	0400		UK, BBC World Service	11945af		

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

0400	0427		Czech Rep, Radio Prague	6080na	6200na	
			7345na			
0400	0430		Australia, Radio Australia	9660as	12080as	
			13690as	15240pa	15515as	17750va
			21725va			
0400	0430	mtwhf	France, Radio France International	7315af		
			9805af			
0400	0430		Netherlands, R Netherlands Worldwide	9575af		
0400	0430		Uzbekistan, CVC International	11650as		
0400	0445		USA, WYFR/Family Radio Worldwide	7455na		
			9505na			
0400	0455		Turkey, Voice of Turkey	6020am	7240va	
			7325na			
0400	0456		Romania, R Romania International	6115na		
			9515na	9690as	11895as	
0400	0457		China, China Radio International	6190na		
			9590as	13650as	15120as	17725as
0400	0457		Germany, Deutsche Welle	5945af		
0400	0458		Germany, Deutsche Welle	15600af		
0400	0458		New Zealand, Radio NZ International	15720pa		
0400	0458	DRM	New Zealand, Radio NZ International	17675pa		
0400	0459		Germany, Deutsche Welle	5905af		
0400	0500		Anguilla, Worldwide Univ Network	6090am		
0400	0500		Australia, ABC NT Alice Springs	2310do		
			4835do			
0400	0500		Australia, ABC NT Katherine	5025do		
0400	0500		Australia, ABC NT Tennant Creek	4910do		
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		Costa Rica, Worldwide Univ Network	5030va		
			6150va	7375va	9725va	
0400	0500		Cuba, Radio Havana Cuba	6000na	6140na	
0400	0500		Germany, Deutsche Welle	6180af		

0400	0500		Guyana, Voice of Guyana	3291do		
0400	0500		Malaysia, RTM/Traxx FM	7295as		
0400	0500		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0400	0500		Netherlands, R Netherlands Worldwide			12080af
0400	0500	vl	Papua New Guinea, Wantok R. Light			7325va
0400	0500		Russia, Voice of Russia	6135na		6155na
			6240na	7335na	7250na	9840na
			9855na	12030na		
0400	0500	DRM	Russia, Voice of Russia	15735as		
0400	0500	vl	Rwanda, Radio Rwanda	6055do		
0400	0500		South Africa, Channel Africa	7230af		
0400	0500	vl	Uganda, UBC Radio	4976do		5026do
0400	0500		UK, BBC World Service	3255af		5875eu
			6005af	6190af	7255af	9410me
			9650af	11945af	12035af	15310as
			15360me	17790as		
0400	0500		Ukraine, R Ukraine International			7440eu
0400	0500		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
0400	0500		USA, Voice of America	4930af		4960af
			6080af	9885af	15580af	
0400	0500	stwhfa	USA, WBCQ Monticello ME	7415am		
0400	0500		USA, WBCQ Monticello ME	9330am		
0400	0500		USA, WBOH Newport NC	5920am		
0400	0500		USA, WEWN Vandiver AL	9455af		
0400	0500		USA, WHRA Greenbush ME	5850eu		
0400	0500		USA, WHRI Cypress Creek SC			5875na
			7315sa	7385va		
0400	0500		USA, WRMI Miami FL	9955am		
0400	0500		USA, WTJC Newport NC	9370na		
0400	0500		USA, WWCR Nashville TN	3215na		5070na
			5890na			
0400	0500		USA, WWRB Manchester TN	3185va		5050na
			5745va	6890va		
0400	0500		USA, WYFR/Family Radio Worldwide			5950am
			6915na	9680na		
0400	0500		Zambia CVC/ The Voice Africa			4965af
			7160af			
0430	0457		Czech Rep, Radio Prague	9855af		
0430	0500	twhfas	Albania, Radio Tirana	6100na		
0430	0500		Australia, Radio Australia	9660as		12080as
			13690as	15240pa	15415as	15515as
			17750va	21725va		
0430	0500		Nigeria, Radio Nigeria/Kaduna			6090do
0430	0500	mtwhf	Swaziland, TWR	3200af		
0430	0500		Uzbekistan, CVC International			155610as
0459	0500		New Zealand, Radio NZ International			11725pa
0459	0500	DRM	New Zealand, Radio NZ International			15720pa

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

0500	0507	twhfas	Canada, CBC NQ SW Service	9625na		
0500	0530		Australia, Radio Australia	9660as		12080as
			13690as	15160as	15240pa	15515as
			17750va			
0500	0530	mtwhf	France, Radio France International			9805af
			11995af			
0500	0530		Germany, Deutsche Welle	6180af		7285af
			9755af	12045af	15600af	
0500	0530		Japan, NHK World Radio Japan			5975eu
			6110na	9770af	9875as	15325as
0500	0530	twhfa	USA, WBCQ Monticello ME	7415am		
0500	0530		Vatican City, Vatican Radio	7360af		9660af
			11625af			
0500	0557		China, China Radio International			5960na
			6190na	11880as	15350as	15465as
			17505va	17540as	17725as	17855as
0500	0600		Anguilla, Worldwide Univ Network			6090am
0500	0600		Australia, ABC NT Alice Springs			2310do
			4835do			
0500	0600		Australia, ABC NT Katherine	5025do		
0500	0600		Australia, ABC NT Tennant Creek			4910do
0500	0600		Bhutan, Bhutan Broadcasting Svc			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		Costa Rica, Worldwide Univ Network			5030va
			6150va	7375va	9725va	
0500	0600		Cuba, Radio Havana Cuba	6000na		6060na
			6140na	9550na	11760am	
0500	0600		Guyana, Voice of Guyana	3291do		
0500	0600		Iran, VOIRI/IRIB	6120na	7160na	
0500	0600		Kuwait, Radio Kuwait	15110me		
0500	0600		Malaysia, RTM/Traxx FM	7295as		
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			15720pa
0500	0600		Nigeria, Radio Nigeria/Kaduna			4770do
0500	0600	vl	Papua New Guinea, Wantok R. Light			7325va
0500	0600		Russia, Voice of Russia	6135na		7335na
			7350na	9840na	9855na	12030na
0500	0600	DRM	Russia, Voice of Russia	15735as		
0500	0600		South Africa, Channel Africa	7230af		9745af
0500	0600		Swaziland, TWR	3200af		
0500	0600		Swaziland, TWR	3200af		
0500	0600	vl	Uganda, UBC Radio	4976do		5026do
0500	0600		UK, BBC World Service	3255af		6005af
			6190af	7255af	9410me	11765af
			11945af	12095eu	15310as	15360me
			15420af	17640af	17790as	
0500	0600	DRM	UK, BBC World Service	6195af		
0500	0600		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
0500	0600		USA, Voice of America	4930af		6080af
			9885af	15580af		
0500	0600		USA, WBOH Newport NC	5920am		
0500	0600		USA, WEWN Vandiver AL	9455af		
0500	0600		USA, WHRA Greenbush ME	7465va		
0500	0600	mtwhf	USA, WHRI Cypress Creek SC			7315sa
0500	0600	Sat/Sun	USA, WHRI Cypress Creek SC			11565pa
0500	0600		USA, WHRI Cypress Creek SC			5875na
			7385va			
0500	0600		USA, WRMI Miami FL	9955am		
0500	0600		USA, WTJC Newport NC	9370na		
0500	0600		USA, WWCR Nashville TN	3215na		5070na
			5890na			
0500	0600		USA, WWRB Manchester TN	3185va		
0500	0600		USA, WYFR/Family Radio Worldwide			5950na
			6915na	9680na		
0500	0600		Uzbekistan, CVC International			15610as
0500	0600		Zambia CVC/ The Voice Africa			4965af
			7160af			
0515	0530	vl	Rwanda, Radio Rwanda	6055do		
0530	0600		Australia, Radio Australia	9660as		12080as
			13690as	15160as	15240pa	15415as
			15515as	17750va		
0530	0600	mtwhf	Italy, NEXUS-IRRS/EGR	5990va		
0530	0600	vl	Rwanda, Radio Rwanda	6055do		
0530	0600		Thailand, Radio Thailand World Svc			11730va

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

0600	0615	Sat/Sun	South Africa, Trans World Radio			11640af
0600	0629		Germany, Deutsche Welle	5945af		7240af
0600	0630	Sat/Sun	Australia, Radio Australia	15180as		15290as
0600	0630		Australia, Radio Australia	9660as		11650as
			12080as	13690as	15160as	15240pa
			15515as	17750va		
0600	0630	mtwhf	France, Radio France International			7315af
			11995af	13680af	15160af	
0600	0630		Germany, Deutsche Welle	12045af		
0600	0630	mtwhf	Italy, NEXUS-IRRS/EGR	5990va		
0600	0630		Nigeria, Radio, National Svc/Abuja			7275do
0600	0630	`	Vatican City, Vatican Radio	4005eu		5965eu
			7250eu			
0600	0645	mtwhf	South Africa, Trans World Radio			11640af
0600	0657		China, China Radio International			16115na
			11750af	11880as	13645as	15145me
			15350as	15465as	17505va	17540as
			17710as	17770me		
0600	0658		New Zealand, Radio NZ International			11725pa
0600	0658	DRM	New Zealand, Radio NZ International			15720pa
0600	0700		Anguilla, Worldwide Univ Network			6090am
0600	0700		Australia, ABC NT Alice Springs			2310do
			4835do			
0600	0700		Australia, ABC NT Katherine	5025do		
0600	0700		Australia, ABC NT Tennant Creek			4910do
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		Costa Rica, Worldwide Univ Network			5030va
			6150va	7375va	9725va	11870va
0600	0700		Cuba, Radio Havana Cuba	6000na		6060na
			6140na	9550na	11760am	
0600	0700		Guyana, Voice of Guyana	3291do		
0600	0700		Kuwait, Radio Kuwait	15110me		
0600	0700		Malaysia, RTM/Traxx FM	7295as		
0600	0700		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0600	0700		Nigeria, Radio Nigeria/Kaduna			4770do
0600	0700	vl	Papua New Guinea, Wantok R. Light			7325va

0600	0700		Russia, Voice of Russia	17665pa	17805pa	
0600	0700		South Africa, Channel Africa	7230af	15255af	
0600	0700		UK, BBC World Service	6005af	6190af	
			7255af	9410af	9860af	11760me
			11765af	15310as	15420af	17640af
			17790as			
0600	0700	DRM	UK, BBC World Service	6195af		
0600	0700		Ukraine, R Ukraine International		7440eu	
0600	0700		USA, Armed Forces Radio Network		4319usb	
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
0600	0700		USA, Voice of America	6080af	9885af	
			15580af			
0600	0700		USA, WBOH Newport NC	5920am		
0600	0700		USA, WEWN Vandiver AL	9455af		
0600	0700		USA, WHRA Greenbush ME	7465va		
0600	0700	mtwhf	USA, WHRI Cypress Creek SC		7315sa	
0600	0700	Sat/Sun	USA, WHRI Cypress Creek SC		11565pa	
0600	0700		USA, WHRI Cypress Creek SC		7385va	
0600	0700		USA, WRMI Miami FL	9955am		
0600	0700		USA, WTJC Newport NC	9370na		
0600	0700		USA, WWCR Nashville TN	3215na	5070na	
			5890na			
0600	0700		USA, WWRB Manchester TN	3185va		
0600	0700		USA, WYFR/Family Radio Worldwide		5745eu	
			6000sa	9680na	11530eu	11580af
0600	0700		Uzbekistan, CVC International		15610as	
0600	0700	vl	Vanuatu, Radio Vanatu	7260do		
0600	0700		Zambia CVC/ The Voice Africa		6065af	
			13590af			
0630	0656		Romania, R Romania International		7180eu	
			9690eu	15135pa	17780pa	
0630	0700		Australia, Radio Australia	9660as	11650as	
			12080as	13690as	15160as	15240pa
			15415as	15515as	17750va	
0630	0700		Vatican City, Vatican Radio	7360af	9660af	
			11625af			
0659	0700		New Zealand, Radio NZ International		9765pa	
0659	0700	DRM	New Zealand, Radio NZ International		9870pa	

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

0700	0703	vl	Croatia, Voice of Croatia	6165eu	9470pa	
			11690pa			
0700	0706		UK, BBC World Service	6005af		
0700	0727		Slovakia, R Slovakia International		13715va	
			15460va			
0700	0730		France, Radio France International		11725af	
			15605af			
0700	0730	mtwhf	UK, BBC World Service	15575as		
0700	0745		USA, WYFR/Family Radio Worldwide		5745eu	
0700	0757		China, China Radio International		11785eu	
			11880as	15125as	15350as	17490eu
			17540as			
0700	0800		Anguilla, Worldwide Univ Network		6090am	
0700	0800		Australia, ABC NT Alice Springs		2310do	
			4835do			
0700	0800		Australia, ABC NT Katherine	5025do		
0700	0800		Australia, ABC NT Tennant Creek		4910do	
0700	0800		Australia, Radio Australia	9475as	9660as	
			9710as	11650as	11945as	12080as
			13630pa	15160va	15240pa	17750va
0700	0800		Bhutan, Bhutan Broadcasting Svc		6035as	
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		Costa Rica, Worldwide Univ Network		5030va	
			6150va	7375va	9725va	11870va
0700	0800	DRM	Germany, Deutsche Welle	7310eu		
0700	0800		Guyana, Voice of Guyana	3291do		
0700	0800		Kuwait, Radio Kuwait	15110me		
0700	0800	Sat	Latvia, Radio SWH	9290eu		
0700	0800		Liberia, Star Radio	9525af		
0700	0800		Malaysia, RTM/Traxx FM	7295as		
0700	0800		Malaysia, RTM/Voice of Malaysia		6175as	
			9750as	15295as		
0700	0800		Myanmar, Myanma Radio	9731do		
0700	0800		New Zealand, Radio NZ International		9765pa	
0700	0800	DRM	New Zealand, Radio NZ International		9870pa	
0700	0800		Nigeria, Radio Nigeria/Kaduna		4770do	
0700	0800	vl	Papua New Guinea, R East New Britain		3385do	
0700	0800	vl	Papua New Guinea, Wantok R. Light		7325va	
0700	0800	DRM	Russia, Voice of Russia	11635eu		
0700	0800		Russia, Voice of Russia	17665pa	17805pa	
0700	0800	vl	Solomon Islands, SIBC	5020do		
0700	0800	vl	South Africa, Channel Africa	9625af		
0700	0800		UK, BBC World Service	6190af	9860af	
			11760me	11765af	15310as	15400af
			15420af	17790as	17830af	
0700	0800	Sat	UK, Bible Voice BC	5945eu		
0700	0800		USA, Armed Forces Radio Network		4319usb	
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
0700	0800		USA, WBOH Newport NC	5920am		
0700	0800		USA, WEWN Vandiver AL	9455af		
0700	0800	mtwhf	USA, WHRI Cypress Creek SC		7315sa	
			11565va			
0700	0800	Sat/Sun	USA, WHRI Cypress Creek SC		5875va	
			11565va			
0700	0800		USA, WHRI Cypress Creek SC		7385na	
0700	0800		USA, WRMI Miami FL	9955am		
0700	0800		USA, WTJC Newport NC	9370na		
0700	0800		USA, WWCR Nashville TN	3215na	5070na	
			5890na			
0700	0800		USA, WWRB Manchester TN	3185va		
0700	0800		USA, WYFR/Family Radio Worldwide		6915na	
			7455na	9495sa	9715am	9985af
0700	0800		Uzbekistan, CVC International		15610as	
0700	0800	vl	Vanuatu, Radio Vanatu	7260do		
0700	0800		Zambia CVC/ The Voice Africa		6065af	
			13590af			
0730	0745		Vatican City, Vatican Radio	4005eu	5965eu	
			7250eu	9645eu	11740eu	15595eu
0730	0800		Bulgaria, Radio Bulgaria	5900eu	7400eu	
0730	0800	Sat/Sun	UK, BBC World Service	15575as		
0745	0800	Sun	Germany, TWR-Europe	6105eu		
0745	0800	Sun	Monaco, TWR-Europe	9800eu		
0750	0800		Saudi Arabia, BSKSA	17785as		

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

0800	0815	Sat	Guam, KTWR/TWR	11840pa		
0800	0815	Sat	UK, Bible Voice BC	5945eu		
0800	0825		Malaysia, RTM/Voice of Malaysia		6175as	
			9750as	15295as		
0800	0827		Czech Rep, Radio Prague	7345eu	9860eu	
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek		4910do	
0800	0830		Myanmar, Myanma Radio	9731do		
0800	0835	mtwhf	Guam, KTWR/TWR	11840pa		
0800	0845		USA, WYFR/Family Radio Worldwide		9985af	
0800	0850	mtwhf	Germany, TWR-Europe	6105eu		
0800	0850	mtwhf	Monaco, TWR-Europe	9800eu		
0800	0857		China, China Radio International		9415as	
			11785eu	11880as	15350as	15465as
			15625va	17490eu	17540as	
0800	0900		Anguilla, Worldwide Univ Network		6090am	
0800	0900		Australia, ABC NT Alice Springs		2310do	
			4835do			
0800	0900		Australia, Radio Australia	5995as	9475as	
			9580va	9590as	9710as	11945pa
			12080as	13630pa		
0800	0900		Bhutan, Bhutan Broadcasting Svc		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		Costa Rica, Worldwide Univ Network		5030va	
			6150va	7375va	9725va	11870va
0800	0900	Sun	Germany, TWR-Europe	6105eu		
0800	0900		Guyana, Voice of Guyana	3291do		
0800	0900		Malaysia, RTM/Traxx FM	7295as		
0800	0900	Sun	Monaco, TWR-Europe	9800eu		
0800	0900		New Zealand, Radio NZ International		9765pa	
0800	0900	DRM	New Zealand, Radio NZ International		9870pa	
0800	0900		Nigeria, Radio Nigeria/Kaduna		4770do	
0800	0900		Nigeria, Voice of Nigeria/Lagos		9690af	
0800	0900	vl	Papua New Guinea, R East New Britain		3385do	
0800	0900	vl	Papua New Guinea, Wantok R. Light		7325va	
0800	0900		Russia, Voice of Russia	15195as	17665pa	
			17805pa			
0800	0900	vl	Solomon Islands, SIBC	5020do		
0800	0900	vl	South Africa, Channel Africa	9625af		
0800	0900	Sun	South Africa, SA Radio League		7205af	
			17860af			
0800	0900		South Korea, KBS World Radio		9570as	
0800	0900		UK, BBC World Service	6190af	9860af	
			11760me	15310as	15400af	17640as
			17790af	17830af	21470af	
0800	0900	Sat/Sun	UK, BBC World Service	15575me		
0800	0900	Sun	UK, Bible Voice BC	5945eu		
0800	0900		USA, Armed Forces Radio Network		4319usb	
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
0800	0900		USA, KNLS Anchor Point AK	9615as		

0800	0900		USA, WBOH Newport NC	5920am		
0800	0900		USA, WEWN Vandiver AL	9455af		
0800	0900	mtwhf	USA, WHRI Cypress Creek SC 11565va			7315sa
0800	0900	Sat/Sun	USA, WHRI Cypress Creek SC 11565pa			5875va
0800	0900		USA, WHRI Cypress Creek SC			7385na
0800	0900		USA, WRMI Miami FL	9955am		
0800	0900		USA, WTJC Newport NC	9370na		
0800	0900		USA, WWCR Nashville TN 5890na	3215na		5070na
0800	0900		USA, WWRB Manchester TN	3185va		
0800	0900		USA, WYFR/Family Radio Worldwide 6915na	7455na		5950am
0800	0900		Uzbekistan, CVC International			15610as
0800	0900	vl	Vanuatu, Radio Vanatu	7260do		
0800	0900		Zambia CVC/ The Voice Africa 13590af			6065af
0805	0900	thf	Guam, KTWR/TWR	15170as		
0815	0850	Sat	Germany, TWR-Europe	6105eu		
0815	0850	Sat	Monaco, TWR-Europe	9800eu		
0815	0900	f	UK, Bible Voice BC	5945eu		
0820	0900	w	Guam, KTWR/TWR	15170as		
0830	0900		Australia, ABC NT Katherine	2485do		
0830	0900		Australia, ABC NT Tennant Creek			2325do
0835	0900	m	Guam, KTWR/TWR	15170as		

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

0900	0915	Sun	UK, Bible Voice BC	5945eu		
0900	0920	Sun	Germany, TWR-Europe	6105eu		
0900	0920	Sun	Monaco, TWR-Europe	9800eu		
0900	0930		Japan, NHK World Radio Japan 9825pa	11815as	15590as	9625va
0900	0930		Uzbekistan, CVC International			15610as
0900	0957		China, China Radio International 15210pa 17570eu	15270eu 17690pa	15350as 17750as	9415as 17490eu
0900	0958		Lithuania, Radio Vilnius	9710eu		
0900	1000		Anguilla, Worldwide Univ Network			6090am
0900	1000		Australia, ABC NT Alice Springs 4835do			2310do
0900	1000		Australia, ABC NT Katherine	2485do		
0900	1000		Australia, ABC NT Tennant Creek			2325do
0900	1000		Australia, Radio Australia 9590va	9475va 11945as		9580va 12080as
0900	1000		Bhutan, Bhutan Broadcasting Svc			6035as
0900	1000		Canada, CFRX Toronto ON	6070na		
0900	1000		Canada, CFVP Calgary AB	6030na		
0900	1000		Canada, CKZN St John's NF	6160na		
0900	1000		Canada, CKZU Vancouver BC	6160na		
0900	1000		Costa Rica, Worldwide Univ Network 6150va 13750va	7375va	9725va	5030va 11870va
0900	1000		Germany, Deutsche Welle	17710as		21840as
0900	1000		Guyana, Voice of Guyana	3291do		
0900	1000		Malaysia, RTM/Traxx FM	7295as		
0900	1000		Netherlands, R Netherlands Worldwide			9795as
0900	1000		New Zealand, Radio NZ International			9765pa
0900	1000	DRM	New Zealand, Radio NZ International			9870pa
0900	1000		Nigeria, Radio Nigeria/Kaduna			4770do
0900	1000		Nigeria, Voice of Nigeria/Lagos			9690af
0900	1000	vl	Papua New Guinea, R East New Britain			3385do
0900	1000	vl	Papua New Guinea, Wantok R. Light			7325va
0900	1000		Russia, Voice of Russia	15195as		17665pa
0900	1000	DRM	Russia, Voice of Russia	13670eu		
0900	1000		Saudi Arabia, BSKSA	15250af		
0900	1000	vl	Solomon Islands, SIBC	5020do		
0900	1000	vl	South Africa, Channel Africa	9625af		
0900	1000		UK, BBC World Service 9740as 15400af 17790as	6190af 9860af 15575me	6195as 11760me 17640af	15310as 17760as 21470af
0900	1000		USA, Armed Forces Radio Network 5446usb 10320usb	5765usb 12133usb	6350usb 13362usb	4319usb 7811usb
0900	1000		USA, WBOH Newport NC	5920am		
0900	1000		USA, WEWN Vandiver AL	9390as		
0900	1000	mtwhfa	USA, WHRI Cypress Creek SC			7315sa
0900	1000	Sun	USA, WHRI Cypress Creek SC			11565pa
0900	1000		USA, WHRI Cypress Creek SC 7385na			5875na
0900	1000		USA, WRMI Miami FL	9955am		
0900	1000		USA, WTJC Newport NC	9370na		
0900	1000		USA, WWCR Nashville TN 9985na	5070na		5890na
0900	1000		USA, WWRB Manchester TN	3185va		
0900	1000		USA, WYFR/Family Radio Worldwide 6915na	7455na	9450as	5950am 9465as
0900	1000	vl	Vanuatu, Radio Vanatu	7260do		
0900	1000		Zambia CVC/ The Voice Africa 13590af			6065af
0930	1000		Australia, CVC International	15555as		

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

1000	1027		Czech Rep, Radio Prague 21745af	9955am		15710af
1000	1030		Vietnam, Voice of Vietnam	9840as		12020as
1000	1057		China, China Radio International 7135as 13720as 15350as 17750as	7215as 15190as 17490eu	9415as 15210pa 17570eu	5995as 13590as 15270eu 17690pa
1000	1058		New Zealand, Radio NZ International			9765pa
1000	1100		Anguilla, Worldwide Univ Network			11775am
1000	1100		Australia, ABC NT Alice Springs 4835do			2310do
1000	1100		Australia, ABC NT Katherine	2485do		
1000	1100		Australia, ABC NT Tennant Creek			2325do
1000	1100		Australia, CVC International	15555as		
1000	1100		Australia, Radio Australia 9590va	9475va 11945as		9580va 12080as
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		Costa Rica, Worldwide Univ Network 6150va 13750va	7375va	9725va	5030va 11870va
1000	1100		Guyana, Voice of Guyana	3291do		
1000	1100		India, All India Radio 15235as 17895pa	15260as	17510as	7270as 13710pa 17800as
1000	1100		Indonesia, Voice of Indonesia	9526va		11784al
1000	1100		Malaysia, RTM/Traxx FM	7295as		
1000	1100		Netherlands, R Netherlands Worldwide 9720as	12065as		6040as
1000	1100	DRM	New Zealand, Radio NZ International			9870pa
1000	1100		Nigeria, Radio Nigeria/Kaduna			4770do
1000	1100		Nigeria, Voice of Nigeria/Lagos			9690af
1000	1100		North Korea, Voice of Korea 9335am	6185as 9850as		6285am
1000	1100	vl	Papua New Guinea, R East New Britain			3385do
1000	1100	vl	Papua New Guinea, Wantok R. Light			7325va
1000	1100		Saudi Arabia, BSKSA	15250af		
1000	1100	vl	Solomon Islands, SIBC	5020do		
1000	1100	vl	South Africa, Channel Africa	9625af		
1000	1100	Sat/Sun	UK, BBC World Service	15400af		17830af
1000	1100		UK, BBC World Service 9605as 15310af 21470af	6190af 9740as 15575as	9860af	6195as 11760me 17640af 17790as
1000	1100		Ukraine, R Ukraine International 15635pa			9950eu
1000	1100		USA, Armed Forces Radio Network 5446usb 10320usb	5765usb 12133usb	6350usb 13362usb	4319usb 7811usb
1000	1100		USA, KNLS Anchor Point AK	6150as		
1000	1100		USA, WBOH Newport NC	5920am		
1000	1100		USA, WEWN Vandiver AL	9390as		
1000	1100	Sun	USA, WHRI Cypress Creek SC			11565pa
1000	1100	mtwhfa	USA, WHRI Cypress Creek SC			7315sa
1000	1100		USA, WHRI Cypress Creek SC 9865sa			7385na
1000	1100		USA, WINB Red Lion PA	9265am		
1000	1100		USA, WRMI Miami FL	9955am		
1000	1100		USA, WTJC Newport NC	9370na		
1000	1100		USA, WWCR Nashville TN 15825na	5070na		5890na
1000	1100		USA, WWRB Manchester TN	3185va		
1000	1100		USA, WYFR/Family Radio Worldwide 6890na 9465as	6915na 9900	7455na skd0109	5950am 9450as
1000	1100		Zambia CVC/ The Voice Africa 13590af			6065af
1015	1045	Sun	UK, Bible Voice BC	5985as		
1030	1100		Iran, VOIRI/IRIB	15460as	17660as	
1030	1100	Sun	Italy, NEXUS-IRRS/EGR	9510va		
1030	1100		Mongolia, Voice of Mongolia	12085as		
1059	1100		New Zealand, Radio NZ International			13840pa

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

1100	1103	mtwhf	Croatia, Voice of Croatia	9830eu		

1100	1127		Iran, VOIRI/IRIB	15460as	17660as	
1100	1130		Australia, CVC International	15555as		
1100	1130		UK, BBC World Service	15400af		
1100	1130		Vietnam, Voice of Vietnam	7285as		
1100	1145		USA, WYFR/Family Radio Worldwide			5950am
			6000sa			
1100	1157		China, China Radio International			5960na
			5995as	6060as	9570as	11650as
			11795as	13645as	13665eu	17490eu
1100	1158	DRM	New Zealand, Radio NZ International			9870pa
1100	1200		Anguilla, Worldwide Univ Network			11775am
1100	1200		Australia, ABC NT Alice Springs			2310do
			4835do			
1100	1200		Australia, ABC NT Katherine	2485do		
1100	1200		Australia, ABC NT Tennant Creek			2325do
1100	1200	DRM	Australia, Radio Australia	5995pa		
1100	1200		Australia, Radio Australia	6020va	9475as	
			9560as	9580va	9590va	11945as
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		Costa Rica, Worldwide Univ Network			5030va
			6150va	7375va	9725va	11870va
			13750va			
1100	1200	Sun	Italy, NEXUS-IRRS/EGR	9510va		
1100	1200		Malaysia, RTM/Traxx FM	7295as		
1100	1200		New Zealand, Radio NZ International			13840pa
1100	1200		Nigeria, Radio Nigeria/Kaduna			4770do
1100	1200		Nigeria, Voice of Nigeria/Lagos			9690af
1100	1200	vl	Papua New Guinea, R East New Britain			3385do
1100	1200	vl	Papua New Guinea, Wantok R. Light			7325va
1100	1200		Saudi Arabia, BSKSA	15250af		
1100	1200	vl	Solomon Islands, SIBC	5020do	9545al	
1100	1200	vl	South Africa, Channel Africa	9625af		
1100	1200		Taiwan, R Taiwan International			7445as
			11715as			
1100	1200		UK, BBC World Service	6190af	6195as	
			9605as	9740as	9860af	11895as
			15310as	15575me	17640af	17790as
			17830af	21470af		
1100	1200		Ukraine, R Ukraine International			15635pa
1100	1200		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
1100	1200		USA, WBOH Newport NC	5920am		
1100	1200		USA, WEWN Vandiver AL	9390as		
1100	1200	mtwhfa	USA, WHRI Cypress Creek SC			7315sa
1100	1200		USA, WHRI Cypress Creek SC			5875na
			7385na			
1100	1200		USA, WINB Red Lion PA	9265am		
1100	1200		USA, WRMI Miami FL	9955am		
1100	1200		USA, WTJC Newport NC	9370na		
1100	1200		USA, WWCR Nashville TN	7490na	9980na	
			15825na			
1100	1200		USA, WWRB Manchester TN	3185va		
1100	1200		USA, WYFR/Family Radio Worldwide			6890na
			7455na	11725sa	11830sa	
1100	1200		Zambia CVC/ The Voice Africa			6065af
			13590af			
1105	1200	Sun	Greece, Voice of Greece	9420eu	15605eu	
1115	1130	mwf	UK, Bible Voice BC	5950as		
1115	1145	st	UK, Bible Voice BC	5950as		
1115	1200	Sat	UK, Bible Voice BC	5950as		
1130	1157		Czech Rep, Radio Prague	11640eu	17545af	
1130	1200		Australia, CVC International	13635as		
1130	1200		Guam, KSDA/AWR	15260as		
1130	1200		Vietnam, Voice of Vietnam	9840as	12020as	
1145	1200		UK, Bible Voice BC	5950as		

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

1200	1230		Australia, HCJB Global	15400as		
1200	1230		France, Radio France International			21620af
1200	1230		Japan, NHK World Radio Japan			6120na
			9625va	9695as	17585eu	
1200	1230		Saudi Arabia, BSKSA	15250af		
1200	1245		USA, WYFR/Family Radio Worldwide			6890na
1200	1257		China, China Radio International			5955as
			7250as	9460as	9600as	9645as
			9730as	9760pa	11650as	11690as
			11760pa	11980as	12080as	13665eu
			13790eu	17490eu		
1200	1258		New Zealand, Radio NZ International			13840pa
1200	1300		Anguilla, Worldwide Univ Network			11775am
1200	1300		Australia, ABC NT Alice Springs			2310do
			4835do			
1200	1300		Australia, ABC NT Katherine	2485do		
1200	1300		Australia, ABC NT Tennant Creek			2325do
1200	1300		Australia, CVC International	13635as		
1200	1300		Australia, Radio Australia	6020va	9475as	
			9560pa	9580va	9590va	11945as
1200	1300	DRM	Australia, Radio Australia	5995va	12080pa	
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		Costa Rica, Worldwide Univ Network			9725va
			11870va	13750va		
1200	1300	Sun	Italy, NEXUS-IRRS/EGR	9510va		
1200	1300	Sun	Latvia, Radio SWH	9290eu		
1200	1300		Malaysia, RTM/Traxx FM	7295as		
1200	1300		Nigeria, Radio Nigeria/Kaduna			4770do
1200	1300		Nigeria, Voice of Nigeria/Lagos			9690af
1200	1300	vl	Papua New Guinea, Wantok R. Light			7325va
1200	1300	vl	Solomon Islands, SIBC	5020do	9545al	
1200	1300		South Korea, KBS World Radio			9650na
1200	1300	f/ DRM	Taiwan, R Taiwan International			9850eu
1200	1300		UK, BBC World Service	5975as	6190af	
			9605as	9740as	9860af	11760me
			15310as	15575me	17640af	17790as
			21470af			
1200	1300		Ukraine, R Ukraine International			9950eu
1200	1300		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
1200	1300		USA, KNLS Anchor Point AK	6150as	6915as	
1200	1300		USA, Voice of America	9345va	9640va	
			11705va	11730va	15190va	
1200	1300		USA, WBOH Newport NC	5920am		
1200	1300		USA, WEWN Vandiver AL	5755va		
1200	1300		USA, WHRA Greenbush ME	15665af		
1200	1300	Sat	USA, WHRI Cypress Creek SC			7315sa
			9410sa			
1200	1300	mtwhf	USA, WHRI Cypress Creek SC			7335sa
1200	1300	Sun	USA, WHRI Cypress Creek SC			9410sa
1200	1300		USA, WHRI Cypress Creek SC			7385na
1200	1300		USA, WINB Red Lion PA	9265am		
1200	1300		USA, WRMI Miami FL	9955am		
1200	1300		USA, WTJC Newport NC	9370na		
1200	1300		USA, WWCR Nashville TN	7490na	9980na	
			15825na			
1200	1300		USA, WWRB Manchester TN	3185va		
1200	1300		USA, WYFR/Family Radio Worldwide			7455na
			11530sa	11970am		
1200	1300		Zambia CVC/ The Voice Africa			6065af
			13590af			
1215	1300		Egypt, Radio Cairo	17835as		
1230	1257		China, China Radio International			11780as
1230	1300	mtwhfa	Australia, HCJB Global	15540as		
1230	1300		Bangladesh, Bangla Betar	7250as		
1230	1300		Bulgaria, Radio Bulgaria	11700eu	15700eu	
1230	1300		Germany, AWR-Europe	15495as		
1230	1300		Thailand, Radio Thailand World Svc			9810va
1230	1300		Vietnam, Voice of Vietnam	9840as	12020as	

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

1300	1330	mtwhfa	Australia, HCJB Global	15540as		
1300	1330		Egypt, Radio Cairo	17835af		
1300	1330		Poland, Polish Radio	9450eu	7325eu	
1300	1345		USA, WYFR/Family Radio Worldwide			7455na
			11970am			
1300	1356		Romania, R Romania International			15105eu
			17745eu			
1300	1357		China, China Radio International			5955as
			7300as	9590na	9655as	9730as
			9765as	9870as	11760pa	11885na
			11900pa	11980as	13610eu	13790eu
			15230na			
1300	1400		Anguilla, Worldwide Univ Network			11775am
1300	1400		Australia, CVC International	13635as		
1300	1400		Australia, Radio Australia	6020va	9560as	
			9580va	9590va		
1300	1400	DRM	Australia, Radio Australia	5995va	12080pa	
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		Costa Rica, Worldwide Univ Network			9725va
			11870va	13750va		
1300	1400		Indonesia, Voice of Indonesia	9526va	11784al	
1300	1400		Malaysia, RTM/Traxx FM	7295as		

1300	1400		New Zealand, Radio NZ International			6170pa
1300	1400		Nigeria, Radio Nigeria/Kaduna			4770do
1300	1400		Nigeria, Voice of Nigeria/Lagos			9690af
1300	1400		North Korea, Voice of Korea	7570eu		9335na
			11710na	12015eu		
1300	1400	vl	Papua New Guinea, Wantok R. Light			7325va
1300	1400	vl	Solomon Islands, SIBC	5020do		9545al
1300	1400		South Korea, KBS World Radio			9570na
			9770as			
1300	1400		UK, BBC World Service	5975as		6190af
			6195as	9410as	9740as	9860af
			11760me	15310as	15420af	15575me
			17640af	21470af		
1300	1400		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
1300	1400		USA, Voice of America	9345va		9640va
			11705va			
1300	1400		USA, WBOH Newport NC	5920am		
1300	1400		USA, WEWN Vandiver AL	5755va		
1300	1400		USA, WHRA Greenbush ME	15665af		
1300	1400	Sat/Sun	USA, WHRI Cypress Creek SC			9495sa
			9840na			
1300	1400		USA, WHRI Cypress Creek SC			11785na
1300	1400		USA, WINB Red Lion PA	9265am		
1300	1400		USA, WRMI Miami FL	9955am		
1300	1400		USA, WTJC Newport NC	9370na		
1300	1400		USA, WWCR Nashville TN	7490na		9980na
			15825na			
1300	1400		USA, WWRB Manchester TN	9385va		
1300	1400		USA, WYFR/Family Radio Worldwide			11830na
			11520as	11560as	11855na	13810as
			15670as			
1300	1400		Zambia CVC/ The Voice Africa			6065af
			13590af			
1310	1340		Japan, NHK World Radio Japan			9875as
1330	1357	fa/ DRM	Czech Rep, Radio Prague	9850eu		
1330	1400	hfa	Guam, KSDA/ AWR	11935as		15660as
1330	1400		India, All India Radio	9690as		11620as
			13710as			
1330	1400		Laos, National Radio	7145as		
1330	1400		Sweden, Radio Sweden	7465va		
1330	1400		Turkey, Voice of Turkey	11735pa		12035eu
1330	1400		Vietnam, Voice of Vietnam	9840as		12020as
1355	1400		Guam, KTWR/TWR	9975as		

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

1400	1425		Turkey, Voice of Turkey	11735pa		12035eu
1400	1427		Czech Rep, Radio Prague	11600as		13580na
1400	1430	Sun	Australia, HCJB Global	15425as		
1400	1430	mtwhfa	Australia, HCJB Global	15400as		
1400	1430		Australia, Radio Australia	5995va		6080va
			7240va	9590va		
1400	1430	sw	Germany, Pan American BC	15205as		
1400	1430	mhf	Guam, KTWR/TWR	9975as		
1400	1430	Sun	Italy, NEXUS-IRRS/EGR	15725va		
1400	1430	`	Japan, NHK World Radio Japan			9875as
			11705va	11780eu	21560eu	
1400	1430		Serbia, Intl Raido Serbia	7200eu		
1400	1430		Thailand, Radio Thailand World Svc			9725va
1400	1430	Sun	United Arab Emirates, FEBA	12045as		
1400	1457		China, China Radio International			5995as
			7300as	9460as	9700eu	9765as
			9795as	11665as	11675na	13685af
			13740na	15230na	17630af	
1400	1500		Anguilla, Worldwide Univ Network			11775am
1400	1500		Australia, CVC International	13635as		
1400	1500		Bhutan, Bhutan Broadcasting Svc			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		Costa Rica, Worldwide Univ Network			9725va
			11870va	13750va		
1400	1500		Germany, CVC Intl/Voice Africa			15745af
1400	1500		Germany, Overcomer Ministries			6110eu
			13810eu			
1400	1500	tw	Guam, KTWR/TWR	9975as		
1400	1500		India, All India Radio	9690as		11620as
			13710as			
1400	1500		Iran, VOIRI/IRIB	15460as		17660as
1400	1500		Jordan, Radio Jordan	11690na		
1400	1500		Libya, Voice of Africa	17725af		21695af
1400	1500		Malaysia, RTM/Traxx FM	7295as		
1400	1500		Netherlands, R Netherlands Worldwide			5825as
			9345as	11520as	12080as	15595as
1400	1500		New Zealand, Radio NZ International			6170pa
1400	1500		Nigeria, Radio Nigeria/Kaduna			4770do
1400	1500		Nigeria, Voice of Nigeria/Lagos			9690af
1400	1500		Oman, Radio Oman	15140as		
1400	1500	vl	Papua New Guinea, Wantok R. Light			7325va
1400	1500	vl	Solomon Islands, SIBC	5020do		9545al
1400	1500		UK, BBC World Service	5960as		5975as
			6190af	6195as	9410as	9740as
			9860af	11760me	11915as	15420af
			21470af			
1400	1500	Sat/Sun	UK, Bible Voice BC	11695as		
1400	1500		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
1400	1500		USA, KJES Vado NM	11715na		
1400	1500		USA, KNLS Anchor Point AK	6150as		
1400	1500		USA, Voice of America	4930af		6080af
			7125va	9480va	9760va	11885va
			12150va	15205va	15580af	17715af
			17750af			
1400	1500		USA, WBOH Newport NC	5920am		
1400	1500		USA, WEWN Vandiver AL	5755va		
1400	1500		USA, WHRA Greenbush ME	15665af		
1400	1500	Sat/Sun	USA, WHRI Cypress Creek SC			9495sa
			9840na			
1400	1500		USA, WHRI Cypress Creek SC			11785na
1400	1500		USA, WINB Red Lion PA	13570am		
1400	1500		USA, WRMI Miami FL	9955na		
1400	1500		USA, WTJC Newport NC	9370na		
1400	1500		USA, WWCR Nashville TN	7490na		9980na
			15825na			
1400	1500		USA, WWRB Manchester TN	9385va		
1400	1500		USA, WYFR/Family Radio Worldwide			6135as
			7320as	9365as	9615as	9865as
			11560as	11565na	11725as	11855
			`na	11860as	13695na	13810as	17760am
1400	1500		Zambia CVC/ The Voice Africa			6065af
			13650af			
1415	1430	mtwhfa	Germany, Pan American BC	15205as		
1415	1430		Nepal, Radio Nepal	5005as		
1430	1445	Sun	Germany, Pan American BC	15205as		
1430	1445	vl/ mtwhf	Moldova, Radio PMR/Pridnestrovie			7370eu
1430	1500		Australia, Radio Australia	5995va		6080va
			7240va	9475as	9590va	11660pa
1430	1500		Ethiopia, Radio Ethiopia	5990af		7110af
			9704af			
1430	1500	f/ DRM	South Korea, KBS World Radio			9750eu
1430	1500		Sweden, Radio Sweden	9400va		

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

1500	1510	mtwhfa	Turkmenistan, Turkmen Radio	5015eu		
1500	1527		Czech Rep, Radio Prague	9955na		
1500	1528		Vietnam, Voice of Vietnam	7285va		9840va
			12020va			
1500	1530		Guam, KSDA/ AWR	12105as		
1500	1530		Nigeria, Radio, National Svc/Abuja			7275do
1500	1530		UK, BBC World Service	9410af		11860af
			15105af			
1500	1530	Sat	UK, Bible Voice BC	11895as		
1500	1545		USA, WYFR/Family Radio Worldwide			15210sa
1500	1550		New Zealand, Radio NZ International			6170pa
1500	1557		Canada, R Canada International			9635as
			11975as			
1500	1557		China, China Radio International			5955as
			6095va	7160as	7325as	9435eu
			9525eu	9720va	9785as	9870as
			13685af	13740na	17630af	
1500	1557		Libya, Voice of Africa	17725af		21695af
1500	1600		Anguilla, Worldwide Univ Network			11775am
1500	1600		Australia, CVC International	13635as		
1500	1600		Australia, Radio Australia	5995va		6080va
			7240va	9475as	9590va	11660pa
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		Costa Rica, Worldwide Univ Network			9725va
			11870va	13750va		
1500	1600		Germany, CVC Intl/Voice Africa			15745af
1500	1600		Germany, Overcomer Ministries			6110eu
			13810me	17485af		
1500	1600	vl	Italy, NEXUS-IRRS/EGR	15650af		
1500	1600		Jordan, Radio Jordan	11690na		
1500	1600		Malaysia, RTM/Traxx FM	7295as		
1500	1600		Myanmar, Myanma Radio	5985as		
1500	1600		Netherlands, R Netherlands Worldwide			5825as

			9345as	11520as	12080as	15595as	
1500	1600		Nigeria, Radio Nigeria/Kaduna			4770do	
1500	1600		Nigeria, Voice of Nigeria/Lagos			9690af	
1500	1600		North Korea, Voice of Korea		7570eu	9335na	
			11710na	12015eu			
1500	1600	vl	Papua New Guinea, Wantok R. Light			7325va	
1500	1600		Russia, Voice of Russia		7350as	7260as	
			9660as				
1500	1600	DRM	Russia, Voice of Russia		5905eu	9675eu	
1500	1600	vl	Solomon Islands, SIBC		5020do	9545al	
1500	1600	vl	South Africa, Channel Africa		9625af		
1500	1600		Uganda, Dunamis Shortwave		4750af		
1500	1600		UK, BBC World Service		5975as	6040as	
			6190af	6195as	9410as	9740as	
			9860af	11915as	12095me	15400af	
			21470af				
1500	1600		USA, Armed Forces Radio Network			4319usb	
			5446usb	5765usb	6350usb	7811usb	
			10320usb	12133usb	13362usb		
1500	1600		USA, KJES Vado NM			11715na	
1500	1600		USA, Voice of America		4930af	6080af	
			6140af	7125va	7520va	9590va	
			9685va	9760va	11525va	11765va	
			12150va	13735va	15460va	15580af	
			17715af	17895af			
1500	1600		USA, WBCQ Monticello ME		9330am		
1500	1600		USA, WBOH Newport NC		5920am		
1500	1600		USA, WEWN Vandiver AL		5755va		
1500	1600	mtwhfa	USA, WHRA Greenbush ME		15665af		
1500	1600	Sun	USA, WHRA Greenbush ME		13650af		
1500	1600	Sat/Sun	USA, WHRI Cypress Creek SC			9495sa	
			9840na				
1500	1600		USA, WHRI Cypress Creek SC			11785na	
1500	1600		USA, WINB Red Lion PA		13570am		
1500	1600		USA, WRMI Miami FL		9955na		
1500	1600		USA, WTJC Newport NC		9370na		
1500	1600		USA, WWCR Nashville TN		7490na	9980na	
			15825na				
1500	1600		USA, WWRB Manchester TN		9385va		
1500	1600		USA, WYFR/Family Radio Worldwide			6180as	
			7320as	11565na	11855na	11860as	
			15520as	15750af	17760am		
1500	1600		Zambia CVC/ The Voice Africa			6065af	
			13650af				
1515	1530	vl/ mtwhf	Moldova, Radio PMR/Pridnestrovie			7370eu	
1530	1557		China, China Radio International			9600me	
1530	1600	mtwhfa	Albania, Radio Tirana		13720na		
1530	1600		Germany, AWR-Europe		11675as		
1530	1600		Iran, VOIRI/IRIB	6160as	7330as		
1530	1600		Mongolia, Voice of Mongolia		12085as		
1530	1600		Sweden, Radio Sweden		9360va		
1530	1600	Sat	UK, BBC World Service		9410af	11860af	
			15105af				
1530	1600		UK, Bible Voice BC		12035as		
1530	1600	mtwhf	UK, Sudan Radio Service		9840af		
1551	1600	DRM	New Zealand, Radio NZ International			6170pa	
1551	1600		New Zealand, Radio NZ International			7145pa	

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

1600	1615	vl/ mtwhf	Moldova, Radio PMR/Pridnestrovie			7370eu	
1600	1615		Pakistan, Radio Pakistan		9385va	11565va	
			15100af				
1600	1615	Sat	UK, BBC World Service		9410af	11860af	
			15105af				
1600	1627		Iran, VOIRI/IRIB	6160as	7330as		
1600	1628		Vietnam, Voice of Vietnam		7220va	7280va	
			9550va	9730va			
1600	1630	Sun	Germany, Pan American BC		13830me		
1600	1630		Guam, KSDA/ AWR		9585as	11690as	
1600	1630		Myanmar, Myanma Radio		9730do		
1600	1630		Nigeria, Voice of Nigeria/Lagos			9690af	
1600	1630		Yemen, Rep of Yemen Radio		9780me		
1600	1645		USA, WYFR/Family Radio Worldwide			11565na	
			11830na	17760am			
1600	1650	DRM	New Zealand, Radio NZ International			6170pa	
1600	1650		New Zealand, Radio NZ International			7145pa	
1600	1657		China, China Radio International			6060as	
			7110af	7235as	7255eu	9435eu	
			9525eu	9600af	11650eu		
1600	1658		Germany, Deutsche Welle		5965as	9560as	
1600	1700		Anguilla, Worldwide Univ Network			11775am	
1600	1700		Australia, CVC International		13635as		
1600	1700		Australia, Radio Australia		5995va	6080va	
			7240as	9475va	9580va	9710as	
			11660pa				
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		Costa Rica, Worldwide Univ Network			11870va	
			13750va				
1600	1700		Egypt, Radio Cairo		12170af		
1600	1700		Ethiopia, Radio Ethiopia		7165af	9560af	
1600	1700		France, Radio France International			11615af	
			15605af				
1600	1700		Germany, CVC Intl/Voice Africa			15745af	
1600	1700	vl	Italy, NEXUS-IRRS/EGR		15650af		
1600	1700		Malaysia, RTM/Traxx FM		7295as		
1600	1700		Nigeria, Radio Nigeria/Kaduna			4770do	
1600	1700		North Korea, Voice of Korea		9990va	11545va	
1600	1700	vl	Papua New Guinea, Wantok R. Light			7325va	
1600	1700		Russia, Voice of Russia		4965va	4975va	
			6130eu	7260as	7305as	7320as	
			9470va				
1600	1700	vl	Rwanda, Radio Rwanda		6055do		
1600	1700	vl	Solomon Islands, SIBC		5020do	9545al	
1600	1700		South Korea, KBS World Radio			9515eu	
1600	1700		Taiwan, R Taiwan International			9785as	
			11550as				
1600	1700		Uganda, Dunamis Shortwave		4750af		
1600	1700		UK, BBC World Service		3255af	5975as	
			6190af	7270af	9740as	12095me	
			15400af	15420af	21470af		
1600	1700		USA, Armed Forces Radio Network			4319usb	
			5446usb	5765usb	6350usb	7811usb	
			10320usb	12133usb	13362usb		
1600	1700		USA, Voice of America		4930af	6080af	
			9345va	13600va	15445va	15580af	
			17715af	17895af			
1600	1700		USA, WBCQ Monticello ME		9330am		
1600	1700		USA, WBOH Newport NC		5920am		
1600	1700		USA, WEWN Vandiver AL		5755va		
1600	1700		USA, WHRA Greenbush ME		17650af		
1600	1700		USA, WHRI Cypress Creek SC			9495sa	
			9840va	11785na			
1600	1700		USA, WINB Red Lion PA		13570am		
1600	1700		USA, WRMI Miami FL		9955na		
1600	1700		USA, WTJC Newport NC		9370na		
1600	1700		USA, WWCR Nashville TN		9980na	12160na	
			15825na				
1600	1700		USA, WWRB Manchester TN		9385va		
1600	1700		USA, WYFR/Family Radio Worldwide			6085sa	
			11760af	11850as	13630af	13695na	
			15705af	17690af	18980eu	21455eu	
1600	1700		Zambia CVC/ The Voice Africa			6065af	
			13650af				
1605	1700		Canada, R Canada International			9610as	
1605	1700	DRM	Canada, R Canada International			9800na	
1615	1700	Sat/Sun	UK, BBC World Service		9410af	11860af	
			15105af				
1630	1700		Guam, KSDA/ AWR		11980as		
1630	1700		Nigeria, Voice of Nigeria/Lagos			15120af	
1630	1700	Sun	UK, Bible Voice BC		9460me		
1640	1650	mtwhfa	Turkmenistan, Turkmen Radio		4930eu		
1645	1700	vl/ mtwhf	Moldova, Radio PMR/Pridnestrovie			7370eu	
1645	1700		Tajikistan, Tajik Radio		7245as		
1645	1700	mwhfa	UK, Bible Voice BC		9460me		
1651	1700	DRM	New Zealand, Radio NZ International			9890pa	
1651	1700		New Zealand, Radio NZ International			9765pa	

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

1700	1705	Sun	Croatia, Voice of Croatia		6165eu		
1700	1715	mtwhfa	Croatia, Voice of Croatia		6165eu		
1700	1715	whfa	UK, Bible Voice BC		9460me		
1700	1720	t	UK, Bible Voice BC		9460me		
1700	1727		Czech Rep, Radio Prague		5930eu	15710af	
1700	1730		Jordan, Radio Jordan		11690na		
1700	1730	Sat	USA, WRMI Miami FL		9955am		
1700	1745		UK, BBC World Service		9410af	11860af	
1700	1750	DRM	New Zealand, Radio NZ International			9890pa	
1700	1750		New Zealand, Radio NZ International			9765pa	
1700	1757		China, China Radio International			6090as	
			6100va	6140as	7100me	7120as	
			7130as	7180as	7205eu	7255eu	
			7335eu	9600me			
1700	1800		Anguilla, Worldwide Univ Network			11775am	
1700	1800		Australia, CVC International		13635as		
1700	1800		Australia, Radio Australia		5995va	6080va	
			9475as	9580va	9710as	11880as	
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		Canada, R Canada International			9610as
1700	1800	DRM	Canada, R Canada International			9800na
1700	1800		Costa Rica, Worldwide Univ Network			11870va
			13750va			
1700	1800		Egypt, Radio Cairo	12170af		
1700	1800		Equatorial Guinea, Radio Africa			15190af
1700	1800		Germany, CVC Intl/Voice Africa			15745af
1700	1800	vl	Italy, NEXUS-IRRS/EGR	15650af		
1700	1800		Malaysia, RTM/Traxx FM	7295as		
1700	1800		Nigeria, Radio Nigeria/Kaduna			4770do
1700	1800		Nigeria, Voice of Nigeria/Lagos			15120af
1700	1800	vl	Papua New Guinea, Wantok R. Light			7325va
1700	1800		Russia, Voice of Russia	4975me		6175as
			7125as	7320eu	9470va	
1700	1800	vl	Rwanda, Radio Rwanda	6055do		
1700	1800	vl	Solomon Islands, SIBC	5020eu		9545al
1700	1800	vl	South Africa, Channel Africa	15235af		
1700	1800		Taiwan, R Taiwan International			11850eu
1700	1800		Uganda, Dunamis Shortwave	4750af		
1700	1800		UK, BBC World Service	3255af		5975as
			6190af	7270as	9740as	11665af
			12095af	15400af	15420af	
1700	1800	Sun	UK, Bible Voice BC	9460me		
1700	1800		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
1700	1800		USA, Voice of America	6080af		13710af
			15580af	17895af		
1700	1800		USA, WBOH Newport NC	5920am		
1700	1800		USA, WEWN Vandiver AL	15610eu		
1700	1800		USA, WHRA Greenbush ME	17650af		
1700	1800		USA, WHRI Cypress Creek SC			9495sa
			9840va	11785na		
1700	1800		USA, WINB Red Lion PA	13570am		
1700	1800		USA, WRMI Miami FL	9955am		
1700	1800		USA, WTJC Newport NC	9370na		
1700	1800		USA, WWCR Nashville TN	9980na		12160na
			15825na			
1700	1800		USA, WWRB Manchester TN	9385va		
1700	1800		USA, WYFR/Family Radio Worldwide			9790af
			13630af	13695na	17545af	17555am
			18980eu	21455eu		
1700	1800		Zambia CVC/ The Voice Africa			4965af
			9420af			
1715	1730		Vatican City, Vatican Radio	4005eu		5885eu
			7250eu	7290eu	9645eu	
1715	1800		UK, Bible Voice BC	9460me		
1730	1745		UK, Bible Voice BC	9460me		
1730	1800		Slovakia, R Slovakia International			5915eu
			6055eu			
1730	1800	mtwhf	UK, Sudan Radio Service	9840af		
1730	1800		Vatican City, Vatican Radio	9755af		11625af
			13765af			
1745	1800		Bangladesh, Bangla Betar	7250as		
1745	1800		India, All India Radio	7410eu		9445af
			9950eu	11620eu	11935af	15075af
			15155af	17670af		
1751	1800	DRM	New Zealand, Radio NZ International			11675pa
1751	1800		New Zealand, Radio NZ International			11725pa

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

1800	1804		Canada, R Canada International			9610as
1800	1804	DRM	Canada, R Canada International			9800na
1800	1815	vl	UK, Bible Voice BC	9460me		
1800	1827		Czech Rep, Radio Prague	5930eu		9400va
1800	1828		Vietnam, Voice of Vietnam	9765eu		
1800	1830		Australia, CVC International	13635as		
1800	1830		Nigeria, Radio, National Svc/Abuja			7275do
1800	1830		Poland, Polish Radio	6015eu		7345eu
1800	1830	DRM	Romania, R Romania International			5895eu
1800	1830		South Africa, AWR Africa	3215af		3345af
			11830af			
1800	1830		UK, BBC World Service	7260as		9740as
1800	1830	mtwhf	USA, Voice of America	4930af		12080af
			15775af			
1800	1856		Romania, R Romania International			7215eu
			9640eu			
1800	1857		China, China Radio International			6020eu
			6100eu	6165me	7100eu	7265eu
1800	1859		Canada, R Canada International			7185af
			11875af	13650af	15365af	17790af
1800	1900		Anguilla, Worldwide Univ Network			11775am
1800	1900	mtwhf	Argentina, RAE	15345va		
1800	1900		Australia, Radio Australia	6080va		7240as
			9475va	9580as	9710as	11880as
1800	1900		Bangladesh, Bangla 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		Costa Rica, Worldwide Univ Network			11870va
			13750va			
1800	1900		Equatorial Guinea, Radio Africa			15190af
1800	1900		Germany, CVC Intl/Voice Africa			11775af
1800	1900		India, All India Radio	7410eu		9445af
			9950eu	11620eu	11935af	15075af
			15155af	17670af		
1800	1900		Kuwait, Radio Kuwait	11990va		
1800	1900		Malaysia, RTM/Traxx FM	7295as		
1800	1900		Netherlands, R Netherlands Worldwide			6020af
			11655af	12045af		
1800	1900	DRM	New Zealand, Radio NZ International			11675pa
1800	1900		New Zealand, Radio NZ International			11725pa
1800	1900		Nigeria, Radio Nigeria/Kaduna			4770do
1800	1900		Nigeria, Voice of Nigeria/Lagos			15120af
1800	1900		North Korea, Voice of Korea	7570eu		12015eu
1800	1900	vl	Papua New Guinea, Wantok R. Light			7325va
1800	1900		Russia, Voice of Russia	4975me		6125as
			7230af	7240eu	7320eu	7335va
			11510af			
1800	1900	Sat/Sun	Russia, Voice of Russia	6055eu		6175eu
			6245eu			
1800	1900	vl	Rwanda, Radio Rwanda	6055do		
1800	1900	vl	Solomon Islands, SIBC	5020do		9545al
1800	1900		South Korea, KBS World Radio			7275eu
1800	1900		Swaziland, TWR	3200af		
1800	1900		Taiwan, R Taiwan International			3965eu
1800	1900		Uganda, Dunamis Shortwave	4750af		
1800	1900		UK, BBC World Service	3255af		5875eu
			5945me	5955va	6190af	7390eu
			9630af	12095af	15400af	15420af
1800	1900	Sat/Sun	UK, Bible Voice BC	6110me		9460
			skd1208			
1800	1900		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
1800	1900		USA, Voice of America	4930af		6080af
			11975af	13710af	15580af	17895af
1800	1900		USA, WBCQ Monticello ME	15420am		
1800	1900		USA, WBOH Newport NC	5920am		
1800	1900		USA, WEWN Vandiver AL	15610eu		
1800	1900	mtwhf	USA, WHRA Greenbush ME	15665af		
1800	1900	Sat	USA, WHRA Greenbush ME	13730af		
1800	1900	Sun	USA, WHRA Greenbush ME	17650af		
1800	1900	mtwhf	USA, WHRI Cypress Creek SC			17650va
1800	1900	Sat/Sun	USA, WHRI Cypress Creek SC			9495va
1800	1900		USA, WHRI Cypress Creek SC			9840va
			11785na			
1800	1900		USA, WINB Red Lion PA	13570am		
1800	1900		USA, WRMI Miami FL	9955am		
1800	1900		USA, WTJC Newport NC	9370na		
1800	1900		USA, WWCR Nashville TN	9980na		12160na
			15825na			
1800	1900		USA, WWRB Manchester TN	9385va		
1800	1900		USA, WYFR/Family Radio Worldwide			6045af
			7395af	9895af	13630af	13695na
			13730af	13780me	15115af	17535na
			17555am	18980eu		
1800	1900		Yemen, Rep of Yemen Radio	9780me		
1800	1900		Zambia CVC/ The Voice Africa			4965af
			9420af			
1830	1900		Bulgaria, Radio Bulgaria	6200eu		7400eu
1830	1900		UK, BBC World Service	6005af		9410af
1830	1900		UK, Bible Voice BC	9460me		
1845	1900	Sun	UK, Bible Voice BC	7260af		

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

1900	1928		Vietnam, Voice of Vietnam	7280va		9730va
1900	1929		Germany, Deutsche Welle	11690af		
1900	1930		Germany, Deutsche Welle	9735af		13780af
			15275af			
1900	1945		India, All India Radio	7410eu		9445af
			9950eu	11620eu	11935af	15075af
			15155af	17670af		
1900	1945	Sat	UK, Bible Voice BC	6015eu		9460me
			7245af			
1900	1945		USA, WYFR/Family Radio Worldwide			6085sa
			15565eu	18980eu		
1900	1950		New Zealand, Radio NZ International			11725pa
1900	1950	DRM	New Zealand, Radio NZ International			11675pa
1900	1957		China, China Radio International			7285eu
			7295va	9440va		
1900	1957		USA, WYFR/Family Radio Worldwide			7395af

1900	2000		Anguilla, Worldwide Univ Network			11775am
1900	2000		Australia, Radio Australia	6080va	7240as	
			9500va	9580va	9710as	11880as
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		Costa Rica, Worldwide Univ Network			11870va
			13750va			
1900	2000		Egypt, Radio Cairo	9310af		
1900	2000		Equatorial Guinea, Radio Africa			15190af
1900	2000		Germany, CVC Intl/Voice Africa			11775af
1900	2000		Germany, Overcomer Ministries			3975eu
1900	2000		Iran, VOIRI/IRIB	6160as	7330as	
1900	2000	fas	Italy, NEXUS-IRRS/EGR	7290va		
1900	2000		Kuwait, Radio Kuwait	11990va		
1900	2000		Malaysia, RTM/Traxx FM	7295as		
1900	2000		Netherlands, R Netherlands Worldwide			7120af
			11655af	11805af	12045af	
1900	2000		Nigeria, Radio Nigeria/Kaduna			4770do
1900	2000		Nigeria, Voice of Nigeria/Lagos			15120af
1900	2000		North Korea, Voice of Korea	7100af	9975va	
			11535va	11910af		
1900	2000	vl	Papua New Guinea, Wantok R. Light			7325va
1900	2000		Russia, Voice of Russia	6175eu	7240eu	
			7290eu	7335af	11510af	
1900	2000	vl	Rwanda, Radio Rwanda	6055do		
1900	2000	vl	Solomon Islands, SIBC	5020do		
1900	2000	vl	South Africa, Channel Africa	3345af		
1900	2000	mtwhf	Spain, Radio Exterior Espana	9605af	9690eu	
1900	2000		Swaziland, TWR	3200af		
1900	2000		Thailand, Radio Thailand World Svc			9805eu
1900	2000	vl	Uganda, UBC Radio	4976do	5026do	
1900	2000		UK, BBC World Service	3255af	5875eu	
			5945me	5955va	6190af	7390eu
			9630af	12095af	15400af	
1900	2000	Sun	UK, Bible Voice BC	7260af	9470me	
1900	2000		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
1900	2000		USA, KJES Vado NM	15385na		
1900	2000		USA, Voice of America	4930af	4940af	
			6080af	9785va	11975af	12020va
			13710af	15580af	17895af	
1900	2000	mtwhf	USA, WBCQ Monticello ME	7415am	9330am	
1900	2000		USA, WBCQ Monticello ME	15420am		
1900	2000		USA, WBOH Newport NC	5920am		
1900	2000		USA, WEWN Vandiver AL	15610eu		
1900	2000	mtwhf	USA, WHRA Greenbush ME	13730af		
1900	2000		USA, WHRI Cypress Creek SC			9495sa
			9840va	11785na		
1900	2000		USA, WINB Red Lion PA	13570am		
1900	2000		USA, WRMI Miami FL	9955am		
1900	2000		USA, WTJC Newport NC	9370na		
1900	2000		USA, WWCR Nashville TN	9980na	12160na	
			15825na			
1900	2000		USA, WWRB Manchester TN	9385va		
1900	2000		USA, WYFR/Family Radio Worldwide			3230af
			6020af	7240eu	7345me	7395af
			9480af	9520eu	9610af	9885af
			13695na	15115af	17535na	17555am
1900	2000		Zambia CVC/ The Voice Africa			4965af
			9420af			
1905	1910	Sat	Croatia, Voice of Croatia	6165eu		
1905	1915	mtwhf	Croatia, Voice of Croatia	6165eu		
1905	2000	Mon	South Africa, SA Radio League			3215af
1930	2000	fas	Germany, Pan American BC	9515af		
1930	2000		Iran, VOIRI/IRIB	6010eu	7260eu	7320eu
			9855af	11695af		
1930	2000		Lithuania, Radio Vilnius	6115eu		
1930	2000		Serbia, Intl Raido Serbia	6100eu	7200eu	
1930	2000		Slovakia, R Slovakia International			5915eu
			7345eu			
1930	2000		Turkey, Voice of Turkey	6050eu		
1930	2000		UK, Bible Voice BC	9470me		
1945	2000	mtwhfa	Albania, Radio Tirana	7465eu	11645na	
1951	2000	DRM	New Zealand, Radio NZ International			15720pa
1951	2000		New Zealand, Radio NZ International			17675pa

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

2000	2005	Mon	South Africa, SA Radio League			3215af
2000	2015	Sun	Germany, Pan American BC	9515af		
2000	2025		Turkey, Voice of Turkey	6050eu		
2000	2027		China, China Radio International			7160eu
2000	2027		Iran, VOIRI/IRIB	6010eu	7260eu	7320eu
			9855af	11695af		
2000	2028		Lithuania, Radio Vilnius	6115eu		
2000	2030		Egypt, Radio Cairo	9310af		
2000	2030	fa	Germany, Pan American BC	9515af		
2000	2030		Swaziland, TWR	3200af		
2000	2030		USA, Voice of America	4930af	4940af	
			6080af	11975af	13710af	
2000	2030		Vatican City, Vatican Radio	7365af	9755af	
			11625af			
2000	2045		USA, WYFR/Family Radio Worldwide			5745eu
			9480af	9610af	9635af	11970eu
			15115af	15195af	17535na	17575sa
2000	2057		China, China Radio International			5960eu
			5985va	7190eu	7285eu	7295va
			9440va	9660eu	11640va	13630va
2000	2057		Germany, Deutsche Welle	9735af		
2000	2058		Germany, Deutsche Welle	13780af		
2000	2059		Germany, Deutsche Welle	9545af	15275af	
2000	2100		Anguilla, Worldwide Univ Network			11775am
2000	2100		Australia, ABC NT Alice Springs			2310do
			4835do			
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek			2325do
2000	2100	Sat/Sun	Australia, Radio Australia	6080va	7240va	
			12080as			
2000	2100		Australia, Radio Australia	9500va	11650as	
			11660pa	11880as		
2000	2100		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		Costa Rica, Worldwide Univ Network			13750va
2000	2100		Equatorial Guinea, Radio Africa			15190af
2000	2100		Germany, CVC Intl/Voice Africa			11775af
2000	2100	fas	Italy, NEXUS-IRRS/EGR	7290va		
2000	2100		Kuwait, Radio Kuwait	11990va		
2000	2100	vl	Liberia, ELWA	4760do		
2000	2100		Malaysia, RTM/Traxx FM	7295as		
2000	2100		Netherlands, R Netherlands Worldwide			7120af
			11655af	17810af		
2000	2100		New Zealand, Radio NZ International			17675pa
2000	2100	DRM	New Zealand, Radio NZ International			15720pa
2000	2100		Nigeria, Radio Nigeria/Kaduna			4770do
2000	2100		Nigeria, Voice of Nigeria/Lagos			15120af
2000	2100	vl	Papua New Guinea, R East New Britain			3385do
2000	2100	vl	Papua New Guinea, Wantok R. Light			7325va
2000	2100		Russia, Voice of Russia	6145eu	7240eu	
			7330eu			
2000	2100	vl	Rwanda, Radio Rwanda	6055do		
2000	2100	vl	South Africa, Channel Africa	3345af		
2000	2100	vl	Uganda, UBC Radio	4976do	5026do	
2000	2100		UK, BBC World Service	3255af	6190af	
			9630af	12095af	15400af	
2000	2100	DRM	UK, BBC World Service	5875eu		
2000	2100		Ukraine, R Ukraine International			5840eu
			9785sa			
2000	2100		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
2000	2100		USA, WBCQ Monticello ME	15420am		
2000	2100	smtwhf	USA, WBCQ Monticello ME	7415am		
2000	2100		USA, WBOH Newport NC	5920am		
2000	2100		USA, WEWN Vandiver AL	11520me		
2000	2100	Sat/Sun	USA, WHRA Greenbush ME	11740af		
2000	2100	mtwhf	USA, WHRA Greenbush ME	7520va		
2000	2100	asmtwh	USA, WHRI Cypress Creek SC			9495va
2000	2100	f	USA, WHRI Cypress Creek SC			15665va
2000	2100		USA, WHRI Cypress Creek SC			9515va
			11785na			
2000	2100		USA, WINB Red Lion PA	13570am		
2000	2100		USA, WRMI Miami FL	9955am		
2000	2100		USA, WTJC Newport NC	9370na		
2000	2100		USA, WWCR Nashville TN	9980na	12160na	
			15825na			
2000	2100		USA, WWRB Manchester TN	9385va		
2000	2100		USA, WYFR/Family Radio Worldwide			6020af
			7430eu	9480af	9610af	9635af
			11970eu	15115af	15195af	17535na
			17575sa			
2000	2100		Zambia CVC/ The Voice Africa			4965af
			9420af			
2030	2045		Thailand, Radio Thailand World Svc			9535eu
2030	2058		Vietnam, Voice of Vietnam	7220va	7280va	
			9550va	9730va		
2030	2100		Cuba, Radio Havana Cuba	9505va	11760va	
2030	2100		Sweden, Radio Sweden	9895va		
2030	2100		USA, Voice of America	4930af	4940af	
			6080af	7595as	11975af	13710af

2045	2100		India, All India Radio	7410eu	9445eu	
			9910pa	9950eu	11620eu	11715pa
2045	2100	DRM	Vatican City, Vatican Radio	9800am		
2050	2100		Vatican City, Vatican Radio	4005eu	5885eu	
			7250eu			

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

2100	2120		Vatican City, Vatican Radio	4005eu	5885eu	
			7250eu			
2100	2127		Czech Rep, Radio Prague	5930eu	9430va	
2100	2130	mtwhfa	Albania, Radio Tirana	7510eu	9345na	
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	9505va	11760va	
2100	2130		Nigeria, Radio, National Svc/Abuja		7275do	
2100	2130		USA, Voice of America	7595as		
2100	2130	DRM	Vatican City, Vatican Radio	9800ca		
2100	2145		USA, WYFR/Family Radio Worldwide		6915eu	
			17535na	17555am		
2100	2157		China, China Radio International		5960eu	
			6135eu	7120eu	7190eu	7205af
			7225eu	7285eu	7325af	9600eu
			11640af	13630af		
2100	2157		Germany, Deutsche Welle	13780af		
2100	2159		Germany, Deutsche Welle	7280af		
2100	2200		Angola, Radio Nacional de Angola		7217do	
2100	2200		Anguilla, Worldwide Univ Network		11775am	
2100	2200		Australia, ABC NT Alice Springs		2310do	
			4835do			
2100	2200		Australia, Radio Australia	9500as	9660as	
			11650pa	11660pa	11695as	12080as
			13630as	15515as		
2100	2200		Belarus, Radio Belarus Minsk	7135eu	7360eu	
			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		Costa Rica, Worldwide Univ Network		13750va	
2100	2200		Equatorial Guinea, Radio Africa		15190af	
2100	2200		Germany, Deutsche Welle	9545af	11690af	
2100	2200		Germany, Overcomer Ministries		6175eu	
2100	2200		Guyana, Voice of Guyana	3291do		
2100	2200		India, All India Radio	7410eu	9445eu	
			9910pa	9950eu	11620eu	11715pa
2100	2200	vl	Liberia, ELWA	4760do		
2100	2200		Malaysia, RTM/Traxx FM	7295as		
2100	2200		New Zealand, Radio NZ International		17675pa	
2100	2200	DRM	New Zealand, Radio NZ International		15720pa	
2100	2200		Nigeria, Radio Nigeria/Kaduna		4770do	
2100	2200		Nigeria, Voice of Nigeria/Lagos		7255af	
2100	2200		North Korea, Voice of Korea	7570eu	12015eu	
2100	2200	vl	Papua New Guinea, Wantok R. Light		7325va	
2100	2200		Russia, Voice of Russia	6145eu	7330eu	
2100	2200	vl	South Africa, Channel Africa	3345af		
2100	2200		Syria, Radio Damascus	9330eu		
2100	2200		UK, BBC World Service	3255af	3915as	
			5965as	5975as	6005af	6110af
			6190af	6195as	7445af	15400af
2100	2200	DRM	UK, BBC World Service	5875eu		
2100	2200		USA, Armed Forces Radio Network		4319usb	
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
2100	2200		USA, Voice of America	6080af	15580af	
2100	2200		USA, WBCQ Monticello ME	15420am		
2100	2200	smtwhf	USA, WBCQ Monticello ME	7415am		
2100	2200		USA, WBOH Newport NC	5920am		
2100	2200		USA, WEWN Vandiver AL	11520me		
2100	2200		USA, WHRA Greenbush ME	7520af		
2100	2200		USA, WHRI Cypress Creek SC		7315sa	
			9525va	11785na		
2100	2200		USA, WINB Red Lion PA	9265am		
2100	2200		USA, WRMI Miami FL	9955am		
2100	2200		USA, WTJC Newport NC	9370na		
2100	2200		USA, WWCR Nashville TN	7465na	9980na	
			12160na			
2100	2200		USA, WWRB Manchester TN	9385va		
2100	2200		USA, WYFR/Family Radio Worldwide		5950na	
			7430eu	9480af	9610af	12055af
			15115af			
2100	2200		Zambia CVC/ The Voice Africa		4965af	
			9420af			
2115	2200		Egypt, Radio Cairo	6255va		
2130	2156		Romania, R Romania International		6030eu	
			6115na	7145na	9755na	
2130	2157		China, China Radio International		7160eu	
			7325eu			
2130	2200		Australia, ABC NT Katherine	5025do		
2130	2200		Australia, ABC NT Tennant Creek		4910do	
2130	2200	mtwhfa	Canada, CBC NQ SW Service	9625na		
2130	2200		Guam, KSDA/ AWR	9625as		
2130	2200		Lithuania, Mighty KBC Radio	6055eu		
2130	2200		Sweden, Radio Sweden	7390va		
2130	2200		Turkey, Voice of Turkey	7180va		
2130	2200		USA, Voice of America	7405as		

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

2200	2100	Sat/Sun	Spain, Radio Exterior Espana	6125eu		
2200	2225		Turkey, Voice of Turkey	7180va		
2200	2228		Lithuania, Mighty KBC Radio	6055eu		
2200	2230		India, All India Radio	7410eu	9445eu	
			9910pa	9950eu	11620eu	11715pa
2200	2230		Japan, NHK World Radio Japan		13640va	
2200	2230		Serbia, Intl Raido Serbia	7200eu		
2200	2230		South Korea, KBS World Radio		3955eu	
2200	2230	w	USA, WBCQ Monticello ME	15420am		
2200	2235		New Zealand, Radio NZ International		17675pa	
2200	2235	DRM	New Zealand, Radio NZ International		15720pa	
2200	2245		Egypt, Radio Cairo	6255va		
2200	2245		USA, WYFR/Family Radio Worldwide		17690af	
2200	2257		China, China Radio International		5915as	
			7170eu			
2200	2300		Anguilla, Worldwide Univ Network		6090am	
2200	2300		Australia, ABC NT Alice Springs		2310do	
			4835do			
2200	2300		Australia, ABC NT Katherine	5025do		
2200	2300		Australia, ABC NT Tennant Creek		4910do	
2200	2300		Australia, Radio Australia	12010va	13630pa	
			15230va	15240pa	15515as	17785pa
			17795va			
2200	2300		Belarus, Radio Belarus Minsk	7135eu	7360eu	
			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, R Canada International		9800na	
2200	2300		Costa Rica, Worldwide Univ Network		13750va	
2200	2300		Equatorial Guinea, Radio Africa		15190af	
2200	2300		Guyana, Voice of Guyana	3291do		
2200	2300	vl	Liberia, ELWA	4760do		
2200	2300		Malaysia, RTM/Traxx FM	7295as		
2200	2300		Nigeria, Radio Nigeria/Kaduna		4770do	
2200	2300		Nigeria, Voice of Nigeria/Lagos		7255af	
2200	2300	vl	Papua New Guinea, Wantok R. Light		7325va	
2200	2300		UK, BBC World Service	5955as	5965as	
			6110af	6135as	6155af	6195as
			9740as	15400af		
2200	2300		Ukraine, R Ukraine International		5830eu	
			9785sa			
2200	2300		USA, Armed Forces Radio Network		4319usb	
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
2200	2300		USA, Voice of America	5910va	6105va	
			7220va	7405as	7425va	7480va
			9490va	11610va		
2200	2300	fs	USA, WBCQ Monticello ME	7415am		
2200	2300		USA, WBOH Newport NC	5920am		
2200	2300		USA, WEWN Vandiver AL	11520me		
2200	2300		USA, WHRA Greenbush ME	7520af		
2200	2300		USA, WHRI Cypress Creek SC		9615na	
			11785na			
2200	2300		USA, WINB Red Lion PA	9265am		
2200	2300		USA, WRMI Miami FL	9955am		
2200	2300		USA, WTJC Newport NC	9370na		
2200	2300		USA, WWCR Nashville TN	5070na	7465na	
			9980na			
2200	2300		USA, WWRB Manchester TN	9385na		
2200	2300		USA, WYFR/Family Radio Worldwide		5950na	
			7285af	9620eu	11740na	15440am
			17690af			
2200	2300		Zambia CVC/ The Voice Africa		4965af	
2230	2245	vl/ mtwhf	Moldova, Radio PMR/Pridnestrovie		6240na	
2230	2257		Czech Rep, Radio Prague	5930na	9435af	
2230	2300		Guam, KSDA/ AWR	15320as		
2230	2300		Sweden, Radio Sweden	5850va		

2230	2300		USA, Voice of America 15445va		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 11620as	11645as	9705eu	9950as 13605as

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

2300	0000		Anguilla, Worldwide Univ Network			6090am
2300	0000		Australia, ABC NT Alice Springs 4835do			2310do
2300	0000		Australia, ABC NT Katherine		5025do	
2300	0000		Australia, ABC NT Tennant Creek			4910do
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	DRM	China, China Radio International			9800ca
2300	0000		China, China Radio International 5990sa skd0109	6020na	6040nana	skd0209na
2300	0000		Costa Rica, Worldwide Univ Network			13750va
2300	0000		Egypt, Radio Cairo		6850na	
2300	0000		Guyana, Voice of Guyana		3291do	
2300	0000		India, All India Radio 11620as	11645as	9705eu	9950as 13605as
2300	0000		Iran, VOIRI/IRIB 9855af	6010eu 11695af	7260eu	7320eu
2300	0000		Malaysia, RTM/Traxx FM		7295as	
2300	0000		New Zealand, Radio NZ International			15720pa
2300	0000	DRM	New Zealand, Radio NZ International			17675pa
2300	0000	vl	Papua New Guinea, Wantok R. Light			7325va
2300	0000		UK, BBC World Service 5965as 9570as	6000as 9740as	3915as 6135as 11955as	5955as 6195as
2300	0000		USA, Armed Forces Radio Network 5446usb 10320usb	5765usb 12133usb	6350usb 13362usb	4319usb 7811usb
2300	0000		USA, Voice of America 7265va 11610va	7405va	7480va	9490va
2300	0000	fas	USA, WBCQ Monticello ME		7415am	
2300	0000		USA, WBOH Newport NC		5920am	
2300	0000		USA, WEWN Vandiver AL		11520me	
2300	0000		USA, WHRA Greenbush ME		5850eu	
2300	0000		USA, WHRI Cypress Creek SC 5875na	7335na	9615na	7315sa
2300	0000		USA, WRMI Miami FL		9955am	
2300	0000		USA, WTJC Newport NC		9370na	
2300	0000		USA, WWCR Nashville TN 9980na		5070na	7465na
2300	0000		USA, WWRB Manchester TN 6890va	9385va	5050na	5745va
2300	0000		USA, WYFR/Family Radio Worldwide 9430sa	15400sa	15440am	5950na
2300	0000		Zambia CVC/ The Voice Africa			4965af
2300	2305	vl	Liberia, ELWA	4760do		
2300	2315		Nigeria, Radio Nigeria/Kaduna			4770do
2300	2330		Australia, Radio Australia 12080pa 17785va	13690pa 17795va	9660as 15230va	12010pa 15240pa
2300	2330		USA, Voice of America 11840va		6180va	7460va
2300	2345		USA, WYFR/Family Radio Worldwide			11740na
2300	2345	DRM	Vatican City, Vatican Radio		7370am	
2300	2355		Turkey, Voice of Turkey		5960va	
2300	2356		Romania, R Romania International 6115eu	7105eu	9610na	6015eu
2300	2357		China, China Radio International 6145as 11790as	7180as	7350eu	5915as 9610as
2315	2330		Croatia, Voice of Croatia		3985eu	7375sa
2315	2330	mtwhf	Moldova, Radio PMR/Pridnestrovie			6240na
2330	0000		Australia, Radio Australia 12080as 17750va	13690as 17795va	9660as 15230va	12010as 15415as
2330	0000		UK, BBC World Service		6170as	
2330	0000		USA, Voice of America 11655va	11840va	6180va	7460va 13640va
2330	0000	m	USA, WBCQ Monticello ME		7415am	
2330	2357		Czech Rep, Radio Prague		5930na	7345na
2330	2358	vl	Lithuania, Radio Vilnius		7325na	
2330	2358		Vietnam, Voice of Vietnam		9840as	12020as

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Albania, Radio Tirana ..... http://rtsh.sil.at/
Angola, Radio Nacional de Angola ..... www.rna.ao/
Anguilla, Worldwide Univ Network ..... www.worldwideuniversitynetwork.com/
Argentina, RAE ..... www.radionacional.gov.ar/rae/rae.asp
Australia, ABC NT Alice Springs ..... www.abc.net.au/radio/
Australia, ABC NT Katherine ..... www.abc.net.au/radio/
Australia, ABC NT Tennant Creek ..... www.abc.net.au/radio/
Australia, CVC International ..... www.christianvision.com/
Australia, HCJB Global ..... www.hcjb.org/
Australia, Radio Australia ..... www.abc.net.au/ra/
Austria, AWR Europe www.awr2.org/
Austria, Radio Austria Intl http://oe1.orf.at/service/international
Bahrain, Radio Bahrain ..... www.radiobahrain.net/
Bangladesh, Bangla Betar ..... www.betar.org.bd/
Belarus, Radio ..... www.radiobelarus.tvr.by/eng/
Bhutan, BBS ..... www.bbs.com.bt/
Bulgaria, Radio ..... www.bnr.bg/
Canada, CBC NQ SW Service ..... www.cbc.ca/north/
Canada, Radio Canada Intl ..... www.rcinet.ca/
China, China Radio Intl ..... www.cri.cn/
Costa Rica, Worldwide Univ Network ..... www.worldwideuniversitynetwork.com/
Croatia, Croatian Radio ..... www.hrt.hr/
Cuba, Radio Havana ..... www.radiohc.cu/
Czech Rep, Radio Prague ..... www.radio.cz/en/
Finland, Overcomer Ministries ..... www.overcomerministries.org
France, Radio France Intl ..... http://rfienglish.com
Germany, AWR Europe www.awr2.org/
Germany, CVC Intl/Voice Africa ..... www.christianvision.com/
Germany, Deutsche Welle ..... www.dw-world.de/
Germany, Overcomer Ministries ..... www.overcomerministry.org/
Germany, Pan American BC ..... www.radiopanam.com/
Germany, The Overcomer Ministries ..... www.overcomerministry.org/
Germany, TWR Europe ..... www.twr.org/
Greece, Voice of Greece ..... www.voiceofgreece.gr/
Guam, AWR/KSDA www.awr2.org/
Guam, TWR/KTWR ..... www.twr.org/
Guyana, Voice of ..... http://voiceofguyana.com/
India, All India Radio ..... www.allindiaradio.org/
Indonesia, Voice of Indonesia ..... www.rri-online.com/
Iran, Voice of the Islamic Rep of Iran www2.irib.ir/worldservice/
Italy, IRRS ..... www.nexus.org
Japan, NHK World/Radio Japan ..... www.nhk.or.jp/english/
Jordan, Radio ..... www.jrtv.jo/rj/index.php
Latvia, Radio SWH ..... www.radioswh.lv/index.php
Liberia, ELWA ..... www.elwaministries.org/
Liberia, Star Radio ..... www.radioswh.lv/index.php
Libya, Voice of Africa ..... www.ljbc.net/home.php
Lithuania, Radio Vilnius ..... www.lrt.lt/
Malaysia, RTM/Traxx FM ..... www.traxxfm.net/index.htm
Malaysia, RTM/Voice of Malaysia http://202.190.233.9/vom/utama.htm
Monaco, TWR Europe ..... www.twr.org/
Nepal, Radio Nepal ..... www.radionepal.org/
Netherlands, Radio Netherlands ..... www.radionetherlands.nl/
New Zealand, Radio NZ Intl ..... www.rnzi.com
Nigeria, Radio, Natl Svc/Abuja ..... http://radionigeriaonline.com
Nigeria, Radio/Kaduna ..... http://radionigeriaonline.com
Nigeria, Voice of/ Ext. Svc Lagos ..... www.voiceofnigeria.org
Oman, Radio Oman ..... www.oman-tv.gov.om
Pakistan, Radio ..... www.radio.gov.pk
Papua New Guinea, NBC ..... www.nbc.com.pg/
Papua New Guinea, Wantok R. Light ..... http://wantokradio.net/
Philippines, Radio Pilipinas ..... www.radiopilipinas.com/
Poland, Polish Radio ..... www.polskieradio.pl/zagranica/gb/
Romania, Radio Romania Intl ..... www.rri.ro/
Russia, Voice of Russia ..... www.vor.ru/world.html
Saudi Arabia, BSKSA ..... www.saudiradio.net/
Slovakia, Radio Slovakia Int ..... www.rsi.sk
Solomon Islands, SIBC ..... www.sibconline.com.sb/
South Africa, AWR Africa www.awr2.org/
South Africa, Channel Africa ..... www.channelafrica.org
South Africa, Trans World Radio ..... www.twr.org/
South Korea, KBS World Radio ..... http://rki.kbs.co.kr/english/
Spain, Radio Exterior Espana ..... www.ree.rne.es/
Sri Lanka, SLBC ..... www.slbc.lk
Swaziland, Trans World Radio ..... www.twr.org/
Sweden, Radio ..... www.sr.se/rs/english/
Syria, Radio Damascus ..... www.rtv.gov.sy/
Taiwan, Radio Taiwan Intl ..... http://english.rti.org.tw/
Thailand, Radio www.hsk9.com/
Turkey, Voice of ..... www.trt,net.tr
UK, BBC World Service ..... www.bbc.co.uk/worldservice/
UK, Bible Voice BC ..... www.biblevoice.org/
UK, FEBA ..... www.feba.org.uk
UK, Sudan Radio Service ..... www.sudanradio.org/
Ukraine, Radio Ukraine Intl ..... www.nrcu.gov.ua/
USA, American Forces Radio ..... http://myafn.dodmedia.osd.mil/
USA, KNLS Anchor Point AK ..... www.knls.org/
USA, KTBN Salt Lake City UT ..... www.tbn.org/
USA, KWHR Naalehu HI ..... www.whr.org/
USA, Voice of America ..... www.voanews.com/
USA, WBCQ Monticello ME ..... www.wbcq.com/
USA, WBOH Newport NC ..... www.fbnradio.com/
USA, WEWN Vandiver AL ..... www.ewtn.com
USA, WHRA Greenbush ME ..... www.whr.org/
USA, WHRI Cypress Creek SC ..... www.whr.org/
USA, WINB Red Lion PA ..... www.winb.com/
USA, WRMI Miami FL ..... www.wrmi.net/
USA, 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 International ..... www.christianvision.com/
Vatican City, Vatican Radio ..... www.vaticanradio.org
Vietnam, Voice of Vietnam ..... www.vov.org.vn
Yemen, Rep of Yemen Radio ..... www.yemenradio.net
Zambia, CVC Intl/Christian Voice ..... www.christianvision.com/

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Change!

"*Change* is the law of life. And those who look only to the past or present are certain to miss the future." – John F. Kennedy (1917-1963) Thirty-fifth President of the USA

It is a word we have all heard a lot in the news lately – Change! And looking at the "big picture" objectively, we are definitely in an era of change.

As this issue is mailed to our readers, we will shortly change our calendars from 2008 to 2009. The occupant in the White House will change this month after an eight year run by the previous occupant. The political power in Washington has changed from the Republicans to the Democrats.

And on the radio front, we are finally starting to see a change from the old sunspot cycle 23 to the new cycle 24, thank goodness.

Even the communications industry isn't immune to changes. In the last five years we have seen all sorts of major changes to the radio spectrum. Public Safety bands have been changed to **narrowband** frequency assignments and transmission technologies. The attacks of 9/11 created a new **interoperability** band – 700 MHz. Sprint and its aggressive frequency/system acquisition tactics forced the FCC to make major changes to the 800 MHz public safety assignments, known as **rebanding**.

In the HF radio spectrum we have seen a change from older analog and digital modes to more robust and reliable **digital** protocols. We have pretty much seen the death of CW (except in the ham bands) and it has been replaced by high performance digital modes that work well even below the noise level and well beyond the ability of any human to discern these signals audibly.

Even the federal government radio land mobile radio service frequencies have come under siege by congressionally mandated changes as a part of "narrow banding." Congress required government agencies to reorganize the Federal Land Mobile Radio (LMR) bands (162-174 MHz and 406.1-420 MHz) from channels spaced every 25 kHz to channels spaced every 12.5 kHz. The result, after all the users switched to the narrowband mode of operation, was to effectively double the number of channels in the LMR bands, thus allowing for more users in the same band.

Phase 1 of the changeover required that all new users of the federal spectrum had to meet the new narrowband requirements as of January 1, 1995. This meant that existing "wideband" radio equipment, which required a signal bandwidth of 16 kHz, could not be used on government LMR frequencies that are "assigned." Instead, new equipment that requires only 11 kHz of signal bandwidth has to be used.

Phase 2 of the government's plan provided that all existing LMR systems in the VHF band (162-174 MHz) had to be converted to narrowband operation prior to January 1, 2005. All existing LMR systems in the UHF band (406.1-420 MHz) had to be converted to narrowband operation prior to January 1, 2008.

❖ Even Military Frequencies Are Changing

Of course, any military communications that include the two government LMR bands mentioned above are also required to change to narrowband communication techniques. But there have been many more unannounced changes in recent times on nearly every milcom frequency band that we monitor in the radio spectrum.

This column has led the way in the radio hobby press in alerting the *Milcom* community of the changes that have been taking place and what bands have been impacted. So let's recap what is going on, what has changed, and what we expect to see in the coming year.

First, the immediate past: In the June 2004 *Milcom* column, I broke the story regarding a major change to the 225-400 MHz military aeronautical band. Research in the NTIA bible known as the *Redbook* indicates that the Department of Defense (through the Military Assignment Group) is solely responsible for all frequency assignment actions in the 225-328.6 and 335.4-399.9 MHz. This is a significant departure from any other portion of the government radio spectrum where the NTIA has final assignment authority for frequency allocations.

In a Deputy Secretary of Defense memorandum dated August 1, 2001, the various military departments were given specific guidance regarding the purchase of equipment for Land Mobile Radio (LMR) Systems. This memo addressed the existing mandates set down in the NTIA *Redbook* regarding the change to narrowband technologies between 2005-2008 (see the April 2004 *Milcom* column in *MT*).

But there was also an interesting mention of another LMR allocation in the 225-400 MHz band.

"In addition, new LMR radios or services procured after the promulgation date of this memorandum (1 Aug 2001-LVH) that operate in the 380-399.9 MHz band (which is not subject to the NTIA mandate) shall nevertheless be designed for narrowband (12.5 kHz) operation in order to make efficient use of the available spectrum."

So at this point we had uncovered a previously hidden LMR band that was created by the Department of Defense for use by the military only. Any other users would have to be relocated.

Over subsequent months of writing about this new sub-band, we began to see a pattern emerge. It became evident that this new sub-band would contain both land mobile and aeronautical communications.

The first major users to be shuffled out of this portion of the spectrum were the various U.S. Coast Guard air-to-ground frequency assignments (e.g., 381.7, 381.8, 383.900, 385.300 MHz). In March 2005, we published the following new USCG A/G assignments (new assignments valid as of January 1, 2005):

Ops Primary	345.000 MHz
Ops Secondary	237.900 MHz
A/G Working Primary	326.150 MHz
A/G Working Secondary	379.050 MHz

❖ Inter Squad Radios

Another major land mobile allocation that popped up in the 380-400 MHz range was the ISR or Inter Squad Radio. These radios are primarily used for mobile communications and operate at a range of 1 to 2 miles. The power output on these radios is less than 2 watts. The 14 channels are as follows:

396.875	Channel 01	397.950	Channel 08
397.125	Channel 02	398.050	Channel 09
397.175	Channel 03	399.425	Channel 10
397.375	Channel 04	399.475	Channel 11
397.425	Channel 05	399.725	Channel 12
397.475	Channel 06	399.925	Channel 13
397.550	Channel 07	399.975	Channel 14

Almost all of these frequencies were known "spectrum holes" in the 225-400 MHz UHF band (see the April 2004 *Milcom* column for a discussion of spectrum holes). This begs the question, are the remaining spectrum holes in the 380-399.1 MHz range being used for LMR (narrowband FM) communications?

Based on the changes we have seen and the frequencies that have not been moved, we feel that this band will be a mix of aeronautical and LMR communications in future years. I strongly recommend that Milcom monitors search the

380-399.1 MHz spectrum with 12.5 kHz steps using the FM mode and see what pops. You may find some interesting new military communications to monitor in your local area.

❖ Metros Making a Change

For years, the military used the following frequencies for their pilot-to-meteorologist (METRO) communications nationwide: 239.800, 342.500, 344.600, and 375.200 MHz.

A couple of years ago I saw a trend developing in which DoD was moving METRO stations off 344.600 and 375.200 MHz to other frequency assignments. It was also interesting to note that other frequency assignments were being cleared out around either side of these two frequencies as well.

While we are not sure exactly what is happening, one theory that has been privately floated among monitors is that DoD is setting up new wideband communications sub-bands within the 225-400 MHz spectrum.

So where have all the METRO stations gone? Below is the latest list of frequencies that have assigned METRO activity on them.

226.100	227.400	228.450	233.950
234.800	239.800	244.775	249.750
261.025	263.450	264.000	264.500
265.600	265.800	267.400	269.200
271.600	274.750	289.950	290.625
304.300	306.500	308.300	309.000
312.400	316.950	317.000	318.650
323.900	323.925	327.400	335.450
339.650	342.000	342.200	342.300
342.350	342.400	342.500	342.550
343.100	343.150	343.200	343.300
343.400	343.500	346.550	346.600
348.300	348.800	349.850	349.900
354.600	356.200	359.600	375.775
386.350	387.400 MHz		

❖ Wideband Frequencies are Changing

Speaking of wideband frequencies, Ted Moran, on one of the *Milcom* internet newsgroups, passed along some very interesting observations regarding these frequencies in the DoD milair radio spectrum.

"It looks to me like we had a major frequency reorganization sometime early in 2007, probably in April (although possibly a little earlier)," Ted wrote.

Here is a list of what he believes are the latest frequencies being used by the various Ground Entry Points (GEP) and airborne command post aircraft using the Northstar wideband communications system:

GEP / Aircraft (MHz)
287.625 / 301.650
325.400 / 230.900
338.950 / 365.000
345.500 / 362.250
358.300 / 344.400
366.600 / 286.100
392.850 / 304.250
394.500 / 370.100

Ted also noted that there are a couple of other aircraft frequencies that were heard during or right after April 2007: 338.950 and 362.150 MHz. "Neither of these two has been reported as in use since then, however. They may still merit scanning. If they are still in use, there may be GEP frequencies associated with them. There is also probably a frequency dedicated to air to air relay use which does not have a GEP frequency," Ted said.

Monitors across the country continue to report 323.800 and/or 382.300 MHz as carrying emergency action message broadcasts from airborne command post platforms, usually in AM mode.

Prior to April 2007, Ted mentioned that there was a nice little group of very active aircraft wideband frequencies which since then appear to have fallen silent. These included:

285.550 (January 2006) [This frequency is now being used as an ATC assignment-LVH]
286.350 (November 2005)
300.400 (November 2006, has been heavily used by AF1 in the past)
356.150 (January 2007)
366.600 (Possible wideband frequency that was last reported in August 2006)
368.250 (January 2007)
374.550 (July 2006)
390.550 (September 2006) [Frequency is now a DoD LMR trunk system frequency]

The information noted above by Ted Moran definitely supports our contention that DoD is and continues to make major changes to all of their frequency assignments in the 225-400 MHz aeronautical band. I would like to thank Ted for sharing his insight with the rest of the Milcom monitoring community.

❖ The T-Bird VHF Frequencies are Changing

In 2008, we noted major changes during the air show season of the primary four-ship VHF high band air-to-air frequency used by the U.S. Air Force Thunderbird flight demonstration team. Fortunately, we had some excellent field reports of these changes passed along by *Milcom* readers and we posted those changes on our Internet blog website, the Milcom Monitoring Post at **http://mt-milcom.blogspot.com/**.

MT readers will get a complete and updated picture in the March issue when we present our 10th annual *MT* Air Show Monitoring Guide, an issue you surely do not want to miss.

❖ DoD VHF LMR Bands are Changing

The changing of the Thunderbird VHF frequencies was one of several clues that led us to believe that DoD is reorganizing their two VHF high LMR bands (138-144/148-150.8 MHz). Based on monitoring from around the country, we can now confirm that they have started their shift to 12.5 kHz spacing like the other government bands mentioned earlier in this column.

We are also seeing trunk radio systems emerge on new frequencies, new AM mode aero assignments, and a host of other changes to frequencies and services which use these bands, including CAP and MARS. More monitoring is needed from various parts of the country to make a determination of what changes are being made and how these bands are being reorganized.

TABLE ONE: DOD RADIO FREQUENCY BANDS

Freq Range (MHz)	Steps	Modes
138.000 - 144.000	12.5 kHz	Narrow band FM and AM
148.000 - 150.800	12.5 kHz	Narrow band FM and AM
162.000 - 174.000	12.5 kHz	Narrow band FM
225.000 - 379.975	25 kHz	AM, Wideband FM for Northstar freqs, Narrowband FM/SSB for the 240-270 MHz satellite sub-band.
380.000 - 399.9875	12.5 kHz	Narrow band FM and AM
406.000 - 420.000	12.5 kHz	Narrow band FM and AM

❖ What Can You Do?

Quite frankly, it is time to put the old military frequency guides away and start our frequency list anew. Start by putting your scanners in the search mode and looking for changes in your local radio scene. If you pass along your results to us, we will not only share them with the rest of the Milcom community, but we can use them to get a better handle on what changes are being made in the various bands. You can pass them along to the email address in the masthead. Use Table One as a guide when setting up your searches, and this should make your monitoring time more beneficial.

Until next time – 73, Happy New Year, and good hunting.

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Feds Make the Slow Move to Digital

The world is becoming digital, no doubt about it. Television, radio, movies, portable music players, cellular phones are all using digital technology. And federal radio communications systems are no exception. Although it has been coming slowly over the last 5 years or so, it is now more common for federal agencies to be using digital modes on their land-mobile radio systems. And with these changes come new challenges and technologies that the scanner listener and radio hobbyist will have to deal with.

When digital radio systems first came on the air, it usually meant the end of listening on the scanner. There were no receivers or converters available to the average consumer that would allow monitoring of these digital radio systems.

However, in 2003 both Uniden and GRE (Radio Shack) began to offer scanners capable of receiving digital signals. They will only receive one type of digital signal, however, and that is the APCO Project 25 digital mode. APCO Project 25 is a suite of specifications for public safety and law enforcement communications systems. It is an "open" standard, meaning that it is not "owned" by any one company, so any radio manufacturer can produce radios that work with other APCO P-25 radios. If you would like to read more about APCO Project 25, check out this link: **www.apco911.org/frequency/project25/information.html.**

It was this compatibility, plus the desire to push the concept of radio communications interoperability, that led the federal government to set APCO P-25 as the standard digital mode for federal radio systems as well. Many federal agencies have begun to replace older equipment with newer, digital capable gear, starting with mobile radios and hand-held units. Repeaters and other fixed infrastructure equipment seem to come later as the budgets permit.

One reason for the slow move to digital radios is cost. The average cost of a hand-held VHF or UHF radio that is capable of P-25 digital is around 30 to 50 percent higher than an analog radio of the same channel capacity. And trunking radios are even more expensive.

At this pace, few federal agencies have completely migrated to digital operations. The only agencies that appear to have totally moved to P-25 across the country are the Bureau of Alcohol, Tobacco, Firearms and Explosives (BATFE) and the Secret Service.

Although the Customs and Border Protection division of Homeland Security has been in the process of switching to digital for quite some time, many parts of the Canadian and Mexican border areas have just started to use the P-25 digital radios in the last year or so.

Many national parks have begun to use P-25 radios, and the US Forest Service has been testing the use of digital radios in forest fire fighting situations for several seasons. The Transportation Security Administration (TSA) has been using digital radios since the agency came into existence, probably the only federal agency that can make that claim!

❖ Federal NAC Information

For many years, monitoring fans were able to utilize various hints and clues to identify the users of many federal frequencies. One of the clues was the use of CTCSS (Continuous Tone Controlled Sub-audible Squelch) or DCS (Digital Controlled Squelch) tones on analog radio systems. Various federal agencies often picked a particular tone and used it consistently through their radio system. However, these subaudible tones are used only with analog radio systems. APCO P-25 radio systems have something else that can be used in a similar way.

Part of the digital data packet stream that makes up a P-25 radio signal is something called the Network Access Code, or NAC. This NAC value is three-digit hexadecimal number that can be set on professional radio gear that allows the users to only talk and listen with other users that have the same NAC.

Originally, digital scanners could not decode this NAC information, but more recent models from GRE and Uniden have allowed scanner listeners to search and read this NAC value on a digital transmission. Listeners can now also set a particular NAC value so that the scanner will only receive digital transmissions with the correct NAC value. In some cases, these NAC codes can help provide a clue as to the users of clear and encrypted digital transmissions.

As more and more listeners are able to start logging NAC values for federal P-25 users, the hope was that some sort of pattern would be developed to indicate which agency was using what NAC. But so far, only a couple of federal NAC values appear to be used regularly.

It seems that, when moving from analog radios to digital, the radio technicians simply took the analog CTCSS tone that they used to use and selected a hex NAC value that was close. So the FBI, which had been pretty consistently using 167.9 Hz as their analog squelch tone, have often used NAC 167 for their P-25 systems. The DEA, which always used 156.7 Hz on their analog radios, have been noted as using NAC 156 on their P-25 radios. And, as noted on trips to Washington DC and at both political conventions, the Secret Service is using NAC 001 on all of their most used frequencies.

Some agencies appear to have picked NAC values randomly; others pick values like NAC 001 out of practical purposes. Most all of the federal interoperability repeaters are using a NAC of 653, which is a sort of "default" value that seems to show up a lot.

In recent months I have been able to upgrade my monitoring capabilities to include P-25 NAC decoding. I should be able to start providing more information on the use of NAC's on federal P-25 systems, so check back here and at the Fed Files blog, **http://mt-fedfiles.blogspot.com/**.

❖ Federal Regional P-25 Networks

Although many federal agencies have started replacing their analog radio networks with APCO P-25 systems, the move is not one big leap, but a series of small steps. In some cases, mobile radios have been replaced with newer, digital capable models, but the base stations and repeaters are still being used in the analog mode. As these new radios are purchased and put into service, they are often programmed with the agency's channels in both analog and digital modes so that they can still be used with systems that have not been upgraded.

One agency that has seemed to move in *very* small steps towards the digital world has been the FBI. One reason for this is that the FBI has a very large land-mobile communications network, probably the largest in the federal government, outside of the military. With much of the Justice

Department's communications budget being committed to the federal Integrated Wireless Network (IWN) project, the agency has appeared to be upgrading very small segments of its radio network as funds are available.

In some areas, these upgrades have not just been replacement of analog equipment with digital, but appear to have taken the form of a new type of P-25 wide-area conventional network. Listeners have reported a number of new repeaters using Justice Department and some new frequency allocations that are linked together and repeating traffic from a number of operating areas at the same time. They may be laying out these new repeater sites as a preview of multiple trunked radio sites that will appear when the IWN VHF federal trunked system makes its way across the country.

In the Florida panhandle area near Pensacola, listeners have reported multiple P-25 frequencies that appear to be linked together to form a network of repeaters that cover a large geographic area. Monitors have heard Jacksonville and Tallahassee base stations, as well as US Marshals units checking in with prisoner transfers. All the repeaters seem to carry the same traffic and all are showing a P-25 NAC of 167, which is a common (but not exclusive) NAC used by the FBI. The traffic from the Marshals is not unexpected, as the FBI assumed national dispatch duties for the Marshals Service a few years ago.

Here are the frequencies being used by this **Florida** system:

167.2375
167.3125
167.4125
167.4375
167.4875
167.7125
167.7875
168.8875

Another system attributed to the FBI and Justice Department is being heard throughout **New Jersey, Pennsylvania, and New York State.** Listeners have reported that the users of these repeaters are keeping the encryption turned on full time, so any unit numbers or station identification has proven difficult so far. This network is utilizing a P-25 NAC of 207.

167.4375
167.4625
167.5875
171.6125
172.1125
172.7625

In the greater **Pittsburgh** area, listeners have noted a new set of frequencies that have become active within the last year or so that may indicate another regional network. All of these repeaters carry the same traffic and also show a P-25 NAC of 167, again, a common NAC used by the FBI. Here are the frequencies that are active so far:

165.8250
165.8750
168.8250
168.9250

Also, there is a network of VHF P-25 repeaters that seems to be used by the **Immigration and Customs Enforcement (ICE)** division of the Department of Homeland Security. These repeaters are all linked and seem to carry traffic from all over the Pennsylvania and New Jersey areas.

These are the frequencies noted in the network so far, but there may be more that I haven't heard of yet. I have not confirmed a P-25 NAC for these yet:

169.8000
170.7625
170.7250

❖ New York City FBI Lineup

As I mentioned earlier, the FBI is one of many agencies still transitioning from analog to digital communications. Although they were one of the first federal agencies to start using DES encryption full time on their VHF analog frequencies, they are just now getting serious about upgrading to APCO P25 radios.

One area that is definitely operating in both worlds is the New York City area. I get to travel to the Big Apple occasionally and have managed to piece together a list of active FBI channels in the NYC area. This list is by no means complete, but it will certainly be a good start for listeners who want to try to catch some FBI action.

In the list below, the channel numbers after the frequency represent the channel names as used by agents in the New York City field office. If the frequency has 2 channels listed, the first channel is usually a repeater, with the frequency shown as the repeater output. The second channel would use the same frequency, but in the simplex mode.

0173.6625 - A1/A2
0172.4000 - A3/A4
0172.5250 - B1/B2
0172.4750 - B3/B4
0172.4250 - B5/B6
0170.8250 - B7/B8
0170.9000 - C5/C6
0170.6250 - C7/C8
0164.5500 - D1/D2 Organized Crime Drug Enforcement Task Force
0166.4625 - D3 DHS & Treasury Common
0167.5625 - D4 FBI Common
0167.5375 - D5/D6 FBI Special Operations
0163.1000 - D7 Federal Government Common
0155.4750 - D8 National Law Enforcement
0167.1500 - E1
0167.4875 - F1
0167.2750 - F2
0167.4375 - F3/F4
0163.9875 - F5
0163.8625 - F6
0168.2250 - G1/G2
0170.4250 - G3/G4
0170.3250 - G5/G6
0168.8250 - H1/H2
0168.3000 - H3/H4
0170.4500 - H5/H6

Keep in mind that the FBI has encryption capabilities on all their frequencies, both analog and digital, and they do use it.

Thanks to all the *Fed Files* and *Monitoring Times* readers who submitted information that helped build this list. And if anyone can help keep this updated or fill in any missing information, feel free to pass it along to us at the *Fed Files* - See you again in March!

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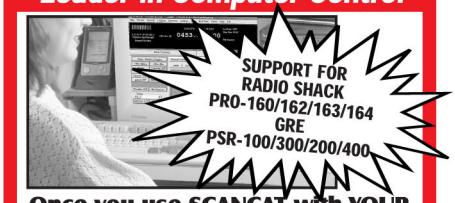

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Cold Weather and Hot DX!

Coast Guard 2005, Coast Guard 2005, this is Bermuda Radio, Bermuda Rescue Coordination Centre.
WGY904 this is CAMSLANT Chesapeake.
This is Thunder Bay Coast Guard Radio.
This is Joe, VA3JG, aboard the "Off Call" in Grenada.

This is the time of year when the long nights and cold weather lead to more time in the radio shack. As I put the lawn mower and the barbeque away and get out the shovels and snow blower, I also enjoy the extra hours of darkness in my radio shack. On a typical winter evening when I am not spending time with my wife or curling, you can find me with a cup of coffee and signals coming in over several radios.

The antenna work is done and some research into frequencies has led me to search for some interesting and unusual signals. The above mention of Bermuda Radio at 0148 was on 5696 kHz USB when they were contacting a USCG aircraft during a rescue.

CAMSLANT Chesapeake was heard on 5211 USB, a FEMA frequency, during Hurricane Ike. Thunder Bay Radio was caught on 2582 kHz USB at 0043, as it came in over Bermuda's 0035 broadcast on the same frequency. This is actually the transmitter in Churchill Manitoba, which is remotely controlled by Thunder Bay Radio. I was also able to catch VFF Iqualuit, through their Coral Harbour transmitter at 1320 on 6513 USB.

The last signal mentioned above is from Joe VA3JG. He and his wife are aboard the 30 foot sloop, "Off Call" in Grenada and he showed up on the local 2 meter amateur repeater through the VE3HST EchoLink connection. They have actually bought a house in Kingston and will be voyaging here next year. You never know where marine communications will turn up!

❖ Tuning in 2182

When I am not tuning the amateur radio bands, my Icom 756 is set on the marine frequencies. If I am not searching the frequencies, I leave it on 2182 kHz. I have managed to hear many East Coast stations on this frequency using my R-8 vertical. I am setting up a simple long wire for my R-500 receiver to leave it on this frequency.

Some of my loggings on 2182 are as follows: (all are USB)

0035	Placentia Coast Guard Radio
0035	ZBR Bermuda announcing weather broadcast on 2582 kHz
0108	St. Anthony Coast Guard Radio announcing weather on 2598 kHz
0008	St. Lawrence Coast Guard radio announcing weather on 2598 kHz
0035	St. John's coast Guard Radio to Destiny, go 2514 kHz
2336	Fundy Coast Guard Radio with a vessel assistance request for the fishing vessel Maxine
0008	Halifax Coast Guard Radio contacting Sambro Island

The author using the radio on the bridge of the Canadian Empress

Just leaving the receiver on 2182 gives a lot of listening.

❖ MultiPSK, anyone?

My new laptop computer now has the program MultiPSK version 4.10 installed and it is used to decode Navtex on 518 kHz. The new version of the program is excellent for decoding digital modes. I have an audio feed from the Kenwood 570 and rig blasted to the computer sound card. The program does the rest.

I remind readers that this is a free download and decodes many digital modes. I hear Navtex from 1700 EST (2100Z) onward and can get quite a range. I usually have to tune the radio to 517.3 kHz and use USB mode. You can tell the station by the coding for the information broadcast. An example would be UE51. The U indicates Fundy Radio, the E indicates meteorological forecast number 51. Messages start with ZCZC and end with NNNN.

Some loggings for 518 kHz are:

2320	Fundy Radio (U)
0100	Boston (F)
2135	Portsmouth, VA (N)
2351	Labrador, NL (X)
1930	Riviere au Renard (C)
0110	Prescott Radio (H)
0240	Sydney, NS (Q)
0020	Miami, Fl (A)

Bermuda Radio Navtex broadcasts are still off the air, but according to the operator on duty they should be back on the air soon. They have purchased two 1 kW Danphone Navtex transmitters, one of which will be on standby. These transmitters and antennas are located at the Cooper's Island site. The antennas are up and they are in the test phase. The Navtex transmitters are remotely controlled by a 900 MHz Radio Modem fed into a 6 dB Yagi antenna at ZBR.

From my visit there (see feature story Feb 2007), I recall that these transmitters replace the venerable 500 kHz CW transmitter that was used for Navtex until this time. I plan some late night listening to see what long range Navtex I can receive. I use an amateur radio sloper antenna which tunes 160, and 80 meters, and it seem to work well for Navtex.

You can also catch some Navtex on 490 kHz. A good listing of worldwide Navtex stations can be found at **www.beaconworld.org.uk/navtex.htm**. The MultiPSK program can be downloaded at **http://f6cte.free.fr/index_anglais.htm**.

❖ Around the Bands

As for amateur radio, I am always monitoring the Maritime Mobile Service Net at 14,300 USB. This net is on from 1200 to 2100 daily and has some great maritime mobile check-ins, weather forecasts, and great controllers. Rooney 6Y5RP in Kingston, Jamaica, Bernie NP2CB in Florida, and Bob K5SIV in Texas readily come to mind.

I also have my VHF marine radio going here, as well as a scanner that covers the local

marine frequencies and the fire/rescue frequencies. You never know when something will turn up here. The local fire department has a new fire/rescue boat. I had the pleasure of administering the exams for their marine radio licenses.

The usual channels are active and monitored here. Channel 12 is the St. Lawrence Seaway control, 14 is the river /lake pilots, 22A is the US Coast Guard, 82A is the Canadian Coastguard, while 16 is the emergency channel. However, it pays to scan the marine channels with your scanner as you never know what will show up.

We have a massive 86 unit windmill project going on at Wolfe Island. These huge windmills are being transported by tug and barge from Ogdensburg, New York, to Wolfe Island, near Kingston. There is a shuttle service using four tugs and two barges to bring the units here. You can see the windmills from Kingston and they look huge even from that distance. They also had a Dutch barge here to lay the cable from the island to the shore.

I keep track of the ships by radio and know when to get pictures of the vessels. They also use channels 72, 74, 76 and 77 to talk between tugs, etc. I even heard when one tug was aground. Right now, I am monitoring the channels to see when they are leaving for the downbound voyage so I can get pictures at a narrow place in the river.

The St. Lawrence Seaway and Welland Canal close on December 29 for the season, so as the traffic builds up, ice forms and the weather gets bad the traffic gets interesting. The recreational boats and local tour boats are all laid up for the winter, so the traffic is mainly commercial vessels.

❖ Going Digital

I have also been monitoring the AIS (Automatic Identification System) receiver here. This is an automated identification system that all ships must carry. It gives name, destination, port of registry, course, speed, range, and other information for any ship in range of your receiver.

Phil N8OZ says you you can find out more about AIS at these two groups. **http://groups.yahoo.com/group/shipplotter** or **http://groups.yahoo.com/group/armarais/** I am also in a group of folks who have set up stations and I can monitor from Lake Ontario to the Gulf of St. Lawrence on my computer. I get signals from a 40 mile radius on my receiver. Any major port or waterway now uses this system for ships entering or leaving their system. By the way, they use VHF marine frequencies for the digital signals, so a good VHF antenna does well for AIS.

I use the program ShipPlotter (**www.coaa.co.uk/shipplotter.htm**), which is a commercial program, to display the signals. You can get this program on a trial basis, but then you must pay to use keep using it.

Another digital mode which is in wide use is ALE (Automatic Link Establishment). This computer-run system tests and chooses the best frequency and then links to the other station. Signals are then exchanged in voice or other mode between stations.

MultiPSK will also decode ALE signals. You can get a good overview and instructions to set up to decode ALE at the F6CTE website mentioned earlier. I will have more on this as I get up to speed on it myself (or you can consult past *Utility World* and *Digital Digest* columns). There are many frequencies where this mode is used, but 5732 and 8674 kHz for the US Coast Guard seem to be mentioned a lot. There is some use of ALE on the amateur bands as well.

BBC Elbe carrying a load of windmills

❖ "Boats" for Beginners

I have been asked by several readers to provide some basic listening information, and the start of a new year is a good time for it. There are two types of marine communications which are easy to monitor. The first is VHF marine radio. You can monitor this with a marine radio or a scanner. You will need a good VHF antenna. You can use a scanner antenna or a marine antenna cut for the marine bands. The antenna needs to be mounted as high as possible. VHF radio is line of sight, so the higher the antenna the better the range. However, if you live near a busy harbor, even a scanner with an antenna on the set will pick up a lot of communications.

VHF radio is organized into channels, so you will see only channel numbers on a marine radio. If you use a scanner, there are a couple of tricks to help monitor the marine bands. First, scan from 156.05 to 157.425 MHz and from 160.65 to 162.025 MHz. These are the two areas of marine radio and you will hear all the frequencies in use in your area.

Some of the channels have two frequencies. The lower, or A frequency, is in the 156 MHz range and the higher, or B frequency, is in the 160 MHz range. When you program your scanner, put both frequencies in and you will hear the ship on the A frequency and the shore on the B frequency.

You can get a good list of the frequencies for each channel in many places. A Google search will bring up the channel list easily. Channel 16 is the calling and emergency channel. Channels 9, 10, 11, 12 and 14 are often used for traffic control.

The HF or shortwave marine channels require a communications receiver capable of Single Side Band operation. Using even a portable radio with a whip antenna will get you some good signals, but an outside antenna will bring in a lot more stations. A simple long wire antenna will do.

Using the Upper Sideband (USB) you can hear many ships at sea. To start, monitor 2182 kHz at night when HF signals travel further. If you live in an active HF area, then you will hear some daytime signals.

The easiest frequencies to start monitoring are 5696 and 8983 kHz USB. These are the frequencies the US Coast Guard uses to talk to its aircraft during searches, etc. on both the east and the west coasts. 8983 is primarily the daytime frequency, but it can be heard at other times as well. 5696 is the nighttime frequency.

I hope this gets some people started monitoring the marine bands.

❖ Cozy and Warm

It is dark now in Kingston. We have our first Gale Warning of the winter season on the Great Lakes and the first forecast of snow for this area. Bermuda Radio is coming in on the R-5000. Navtex is being decoded on the Ts 570. My VHF radio is hearing Seaway Clayton which is receiving the ships' ETAs while giving the upbound and downbound traffic. The Icom 756 is monitoring the maritime net on 20 meters. And my two meter rig is tuned to the local repeater. It's warm, I am seated in a comfortable chair and have my coffee at hand. What more could a radio enthusiast ask for? Well, low noise and great propagation, of course!

For the Christmas present which is welcome any time of the year, please send me your loggings so I can list them here for others to use. Have a great winter DX season!

VHF CHANNEL LIST

09	156.450	156.450	Boater Calling/Commercial and Non-Commercial.
10	156.500	156.500	Commercial
11	156.550	156.550	Commercial/VTS in selected areas.
12	156.600	156.600	Port Operations/VTS in selected areas (St. Lawrence Seaway Control)
14	156.700	156.700	Port Operations/VTS in selected areas (River/Lake pilots)
16	156.800	156.800	International Distress, Safety and Calling. Ships required to carry radio, USCG, and most coast stations maintain a listening watch on this channel.
22A	157.100	157.100	Coast Guard Liaison and Maritime Safety Information Broadcasts. Broadcasts announced on channel 16.
72	156.625	156.625	Non-Commercial (Intership only)
74	156.725	156.725	Port Operations
76	156.825	156.825	Port Operations
77	156.875	156.875	Port Operations (Intership only)
82A	157.125	157.125	U.S. Government/Canadian Coast Guard

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Let's Get Digital

Happy New Year to all *Below 500 kHz* readers! A new year is a great time to explore a new mode, and as *MT* plans to step up its coverage of digital modes this year, there's no better time to try pairing up your PC with your LF receiver. This month, we'll explore the computer-assisted mode of QRSS and how it can be used to pull out the weak ones, even when you're not at your radio.

What comes to mind when someone mentions slow-speed CW? Five words-per-minute? Two words-per-minute? How about less than *one* word-per-minute? If you chose the last speed, you've entered the realm of QRSS -- a relatively new computer-assisted mode for copying extremely weak signals. QRSS has become a mainstay for experimenters on the 160-190 kHz license-free band, and it is also a favorite among those exploring the 136 kHz (135.7-137.8 kHz) and 500 kHz (501-515 kHz) experimental bands.

The mode gets its name from the Q-signal "QRS" used by hams to request a slower sending speed. By extension, QRSS has come to mean "super-slow" CW, where speeds are often measured in dot lengths of 3 to 60 seconds.

Why would anyone want to go this slow in today's world of high speed, broadband Internet connections? A brief explanation is in order…

❖ Taking a Narrow View

You may already know that CW occupies one of the narrowest bandwidths of any transmission mode. That's one of the reasons it has remained popular on today's amateur bands. In fact, it is possible for several CW signals to fit into just one 5 kHz slice of spectrum -- all communicating simultaneously -- without causing any mutual interference. The only requirement is that sufficiently narrow receiving filters be used.

As narrow as CW's bandwidth is, it can be made even more so by reducing the transmission speed. A characteristic of CW (or any form of on/off keying) is that the *bandwidth* is directly related to the *speed* of transmission. Slow the speed down, and you lower the bandwidth. For example, if a 12 WPM CW signal occupies 10 Hz of bandwidth, slowing the keying down to 4 WPM will reduce the bandwidth to a mere 3.3 Hz, and so on. As you get down to the speeds used for QRSS, the bandwidths become so narrow that they are rated in *millihertz* -- that's less than 1 Hz!

With narrower bandwidths, you can employ a narrower receiving filter, and this brings us to the key benefit of QRSS. With CW speeds of less than 1 WPM, *extremely* narrow audio filters can be used, greatly reducing adjacent signals and extraneous noise from the received signal. Nearly all of the receiving energy can be focused on the desired signal, bringing a dramatic increase in signal-to-noise ratio -- often on the order of 22 dB or more.

Of course, this improvement can also be accomplished by raising the transmitter power, but it would require a significant increase in circuit complexity, not to mention the legality issues under FCC rules. All things considered, QRSS is a better solution for boosting the signal-to-noise ratio of a weak signal in Lowfer applications.

❖ QRSS in Action

Experimenters have proven QRSS to be effective for weak signal work. Over the past few years, several long distance records have been set with QRSS, including a few ocean-spanning intercepts. QRSS seems to be the "magic" solution Lowfers have been looking for. Figure 1 shows an example of QRSS reception using Argo software. In this instance, Steve Sykes (NY) was receiving lowfer EAR at a distance of about 200 miles from his location.

Of course, most things come with a tradeoff, and with QRSS we must trade transmission speed for signal-to-noise ratio. Even at 3-second dot lengths (QRSS3), it could easily take half an hour to complete a short contact with another station. For this reason, QRSS sees only limited use in real-time communication.

Where QRSS really shines is in identifying Lowfer beacons. In these cases, you don't mind waiting a little while to confirm reception of a station's relatively short ID. Another common technique is to let the computer monitor activity overnight for later "playback." This takes advantage of enhanced propagation that may occur at various times during the night. Imagine waking up in the morning and discovering that you have logged a Lowfer beacon from five states away! It is possible with QRSS.

What's more, the computer plays back the received signal at a much faster rate, sparing you the agony of sitting through hours of slow speed reception. Think of it as time-warp listening for the longwave DXer!

❖ Hardware/Software Requirements

A computer is needed to reap the benefits of QRSS. Although copying by ear is technically possible, it would require a great deal of patience to decode even short message strings, and you would not gain the advantages of signal processing and display offered by a computer. Most computers sold in the last ten years are up to the task of copying QRSS.

First, you'll need a sound card, which is standard (built-in) equipment on all but the oldest computers in use today. You'll also need to connect your receiver's audio output to your computer's sound input jack. (Shielded cable is recommended.)

You will need to obtain QRSS software, but the best part is that it is available for download at no cost. Programs such as **Argo**, **Spectran** and **Spectrum Lab** are three examples of currently available packages. These downloads will place an executable (.exe) file on your computer that you double-click to install the full program in the location you specify. Sources for downloading QRSS software are listed below:

Argo: www.weaksignals.com
Spectran: www.weaksignals.com
Spectrum Lab: www.qsl.net/dl4yhf/spectra1.html

❖ Learning More

There isn't enough room to discuss all of the details of QRSS in a one-page column, but I encourage you to learn more about this exciting mode by doing some research and experimentation of your own. Enter "QRSS" in your favorite search engine and you will find a multitude of websites where you can learn more. For Lowfer operating schedules and frequencies (including QRSS), visit the Longwave Club of America's website at **www.lwca.org**.

To encourage more activity on this mode by *MT* readers, I'm offering a free copy of the latest ***BeaconFinder II*** directory to the first two readers who send in a .jpg image of a QRSS intercept. Entries may be sent via email at the address in the masthead. More reader feedback is also needed. Would you like to see additional coverage of computer-assisted, high tech modes? I will give all comments serious consideration for future issues.

See you next month!

OUTER LIMITS

THE CLANDESTINE, THE UNUSUAL, THE UNLICENSED

George Zeller
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Radio Euzkadi Returns?!

Veteran DXer Don Jensen reminds us that evidence continues to pile up as to the actual transmitter locations of old clandestine broadcasters from the 1960s. In those days, loggings were common of the Basque clandestine **Radio Euzkadi** from "Spain."

Additional new evidence has surfaced that establishes that this station actually was transmitted from a utility transmitter in Venezuela. A recent book, *Jon de Igeldo, Corresponsal Clandestino de Radio Euzkadi* published by the Sabino Arana Cultural Association and Radio Euzkadi, says that Gerardo Bugando, using a pseudonym of Jon de Igeldo, wrote letters to Venezuela containing news about the Spain from a Basque separatist point of view. The content of those letters was read over the air on Radio Euzkadi from the Venezuelan transmitter. The book was actually published in 2004, but the confirmation of this news has filtered quite slowly into the DX scene. Information from the book was also reported on the excellent Clandestine Radio Intel web site.

The nostalgia for mysterious old shortwave clandestines is enhanced by a recording of the sign-on announcement for **Radio Euzkadi** that can be downloaded from the internet via the Interval Signals Online web site at **www.intervalsignals.net/**

Astonishingly, a web-based descendant of **Radio Euzkadi** is still being produced. Programming can be heard on your internet dial from **ETB Radio** at **www.eitb.com/radio/radio-euskadi/**

❖ Boulder CO Pirate

Veteran DXer Harry Helms points out that long-running free form FM pirate **KBFR** is back on the air, both via a 93.9 MHz FM signal, and also via its **http://stardust.wavestreamer.com:5394/li sten.pls** live internet stream. We see their logo here this month.

❖ Books

This month we mention one old book and two new books. Veteran DXer Jerry Berg points out that an often overlooked book is *40 Watts from Nowhere* by Sue Carpenter. This 2004 book is an interesting account of how some local California residents set up and operated FM pirates **KPBJ** and **KBLT** in 1995. The book is published by Scribner, and it should be possible to order a copy from most bookstores.

Jerry also mentions that the second and third volumes of his massive *On the Shortwaves* series are now available. Titled *Broadcasting on the Shortwaves 1945 to Today* and *Listening on the Shortwaves 1945 to Today,* the new books are an amazingly detailed and well researched history of the shortwave radio broadcasting industry and the DX hobby. These new books are available from their publisher, McFarland & Co., Inc., Box 611, Jefferson, NC 28640. Virtually every *Monitoring Times* reader will be fascinated by Jerry Berg's wonderful books. They cover the entire spectrum of shortwave broadcasting, including some reference to pirate radio.

❖ What We Are Hearing

Monitoring Times readers heard 31 different pirate radio stations this month. You can hear them, too, if you use some simple techniques. Pirate radio stations never use regularly announced schedules, but shortwave pirate broadcasting increases noticeably on weekends and major holidays. You sometimes have to tune your dial up and down through typically used pirate radio frequencies to find the stations, but more than 95% of all North American shortwave pirate broadcasts are heard on **6925 kHz**, plus or minus 30 or 40 kHz.

Ann Hoffer Radio- The music on this unusual pirate is always sung by Ann Hoffer. We still know little about this station. (Unknown)

Back Door Show- The programming on this new pirate has consisted of classic rock music. (None announced)

Back to the Wall Radio- This new pirate has produced a rock music format, but little is known about them yet. (None)

Captain Morgan- TV audio from the old Outer Limits show is added to their rock music format, which sometimes expands to rockabilly. (None, says to send loggings to the Free Radio Network web site)

Conelrad Radio- Their air raid sirens are from the old civil defense radio system in the United States. To complete the effect, they say to tune to 640 or 1240 MW. (None)

Dead Cat Radio- Their rock music and commentary by cats has nothing to do with the stock market. (*cattus.mortuus@gmail.com*)

Happy Halloween- Guess which holiday dominates the programming of this one? They returned once again this year. (None)

KIPM- Alan Maxwell's existential pirate is back on the air, but it is not clear if these broadcasts are relays or new productions. (Announces Elkhorn, which is no longer valid)

Liquid Radio- They primarily broadcast classic rock music, but their definition of that genre is broad. (*wwrbfm@gmail.com*)

Mad Dog Radio- Rock music has been the only fare so far from this new one. (None announced)

Mystery Radio- Some east coast DXers are hearing this Europirate on 6220 kHz on weekends near local sunset. (*radio6220@hotmail.com*)

Northwoods Radio- Claiming to broadcast from the Great Lakes, most of their productions are rock music. Look for their "loon call" interval signal. (*northwoodsradio@yahoo.com*)

Old Vampire Radio- This classic Halloween station returned once again this year. (None)

Outhouse Radio- Country music and the old "Convoy" CB song appear to be their specialties. (None known)

Radio Appalachia- Their programming has been primarily Appalachian folk music and country music from an alleged location in Moundsville, WV. (None)

Radio is My Friend- This strange tale of an inmate in an asylum has returned to the pirate airwaves once again. (None)

Radio Paisano- They have been appearing annually on Columbus Day with Italian music and themes. Jerry Berg and Don Jensen got one of their QSLs. (*radiopaisano@gmail.com*)

Radio Free Speech- Bill O. Rights still promotes the USA constitution between his pirate radio discussions and rock music. Look for his "O Francis Scott Key" parody of the USA national anthem at sign-off. (Belfast)

Radio Jamba International- Rock music, comedy, and pirate radio discussions normally define their productions. (Belfast)

The Dark Side- They have been transmitting mellow country and folk music thus far. But, information is sparse about the station. (None)

The Wave- Their specialty is classic rock and pop music. (Belfast)

Tangerine Radio- Somebody is relaying Raunchy Rick's old anarchist programs. (Belfast)

Toynbee Radio- Their confusing theology about an afterlife on Jupiter is still baffling Dxers. (Unknown)

Undercover Radio- Dr. Benway still broadcasts rock music "from the middle of nowhere," pirate discussions, and fables about his travels. (Merlin and *undercoverradio@gmail.com*)

Victory Radio- This new one emerged last spring when the University of Texas won a tournament basketball game. It returned again in the fall to celebrate the Texas football win over Oklahoma. Look for them when Texas wins. (None announced)

Voice of Influenza- This classic station has returned from the past. Their obviously ill announcer wheezes his way through rock music shows. (Belfast)

WAHR- The usual flood of Halloween pirates was increased by this new one, which uses a slogan of "Automated Halloween Radio." The voices on their shows are generated by computers. It should not be confused with a licensed station in Huntsville, AL. (None)

WBNY- Former Presidential candidate Commander Bunny of the Rodent Revolution has returned to his parodies of rock tunes and clandestine radio stations. (Belfast and uses *rodentrevolutionhq@yahoo.com*)

WPON- Their slogan of "The Weapon" leads to machine gun noises and rock music. (None)

Wolverine Radio- Following a rock music riff interval signal, the remainder of their programming combines analog rock music and digital SSTV images. (None announced)

WNKR- Andy Walker's European pirate has been getting some relays by North American Transmitters lately. (*wnkrsw@gmail.com*)

Continued on page 63

T.J. "Skip" Arey, N2EI
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New Years Resolutions for the Ham Hobby

Every year I use the January column to make some suggestions about resolutions for hams to ponder and practice throughout the coming year.

As always I will begin with my traditional New Years Resolution Rant:

Repeat after me...

1) If I do not have an Amateur Radio license I will get licensed this year.
2) If I do have a license I will upgrade it to the next highest license until I am an Extra class.
3) If I am an Extra class I will find somebody who isn't licensed and help them get licensed.
4) I will repeat Number 3 until Uncle Skip tells me I can stop.
5) I won't hold my breath waiting for Uncle Skip to tell me to stop.

Okay, with that out of the way, let's take a decidedly different tack with this whole resolution game this year. Let's look at some resolutions that should be taken up not by hams, but by the Amateur Radio Community in general and the various businesses that supply our hobby.

❖ Thanks... But No Thanks

Have you purchased a new handheld lately? There are some amazing rigs out there on the market, full of features and tiny enough to carry in a watch pocket. However, many of these remarkable, full featured rigs come with manuals that weigh twice as much as the radio itself. I must confess that I have a couple of handhelds around the shack that I can barely turn on without a quick reread of several pages of support documentation. Is it any wonder that companies such as Bernie N6FN's Nifty Accessories (**www.niftyaccessories.com**) are doing a land office business selling cheat sheets and wallet crib cards to help forgetful hams stay on top of their radio's features?

During this year's MS-150 bicycle charity ride, I ran into some trouble giving the kind of support that I wanted to (I was a safety rider) because I accidentally turned on a feature on my trusty Yaesu FT-50 and couldn't, in the heat of the moment, figure out how to turn off. After a few minutes of digging into the deeper recesses of my brain case, I recalled the solution.

However, as they say, had this been an actual emergency, I would have been unable to render the level of assistance folks depend on hams to provide during such events. Not good at all.

I am still searching for a handheld that is both rugged and simple. Even the most basic units seem to have lots more features than I really need for quick, dependable emergency communication. So let me toss out a proposal to the manufacturers: Next time you are looking to add a new feature (or features) to your latest iteration of your top end handheld, how about a combination of two or three buttons that, when pressed, throws the rig into Ultra-Basic mode? Something that turns off and locks down all the bells and whistles. All you get is push to talk, squelch, and maybe about 20 memories you can either pre-enter or quickly key in as needed.

Better yet, how about a 20 channel, 5 watt handheld *without* any bells and whistles? Give it a rugged, waterproof case and replaceable standard AA power cells and I would have my wallet wide open in a nano-second! So would a lot of other hams, too, I reckon.

And before I get away from this topic, let's not forget the HF side of the house. One of my favorite HF QRP rigs has only three controls on its front panel: Gain, Tuning and Receiver Incremental Tuning (RIT). With such a limited control complement, I am still able to work the world without any problems. Actually, I don't really use the RIT all that much. I could probably get along without it.

So it is possible to get on the air and have tons of fun without several dozen buttons and

Dave Benson K1SWL's SW+ transceivers have only two controls. What more do you need?

a 500 page manual. Sure, the high featured (and high priced) rigs have a lot to offer. No doubt the profit margin on a full featured radio makes for a better bottom line to a manufacturer who sees the ham radio community as a shrinking market. But I would submit that the radio companies would probably sell a lot more of those high end rigs in the future if they would sell low cost, simple to operate, beginners' transceivers to get folks into the game. How about a 2 band (20/40 meter) 50 watt transceiver, CW and phone, and keep it under $250? I think that is a challenge that is not out of the realm of possibility.

❖ Let's Get Organized

When I first got into this hobby, hams had access to only one true digital mode, Baudot RTTY. (I know, some people argue that CW is a digital mode, but look closely: it is not truly binary. Pay no attention to that man behind the curtain!)

Today, an amateur radio operator can choose from any of well over a dozen digital modes and protocols for reliable communication. I think it is high time we all got on the same sheet of music, at least when it comes to emergency communication. The problem is, what to choose? VHF, Packet, D-Star, WIRES II? And what about HF? Do we use ASCII, PSK31, MFSK16 or any of many others? All these modes are great fun, and experimenting with even more ways to communicate is the essence of the amateur radio art. Nobody wants to discourage innovation, but we need to go through all these modes to find standards and protocols that can be universally implemented for dependable emergency communication.

As you know from reading this column, over the last year, I have been keeping an eye on a D-Star system implementation in Cape May County, New Jersey. NJ2DS is running a

full featured D-Star operation. I am impressed with the D-Star standard. However, unless radio manufacturers other than ICOM (and to a limited extent Kenwood) get behind the system, it might not become a widespread standard. The same could be said of other digital systems. There needs to be some agreement within the community that leads to true interoperability between the standards, if not an agreement on a single standard. If we keep walking down the path we are on, the various modes will become even more entrenched as folks invest more time and money in their local systems.

Fortunately, all is not lost, and it is even possible for different systems to work together. That is one of the true engineering miracles of digital communication. In the end, it all comes down to the neat arrangement of a series of ones and zeros. Bridge protocols can be developed and implemented on repeater or link systems to get these various modes talking together.

But, to make this all happen, the guiding ham organizations such as the ARRL and its international counterparts need to have a few sit downs to get the ball rolling. If our chosen leaders cannot get the job done, perhaps a grassroots, common sense movement might prevail. Look at APRS for example. Packet based, APRS is not the fastest mode on the planet, but it is reliable and has become the way we do beaconing in the ham radio world.

❖ Bring Back the Novice Ticket

Yes, you heard me correctly. But let's make a change or two along the way. Instead of calling it the Novice license, let's call it the STUDENT LICENSE. Local ham clubs and VEs could partner with area elementary and high schools to offer basic training and accreditation that would allow licensed students to operate from a school club station. School club stations would be given a specific block of VHF and HF frequencies for the purpose of communicating with other school club stations.

By creating a limited operating frequency region, manufacturers could design equipment that would be simple and have a reasonable cost, in line with other school equipment such as science lab supplies. Carole Perry Parker, WB2MGP has been putting forward ham radio school curriculum ideas for over 20 years. Creating a Student License system to support these efforts might just be the thing to take her ideas over the top.

As the student's interests in amateur radio grow, they can go on to climb the ladder of the current amateur radio license structure to operate their own stations like other hams. If we can spend a small pile of money to allow a sports team to play within the school system, why can't we spend a similar amount of money on developing future engineers and communicators?

❖ Repeater Consolidation

I have climbed on this horse before, so I won't take too much of your time with it. If you spend any time monitoring VHF and UHF these days, you know that it is fairly clear that we could probably get along with about half the number of repeaters currently throwing out their auto IDs (and not much else). The only thing keeping this state of affairs status quo is a general unwillingness by far too many repeater licensees to give ground and combine efforts to improve service to their local ham radio community.

In the good old days (not all that far back, actually), commercial radio and TV stations were required to submit proof that they were operating in the public interest in order to keep their licenses. Maybe it is time to revisit this standard and apply it to amateur radio repeater operation. I expect I'll get a bit of hate mail with this position, but you need to remember that I am a "more with less" kind of guy who prefers efficiency in radio theory and practice.

Come on, guys and gals! Time to pull the plug on some of those old repeaters and get started working together to build a really powerful and practical modern repeater system you can all be proud of.

❖ On Line License Testing

I have been a Volunteer Examiner since the beginning of the program. I appreciate how the VE system has made it possible for more folks to get on the air and enjoy our hobby. Even with the general success of this program, I wonder if it is not time to take the next step. I think the FCC should look into offering at least the current entry level Technician's Class license by way of on line testing.

Yes, I know this is a radical departure from those days when potential hams had to head to their local FCC offices to sit under the gaze of a stern examiner's ever watchful eye. But remember, folks thought VE testing would be the ruin of the hobby. Instead, it has brought many new folks into the amateur radio fold. Perhaps an online testing system that gives a person some provisional level of access to the hobby would be a great way to expand our future pool of ham radio operators.

Okay, I am guessing by now I have ruffled quite a few feathers. Remember, these are just resolutions. Most, if not all, will be long forgotten after the first few weeks of the New Year. But that doesn't mean they can't foster further discussion about the future direction of the greatest hobby in the world.

Have fun! I'll see you at the bottom end of 40 meters.

UNCLE SKIP'S CONTEST CALENDAR

ARRL Straight Key Night
Jan 1 0000 UTC - 2400 UTC

ARS Spartan Sprint
Jan 6 0200 UTC - 0400 UTC

ARRL RTTY Roundup
Jan 3 1800 UTC - Jan 4 2400 UTC

North American QSO Party (CW)
Jan 10 1800 UTC - Jan 11 0600 UTC

Hunting Lions in the Air
Jan 10 0000 UTC - Jan 11 2400 UTC

North American QSO Party (SSB)
Jan 17 1800 UTC – Jan 18 0600 UTC

CQ 160-Meter Contest (CW)
Jan 24 2200 UTC – Jan 25 1600 UTC

Outer Limits continued from page 59

❖ QSLing Pirates

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

PO Box 1, Belfast, NY 14711
PO Box 109, Blue Ridge Summit, PA 17214
PO Box 146, Stoneham, MA 02180
PO Box 293, Merlin, Ontario N0P 1W0.
PO Box 69, Elkhorn, NE 68022 is no longer a valid address.

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

❖ Thanks

Your loggings and news about unlicensed broadcasting stations are always welcome via 7540 Highway 64 W, Brasstown, NC 28902, or via the e-mail address atop the column. We thank this month's valuable contributors**:** Jerry Berg, Lexington,MA; Artie Bigley, Columbus, OH; Ross Comeau, Andover , MA; Wendel Craighead, Prairie View, KS; Richard Cuff, Allentown, PA; Rich D'Angelo, Wyomissing, PA; Gerry Dexter, Lake Geneva, WI; Bill Finn, Philadelphia, PA; Harold Frodge, Midland, MI; William T. Hassig, Mt. Prospect, IL; Harry Helms, Corpus Christi, TX; Ed Insinger, Summit, NJ; Terry Krueger, Clearwater, FL; Ed Kusalik, Camrose, Alberta; Don Jensen, Kenosha, WI; Chris Lobdell, Tewksbury, MA; Greg Majewski, Oakdale, CT; A. J. Michaels, Blue Ridge Summit, PA; Kevin Mikell, Chicago, IL; Lee Reynolds, Lempster, NH; Mike Rhode, Columbus, OH; Fred Roberts, Hamburg, Germany; Lee Silvi, Mentor, OH; Bob Wilkner, Pompano Beach, FL; John Wilkins, Wheat Ridge, CO; and Joe Wood, Greenback, TN.

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Impedance Matching for Antennas and Feed Lines

Last month we introduced the concept of impedance. For our discussion here we only need to know a couple of simple things about impedance. One thing is that we find impedance present at the terminals where we connect antenna feedlines.

Impedance is present both in the feed line and in the circuits of the terminals or connectors to which we attach the feed line. Examples of terminals to which we connect feed lines are the antenna feed-point on the antenna, transmitter output-connection, or receiver antenna-input connection.

The other thing we should know about impedance is that, for maximum transfer of radio-frequency energy, we must have equal-value impedances in the circuits which are connected to each other (for example: feed line to antenna feed point). Thus, if we connect a feed line to an antenna, then the feed line's impedance and the impedance of the antenna's feed point should have the same value.

❖ Matching Mis-Matched Circuits

Many of the various circuits or devices used in today's antenna systems (feed line, antenna feed point, receiver antenna-input circuit, transmitter output circuit) have an impedance value of 50 ohms. So impedances are often matched without any help from us (fig. 1A).

Some radio circuits or devices present impedance values other than 50 ohms. For example, consider television receivers which commonly have an antenna-input circuit offering 75 ohms of impedance. They also utilize a feed line with 75 ohms of impedance, so receiver and line are matched.

But, some TV antennas have a feed point that offers 300 ohms of impedance to the feed line (fig. 1B). If the commonly-used 75-ohm feed line is connected directly to the 300-ohm antenna, there will be a mismatch. This mismatch will reduce the amount of the received TV signal that is routed from the antenna toward the receiver. In this case, there is one more component needed for the TV's antenna system to make a good match at the antenna-feed line connection. It's called a "balun."

Baluns can be made to correct various impedance mismatch ratios: for instance a 4:1 balun will match our 75 ohm coax to the 300-ohm antenna feed point (75 x 4 = 300). For the TV antenna system we discussed above, this will correct the mismatch between antenna and feed line.

But something called "balance" is also corrected by the balun. When all elements of an antenna or of a feed line have the same spatial relationship to the earth or to other large conductive objects near them, we say that they are "balanced" electrically. So the elements of a horizontal TV antenna are balanced with respect to earth. But coax feed lines are unbalanced, because one conductor is shielded from earth and one isn't.

Connecting a balanced antenna to an unbalanced feedline or vice versa creates problems, such as radiation-reception pattern distortion and signal-strength loss. However, baluns can not only transform impedances so that they match, they can also convert balanced circuits to unbalanced circuits, and vice versa.

"Bal-un" is the acronym for balanced-to-unbalanced. With the addition of the balun (fig. 1B), the TV antenna system just discussed will deliver maximum signal power from the antenna to the coax feedline, and thus to the receiver's antenna input circuit.

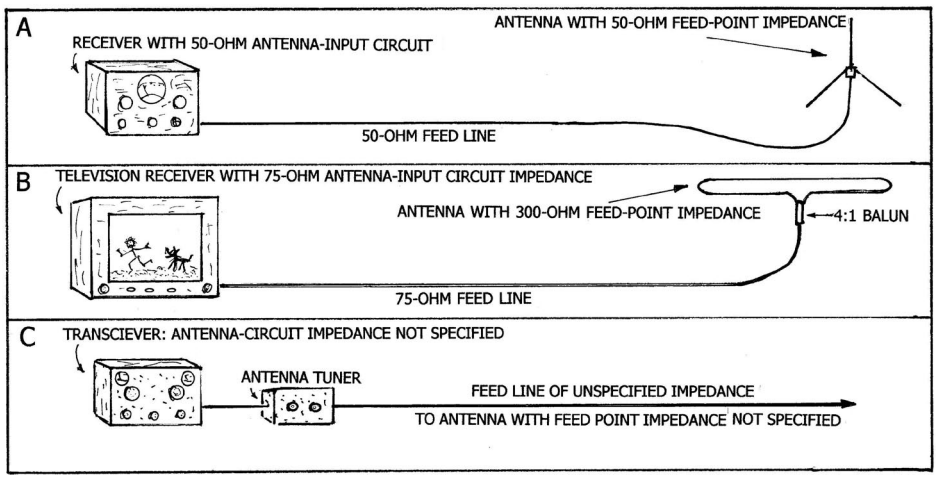

Fig. 1. AN ANTENNA SYSTEM WITH NO MATCHING CIRCUITS NEEDED (A), A TV RECEIVER ANTENNA SYSTEM USING A BALUN (B). AN ANTENNA SYSTEM USING AN ANTENNA TUNER (C).

❖ Matching Circuits

There are many different types of circuits other than baluns that can be utilized to correct mismatched antenna system connections. Some of these circuits are designed for use at the antenna-to-feed line connection; others are designed to function at the transmitter-to-feed line connection or the receiver-to-feed line connection. The more commonly-utilized of these are described in the *ARRL Antenna Book*.

One common kind of matching circuit is the so-called "antenna tuner." Antenna tuners are used to correct a mismatch between a transmitter's RF current output circuit and the antenna system (combined feed line and antenna, fig. 1C). Less often (for a reason discussed below), they are used between the antenna feed line and the receiver's antenna input terminal.

By adjusting the value of the inductor and the capacitors in the tuner, a good match can usually be obtained between the receiver/transmitter and the rest of the antenna system. For transmitting, this assures that maximum transmitter power is being sent toward the antenna, or, for reception, that maximum power from the feed line is being routed toward the receiver's antenna-input circuit.

❖ Is Matching Impedances Worthwhile?

Transmitting:

For transmitting, especially at HF or lower frequencies, a perfect match is often not necessary for good performance. If the feed line is of good, low-loss quality and is not too long (say, less than 100 feet), then signal loss due to slightly-mismatched impedances at the antenna usually is not excessive.

On the other hand, when feed line loss is significant, then improving the match reduces

This Month's Interesting Antenna-Related Web site:

This site has what appears to be the complete text of a 1921 book called *The Principles Underlying Radio Communication:*
http://books.google.com/books?id=4JVEAAAAIAAJ
This MIT site offers free lecture notes on antenna courses:
http://ocw.mit.edu/OcwWeb/Electrical-Engineering-and-Computer-Science/6-661Spring2003/LectureNotes/

loss and thus increases the signal level received at a distant receiver. This added signal strength improves the ratio of desired signal strength compared to the strength of static or interference received at that location. This ratio is called the "signal to noise" ratio, or simply "S/N." A high S/N indicates strong signal strength as compared to strength of received noise, and thus good reception.

Reception:

If we improve a mismatch at the antenna-to-feed line connection, then more of the signal captured by the antenna reaches the receiver. However, where significant received noise is present, the increase in the desired signal strength will also be accompanied by the same amount of increase in the strength of the received noise that the antenna has captured. So the S/N is still the same and quality of reception is not improved.

Received noise is generally abundant from 10 or 15 MHz and lower in frequency. Thus, using an antenna tuner at HF or lower frequencies is usually not effective in improving quality of reception. An antenna tuner will help in locations with a very low received-noise level, but usually this is not the case below 10 to 15 MHz or so.

However, at higher frequencies, particularly at VHF and UHF frequencies, received noise becomes progressively less as frequency increases. So at these higher frequencies, the improved received-signal strength resulting from an improved match usually does improve the S/N, and quality of reception is improved.

RADIO RIDDLES

Last month:

I asked: "Consider a transmission line feeding current from a transmitter to an antenna, and the antenna accepting that current. When the antenna has received current from the transmission line, the antenna itself could become a source of current, right? But where does the current then go?"

Well, the current in the antenna produces both electric and magnetic fields around the antenna. During a cycle of current flow, a portion of both fields returns to the antenna, and another portion of the fields is converted into waves of photons or what we call "electromagnetic waves." These waves are radiated away from the antenna. The travel of these waves between the antenna launching them and the antennas which capture them (reception) is what makes radio communication possible.

This Month:

When a feed line and antenna are mismatched, then some of the energy sent toward the antenna by a transmitter will not be accepted by the antenna and will be reflected back down the line. This will cause what is called "standing waves" on the line. What is a standing wave, and what is standing-wave ratio (SWR)? And, by the way, what is it that is standing?

You'll find an answer to this month's riddle, another riddle, another antenna-related web site or so, and much more, in next month's issue of *Monitoring Times*. 'Til then, Peace, DX, and 73.

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The Earliest Vacuum Tubes

Whenever I hit a blank wall with an ongoing restoration project, I need to buy some time by digressing with an off-subject article, usually historical in nature. That hasn't happened in awhile, but this is such a month.

As regular readers know, we've been working on a Globe Scout 680 AM/CW transmitter intended primarily for the Novice ham market of the late 1950s. But just at the moment, this deceptively simple-looking rig has me stumped.

To sum up my limited progress, I've replaced all eight of the electrolytic capacitors (luckily there were no paper capacitors to worry about), fired up the set, and found that the crystal oscillator was apparently not functioning. After a couple of days spent, on and off, in troubleshooting, I'm no closer to restoring operation. Check us out next month for what I hope will be a more positive report!

As for this month's subject, it's an addition to two previously published columns on tubes: "How many Volts to Light a Tube" (October 2005 issue) and "A Short History of Vacuum tubes (April 2003 Issue).

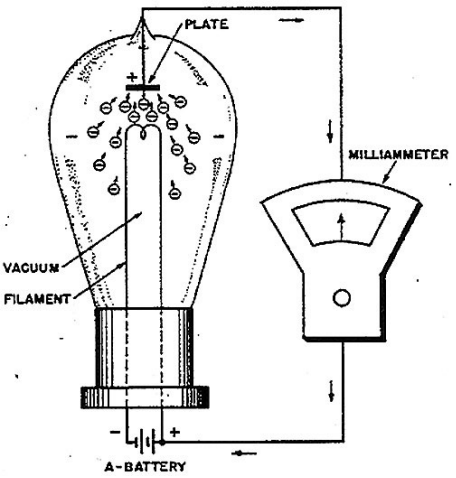
For descriptions of these articles and others in my historical series, visit **www.monitoringtimes.com**, then click on "MT Columns," "Radio Restorations," and "Radio History."

The Edison Effect

Historians generally agree that the vacuum tube era dawned in the 1880s, when Thomas Edison went to work on an annoying phenomenon he had encountered during his early development of the electric lamp. The primitive carbon filaments of his lamps were burning out too soon. At the same time, the interiors of the glass bulbs darkened rapidly with use – becoming coated with a deposit of carbon from the filament.

Deciding that the filaments were being weakened by the carbon "evaporating" from them onto the glass, Edison sealed a metal plate into a bulb, between the filament and the glass, to see if he could intercept and study the flow of carbon. During his experiments with such experimental bulbs, Edison tried connecting a milliammeter between the positive side of the power source feeding the filament and the metal plate inside.

He got a reading on the meter, which meant that an electric current was somehow flowing between the filament and the plate



"Edison Effect" test circuit. Milliammeter indicates current flow through bulb when connected between plate and positive filament lead.

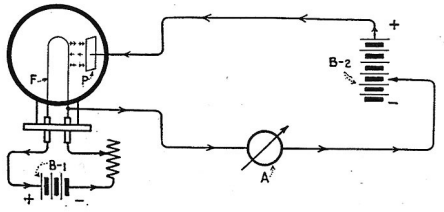
through the vacuum separating them. When the meter was switched to the negative filament connection, no current flowed.

Edison never got around to investigating the meaning of the odd phenomenon he had discovered, but in 1899 the eminent British Scientist J.J. Thompson theorized that the current was, in fact, a flow of infinitesimal negative "particles of electricity" which he termed electrons. Emitted by the heated filament of the bulb, the negative particles were attracted to the plate when it was connected to the positive side of the filament through the meter.

Hence, an electron current flowed from the filament to the plate, through the meter, and into the positive filament connection. When connected to the negative side of the filament, the plate became negatively charged, which meant that it repulsed the electrons emitted by the filament and no current could flow.

The Fleming Valve

But it remained for John Ambrose Fleming, working for British Marconi, to put the Edison effect to practical use. After duplicating Edison's original

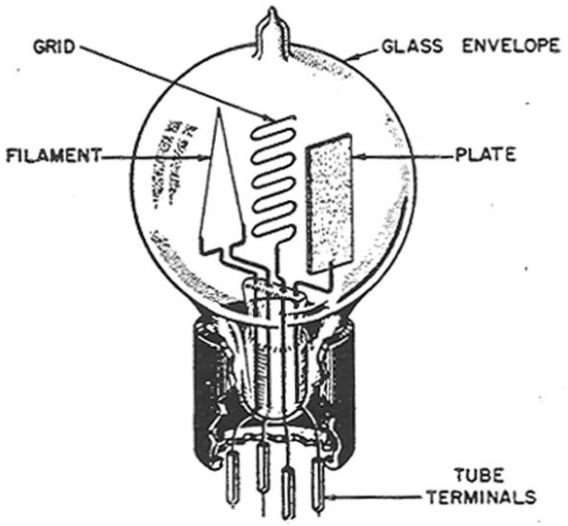


Fleming valve demonstration circuit. When a.c. source is connected in place of battery b-2, rectification will take place – converting a.c. to pulsating d.c.

experiment, he connected a source of alternating current between the filament and plate of the test lamp. Current then flowed through the bulb only during the portion of the a.c. cycle when the plate was positive with respect to the filament.

When the cycle reversed and the plate was negative with respect to the filament, no current flowed. This, of course, is the principle of rectification; the alternating current was changed to a pulsating direct current. And it was already well understood that the crude mineral radio detectors of the era operated by rectifying the received signal.

Fleming found (1904) that his device would work in place of a mineral detector, receiving signals more reliably at some sacrifice in sensitivity. He had, in effect, developed the first radio diode (two-element tube). It was known as the Fleming *valve* because of its ability to control the direction of the current flowing through it.



A simplified drawing of deForest's three-element "Audion." The original version had no base.

❖ The Audion

An epoch-making innovation in vacuum-tube technology was patented by Lee DeForest in 1906-7. Physically, it was nothing more than a few turns of fine wire surrounding the filament and positioned between the filament and the plate. This new element was dubbed the *grid*, and by inserting it, Deforest had created the first three-element tube, or triode.

With nothing connected to the grid, the new tube behaved like a Fleming valve; making the plate positive caused a current of electrons to flow from filament to plate. However, connecting a small positive voltage to the grid would attract and accelerate the electron stream flowing to the plate. As a result, the plate current would increase. Conversely, making the grid negative would have the opposite result.

But the significant thing was this: very tiny variations in the voltages on the grid would cause similar, but much larger, variations in plate current.

The implication was that, properly connected, Deforest's triode (or "Audion" as he called it) would act not only as a detector of radio signals but as a very sensitive amplifier. It could accept the minute radio frequency voltages present at the antenna and strengthen them to the point where they would provide comfortable volume in the headphones.

It was soon discovered that the amplifying effect of the tube also made it very adaptable for use as an oscillator to generate a radio signal. This vas a major breakthrough. Radio signals could now be generated in a more controlled manner and tuned more easily; the equipment for this could be relatively lightweight and easily constructed; ferocious arcs or heavy rotating machinery would no longer be required. Further, the way was paved for the development of effective and reliable methods for the transmission of voice and music.

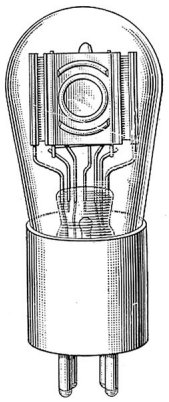
Though the Audion was a watershed development in the evolution of radio and – from the beginning – DeForest gave many flashy demonstrations of his invention in that application, the first practical, large-scale use of the device was in telephony. DeForest had sold telephonic rights to AT&T, whose engineers quickly improved the Audion, notably by evacuating the bulb to a higher vacuum. DeForest's brainchild was then quickly put to work as a voice amplifier on long-distance telephone circuits, including the first US transcontinental line (1915).

Large-scale commercial development of the vacuum tube for other applications was hindered for some time because of divided ownership of the patents. Marconi held the patents on the basic two-element tube (Fleming having been a Marconi employee), but DeForest held the patent on the grid. The stalemate was broken during World War I, when vacuum tube development was considered critical and the U.S. Navy offered to indemnify tube manufacturers against patent infringement.

❖ Civilian Tubes and the Broadcast Craze

After the war, a cross-licensing agreement was worked out that permitted the major tube patent holders to pool their expertise and manufacture vacuum tubes incorporating the major technological advances. In 1920, RCA released the first two receiving tubes, types '200 and '201, intended for the consumer market.

Requiring an automobile-type storage battery to provide "A voltage" to light their filaments, as well as an array of disposable dry batteries for plate and bias ("B" and "C") voltages, these tubes were inconvenient and expensive to operate. But their performance and ease of operation were light years better than those of the old galena or "crystal" detectors. Soon a thriving industry producing home receivers utilizing the new tubes was born.



The ubiquitous 01-A tube was used in the majority of consumer broadcast battery radios during the 1920s.

The ready availability of efficient receivers, in turn, stimulated the broadcast industry, and soon hundreds of stations, large and small, were established in cities and towns all over the country. The broadcast programs quickly became a major source of listening entertainment. In addition, devoted hobbyists – many using home-made sets built from magazine and newspaper plans – vied with each other to see who could pull in the most distant stations.

The '200 and '201 filaments drew an ampere apiece, and since the typical receiver used five of these tubes (a '200 detector and '201 r.f. and a.f. amplifiers), it wasn't long before the car battery powering them had to be recharged. But technology marched on, and in a few years the '200 and '201 were replaced with versions whose filaments required only a quarter-ampere. This was accomplished by introducing a small amount of the element thorium into the tungsten filament.

The ubiquitous '201-A – usually referred to as the "'01-A" – appeared in 1923, and the '200A or "'00-A" came out few years later. The '00-A never really caught on, with the '01-A generally used in all five positions of the typical battery set.

By the way, the apostrophes in the tube names used throughout this article stand for base style and manufacturer codes that are rarely used today. For example, one version of the '01-A was designated "UX-201-A." Even the apostrophes are usually dropped in modern practice.

❖ Battery Eliminators

Eventually, "B" and "C" eliminators appeared on the market. These converted the 110-volt a.c. line voltage of the era to the various direct current voltages needed for the set's "B" and "C" supply. Less common, more cumbersome and more costly were the "A" eliminators that replaced the storage battery, converting house current to 5 volts d.c. for lighting the tube filaments.

By purchasing these "eliminators" at some expense, the set owner could free himself from dependence on batteries – but he still had to deal with a bunch of hardware and a tangle of interconnecting wires.

The first radios that operated directly from the household a.c. line without requiring external "eliminators" or other power sources, began to appear in the late 1920s. They were called "socket power" sets, because, at that time, electricity for appliances was often accessed via adapters screwed into light sockets. The duplex wall socket so common today was relatively unknown.

The "socket power" radios were made possible by a new range of tubes whose filaments could be powered by a.c. These were the types 26, 27, 71-A, and 80. These tubes are discussed in detail in my article "The First a.c. sets" (March 2000 issue).

Beginning in the 1930s, radio designs grew exponentially more sophisticated and new tube types proliferated. However, by 1929, the family broadcast receiver had already lost its resemblance to a piece of scientific apparatus. It now blended in with the household decor and was perfectly at home in a living room or den.

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Grundig G6 Aviator

Big Performance, Little Package, Low Cost

By Larry Van Horn, N5FPW

Recently while visiting with the Grove Enterprises staff, one of our technicians was singing the praises of the Grundig G6 Aviator portable. "It has one of the best SW sensitivities I have seen," she said.

Well, it is a low end $100 portable, so how good could it really be? We decided to take one home and perform an *MT First Look* test on this small footprint portable.

❖ Inside the Box

The first thing I noticed when I took the radio out of the box was its size. Dimensions are 5 inches (127mm) x 3 inches (76.2 mm) x 1.2 inches (30.48 mm) and it weighs 9 oz. (255.1 grams), excluding the two batteries. This radio can easily be thrown into a briefcase or purse for travel.

Accessories included in the box include a carrying pouch, operating manual, warranty card, AC adapter/charger, supplementary antenna, and a carrying strap.

The manual was okay. I have not been a big fan of Eton/Grundig receiver manuals in recent years. For instance, there is no explanation for the beginner on the basics of shortwave listening. They tell you to do a Google search. The typeset is a bit small due to the small size of the manual itself, but at least the G6 manual is in black ink (not gray as in the Satellit 750).

❖ On-the-Air Testing

During our testing we used the venerable Sony 2010 as our bench mark receiver. The first noticeable difference was in FM broadcast band reception. The G6 definitely beat the 2010 hands down, even when using the whip antenna.

Overall, I was very surprised at this receiver's sensitivity. Shortwave sensitivity was almost equal to my 2010. It was pulling out some interesting stations from within the HF utility bands, voice and digital. AM reception was reasonable (see negative below).

The receiver has good audio, one of the best I have tested in this price category. Even given the small size of the speaker, it was interesting to hear decent audio from such a small package. As I expected, there was a noticeable improvement in audio when I used earphones versus the speaker. Like many of the Grundig/Eton portables, you can select mono or stereo reception via the earphone jack.

What really surprised me about the G6 was the fact that they included SSB reception capability at this price range. However, receiver selectivity, especially for SSB reception, was a bit disappointing. There appears to be only one bandwidth available, and it is shared by both the AM and SSB modes. On the other hand, I was particularly pleased with the FM selectivity, which is usually an afterthought in this price range.

This is a dual conversion receiver. While that is good, we noticed more images when we connected it to an external antenna as compared to the same setup for the Sony 2010. If you connect an external antenna to this radio, I

Overall rating: 2 and 1/4 stars

TABLE 1: GRUNDIG G6

Manufacturer Specs/Key Features

Frequency Coverage:
- LW/MW/SW: 150-29999 kHz (steps selectable depending on jog switch position);
- AM steps selectable for either 9 or 10 kHz spacing.
- FM Band: 87.5-108.0 MHz (76.0 MHz selectable for outside the US and Canada)

Conversion: Dual conversion
Bandwidths: One bandwidth AM/SSB
Freq/Meter Conversion: LCD signal strength meter
Attenuator: None
Tuning Options
- Digital frequency readout / manual tuning knob
- Auto up/down buttons
- Keyboard direct frequency entry
- Auto search
- Auto tuning storage for FM band

Memory Locations
- 700 memories arranged in 100 pages; each page holds seven memories. SSB selection is not stored.

Clock function: 12/24 hour selectable
- Sleep time direct entry 0-99 minutes
- Three programmable alarms

Audio Control: Push button (31 levels selectable by user)
Tone select: News/music switch, FM stereo bass (earphones only)
Backlighting: Display backlight
Antennas
- Telescopic antenna for FM and shortwave
- Built-in ferrite bar antenna for LW/AM
- External antenna jack

External Jacks
- Earphone jack (stereo on FM) and Antenna jack; both 3.5 mm diameter

Power Source
- Battery 2 AA batteries;
- External power: DC 4.5V, center pin positive
- Includes AC-DC 4.5V 300 mA adapter

MT FIRST LOOK RATING (0-10 SCALE)

Audio Quality	4
Audio Levels	5
Back light/Display	6
Battery Life	6
Dynamic Range	5
Ease of use	6
Feature Set	5
Keyboard/Button/Control Layout	5
Sensitivity: AM-5, FM-6, SW AM-5, SW SSB-4	
Selectivity	4
Overall Construction	6
Overall Reception	6
Overall Manual	4

highly recommend adding the capability to attenuate some of the incoming signal to reduce the problem of the strong signal overload that the radio will experience.

Finally, for those who like tuning around, there was no chugging when tuning the G6 like you have with the older Sony.

❖ The G6 Negatives

As I have said many times in these *First Look* columns, no radio is perfect. Keeping in mind that we are talking about a $100.00 portable, the G6 does have a few skeletons in its closet.

Tuning SSB signals is a bit better with this radio than some other models we have tested. There is a SSB button on the front of the receiver. When you press that button you will be able to decode the SSB transmission, but you will have to use the front panel tuning wheel to fine tune the SSB signal. There is no USB/LSB, so it will not be obvious which sideband you have selected.

Another negative that I noted when testing SSB reception was an AGC action that was way too fast, so some of the stronger stations were a bit distorted on signal peaks.

One thing that can make the Grundig G6 radio more difficult to use is the much smaller display screen, especially if you are sight-impaired.

AM reception compared to the Sony was not as good, and this was probably the result of a smaller ferrite loop coil inside the radio as compared to the 2010. And the external antenna on the G6 only works on the shortwave/FM bands, so AM broadcast band reception is not as good ason the other two radios.

I did note a bit of synthesizer noise while tuning around, but I have not seen it mentioned by others who own the radio, so it may have been unique to the model I tested.

Table 1 is a listing of manufacture specs and key features.

❖ Bottom Line

As I mentioned in my past reviews, manufacturers have come a long way in the last decade in improving under $100 portable radios, and that was quite evident when we tested this radio.

The Grundig G6 will have a wide appeal to the traveler. You get a lot of bang for the buck using this radio, including SSB reception.

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Antenna Tuner for the Long Waves

By Harry A. Weber

For more than a decade now, the scene in consumer communications receivers has reached a level of sophistication that would have been unimaginable in the past. Thanks to the combined efforts in advanced circuit design, microprocessors, and newly introduced digital signal processing techniques, one is now able to span the range of dc to daylight with simply a turn of the dial or a key pad entry.

Gone are the days of owning multiple receivers taking up room and power; today they are replaced by a desktop box that can even be connected to one's home computer, offering reception capabilities of receivers costing in the tens of thousands of dollars.

While all of these new sets are excellent performers in their own right, I have noticed, however, that some of them are quite deficient when it comes to tuning in the lower frequencies. One would think that in today's technological advancement, the lack of poor sensitivity could either be attributed to engineering oversight or end user neglect in not demanding full spectrum sensitivity. Surely the simple redesign of front end filters, preselectors, and first stage mixers would bring up a set's sensitivity of equal value, whether one is tuned to 10 kilohertz or 1 gigahertz.

In the past, overcoming this deficiency was easily solved by one's imagination or modification, but those days are also gone; unfortunately the word *modification* is no longer to be found in today's radio lexicon. For now, we have to be satisfied by adding external devices to designated jacks and connectors, for fear that a blob of solder on the circuit board might destroy the whole set.

Finding a solution for this problem took me in several directions, from basic designs in filter theory to preamplifiers and converters – all having their complexity and challenges – while trying to come up with a circuit that could be easily duplicated by our readers. The design needed to be low in cost and complexity, while at the same time giving excellent results and receiving signals that were previously considered to be impossible.

Another consideration in developing the tuner was based upon the goal of allowing the builder to keep his project confined to specific bands of interest, such as the very low frequencies, European longwave broadcast band, or DXing aeronautical-marine beacons. Even the mechanical method of tuning the antenna coil could take on several forms, constrained only by the availability of tubing cutters or dial string assemblies.

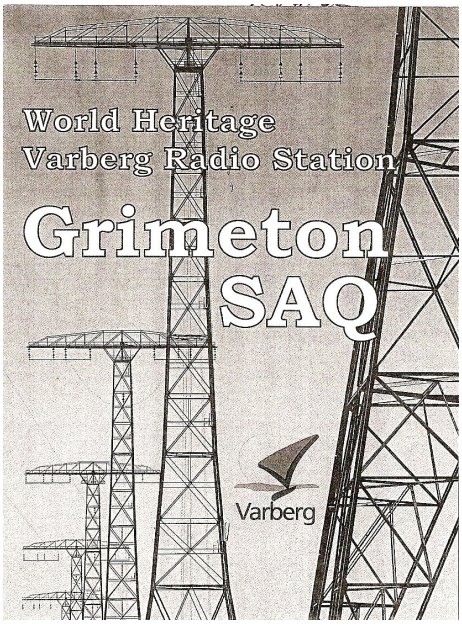
What Have I Been Missing?

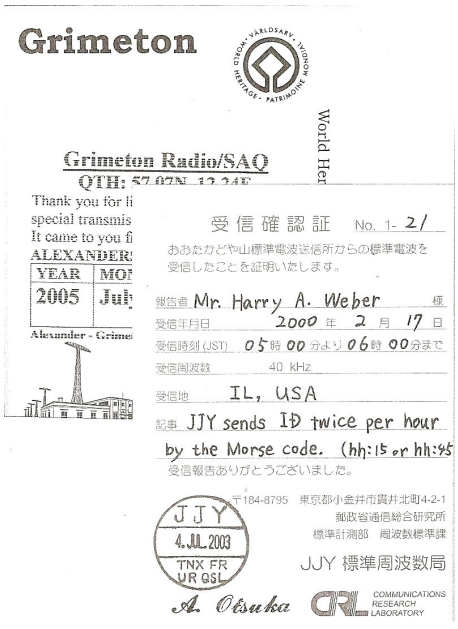
By convention, the longwave band is divided into several sections; starting below the broadcast band at about 300 kHz (what is commonly referred to as the medium frequency). Tuning down to about 30 kHz includes the low frequency band, while from here to 3 kHz are the very long waves. Within this range of about 500 kHz total, there is a tremendous variety of signals to be heard – navigation alerts, high power European broadcasters, radio experimenters, and even the time signals that synchronize your desktop atomic clock.

While tuning further down the dial, the VLF band is host to some of the most powerful transmitters in the world, having the capability of spanning the globe with signals from air or ground, or traveling above or below the water line. Those experimenters with PC soundcards and the appropriate software can even see the fine squiggles of submarine communications taking place at 82 Hertz.

Receiving any or all of these signals is quite a challenge, but with the help of this tuner we will try to improve the long wave reception capability of your high end receiver. (My test receiver is a Harris 590.) For the most part, failure in this area has been due to the fact that as one goes lower in frequency, the antenna resistance starts to rise, thus resulting in a mismatch, followed by the poor sensitivity of the receiver.

By applying our tuner, we can correct this problem to a point of generating the proper terminating input impedance to the receiver; while at the same time providing the up front selectivity which is so important when trying to separate signals that are only hundreds of cycles apart as found in the VLF spectrum.

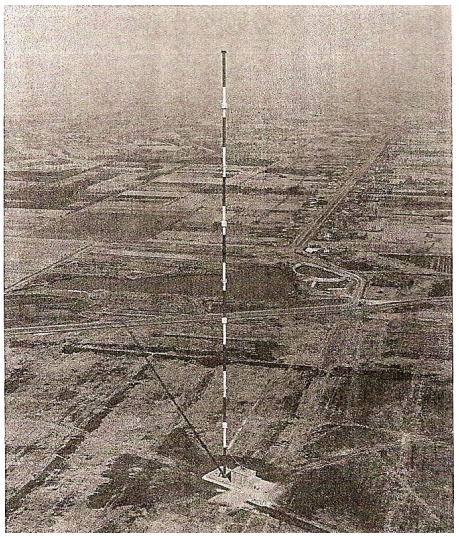




A Visit to the Hardware Store

Looking at the construction details, the parts count to performance ratio would seem out of balance, but by virtue of its make-up it can be shown that through careful assembly a truly unique tuner can be realized. Even its construction would seem rather unconventional, using a modified tubing cutter to manipulate the ferrite rod, with secondary coil attached to micrometer precision. As it turns out, this project will become more of an exercise in mechanical assembly than electronic complexity, therefore allowing almost identical duplication without too much technical difficulty.

Depending on what type of antenna is used, the coil chart is an approximation in the number of turns required, and noting the low impedance input characteristics of our receiver, all secondary coils should be left to the same number turns as described.



Leider können wir zu der genannten Frequenz keine Aussage machen, wünschen Ihnen aber weiterhin viel Erfolg beim Längstwellen DX´en !

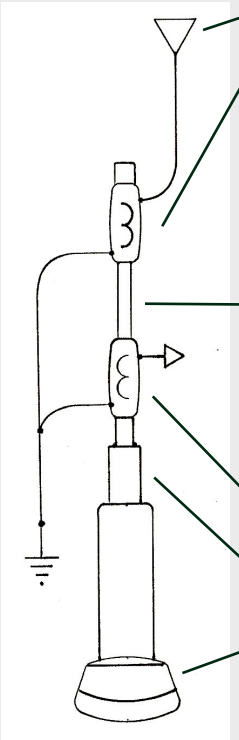
The ferrite rod should move freely within the core of the primary antenna coil, making sure that linear motion from the mechanical tuning assembly is held throughout its travel. Coil construction can easily be realized by making cardboard bobbins and using a small battery-powered drill to form the windings.

LED lights come in handy to indicate the band in use, while calibration of each of the micrometer dials was considered unnecessary, because all we are tuning is for maximum gain.

Please note that the tuning mechanisms and coil mounts must be secured to a stable base, while cabinet styles are optional. Just remember to keep the input and output leads far apart, and use coaxial cable for the receiver connection.

Because of the unique design, this tuner will work with almost any antenna, and it will perform even better by not grounding the shielded portion of your shortwave antenna lead-in wire.

MECHANICAL LAYOUT - COMPONENT DETAIL



1. Long wire antenna, 50 to 500 feet long
2. Permeability-tuned antenna coils. All five coils are wound with #40 enameled magnet wire. Antenna coils are held in fixed position.

   COIL WINDING DATA

15.0 kHz to 40.0 kHz	850 turns
40.0 kHz to 90.0 kHz	625 turns
90.0 kHz to 175 kHz	430 turns
175 kHz to 250 kHz	210 turns
250 kHz to 600 kHz	100 turns

3. Five ferrite rods 1/4 inch diameter, each four inches long (mu factor 125). Ferrite rods are available from CWS Coil Winding Specialists, 353 West Grove Ave, Orange, California 92865; phone 800-377-3244 or 714 -279-9010; www.cwsbytemark.com/
   Ferrite rod must be fully inserted and secured inside secondary coil. Ferrite rod must move freely inside antenna coil. Signal transfer is via mutual inductance of coil and ferrite rod.
4. All secondary coils are 100 turns: #40 enamel wire, which is connected to receiver.
5. Secondary coil and ferrite rod are secured to movable post on tubing cutter
6. Tubing cutter is mounted with bracket to base

Bandswitch detail not shown: Uses 4 wafer sections, each with 5 positions.

Tuning:
Turning knob will cause ferrite core to change inductance-resonance of antenna coil. By mutual coupling, desired frequency is transferred to low impedance antenna coil.
As described in the article, tuning is accomplished via the receiver coil. Being part of the ferrite rod, it moves in a linear fashion to the stationary coil. The change of position causes a corresponding change in the antenna coil's inductance, thus variation in frequency. The in and out motion is provided by the tubing cutter's gear mechanism.

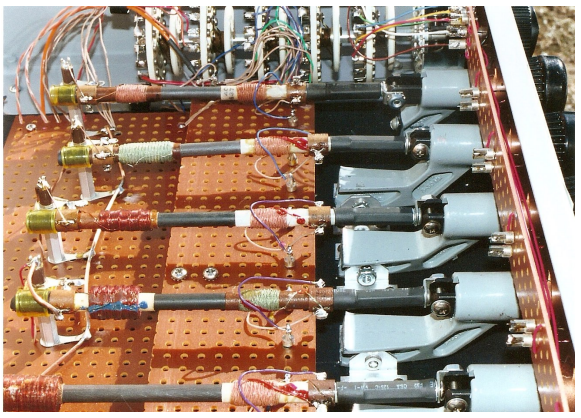
MISCELLANEOUS HARDWARE:
Perforated base, shrink tubing, support-connecting brackets, antenna jacks, selector switch, LED band position indicator lights & battery, coil support clamps & standoffs, RTV glue , Superior Tool Type ST-1200 cutter, coil bobbins, winding drill

Your tubing cutter is modified by removal of the circular cutting wheel and roller anvil.

In Conclusion

Once assembled, the tuner should become most intuitive to operate, and you will listen with amazement at how well this unit performs in unlocking those last few kilohertz of our radio spectrum.

As always, protect your investment by properly grounding, bonding, and using lightning arresters. In your eagerness to wring out one more signal, be cautious not to receive that last signal that prematurely calls you Home!



John Catalano, PhD
johncatalano@monitoringtimes.com

Trying Out RadioCom 6

Last month we "massaged" our USB PC to work with Radio Control 6 (RC6), **www.bonito.net**. Since this software uses the old 9 pin serial connection, we needed a USB-serial adapter to allow it to work with the latest computers that only have USB (universal serial bus) ports.

Now we are ready to use RC 6 -- that is, as soon as we configure the PC's sound port. I feel the same about sound port configurations as Indiana Jones feels about snakes. As Indy says, "Snakes…I hate 'em!" The same goes for sound card configurations and their drivers. I hate 'em!

On the other hand, sound cards are necessary for getting the analog audio signal from the receiver into our computer. There it can be digitized and manipulated in wonderful ways. Sound ports exist in two manifestations: integrated onto the PC's motherboard or as an add-on card. For this discussion we will consider them one and the same.

Problems in dealing with sound ports are three fold. First is the myriad of different manufacturers of sound ports and their associated unique circuitry. Added to this are the varied types of sound processing integrated circuits from many different chip manufacturers. And then there are the software drivers, which allow the PC's operating system and hardware to talk with the sound card. These drivers must match all of the above parameters or the show does not go on!

Turn On Then Tune In

First, make sure you have the latest audio/sound drivers installed in your system. Go to your PC manufacturer's or your sound card manufacturer's website. Then download ONLY the drivers for your exact operating system (for example, Windows XP) and exact hardware. It's always a good idea to create a system restore point before you install new drivers. If anything goes wrong, you can get back to your previous system configuration. Go to Windows Help for instructions on creating restore points.

The RC6 website specifically suggests that you DO NOT use special audio drivers. Instead, make sure your system is using the Windows-based drivers as we have indicated above.

RC6 can use either your sound port microphone or the Line-in. Therefore, we must make sure that the sound port input that we have connected to the receiver's audio is turned on. However, it must be turned on in three places: the computer hardware, the PC's audio mixer, and in RC6.

PCs have different methods of turning on the hardware. My laptop port was activated only after I physically plugged into it. Once you have connected the receiver audio to a sound port input, go to the Audio Mixer. You can access this via the Control Panel or right click on your speaker icon in the right accessory tray. Get to the Mixer screen and make sure the input you are using (i.e. Mic) is checked. Also check that the level for this input is set to at least mid range.

RC6's "Preferences" menu can be accessed in a number of ways. It is visible in Figure 1 at the top left side. (We'll get back to Figure 1 in detail later.) Or we can access it from RC6's Start-Up program.

Take a look at the resulting Preferences menu in Figure 2. Here we can see all the sound and serial selections we have been discussing. Make sure RC6's parameters match *all* your system.

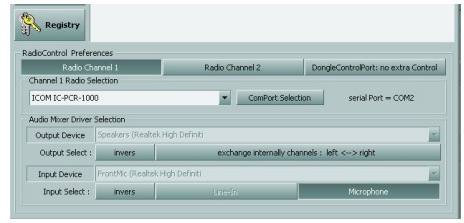


Figure 2 – RC6 important sound card preferences menu

Ready for Liftoff

Our Icom ICR-1000 is connected to the computer serial port via the dongle. (Remember the dongle from last month? This is RC6's copy protection/interface box.) If necessary, the dongle is connected to the PC's USB port via the serial converter, which we also discussed last month. And finally, we have connected the audio out of the receiver to the Mic input of the PC's sound port. All systems are Go.

What Can RC6 Do?

RC6 does just about anything a radio monitor or ham operator would ever want or need to do! As the byline on the boxes says, "DSP Filter and Multimode-Decoder…RTTY, CW, PSK, FAX, Satfax, Synop, SSTV Decoder, Dual Radio Control for more than 100 receivers and transceivers, audio recorder, 3D scanner, equalizer, sattracking, audio analyzer scopes and frequency analyzer time frequency management." Add to all these features the ability to customize the screen display in many ways, comprehensive station logging, and importing of databases and WOW -- reviewing RC6 is a real challenge!

Let's keep it simple. We'll just explore using RC6 for fax station look-up, tuning, and decoding to see how easy it is to use and how well it performs. Let's start by looking at each section of the screen displayed in Figure 1.

In the top center section of Figure 1 we can see the title "Channel-1 Frequency Manager

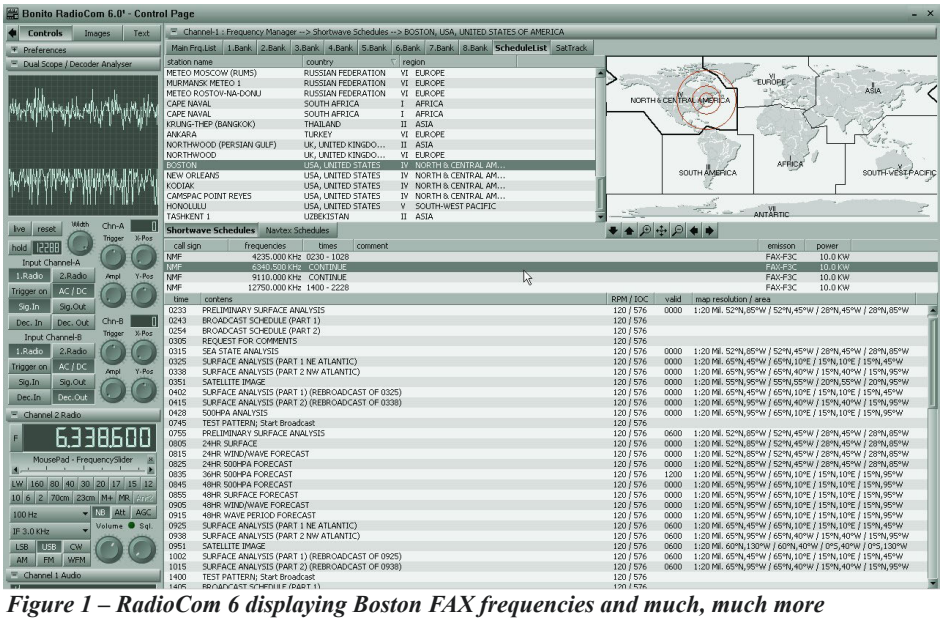


Figure 1 – RadioCom 6 displaying Boston FAX frequencies and much, much more

->Shortwave Schedule->Boston, USA." That indicates exactly what we have selected, which is also being displayed. Notice in the top list of stations we have highlighted BOSTON. As a result, the next region down displays the Boston station's frequencies, corresponding times, modes and power output.

Further below is a display showing a description of the FAX images Boston is broadcasting, their FAX parameters (RPM/IOC), map resolution, and geographic area covered. This gives you an idea of how comprehensive RC6's logging and station database is -- and this is just for openers!

❖ Have It Your Way

On the top left of Figure 1 we have chosen to display the "Dual Scope/Decoder Analyzer." The display shows the waveform of the audio coming from the receiver.

The next section down, Channe1 2 Radio, is where we can control most of the receiver's operation: frequency display, three methods of tuning, IF bandwidth selection, noise blanker, attenuation, AGC, mode and volume/squelch levels. It can all be done from this small display.

Each of these screen areas can be user customized, as seen in Figure 3. Here we have chosen a large receiver control screen by replacing a portion of the Frequency Manager with Receiver Control functions (notice the large tuning "knob"). The two waveform displays under the frequency show the audio spectrum being received (left) and the output of the FAX decoder (right).

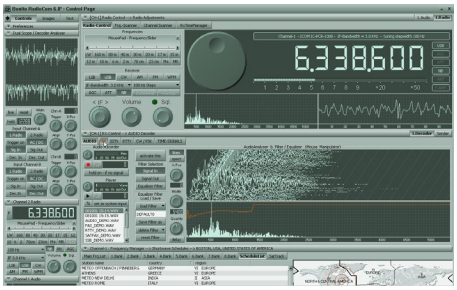


Figure 3 – Lots of audio waveform displays in RC6

Next, look at the Audio Decoder section with its large waveform display. This section's features change depending upon which decoder type the user chooses. Here, under the small cursor, we have clicked on "FAX." The large waveform shows the same receiver audio spectrum seen above, but with a third dimension -- time. In this way we can see the variation of audio frequency with time. Notice the large "wall" which is the FAX signal from the Boston station.

The small region to the left of the large waveform display and filter section (another very useful section of RC6) is the Audio Recorder. From this display we can record and play back audio signals. Notice the listed of previously saved recordings.

❖ Just the FAX

The small screen area below the receiver's IF, Volume and Sql. "knobs" is the FAX Decoder. Here just about all FAX signal parameters that you can think of can be set manually, or they may be automatically determined by RC6.

Figure 4 shows the fax message "CHART NOT AVAILABLE." Sounds cruel after all our work. But the clarity of the text, which was created by FAX imaging, proves how well RC6 decodes FAX operates, and with ease. We decoded a number of full maps with the same ease and clarity. Thumbnails of faxes we have saved are seen to the far right of the text. And in Figure 5 is the very first FAX that I tried to decode with RC6. It has amazing quality for the very first try!

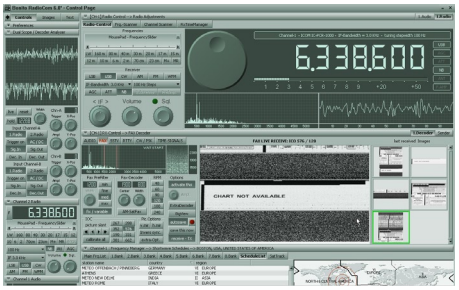


Figure 4 – RC6's FAX decoder in operation

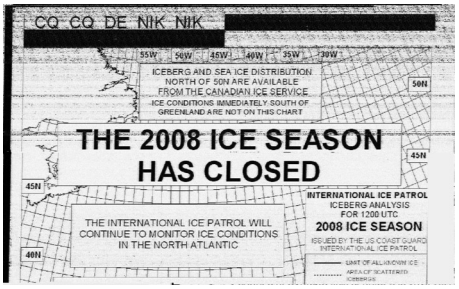


Figure 5 – The very first FAX decoded with RC6 – very impressive!

We also decoded RTTY, SITOR, NAVTEX and CW with RC6. They all produced excellent results as did the FAX decoder, and were easy to use.

❖ A Micro Slice

To say we have just touched the surface of RadioCom 6 is a gross understatement. RC6's receiver control worked flawlessly on the Icom and Yaesu receivers we tried.

Interesting and useful features we did not try are the multiple radio and multiple decoder capabilities of RC6. This software can control two radios and six decoders ***per*** radio, simultaneously with only one sound port/card. That's a trick.

RC6 has some pretty impressive satellite decoding and tracking capabilities, which we have not mentioned. Nor did we try RC6's multi-display capability that allows the program to display the screen over two monitors.

RadioCom 6 does not come cheap, costing around 200 Euros or $270 at the current exchange rate. Check with your dealer (including Grove Enterprises) for exact costs. However, once RadioCom 6 is installed, configured, and running, this program does it all, and does it all very, very well. In fact, I would say it's one of the best I've seen.

Till next time, Happy 2009.

Goodbye Vista? Already?

An editorial rant by John Catalano

It's been barely twenty-one months since I purchased my last PC (a laptop). As reported in this column, at that time the major computer retailers had been forced to stopped selling PCs with Windows XP.

With no other choice, I purchased the Vista PC and fought through the first year. It was a difficult year with much software incompatibility. Sometimes even Microsoft Vista approved software didn't work. And Vista required many (almost daily) "important and critical" download patches. The result was lots of wasted and frustrated hours for me.

But with all their hype and effort, I really thought Microsoft would eventually get Vista right, so I stuck with it. And in fact, twenty months later, Vista is a pretty good operating system.

❖ I Was Wrong!

A few onths ago Microsoft announced that their next operating system, Windows 7, is operational and due for early release mid/late 2009. According to Microsoft's basic overview of Windows 7's new features, they include: better performance, more speed, longer battery life, total Vista software compatibility, user friendly system restore feature and shorter turn-on/turn-off times.

Microsoft, are you trying to tell us that computing has changed so much in three years that you didn't know about these basic useful features? Is that why they were not included in the great and wonderful Vista that you forced us into buying? Or are you telling us Vista users we will have to pay another $150+ to get the system that we were promised when we bought Vista?

Not only did you waste a year of my time and efforts, but also now you want to charge me for fixing your mistakes and omissions. This MUST stop!

If we as consumers were to demand fair compensation for all of our pain and effort, Microsoft would be the next company/bank that would need to be "bailed out" with our tax money. No matter how you cut it, the average person always gets the bill.

Yes, product development costs money. But then the offering should be a real ***finished*** *product* for sale, not one requiring "major or critical" patches, and then requiring the user to purchase a whole new product.

❖ A New Years Resolution

The "keep Windows XP" movement, which initially boycotted Vista, almost worked. This time, with Windows 7, Microsoft and software manufacturers need to get the message from the masses -- "We have had enough! Keep your "new and improved" marketing hype. We are not paying you another penny!"

We could just keep believing in the hype and paying for the same "product" again and again. Or we could vote NO with our wallets. It's up to you to make a difference.

What's NEW

Tell them you saw it in Monitoring Times

DXtreme Station Log - Multimedia Edition

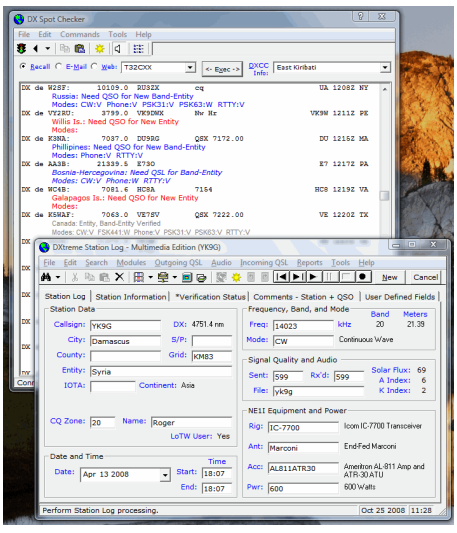
DXtreme Software™ has released a new version of its popular logging program for amateur radio operators, the DXtreme Station Log – Multimedia Edition™ Version 6.0.

Like other amateur radio logging programs, the DXtreme Station Log lets hams log their contacts and import ADIF files from popular contest programs. But unlike other logging programs, Station Log provides multimedia and advanced functions that can add a new dimension to amateur radio logging activities.

Station Log includes a DX Spot Checker™ facility that lets hams receive incoming DX spot announcements from Telnet-based DX Cluster and DXSpider servers. As each spot arrives, the DX Spot Checker queries the ham's Station Log database and lets the user know by means of colorful rich-text and audio whether a QSO is needed with the station for a new or verified DXCC® entity or band entity. The rich-text messages and audio announcements are fully customizable by the user. The DX Spot Checker also lets hams:

- Send incoming spot announcements to others by e-mail.
- Perform Web-based, call sign lookups on stations spotted.
- Quickly check their complete DXCC status information without having to leave the DX Spot Checker window.

The program also uses the multimedia capability of Windows to enhance the program's utility. Station Log features an embedded audio facility that lets hams create and maintain an audio archive of their memorable contacts. It also features an integrated QSL Imaging™ facility, which lets hams scan the physical QSL cards they receive from regular mail and capture the electronic QSLs – including *ARRL Logbook of the World QSLs* – they receive over the Internet. You can save both types of QSLs as compatible digital images that other hams can view at any time.



This program includes some advanced functions that hams will really appreciate. You can integrate Station Log with Microsoft® Word to create customized, rich-text-formatted QSL labels for physical QSLs. The labels can be created manually or automatically. You can create ADIF-based electronic QSLs for uploading to Web sites that specialize in the delivery of eQSLs – including *Logbook of the World*.

Interested in how your station is performing? Station Log offers a variety of reports to help the operator do just that and they can output these reports to printers, as well as to the DXtreme Active Report Viewer.

The DXtreme Active Report Viewer lets hams view and sort reports within Microsoft Internet Explorer – either locally, or over the Internet. An FTP facility is embedded in Station Log to let hams upload their reports to the Web automatically, where they or their friends can access them remotely.

To safeguard data, Station Log can be configured to back up database, QSL imaging, and audio files to two locations automatically whenever the program is closed.

DXtreme Station Log includes two Help systems:

- Embedded HTML Procedural Help.
- Context-sensitive What's This? Help.

The user can also access to the Internet-based DXtreme Station Log Information Center for late-breaking news and instructions.

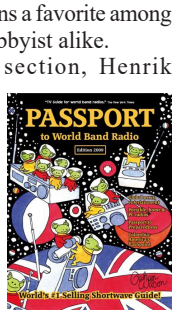
Station Log runs in 32- and 64-bit versions of Microsoft Windows® Vista™ and Windows XP. It retails for $89.95 USD in North America and $92.95 USD elsewhere. Special pricing is available for upgrading users. All prices include shipping and handling charges and lifetime product support by Internet e-mail.

For more information about DXtreme Station Log – Multimedia Edition V6.0, visit **www.dxtreme.com.**

2009 Passport to World Band Radio

For 25 years *Passport to World Band Radio* has been the number one selling guide to the shortwave listening hobby. And the 2009 edition once again proves why it remains a favorite among the beginner and seasoned hobbyist alike.

In the Global Focus section, Henrik Klemetz, a well respected DXer, penned an excellent, in-depth feature entitled *Colombia: Bandits, Ballads and Broadcasts*. This feature delves into the underbelly of Colombia, a country torn apart by Marxist guerrillas and outlaws, peasants and landowners, all trying to coexist in a divided country of extreme wealth and extreme poverty.



Are you new to the shortwave hobby? The *Getting Started* section has some great material that will help the newcomer get started in the radio hobby. Here you will find everything from finding stations to selecting the right radio. For instance, if you're ready to do some bandscanning, you may want to consult the *Best Times and Frequencies for 2009*. This section will give you a good idea when and where to tune.

Another *Getting Started* article is titled *Ten of the Best: 2009's Top Shows*. This piece presents the best of the best in shortwave programming from Radio Taipei International to China Radio International's *News and Reports*.

In the *Passport Reports* section, you will find an introduction on how to select a radio. Then it is on to their famous radio reviews that cut through the manufacturers' specifications and clutter to bring readers concise and unbiased reviews on portable and table top receivers. There are also four sections of antenna reviews to help the hobbyist sort through the multitude of available antennas to fit your needs to enhance listening.

Readers will find the hour-by-hour guide to world band programs in *What's On Tonight.* This section has an informative synopsis of the best shortwave programs on the air.

Addresses Plus is a staple resource DXers have come to depend upon in *Passport*. It includes an updated by-country guide of station addresses, websites and more. There is also a section devoted to *Worldwide Broadcasts in English 2009* where you will find broadcast times and frequencies sorted by-country.

Passport's Blue Pages are a by-frequency listing of world band frequencies from 2310 to 21840 kHz. The Blue Pages' signature graphic chart helps listeners quickly narrow their search by country, station, broadcast hours, language and targeted areas. It includes station name/location, modes, alternative frequencies, power, and if applicable, network information.

Passport to World Band Radio is a very good reference aid for any DXer, providing equipment advice on receivers and antennas, and frequency and tuning advice for your shortwave radio journey. *Passport to World Band Radio 2009* (BK-18-09) is available through many dealers, including Grove Enterprises (**www.grove-ent.com** or 1-800-438-8155) for $22.95 + $3.00 s/h.

Passport to World Band Radio continues to provide an excellent resource for hobbyists. It remains an authoritative guide for beginning or seasoned shortwave enthusiasts. Every listening-post should have a *Passport* next to the receiver.

Reviewed by Gayle Van Horn

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

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*Frequency specs may vary. Refer to owner's manual for exact frequency specs.

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