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

Monitoring Times

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Interoperability on the MT Radar

In this issue:

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AR-ALPHA

Communications Receiver

- Multi-mode unit capable of receiving AM (synchronous), ISB, RZ-SSB, USB, LSB, CW, WFM including FM stereo, NFM, APCO-25 digital, and TV in both NTSC and PAL formats
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Monitoring Times

Vol. 26 No. 7 July 2007

Lead Story

Public Safety Interoperability 2007

By Larry Van Horn

After all the hoopla about the inability to communicate following 9/11 and Hurricane Katrina, what has been accomplished? Millions of dollars have been spent, but are the states any closer to achieving interoperability, even between agencies in the state? (Not to mention between neighboring states or federal agencies.)

MT takes a state-by-state look at the "state of interoperability" and finds the country is a patchwork of systems and the states are in varying stages of planning.

This article also includes the first full listing of 700 MHz channels and frequencies to be published in the hobby press. Turn to page 8 for the article.

On our cover: Photo of an Illinois State Patrolman by Harry Baughn.

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Reviews

In our continuing series of HD Radio reviews, the SANGEAN HDT-1 is the only radio which is designed to be a component in a home stereo system instead of a stand-alone. This tuner is simplicity itself, and it will ensure your expensive system doesn't become obsolete if analog FM is ever finally discontinued. Best of all, it's the most sensitive of the receivers Ken Reitz has tested. (See page 66.)

This month, John Harr looks at a number of solutions for your "mounting problem" of installing one or more radios without drilling holes in your car. Depending on whether you are trying to mount a hand-held radio or a more substantial mobile radio, a variety of mounts are available to suit your needs. (See page 70.)

Jumpin' Jupiter, that's far-out DX! Did you know Jupiter emitted radio waves and you can hear them on your shortwave receiver? RADIO JUPITER PRO 3 takes a lot of the guesswork out of knowing when radio storms might be active and when Jupiter is within the reception area of your antenna. (See page 72.)

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COMMUNICATIONS

"Communications" is compiled by editor Rachel Baughn KE4OPD from newsclippings submitted by our readers. Thanks to this month's fine reporters: Anonymous, Alokesh Gupta, Jerry None, Mark Regen, Ken Reitz, Doug Robertson, Robert Thomas, Gayle Van Horn, Larry Van Horn, Ed Yeary, George Zeller.

SCANNING

GAO Report on Communications Interoperability

It seems to us the Department of Homeland Security was created to provide "adult leadership" to all the other agencies who didn't want to play nicely together. (See this month's lead feature article.) Now the Government Accounting Office seems to imply DHS isn't doing much better. Here are excerpts from the GAO report on Communications Interoperability.

"According to DHS, $2.15 billion in grant funding was awarded to states and localities from 2003 through 2005 for communications interoperability enhancements. This funding, along with technical assistance, has helped to make improvements on a variety of specific interoperability projects. However, states that GAO reviewed (New York, Florida, Kentucky, and Oregon) had generally not used strategic plans to guide investments toward broadly improving interoperability. Further, no national plan was in place to coordinate investments across states.

"To its credit, DHS has required states to implement a statewide plan by the end of 2007, and DHS has recently been required to implement a National Emergency Communications Plan. However, no process has been established for ensuring that states' grant requests are consistent with their statewide plans."

"Until recently, the private-sector coordinating body responsible for developing Project 25 standards – a suite of national standards intended to enable interoperability among the communications products of different vendors – has made little progress."

"Nevertheless, DHS has strongly encouraged state and local agencies to use grant funding to purchase Project 25 radios, which are substantially more expensive than non-Project 25 radios. ... Until DHS modifies its grant guidance to provide more flexibility in purchasing communications equipment, states and localities are likely to continue to purchase expensive equipment that provides them with minimal additional benefits."

The Telecommunications Industry Association sharply disputed the GAO's findings, which they said were misleading ... The GAO report concluded that ambiguities in the standards have led to incompatibilities among products made by different vendors. Without compliance testing, there's no way to know if the products are interoperable, according to the report.

However, the TIA, which published the Project 25 standards, insists that products meeting the standards must meet mandatory standard operating requirements and will therefore be compatible. If various products are incompatible in the field, the TIA suggested it is probably because public safety users have been asking for additional, proprietary features.

The TIA spokesman said that 114 Project 25 standards and documents were published between 1993 and 2005. The Project 25 community has been collaborating with the National Institute of Standards and Technology to develop compliance testing.

Meanwhile, Cisco IP Systems is lobbying for IP solutions to interoperability. Their spokesman, Morgan Wright, said that IP technologies have evolved faster over the past dozen years than public-safety radios have over the past six decades. He suggested that first responders start looking at their radios as one endpoint in their communications networks, not the sole endpoint.

However, even if public safety changed its thinking regarding its communications systems, a lack of standards – as well as the slow pace of standards development – stands in the way of achieving the "any device, any time, any place," goal, Wright said.

Wright noted that the situation is even more curious when one considers all of us – first responders included – live in a standards-driven world. "Without standards, you wouldn't be able to plug anything in without multiple adapters. ... People are used to ten times more technology in their homes than what is provided to the public-safety sector.

Standards, eh? Sounds like we're talking about adult supervision again ...

They Hear it on the Scanner

- Dr. Deanna Post, of the Animal Hospital of Dodge City, heard about the Greensburg, Okla. tornado on a police scanner late Friday, May 4.
  "They were calling over the scanner for all available ambulances, and police and response personnel to go to Greensburg," she said. As a veterinarian, she knew that not only would the human victims need help following the storm, but that their animal companions would need help too.
- Firefighters and equipment from five townships responded to a first-alarm fire in New Hampton, New Hampshire.
  David MacDonald, the home's owner, said, "I heard it on the scanner leaving work and I hightailed it right here." Members of his family also heard about the fire on the scanner and came to offer him support.
- In *MT*'s home county, a dispatch was recently heard regarding a two-year-old who had fallen into a swimming pool. A county nurse heard the call on her way home from work and knew it was in her neighborhood. Her assistance in administering CPR was critical, as the ambulance lost precious time by going to a similar address in another part of the county.
- A tow truck driver in Willoughby, Ohio, called in the location of a vehicle driven by suspects in a burglary and felonious assault case.
- We know the scanner brings aid and comfort to someone every day – especially to volunteers and to the families of public safety officers and firefighters.

Some Happy, Others Not

In public safety, few tools are more important than the two-way radio. "It's your lifeline," said Georgia's Hall County Sheriff's Sgt. Steve Mickels. "Everything depends on your ability to communicate. ...It's essentially the key to doing your job."

Hall County's new $16 million 800 MHz digital trunked Motorola system replaces 50-year old technology, supports 64 channels, wipes out a myriad of "blackout" spots where coverage was hit-or-miss in the county, and provides static-free reception.

However, what does *not* please those who monitor radio traffic at home is the fact that the department has chosen to encrypt all communications.

The department defends the decision because, "Criminals can monitor traffic, too."

Mickels said deputies responding to burglary calls have keyed up their radio mics only to hear their voices repeated back to them over police scanners.

MT's thoughts:

- How often has this really happened? Be honest now ...
- If the police are close enough to hear the scanners, they are close enough to nab the burglars, so what good did the scanners do the "criminals"?
- That's also why encryption can be used selectively: When detectives need to be stealthy, they should encrypt.
- By leaving the dispatch channel unencrypted, the public is still informed and can occasionally be helpful, as most police departments can testify. When police lose the eyes and ears of scanner listeners, they not only lose a valuable asset, they may also lose public support as awareness of police activities fades.
- Widening the gap between the public (including the media) and public servants involved in law enforcement causes some to wonder, "What do the police have to hide?"

MISCELLANEOUS

Contractors Take no Quarter

Around the first of the year, the US Defense Department issued a public espionage warning about suspect Canadian coins, thought to possibly contain tracking technology and found "planted" on several US defense contractors.

Much to the embarrassment of the Department, it was simply a new Canadian commemorative coin with a red poppy laid over the maple leaf. The supposed nano-technology was a protective coating to keep the red color from rubbing off. 30 *million* poppy quarters were minted in 2004 to commemorate Canada's 117,000 war dead.

David Rosenthal

QST author, DXpeditioner and photographer David Rosenthal, N6TST, 58, of Ridgecrest, California, died March 16 after a long illness. Rosenthal also wrote a couple of stories for *Monitoring Times* under editor Larry Miller's tenure.

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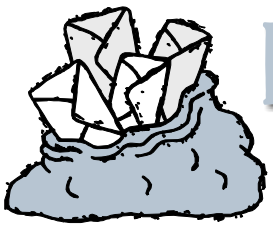


LETTERS TO THE EDITOR

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

Happy monitoring!

- Rachel Baughn, KE4OPD, Editor

Antennas

Hi Clem, from Salt Spring Island, British Columbia, Canada. I was fascinated by your excellent article about antennas. [*Ed note: not sure which article he refers to, perhaps the Feb issue on HF antennas.]* As the crow flies I live about 200-miles at least from Seattle, Washington, and monitor Seattle International Airport frequencies. Some are reasonable, to put it at its best, and the others, ropey.

Reading your comments about random-length antennas, I wondered whether I would be able to improve those signals with a long length of wire? Some amateurs didn't know what I was talking about and another suggested I go for it. Another suggested a directional antenna which I could either purchase or make. Technically, I'm a sackhead. I have a 5-acre lot, on which I can string up what I like.

I am surprised I can get into Seattle, keeping the line of sight theory in mind!

Before coming to Canada to retire I was a daily newspaper reporter, and later BBC news interviewer. Since I was a small boy, listening to SWs never failed to intrigue me. The thing I got fixed on was monitoring deep sea ships even as far as Australia – until the advent of satellites.

Among my clippings is an article written by a guy in the UK who described how he made a small dish in his garden and monitored Inmarsat, and other certain things which he wisely didn't publicize. Why hasn't that become an industry? Perhaps, I can answer my own question and say that here and Canada we can listen on what we like!

Signing off, I would mention that on my bookshelf as I write I have a world map book and on the inside cover I wrote the call signs of the Post Office Radio transmitters in the UK, who connected deep sea passengers ships such as the Capetown Castle or Pretoria Castle, making their way to or from South Africa, with telephone calls. I was based for the London Daily Mail in those days as a Shipping reporter at Southampton, Hampshire, UK., the passengers vessel's home port, where the famous ships such as the United States and America embarked and disembarked passengers.

A mixed letter, but I thought you might like to hear from a Brit, well a bit old in the tooth, but still at it! All the best,

- George.

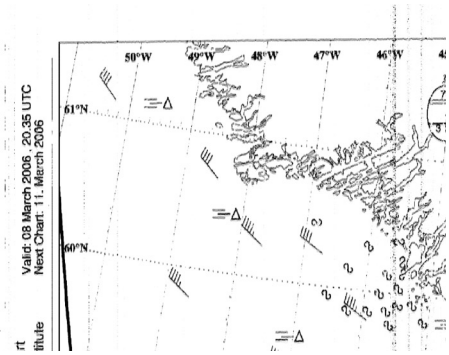
George, Grove has considered putting together an Imarsat monitoring system, and we are looking for someone with the expertise to write an article for MT on what can be heard by hobbyists – or is it all digital now? Any takers? Contact editor@monitoringtimes.com

Interesting article on page 18 of the March issue by Clem Small, his "Confessions of a Radioist." It brought back some memories for me. He makes mention of ISCET, with no explanation of its meaning: International Society of Certified Electronic Technicians. I am a member of that society, proudly holding my certificate issued July 1974, number MN-61.

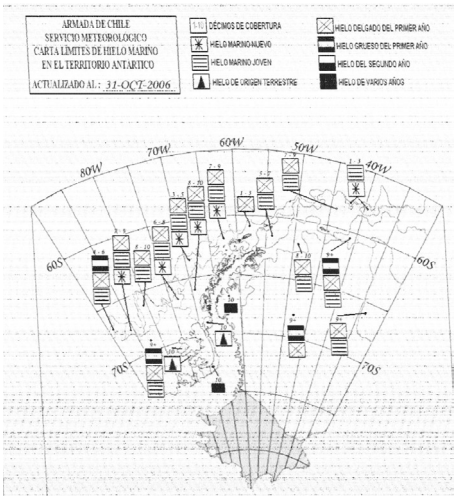
John Ebeling, Bloomington, MN

Keeping Cool

I have in my "library" two fax charts that you might want to use in your column during the summer months to cool the readers. Both charts were intercepted last year around this time (late March).



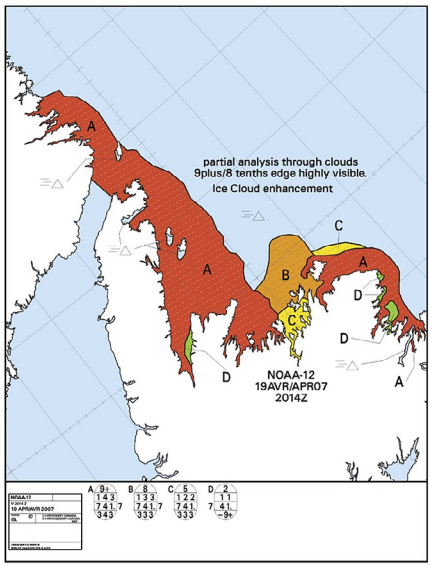
One was sent by the Danish fax station and represents the ice conditions around the southern tip of Greenland. The second one was sent by the Naval Station in Chile and shows the ice conditions around some part of Antarctica.

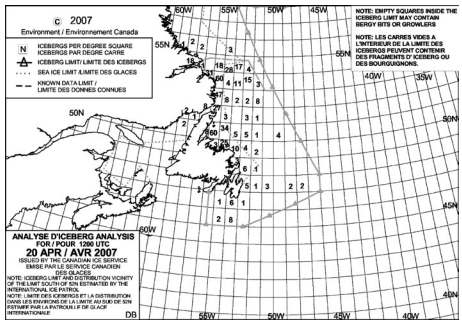


The interesting thing about the Chilean map is that it was sent on 17.1464 MHz which is the one of the frequency also used by CAMSLANT NMG New Orleans. If you listen closely on the freq after NMG has gone off the air you can hear this 1kW station in the distance. (While I am typing this I can hear their signal in the background, but too weak to copy).

And one month later in late April, Jacques sent two more maps produced by the Canadian Ice Centre. One shows an iceberg map in which one square contained 60 icebergs!

The other is a view of the ice field that is keeping over 100 fishing vessels from reaching port. This has been ongoing for the past 9 days and there are three icebreakers trying to get them unstuck. It is so bad that two icebreakers got stuck in the last few days and they had to call for an Arctic Icebreaker to help.





Some small vessels have been pushed out of the water and are resting on the ice!!

Jacques d'Avignon

Surge and Lightning Protectors

In "Monitoring Times", 2007 April (volume 26, number 4), page 20, Ken Reitz "Stormy Weather, Help from Readers & Tracking Those Elusive IRCs" under "The Least You Can Do", suggest using a GFI (actually, called GFCI, Ground Fault Circuit Interrupter these days) in order to protect appliances where you have no room for a "surge protector" outlet strip.

I suggest a whole house surge protector. These probably cost US$500 to US$1500 when installation is included. Replacement of the guts after a big hit on the power line on the

other site of the pole transformer is probably around $200. (If you get you get hit directly or on your side of the pole transformer everything is toast, but the house surge protectors can probably absorb 10 times the jolt that any of the power strip things will.)

Mark Fineman

Certainly appreciate your current article in *MT*. On Sun 11 Mar 07 we had a VERY CLOSE hit by lightning. Lost two multi-line phones, a fax machine, a KVM-switch for the pc's, the outside sensor for the remote thermometer also got fried.

The good news – and you may want to 'store' this – the modems on the pc's were protected by an APC Protectnet Telecom 2 line (PTEL2). While the PTEL2 itself also got fried, APC has already provided the replacement (lifetime warranty). The replacement is installed/in service. This is one of few phone-line protectors that protects two lines?! TrippLite also makes a 2-line phone protector. There may be more on the market, these are the only two I've found. The damage this time was via phone lines. The big APC UPS (Back UPS Pro 650) 'kept on ticking'....

The APC website, if you can find the page, has a Very Good map of the US with average days of lightning per calendar year. It's still there, but very difficult to find. When I called about the lost PTEL2, I 'beefed' about how hard that page is to find – considering how useful that information is?!

Sounds like I may have to get busy replacing standard outlets with GFI-outlets? I figure I can do that without involving an electrician – Large gauge, solid core wire to 'ground'? Number 12 large enough for the 'storm connection'?

There were three houses hit and burned that same night here in town.

Other suggestions?

Morgan Little

Ken,

I just reread your article in *MT* reference lightning protection. Please explain HOW a GFI is going to help in a lightning event? The basic GFI is made to detect a current differential between the neutral and hot lead from your AC power source. When this level exceeds about 5 Ma. , the unit opens the hot lead, thus rendering the circuit harmless to humans who come in contact with the electrical line by mistake.

There is no provision in the item for surge detection...thus no lightning protection. A third wire ground is not even needed for it to function.

Also it should be noted that GFI equipment can cause significant interference to SW reception. Please explain your theory before operators unplug their equipment for good due to self created QRM.

73 de KF6GNI, John Butler...
Novato,Ca.

Hi John -

Thanks for writing. You're exactly right about the GFI [not providing] lightning protection.

But, your problem with RF induced interference caused by GFIs is not correct. I called the Engineering Manager at our local power company and he said he had never heard of any RF interference caused by GFI outlets or circuit breakers. He said that if there is interference on such a circuit it is likely caused by connections associated with a GFI device which simply needed to be tightened. My own experience with nearly 30 years of GFI outlets and circuits in the house with innumerable radios tuned to all parts of the RF spectrum is that I have never experienced any such interference and, in fact, enjoy extremely low noise across all bands.

Thanks again for writing, 73!

Ken

Public Safety Interoperability 2007

By Larry Van Horn, N5FPW
Monitoring Times Assistant Editor

"Communication is critical to direct emergency response. Emergency responders must be able to talk to one another. You can't coordinate if you can't communicate. What we experienced in Katrina was not a failure to communicate, but an inability to communicate."

– Louisiana Governor Kathleen Babineaux Blanco

Until the disasters of 9/11 and Katrina/Rita, interoperability among public safety agencies wasn't on many people's radar. And despite the widespread media attention that the interoperability communications crisis received after 9/11 and the disastrous 2005 hurricane season, most public safety agencies in the Gulf and in a lot of other states remain unable to effectively communicate with one another both during "routine" emergencies and major disasters.

The most common reason given by politicians and some in the media is the lack of spectrum space (*aka* frequencies). But there is much more to this story than just the lack of frequencies.

There are five key issues underlying the current status of interoperability among public safety agencies in this country:

- Incompatible and aging communications equipment
- Limited and fragmented funding
- Limited and fragmented planning
- A lack of coordination and cooperation, and
- Inadequate and fragmented radio spectrum

What is Interoperability?

Interoperability means that public safety agencies – including law enforcement, firefighters, and emergency medical services – can talk to one another via radio communication systems exchanging voice and/or data on demand, in real time, during an event. The current state of interoperability varies from state to state.

However, most states are still operating under temporary, patchwork solutions that often do not accommodate all responders and may require the cumbersome use of more than one radio during an incident.

Just as different computer operating systems will not work together, or an AM receiver will not accept an FM signal, radio systems operating on different equipment and frequencies cannot communicate with one another. Moreover, some newer digital radio systems operate on unique proprietary software that prevents the exchange of voice or data communications even on the same radio frequency.

More than half of the states are in the development stages of interoperability: that is, "crafting strategic plans for system design, engineering, and implementation."

The biggest problem in all this is there is no responsible supervision by the government agencies, specifically the Department of Homeland Security (DHS). This major government agency is dispensing the taxpayer's money and requiring the states to actually spend the money on statewide interoperability. Because of a lack of leadership, the federal government and some states have wasted millions of dollars, and more than half of this country is still not even close to interoperability within their own states. As a famous Civil War general once said, "You can't lead from behind."

If we are truly committed to interoperability, the need for a coordinating body providing leadership is clear. However, the reality is that many public safety agencies are reluctant to cede management and control of their communications systems, due to disparate agency missions and jurisdictional responsibilities. Interoperability requires shared management, control, policies, and procedures. While it may appear to be a technical issue, interoperability has more to do with establishing trust and buy-in among stakeholders.

Another problem that I see in establishing true interoperability is what I call the "piling on" effect. Planners are trying to do too much with the systems we are creating. Go back and look at the basic definition of interoperability again. We want our first responders to be able to talk to each other, communicate.

A wise man who is deeply involved in the interop battles told me in a recent interview, "true interoperability is 80 percent people and procedures, and 20 percent technology." You can build the greatest monument to radio communications in the world, but if no one can operate it, it is absolutely useless when we get in a crisis situation. And true interoperability is still people communicating with other people.

Statewide Wireless Systems

In compiling information for this article we consulted a wide variety of public domain sources, looking for any planning or existing statewide wireless systems that can be used for interoperability. We cover all 50 states in our survey.

The callsign in parenthesis is the call which will be associated with the state's 700 MHz system. In future articles in *MT* we will talk more about the new 700 MHz band, and state plans and operating systems for it.

The monetary amount next to the callsign is the total of DHS Interop grant money the state has received between fiscal year's 2003 through 2005. The source for this information came from the DHS Interoperable Grants (May 2006) publication. You can see that publication on the *MT* website at **www.monitoringtimes.com/html/State_Interoperable_Communications.pdf**

At the end of this article you will find, for the very first time in the hobby press, a complete list of the new 700 MHz channels and frequencies. For my complete list of Interop/Mutual Aid and other special nationwide frequencies used by local, county, state and federal agencies, turn to this month's *MT Help Desk* column on page 23.

ALABAMA (WPTZ783 - $27,199,790.62)

This state is one of a handful that has submitted a plan for 700 MHz, but at the present, there are no announced plans for a future statewide system. There is an 800 MHz EDACS network supplied by the Southern Company (Southern LINC) using the iDEN Standard that has a few state, county and local users. There is a patchwork of Motorola, EDACS and LTR trunk radios systems used by public safety agencies in this state.

By and large Alabama remains largely uncoordinated. This proved to be a major issue when state agencies arriving into locally affected disaster areas were unable to communicate directly with local first responders. This situation was highlighted in the press earlier

this year when there was a major outbreak of tornadoes in the southeastern portion of the state.

There is only one confirmed statewide mutual aid net (155.010 MHz) that is known as the "State Net."

ALASKA (WPTZ767 - $20,215,258.00)

Alaska is currently building a statewide P25 VHF trunk radio system for state, local, and some federal/military agencies. It is known as the Alaska Land Mobile Radio (ALMR) system. Any radio connected into the ALMR system can communicate to any other radio on the system, from Juneau to Anchorage, to Seward, to Fairbanks, or to Valdez where the Trans Alaska Pipeline ends at the Marine Terminal. Readers can lean more about the system at **www.ak-prepared.com/almr/default.htm**

ARIZONA (WPTZ765 - $21,370,246.47)

The Arizona Emergency Radio System (AERS) Project consists of the installation of a four radio suite (VHF-Low, VHF-High, UHF, 800) into 45 remote Department of Public Safety (DPS) sites throughout Arizona that provide access to a mutual-aid channel for interagency communications. In addition, reports indicate some of the following frequencies are being used statewide: 39.180, 154.280 (Fire Mutual Aid), and 155.4750 MHz. There is a mix of Motorola and LTR trunk systems used by public safety agencies in this state.

ARKANSAS (WPTZ801 - $40,099,741.98)

Arkansas has completed Phase I of the Arkansas Wireless Information Network (AWIN) program. The results of Phase I allow users at both the state and local levels of government to operate on a statewide, interoperable, digital communications network, utilizing the Project 25 platform in the 700/800 MHz frequency bands. AWIN will allow state, local command and control personnel to communicate on one system. You can get more information on the AWIN system at **www.awin.arkansas.gov/**.

CALIFORNIA (WPTZ774 - $161,068,141.87)

At present, there is no statewide system in California. There are some statewide and regional channels that have been set aside for interoperability and mutual aid support. We have heard some rumblings that a statewide system is being studied that may use one of the M/A-COM proprietary digital protocols.

Southern California (Region 5) has submitted and received approval by the FCC for their 700 MHz plan. There is a mix of Motorola, EDACS and LTR trunk systems in use by public safety agencies in this state.

COLORADO (WPTZ761 - $44,674,791.50)

Colorado has a statewide 700/800 MHz Project 25 Standard system known as Digital trunked Radio System (DTRS). You can learn more details at **www.colorado.gov/dtr/**.

CONNECTICUT (WPTZ807 - $26,249,780.00)

The Connecticut State Police uses a Motorola Type II SmartZone trunk system.

It is being reported that the state has initiated the development of a statewide telecommunications infrastructure and protocol that will allow timely, efficient and cost effective communications for all public safety and public healthcare agencies. There is a mix of Motorola, EDACS and LTR trunk systems used by public safety agencies in this state.

DELAWARE (WPTZ791 - $11,851,670.68)

On October 15, 1993, the State of Delaware purchased a state-of-the-art, P25 digital 800 MHz trunked radio system to provide statewide communications for all state, county and municipal government agencies, including fire and emergency medical services. The system is sub-divided into three geographic regions which correspond to the three counties of the State.

You can learn more about this system at **www.state.de.us/pscomm/800mhz_radio_system.htm**

DISTRICT OF COLUMBIA (WPTZ766 - $45,580,157.00)

All first responders in the National Capitol Region (NCR) can communicate either by direct or patched communications. A tri-band radio network and voice gateways are in place that also increase radio interoperability. The Washington Area Warning Alert System (WAWAS) system is in place. This is a 24-hour continuous private wire landline telephone system. We have heard rumors that a 700 MHz is being studied for the NCR. There is a mix of Motorola, EDACS and LTR trunk systems used by government public safety agencies in the District.

FLORIDA (WPTZ787 - $55,728,209.00)

The new statewide law enforcement system, known as SLER (Statewide Law Enforcement Radio System), is a M/A-COM DES Provoice and ESK with Extended Addressing trunk system. The system is completely built out for both analog and digital operation. They are using the digital portion full time, which is Provoice with DES encryption. They have the ability to rekey the radios over the air with the use of OTAR and the ability to program the radio remotely over the air as well. This system is completely IP-based, the whole way from console to base station. It is also the same system that New Orleans was using at the time Katrina hit.

The drawback to Florida's SLERS system is that it is a state law enforcement network, linking together only state agencies. Local departments still rely upon their own, unique radio communications systems. Cost is prohibiting local communities from upgrading to the statewide system. As a result, state agencies arriving into locally effected areas may be unable to communicate directly with local first responders, compromising the ability to communicate and, by extension, an effective emergency response.

This is exactly what happened in May during the emergency associated with the wildfires in northern Florida. Given its location and population, Florida remains an area of concern, especially if a major disaster hits the state involving local and out of state federal agencies.

There is a mix of Motorola, EDACS and LTR trunk systems used by public safety agencies in this state.

GEORGIA (WPTZ768 - $69,146,139.64)

The state has undertaken a project that will increase communications abilities and create a statewide interoperable system by 2010. It is known as the Georgia Emergency Wireless Interoperable Network (GEWIN). So far the trunk systems that are a part of GEWIN are P25 800 MHz systems. The plan will start with the population centers and systematically incorporate surrounding areas.

There is a mix of Motorola and EDACS trunk systems (including an Open Sky system) used by public safety agencies in this state.

HAWAII (WPTZ784 - $15,961,072.00)

The city/county of Honolulu, Maui, Kauai, and Hilo have all been linked together using a wireless interoperability system that uses a mixed mode (Analog/AEGIS) EDACS trunk system. They are considering expanding their statewide system using 700 MHz.

IDAHO (WPTZ800 - $13,605,500.66)

Idaho is in the first stage of implementing their new statewide trunked radio system known as the Idaho Interoperable Mutual Aid Radio System (IIMARS). The first two counties to come online were Bannock and Ada Counties. Construction is well underway in Bingham and Bonneville Counties. When finished, IIMARS will connect all cities, counties, federal, and state agencies together on one 700 MHz P25 digital trunk system.

***ILLINOIS* (WPTZ798 - $124,167,485.94)**

The state has installed a statewide P25 800 MHz system known as STARCOM21. This system has 800 MHz radios at public safety agencies throughout the state. Radios have been offered to every police, fire, emergency management, public health and other public safety agencies throughout the state. The radios provide an interoperable communications link to the State EOC and are the same statewide radio system that Illinois State Police uses. You can read more about this system at **https://www.motorola.com/governmentandenterprise/northamerica/en-us/Public/Functions/microsite/microsite.aspx?site=en_US/microsites/starcom_statewide**.

***INDIANA* (WPTZ769 - $29,271,551.18)**

Project Hoosier SAFE-T (Safety Acting for Everyone - Together) is an innovative approach in the development of a statewide interoperable system. SAFE-T is a mixed mode 800 MHz interoperable, wireless public safety communication system for Indiana local, state, and federal first responders and public safety officials. Construction of the remaining sites for Project Hoosier SAFE-T is underway, with all construction scheduled to be completed by the time you read this article. Coverage testing and final system acceptance is scheduled to be completed sometime this summer.

There are more than 28,000 radios from 700 agencies in 87 Indiana counties on this system. This includes first responders in 55 counties, 16 state agencies (including 2500 state Department of Transportation workers and 2500 Corrections Officers); and three federal agencies. Project Hoosier SAFE-T is building and maintaining the system backbone: towers, antennas, shelters, generators, transmitters, base stations, cabling and frequencies.

Participating agencies provide their own user equipment, including dispatch consoles, radios and computers, which they can buy at a 20-25% discount through the state. Participation is voluntary and agencies pay no user fees. The goal is to make interoperable communications affordable and available for every community. You can get more information at **www.ai.org/ipsc/safe-t/**.

***IOWA* (WPTZ782 - $15,847,112.19)**

Based on information in the public domain, we see no indication of any statewide system being planned or implemented as of presstime. There is a mix of Motorola, EDACS, and LTR trunk systems used by public safety agencies in this state.

***KANSAS* (WPTZ799 - $19,643,072.59)**

Kansas is building a statewide P25 800 MHz interoperable communications system. The system is known as the Kansas Statewide Interoperable Communication System (KSICS). Any communities which will not be covered by this 800 MHz system will be connected to the interoperable communications system through ACU1000's and similar devices, which will allow multiple agencies with diverse frequencies to communicate on common channels. The State has installed these devices on established communications towers operated by the Kansas Department of Transportation. Additionally, numerous portable and handheld radios have been purchased to build out the new system and replace aging equipment.

***KENTUCKY* (WPTZ806 - $49,979,944.11)**

The Kentucky Mutual Aid and Interoperability Initiative (KYMAI) is a statewide mutual aid system maintained by the Kentucky State Police for use by all first responder agencies in the Commonwealth. It is a four pronged system using mostly existing frequencies in the three bands (150, 450 and 800 MHz) with bridging between the 150 and 450 MHz systems as needed by the various KSP Posts across the Commonwealth. Go to **www.kwiec.ky.gov/interoperability/mutualaid.htm** for a basic explanation of the plan.

***LOUISIANA* (WPTZ793 - $53,742,101.54)**

Since 1999, the State of Louisiana has received $135,065,086 in total federal awards from the Department of Homeland Security's (DHS) Office of Domestic Preparedness for communications systems. Of this, $106,873,872 was allocated for equipment purchases, but only $48,213,765 (45%) had actually been expended. Of the $135,065,086 received from DHS, interoperability expenditures totaled $15,906,999, or just 12% of the total awards received. The majority of that money went into their statewide 800 MHz state police trunk system.

Wind the clock forward to August/September 2005. Hurricanes Katrina and Rita confirmed the need for a single network, multiple zone redundant architecture with an expanded capacity to provide reliable and survivable communications to the Louisiana emergency response community.

Louisiana is installing an integrated P25 communications platform using the 700/800 MHz bands. This system provides several layers of redundancy and increased capacity to the current communications capability of the state network. These measures will provide for greater interoperability among the State's emergency response community, further augmented by implementing bridging capabilities among local networks and the state network. And, it will provide a system which permits communications support for responders from other jurisdictions when in a disaster area. The focus will first be on coastal parishes of Louisiana reaching up to the I-10/I-12 corridor.

Immediately following landfall of Hurricane Katrina, Louisiana officials met with FEMA in an effort to coordinate the emergency implementation of the 700 MHz communications network. In response, FEMA issued a purchase order to Motorola for $15.9 million to repair and augment the current infrastructure in the affected area. This included the construction and upgrade of 19 communications tower sites in southeast Louisiana. The project consists of an Astro25 700MHz, 19 site network providing interoperable voice communications for sixteen parishes. Additionally, FEMA funded a $5 million purchase of mobile and portable radios for St. Bernard and Plaquemines Parishes that utilizes this new state 700 MHz communications system.

The UASI Region 1 (New Orleans metro area), utilizing $16 million in DHS/COPS grant funding, acquired an APCO Project 25 compliant dual mode 700/800 MHz digital trunked system, which is a zone within the single system multi-zone statewide 700 MHz system. This system replaces the M/A-COM Provoice system which was scrapped after the Katrina disaster. This architecture will provide seamless, interoperable roaming within the entire state system. Additionally, the Louisiana legislature appropriated $2.8 million to the Louisiana State Police to remediate nine additional sites in southwest Louisiana.

To establish levels of interoperability between disparate communications systems, Louisiana State Police has purchased eight ACU1000 devices (two are portable). These devices have been installed at the LSP Troops located in Shreveport, New Orleans, Lake Charles, Lafayette, Grey and Covington, and will allow multiple agencies to communicate with each other on a common channel. You can learn more about the new State 700 MHz system at **http://siec.louisiana.gov/index.html**.

Most of the local systems are operating

under FCC STAs (Special Temporary Authority) and at presstime there is no 700 MHz Region 18 Plan. This could present some issues in the future as other states and Louisiana coordinate frequencies in their border areas.

MAINE (WPTZ810 - $29,384,818.64)

Based on information in the public domain, we see no indication of any statewide system being planned or implemented as of presstime. The state uses VHF fire and law enforcement mutual aid networks as noted below.

Fire Mutual Aid Networks (Used by all fire departments throughout the state for interoperability and fireground communications.)

33.700 Coastal Fire Network - Primary
154.190 County Fire Chief's Association
154.250 County Fire Chief's Association
154.265 Fireground 1
154.280 Fireground 2
154.295 Fireground 3
154.310 Intercity Fire - Statewide Calling

Law Enforcement Regional Networks - Used for statewide mutual aid coordination between county sheriffs, municipal police, and state law enforcement agencies. (All frequencies use 192.8 Hz PLs)

154.800 Region 6 – Penobscot
154.995 Region 8 – Washington
155.025 Region 10 – Piscataquis
155.055 Region 4 – Reported off the air
155.415 Region 9 – Aroostock
155.430 Region 7 – Franklin/Kennebec/Somerset
155.460 Region 3 – Lincoln/Sagadahoc
155.535 Region 2 – Cumberland
155.550 Region 5 – Androscoggin/Oxford
155.580 Region 1 – York

MARYLAND (WPTZ805 - $33,605,961.00)

Based on information in the public domain, we see no indication of any statewide system being planned or implemented as of presstime. The public safety agencies do make use of the various VHF/UHF nationwide mutual aid channels.

MASSACHUSETTS (WPTZ789 - $44,677,306.04)

The Massachusetts State Police operate a Motorola 800 MHz mixed mode trunk radio system that has various state agencies and some local public safety agencies using it.

MICHIGAN (WPTZ773 - $44,749,593.39)

In 1994, Michigan began the construction of an all-weather digital statewide interoperable 2-way mobile radio communication system for use by Michigan's public safety community. Known as the Michigan Public Safety Communication System (MPSCS), the system was constructed to support the communication needs of all public safety agencies in the state wishing to join MPSCS as a member. You can learn more about it on their website at **www.michigan.gov/mpscs**.

MPSCS is an 800 MHz P25 trunk radio system. MPSCS is supported by a microwave backbone that controls traffic on the system and also supports a sophisticated alarm and control system. MPSCS' present design capacity will support 64,000 radio IDs and 16,000 talkgroups.

MPSCS has the ability to integrate with other 800 MHz Motorola systems (thereby expanding its capacity within the State) and to support data sharing. Of course, that integration requires that the system being integrated has to utilize the same system as MPSCS, not just the same frequency band.

A large population center just northwest of Detroit, Oakland County, is in the process of building a M/A-COM designed proprietary digital (Open Sky) trunk communication system. Oakland's communication system is intended to provide interoperable public safety communications for all public safety agencies in the County, but they won't be interoperable with the state.

MINNESOTA (WPTZ762 - $72,787,099.89)

The official name for the Minnesota statewide system is the Allied Radio Matrix for Emergency Response (ARMER). The ARMER P25 800 MHz trunk radio system will be expanded in multiple phases across the state over the next several years. ARMER is designed to provide statewide radio coverage to state, county, city public safety officers, and government workers. The system will provide radio coverage to mobile radio users in 95 percent of the state, and on-the-street portable radio users in 85 to 90 percent of the state. Learn more on the web at **www.srb.state.mn.us/**.

MISSISSIPPI (WPTZ808 - $12,839,428.83)

Up until the aftermath of Katrina, this state had nothing but plans on the drawing board and a mess across the state for interoperability. In 2005, the state senate passed a bill directing state agencies to build the Mississippi Wireless Interoperable Network (MWIN), a 700 MHz Project 25 standard trunk radio system. This system is supposed to be used by all of Mississippi's public safety agencies with county and municipality subscription possible.

As is usually the case, a commission was formed, and their chief concern was not technology, but cost and funding. What is even more disappointing is that as late as last year, the commission didn't even know what the existing communications structure was in their state.

Wind the clock forward to the Spring of 2007, when the state's two Senators got federal funding through FEMA to build the first six sites (covering Hancock, Harrison, Jackson, Pearl River, Pike, and Stone counties) for the MWIN system. Using 700 MHz equipment on loan from FEMA, they want the system operational by the start of hurricane season. There is still no 700 MHz plan for the state and at presstime there had been no coordination of this system with neighbors Louisiana or Alabama.

Only time will tell if this system will get off the ground in time to meet the dangers posed by the 2007 hurricane season.

MISSOURI (WPTZ785 - $54,580,039.54)

At present, Missouri uses VHF/UHF mutual aid frequencies for interoperability. There is a plan to go 700 MHz, but the state seems to be concentrating more on making their nine Missouri Homeland Security Regions interoperable. No statewide system currently exists.

MONTANA (WPTZ809 - $29,070,588.36)

The Montana State-Wide Interoperability Communication Project, a VHF P25 conventional/trunk system, started construction in 2005. This project will provide interoperable communications through three key elements:

· Trunked/conventional VHF radio system connecting local, state, tribal and federal response agencies across Montana.

· An integrated mobile data system supporting field transmission of data to responders.

· Statewide enhanced 9-1-1 providing wire line and wireless connection from the public to the response community.

NEBRASKA (WPTZ786 - $36,195,265.00)

Nebraska is trying to achieve communication interoperability by first establishing regional communication systems and then by integrating those systems to provide statewide interoperability. Nebraska has allocated $42 million in grant funds from FY99-FY05 towards interoperable communications. This amount equals 66.82% of Nebraska's overall funding, with 83% of FY04 funds and 85% of FY05 funds dedicated to interoperable communications. Projects include the replacement and updating of aging communications equipment, communication tower assessments, and a frequency study.

NEVADA (WPUC245 - $24,600,722.74)

The state is putting up a statewide 800 MHz Analog EDACS system called the Nevada Shared Radio System (NSRS). The City of Las Vegas uses an EDACS Open Sky trunk system.

NEW HAMPSHIRE (WPTZ790 - $21,026,648.45)

Based on information in the public domain, we see no indication of any statewide system

being implemented as of presstime. There is some talk about fire/EMS agencies putting up a statewide system similar to the LAWNET system. Not much more is known at this point.

***NEW JERSEY* (WPTZ794 - $35,835,577.34)**

The New Jersey Interoperability Communications System (NJICS) is a statewide communication system comprised of a series of specific interoperable communications assets established in each of New Jersey's five regions. These assets include radio cache radios; interconnect switches; tactical interoperability channels and region-wide interoperability channels. The infrastructure for the NJICS is housed at county and local sites in the individual regions.

***NEW MEXICO* (WPTZ778 - $15,778,192.31)**

Based on information in the public domain, we see no indication of any statewide system being planned or implemented as of presstime. The public safety agencies do use the various VHF/UHF nationwide mutual aid channels.

***NEW YORK* (WPTZ779 - $145,505,624.00)**

Recently, the State of New York awarded a contract for the Statewide Wireless Network to M/A-COM, and they will use the OpenSky format, Network First, and SAFECOM P25 technologies. Complete details can be found at **www.oft.state.ny.us/oft/swnindex.htm**

***NORTH CAROLINA* (WPTZ771 - $76,159,866.09)**

The state is building an 800 MHz mixed mode trunk system known as Voice Interoperability Plan for Emergency Responders (VIPER) system. It is supposed to be fully operational Statewide by FY 2009. The ambitious project is supposed to integrate communications with state and local entities and is being managed by the North Carolina State Patrol. Many local areas have not signed on to be a part of this system.

***NORTH DAKOTA* (WPTZ763 - $21,629,316.11)**

Based on information in the public domain, we see no indication of any statewide system being planned or implemented as of presstime. The public safety agencies do use the various VHF/UHF nationwide mutual aid channels.

***OHIO* (WPTZ770 - $74,004,815.87)**

Ohio has implemented the Multi-Agency Radio Communication System (MARCS) within the state. It currently provides 800 MHz P25 voice and data communications to first responders and public safety personnel within 14 state agencies. Also, interfaced into the system are all Ohio County Sheriffs, emergency management agencies/Emergency Operations Centers (EOC), and hospitals and health departments. The MARCS is open to all who are interested, with over 600 local government agencies currently interfaced into the system.

***OKLAHOMA* (WPTZ803 - $30,600,993.40)**

The state has proposed building a 800 MHz P25 system along the Interstate 44 corridor, but nothing has been seen on this recently.

***OREGON* (WPTZ796 - $53,413,922.10)**

Oregon State officials suffered sticker shock in May when they were presented with a $665 million proposal to build a statewide radio network. The system is supposed to be a 700 MHz P25 network, but the ambitious program is currently on hold. (See this month's *Scanner Report* for more details)

***PENNSYLVANIA* (WPTZ795 - $25,511,673.39)**

Pennsylvania is completing the roll-out of a statewide voice and data interoperability system across the state's 800 MHz Open Sky Public Safety Radio Network. This network connects key state agency headquarters and field operations, the 67 county emergency managers and 9-1-1 centers. It also includes digital voice units at the county 9-1-1 centers to allow legacy first responder radio systems to communicate with state agencies and neighboring county emergency operations centers. Learn more about this system at **www.radio.state.pa.us/portal/server.pt?**.

***RHODE ISLAND* (WPTZ792 - $15,071,655.00)**

The state has built the Rhode Island Tactical Emergency Radio Network (RITERN) 800 MHz Project 25 Standard that is in the testing phase at presstime.

***SOUTH CAROLINA* (WPTZ777 - $17,646,755.00)**

The state has built an 800 MHz mixed mode trunk system known as the Palmetto 800. Learn more about this system at **www.cio.sc.gov/cioContent.asp?pageID=756&menuID=411** or see the July 2005 issue of *Monitoring Times – Patrolling the Palmetto 800 Trunk System*.

***SOUTH DAKOTA* (WPTZ802 - $7,668,491.00)**

Based on information in the public domain, we see no indication of any statewide system being planned or implemented as of presstime.

***TENNESSEE* (WPTZ797 - $34,569,315.11)**

Based on information in the public domain, we see no indication of any statewide system being planned or implemented as of presstime. The public safety agencies do use the various VHF/UHF nationwide mutual aid channels.

***TEXAS* (WPTZ776 - $136,829,703.61)**

Currently there is no statewide trunk system planned for Texas. According to some government sources the state is too big in geographic area and cost would be prohibitive. The Texas State Interoperability Executive

Committee recently released their Texas Interoperability Channel Plan and it is available at **http://tsiec.region49.org/**.

***UTAH* (WPTZ788 - $21,526,395.00)**

Based on information in the public domain, we see no indication of any statewide system being planned or implemented as of presstime.

***VERMONT* (WPTZ760 - $9,827,516.52)**

Approximately 90 percent of all local and State law enforcement agencies in Vermont can communicate by "flipping" a switch on their mobile radios. Vermont State Police (VSP) have the ability to communicate with emergency medical and fire services from their cruisers and four dispatch centers. Over 50 percent of these first responders have the ability to communicate with the VSP dispatch centers.

***VIRGINIA* (WPTZ775 - $33,455,860.34)**

The state is rolling out a mixed band P25 trunk system known as STARS (Statewide Agency Radio System).

***WASHINGTON* (WPTZ781 - $37,861,510.16)**

Based on information in the public domain, we see no indication of any statewide system being planned or implemented as of presstime.

***WEST VIRGINIA* (WPTZ804 - $25,373,494.20)**

West Virginia has implemented a statewide interoperable communications project using a UHF (453/460 MHz) P25 digital trunked radio system which utilizes a microwave communications backbone within the State. It is known as the West Virginia Interoperability Radio Project.

***WISCONSIN* (WPTZ772 - $37,178,598.99)**

Based on information in the public domain, we see no indication of any statewide system being planned or implemented as of presstime. The state makes extensive use of regional VHF/UHF mutual aid networks.

***WYOMING* (WPTZ780 - $25,373,494.20)**

The WyoLink Statewide Interoperability Matrix System is a VHF Project 25 Standard. You can find more information about it at **http://wyolink.state.wy.us/**

700 MHZ INTEROP CHANNELS/FREQUENCIES

NATIONWIDE CALLING

Narrowband Base Channels

Ch	6.25 kHz center	12.5 kHz center	25 kHz center
39	764.240625	764.24375	
40	764.246875		
681	774.253125	774.25625	774.26250
682	774.259375		

Narrowband Mobile Channels

Ch	6.25 kHz center	12.5 kHz center	25 kHz center
999	794.2406250	794.24375	
1000	794.2468750		
1641	804.2531250	804.25625	804.26250
1642	804.2593750		

INTEROP CHANNELS

Ch	6.25 kHz center	12.5 kHz center
23	764.140625	764.14375
24	764.146875	
63	764.390625	764.39375
64	764.396875	
79	764.490625	764.49375
80	764.496875	
103	764.640625	764.64375
104	764.646875	
119	764.740625	764.74375
120	764.746875	
143	764.890625	764.89375
144	764.896875	
159	764.990625	764.99375
160	764.996875	
183	765.140625	765.14375
184	765.146875	
199	765.240625	765.24375
200	765.246875	
223	765.390625	765.39375
224	765.396875	
239	765.490625	765.49375
240	765.496875	
263	765.640625	765.64375
264	765.646875	
303	765.890625	765.89375
304	765.896875	
319	765.990625	765.99375
320	765.996875	

Ch	6.25 kHz center	12.5 kHz center	25 kHz center
641	774.003125	774.00625	774.01250
642	774.009375		
697	774.353125	774.35625	774.36250
698	774.359375		
721	774.503125	774.50625	774.51250
722	774.509375		
761	774.753125	774.75625	774.76250
762	774.759375		
777	774.853125	774.85625	774.86250
778	774.859375		
801	775.003125	775.00625	775.01250
802	775.009375		
841	775.253125	775.25625	775.26250
842	775.259375		
857	775.353125	775.35625	775.36250
858	775.359375		
881	775.503125	775.50625	775.51250
882	775.509375		
937	775.853125	775.85625	775.86250
938	775.859375		

Ch	6.25 kHz center	12.5 kHz center
983	794.1406250	794.14375
984	794.1468750	
1023	794.3906250	794.39375
1024	794.3968750	
1039	794.4906250	794.49375
1040	794.4968750	
1063	794.6406250	794.64375
1064	794.6468750	
1079	794.7406250	794.74375
1080	794.7468750	
1103	794.8906250	794.89375
1104	794.8968750	
1119	794.9906250	794.99375
1120	794.9968750	
1143	795.1406250	795.14375
1144	795.1468750	
1159	795.2406250	795.24375
1160	795.2468750	
1183	795.3906250	795.39375
1184	795.3968750	
1199	795.4906250	795.49375
1200	795.4968750	
1223	795.6406250	795.64375
1224	795.6468750	
1263	795.8906250	795.89375
1264	795.8968750	
1279	795.9906250	795.99375
1280	795.9968750	

Ch	6.25 kHz center	12.5 kHz center	25 kHz center
1601	804.0031250	804.00625	804.01250
1602	804.0093750		
1657	804.3531250	804.35625	804.36250
1658	804.3593750		
1681	804.5031250	804.50625	804.51250
1682	804.5093750		
1721	804.7531250	804.75625	804.76250
1722	804.7593750		
1737	804.8531250	804.85625	804.86250
1738	804.8593750		
1761	805.0031250	805.00625	805.01250
1762	805.0093750		
1801	805.2531250	805.25625	805.26250
1802	805.2593750		
1817	805.3531250	805.35625	805.36250
1818	805.3593750		
1841	805.5031250	805.50625	805.51250
1842	805.5093750		
1897	805.8531250	805.85625	805.86250
1898	805.8593750		

INTEROP LOW SPEED DATA

Ch	6.25 kHz center	12.5 kHz center	25 kHz center
279	765.740625	765.74375	
280	765.746875		
921	775.753125	775.75625	775.76250
922	775.759375		
1239	795.7406250	795.74375	
1240	795.7468750		
1881	805.7531250	805.75625	805.76250
1882	805.7593750		

Whatever Happened to Rebanding?

By Dan Veeneman

Imagine yourself in a room with one other adult and a dozen children. You would like to have a conversation with the adult, but the children are all playing their own game, running around and shouting according to rules you don't understand. The noise and mayhem from the children interfere with your ability to carry on a reasonable conversation. Who let all these children into the room, anyway?!

Over the past decade, this is the predicament in which an increasing number of public safety agencies found themselves. Due to interference from adjacent radio services, many public safety agencies operating equipment in the 800 MHz frequency band found it difficult to maintain safe and efficient communication throughout their service area. Beginning in the late 1990s, police officers and firefighters in metropolitan areas would find "dead zones" and experience radio dropouts that were eventually traced to increased activity from commercial mobile radio service (CMRS) operators. The most common source of interference was found to emanate from a provider called Nextel. (Nextel and Sprint merged in 2005 to become Sprint Nextel.)

In many cases of suspected or proven interference, whether in the 800 MHz band or elsewhere, the usual process was for the party suffering from interference to work with the interfering party and come up with a "technical fix" to the problem. Re-orienting antennas, re-tuning transmitters, and adding filters were all considered potential methods of reducing or eliminating interference.

As reports of interference between commercial service providers and public safety agencies grew, these technical changes were the only short-term fix available. In 2000 a group of radio engineers produced a *Best Practices Guide*, essentially a compilation of advice, recommendations, and suggested changes that affected operators could use to reduce interference problems.

However, as Nextel and other commercial providers continued to grow, the interference problem became so widespread and so pervasive that corrective action on a case-by-case was no longer successful. Something more comprehensive would have to be done.

How Did This Happen?

In the United States, the Federal Communications Commission (FCC) is responsible for allocating non-governmental frequencies. Over the years, the FCC has used a number of means to determine who should be able to use which frequencies. The spectrum used for commercial radio and television, for example, was basically given to broadcasters decades ago. For the introduction of cellular telephone service in the early 1980s, the FCC operated a lottery, granting a limited number of licenses to a handful of lucky winners. More recently, the FCC has been running auctions for frequencies, generating millions of dollars for the U.S. Treasury by awarding licenses to the highest bidder.

The FCC is also responsible for setting the rules under which license holders must operate. The Commission specifies technical requirements and limitations, including such things as transmitter power and acceptable levels of interference that each operator can generate and what each operator must tolerate.

Back in the 1970s, the FCC eliminated UHF television channels 70 through 83 and reassigned that spectrum, which included the 800 MHz band, to private and commercial land mobile radio services. The allocation provided the necessary frequencies for the first analog cellular telephone companies, although the FCC rule-making process for cell phones would delay the introduction of service until 1983.

In the 1980s, the Commission established service categories for Specialized Mobile Radio (SMR), Public Safety, Business, and Industrial Land Transportation (B/ILT), and assigned to each service a set of frequencies in the 800 MHz band. Since the technology of the time did not require the use of larger continuous blocks of spectrum, the FCC interleaved frequency assignments between these services. This decision laid the groundwork for future interference problems.

In the 1990s the FCC began auctioning additional spectrum above 1 GHz to alternative cellular telephone service providers, in part to provide competition for the existing "duopoly" of analog cellular companies. New companies sprung up, bidding millions of dollars for this newly available spectrum and began building competitive cellular networks.

During this period of time Nextel began offering voice services similar to cellular companies to the general public, but used Specialized Mobile Radio (SMR) frequencies in the 800 MHz band. These frequencies were used by taxicabs, tow trucks, and other vehicle fleet dispatchers, and were generally less expensive to acquire than the traditional cellular spectrum. While traditionally these frequencies were used on a local basis for specific business purposes, Nextel tied them to a telephone interconnect – a device for seamlessly linking a radio to the public switched telephone network (PSTN) – and sold portable radios to the public that looked and acted very much like cellular telephones. The "push-to-talk" capability, actually a holdover from the dispatch days, ultimately proved to be a significant advantage in the marketplace.

Radio Architectures

Public safety radio systems are generally built to maximize coverage and minimize cost for a limited and well-defined set of users. What this ends up meaning is that relatively few repeater sites are built, and they are located on higher geographic locations. These "high site" transmitters are expected to provide adequate coverage for mobile and portable radios carried by public safety personnel.

Since CMRS operators, in contrast, make money based on the number of customers they can support, it is in their best interest to build radio networks that can carry as many simultaneous conversations as possible. Paying customers are also quick to complain about dropped calls, so it's important for these operators to provide sufficient coverage in all the areas where their customers live and work.

Many CMRS operators, including Sprint Nextel, meet these needs by constructing a large number of interconnected repeater sites, where each site covers a relatively small geographic area. These "low site" transmitters blanket areas of high population density and are able to support a large number of subscribers.

This interconnected architecture of commercial operators, first put into widespread use by cellular telephone companies, relies on many small "cells" to carry calls. As a subscriber

moves around the service area, a call is transferred (*handed off*) from one cell to another. These "low site" repeaters are typically much smaller and much less expensive than the "high site" base stations and end up being installed in relatively large numbers. By setting antennas and power levels appropriately at each cell, the same radio frequency can be reused many times across the service area. This "cellular" architecture allows the operator to maximize the number of customers using the network.

High Site (non-cellular)
- Public Safety
- Private Wireless
- Some SMR operators

Low Site (cellular)
- Enhanced SMR
- Cellular telephone

As Sprint Nextel expanded their radio network in many cities and towns across the United States, numerous new "low site" transmitters rapidly surrounded the established "high site" public safety repeater sites. Because these new sites were operating on frequencies adjacent to the old sites, the amount and intensity of interference quickly rose.

Although there was a significant amount of controversy regarding who was at fault and why, the FCC has remained neutral, choosing to state that "generally incompatible technologies whose current proximity to each other is the identified root cause of unacceptable interference."

Report and Order

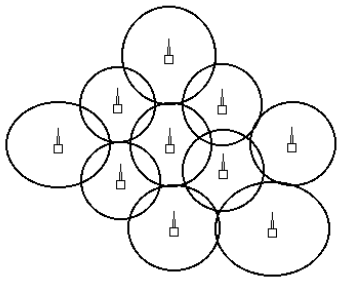
After years of consideration, the FCC eventually released a Report and Order (R&O) in August of 2004. Weighing in at about 250 pages, this document laid out how the interference problem was to be resolved.

In the 800 MHz band, as in other areas of the spectrum where two-way radio operates, radio frequencies are paired up. The mobile radio transmits on one of the pair and receives on the other. The repeater site uses the same pair but reverses their use, receiving on the frequency the mobile transmits on and vice versa. In the 800 MHz band, the convention is that the mobile transmit frequency is exactly 45 MHz lower than the repeater transmit frequency.

The R&O requires that Sprint Nextel give up frequencies in the 700 MHz band and all of its 800 MHz frequencies below 817 MHz (for mobile transmit frequencies) and 862 MHz (for repeater site frequencies). In exchange, the FCC promises to give Nextel 10 MHz of spectrum in the 1.9 GHz range. Because the value of the spectrum Sprint Nextel gives up is far less than what they will gain, the FCC is also requiring Sprint Nextel to pay the relocation costs of those affected by the R&O.

Apart from the financial aspects of the deal, the FCC decided to reconfigure portions of the 800 MHz band in order to reduce the likelihood of interference. The intent is to separate the public safety users from the Sprint Nextel users by reallocating the frequencies each party is allowed to use.

Currently there are four fundamental blocks in 800 MHz band involved in the rebanding



Overlapping coverage areas of "low site" transmitters

process.

The *General Category* occupies 7.5 MHz of bandwidth and contains 150 channels.

The *Interleaved Spectrum* is 12.5 MHz wide and is divided into 250 channels. It is in this block where most of the interference complaints arise, since the 250 channels are mixed between 80 SMR channels, 70 Public Safety channels, 50 Business channels and 50 Industrial Land Transportation channels.

The third block is dedicated to *Enhanced SMR* (ESMR) operations, primarily Sprint Nextel. It is 10 MHz wide and holds 200 channels.

The last block is devoted to public safety and is referred to as the *NPSPAC* (National Public Safety Planning Advisory Committee). It is 6 MHz wide and contains 225 channels. Five of these are allocated nationwide as mutual aid channels.

The FCC R&O reallocates the spectrum used by these four blocks into five new blocks.

The new first block will be the NPSPAC, identified as channels 1 through 230, and will be dedicated to public safety.

The new second block will still be interleaved, but there will be no high-site activity. Channels 231 through 470 here will carry Public Safety, Business and Industrial Land Mobile users, and non-cellular SMR users.

The new third block is 1 MHz wide and is called the Expansion Band. Channels 471 through 510 here are intended to carry Business and Industrial Land Mobile users as well as non-cellular SMR users. Public safety agencies currently operating in the Expansion Band have the option of staying where they are or relocating to lower frequencies.

The new fourth block is also 1 MHz and is referred to as the Guard Band, since it is the final separation between public safety users and ESMR users. It occupies channels 511 through 550. Operating in the Guard Band is voluntary for any public safety agency, although, depending upon nearby ESMR systems, they may experience interference and will have "limited protection" from such.

Portion	Mobile	Base	Total	Who
Lower	806 - 815	851 - 860	18 MHz	Public Safety
Upper	817 - 824	862 - 869	14 MHz	ESMR

Assuming Sprint Nextel meets all of the requirements in the R&O, they will receive nationwide rights to 10 MHz of spectrum in the 1.9 GHz range, specifically 1910 to 1915 MHz and 1990 to 1995 MHz. This block of frequencies was formerly designated as the Unlicensed Personal Communications Services (UPCS) but will now include a new service called Advanced Wireless Service (AWS).

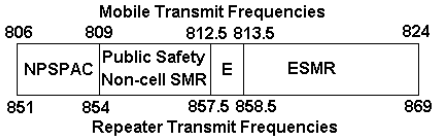
As you can see from the fundamental changes to the 800 MHz band, many public safety license holders will have to change the frequencies they use. Sprint Nextel is required to pay all of the costs associated with relocation.

A neutral third party, called the Transition Administrator (TA), was established by the FCC to oversee the transition process. The TA will establish a schedule for each region, identify individual frequencies for reconfiguration, and – most importantly – mediate disputes between public safety agencies and Sprint Nextel.

Southeastern Band Plan

After deciding on a new band plan for 800 MHz, the FCC realized that in certain parts of the country there would not be enough ESMR frequencies to go around. Besides Sprint Nextel, in the southeastern United States another ESMR operator, Southern LINC, has licenses for a significant number of frequencies in the current Interleaved segment as well as the General Category segment.

800 MHz CONFIGURATION (SOUTHEASTERN)



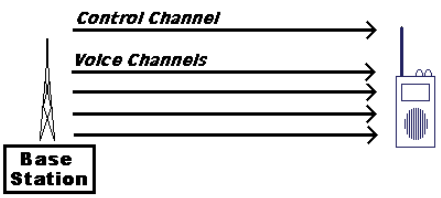
In order to accommodate the need for so many channels, the FCC designated a separate band plan for the southeastern portion of the U.S., including areas in Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina and Tennessee. This plan expands the new ESMR allocation by reducing the new Interleaved block.

Transition Process

Under the FCC plan, the reconfiguration process is supposed to occur in stages and must be complete within three years of the start of reconfiguration in the first region.

The first stage is for public safety agencies using channels 1 through 120 (806 to 809 MHz and 851 to 854 MHz) to switch places with Sprint Nextel channels (809 to 814 MHz and 854 to 859 MHz). For any particular agency, it is the responsibility of the TA to determine exactly which channels need to be swapped.

The second stage is to move the National Public Safety Planning Advisory Committee (NPSPAC) frequencies, currently at 821 to 824 MHz and 866 to 869 MHz, down to current Nextel frequencies at 806 to 809 MHz and 851 to 854 MHz. The NPSPAC frequencies will be exactly 15 MHz lower than they are now.



Trunked System Channels

The five mutual aid NPSPAC channels will also move:

Channel	Old	New
I-CALL	866.0125	851.0125
I-TAC1	866.5125	851.5125
I-TAC2	867.0125	852.0125
I-TAC3	867.5125	852.5125
I-TAC4	868.0125	853.0125

Scanner Listeners

So, how will all of this rebanding activity affect scanner listeners?

First of all, the rebanding effort is limited to the 800 MHz band, so any systems using frequencies in other bands will not change. Within the 800 MHz band, most public safety agencies will have new frequencies, so, at a minimum, the scanner will have to be reprogrammed. Agencies that are operating conventionally (that is, not trunking) can still be monitored after entering their newly assigned frequencies.

For those systems that are trunked, EDACS and LTR should not be affected beyond having to program in the new frequencies.

Motorola analog trunked systems are another matter.

Broadly speaking, a trunked radio system uses radio frequencies to carry two kinds of information. One is the voice content of conversations, whether in analog or digital form, and is carried on *voice channels*. The other is information related to the operation and status of the radio itself, carried on a *control channel*.

When a radio is not involved in a conversation, it tunes to the radio frequency of the control channel and listens for messages from the repeater. This process is sometimes referred to as *camping*.

When a particular talkgroup is active in a trunked radio system, the repeater site sends a message on the control channel, informing camping radios of the voice channel to which the talkgroup is assigned. If the active talkgroup is one that is programmed in the radio, the radio will tune to the voice channel and begin piping the audio to the speaker.

One of the differences between trunking manufacturers is the way in which specific channel information is communicated from a repeater to a radio. Rather than sending the actual frequency, such as 852.2375 MHz, trunked systems will send a reference number that the radio will use to figure out that 852.2375 MHz is where to tune.

Logical Channel Numbers

EDACS and LTR use something called "Logical Channel Numbers" (LCNs) to identify frequencies. Each radio is programmed with a table of frequencies, where each frequency is programmed into a specific place. Instead of carrying the actual frequency, control channel messages use a reference number to identify the storage place. This reference number is the LCN. For example, imagine an EDACS system that uses five frequencies, organized like this:

LCN	Frequency
1	859.9875
2	853.9625
3	855.2375
4	860.9875
5	856.7375

If talkgroup 02-022 is active on the voice channel of 855.2375 MHz, the control channel will deliver a message from the repeater containing 02-022 (the talkgroup) and 3 (the LCN). When the radio receives the message, it checks that "02-022" is programmed in as a valid talkgroup. If so, the radio looks up reference number "3" in its internal frequency table and finds that it equates to 855.2375 MHz. The radio then tunes to that frequency and joins the conversation.

If the repeater switches the talkgroup to a new frequency, say 856.7375 MHz, it will send out a message containing 02-022 and 5. The radio will repeat the lookup procedure and discover that "5" means 856.7375 MHz, which is where it tunes to next.

The LCN method requires that all radios use a common frequency table. In order for a scanner to properly track a conversation, it must also have that same frequency table, since it's overhearing the same control channel messages from the repeater.

A public safety agency using EDACS or LTR that relocates due to rebanding will need a new frequency table. Scanner listeners following these systems will simply have to program in a new frequency table to be back up and running.

Motorola Trunking

Motorola, as you might expect, uses a different method to convey frequency information. Rather than having a frequency table, Motorola uses channel numbers originally defined by the FCC. Channel 1 starts at 851.0125 MHz and goes up in 25 kHz steps, where Channel 2 is 851.0375 MHz, Channel 3 is 851.0625 MHz, and so on up to Channel 830, which is 868.9875 MHz. Each channel is 25 kHz away from the next channel, so the *bandwidth* of each channel is 25 kHz. If you're mathematically inclined, you can compute the frequency of any channel using this formula:

Frequency = (Channel x 0.025) + 850.9875

Motorola radios use a similar formula internally. The Motorola control channel in Type II systems (the most common) use these channel numbers rather than explicit frequencies. A "talkgroup active" message sent from the repeater will include a talkgroup identifier and a channel number. The radio will compute the actual frequency from the channel number.

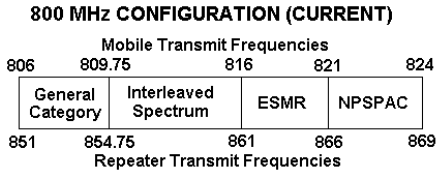
The mapping between a channel number and a frequency is known as a *channel plan*.

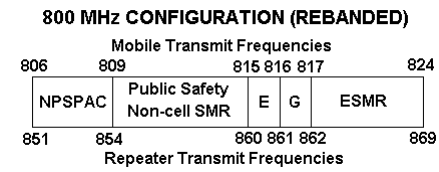
The problem for scanner listeners is that the Rebanding R&O changes the existing channel plan. When the FCC first began allocating space in for public safety in this band, radio equipment required 25 kHz of bandwidth to operate effectively. However, subsequent improvements in technology allowed radios to work quite well in half that space – a bandwidth of only 12.5 kHz. So when the FCC later allocated space for NPSPAC channels, it used a channel spacing of 12.5 kHz. To add further confusion, because some older equipment might have to use the five nationwide NPSPAC mutual aid channels, those five frequencies were reserved as 25 kHz wide.

All of the trunking scanners built up until now were designed with the existing channel plan in mind. When a Motorola system uses a channel number between 1 and 400 (corresponding to a frequency between 851 and 861 MHz), the scanner automatically assumes that the channels there are 25 kHz apart. Likewise, when a channel number between 601 and 830 (corresponding to a frequency between 866 and 869 MHz) is used, the scanner expects those channels to be 12.5 kHz apart.

New Channel Plan

Rebanding creates a new channel plan, where the old channel numbers now refer to different frequencies. It's sort of like the recent changes to the Pennsylvania Turnpike. Exits off the Turnpike used to be numbered sequentially, starting from the Ohio border. The first exit was assigned number 1, the second exit number 2, and so on. However, what happens if you want to add a new exit? Do you renumber all of the old exits? Pennsylvania opted to assign exit numbers based upon their mile marker location. For instance, Philadelphia used to be Exit 28, being the 28th exit from Ohio, but is now Exit 351, since it's 351 miles from the Ohio border.





This creates an opportunity for confusion. If someone says, meet me at Exit 28, do they mean Philadelphia (Exit 28 under the old system) or Cranberry (Exit 28 under the new system)?

Likewise, the new channel plan has the potential to create the same type of confusion. Since scanners tracking Motorola systems are interpreting numbers under the old channel plan, when they receive numbers which use the new plan, they will tune to the wrong frequency.

The new channel plan is nearly the reverse of the old channel plan, with a wrinkle. Channel numbers from 1 to 230 (corresponding to frequencies between 851 and 854) will be 12.5 kHz apart, except for the five NPSPAC mutual aid channels, which will remain 25 kHz. This creates five "jumps" where the normal 12.5 kHz spacing is replaced with 25 kHz spacing. The table below provides the channel number and frequency assignment for each of these "jumps."

Also under the new plan, channel numbers between 231 and 830 (corresponding to frequen-

cies between 854 and 869 MHz) will be 25 kHz apart.

Ch Number	Old Freq	New Freq
1	851.0125	851.0125
2	851.0375	851.0375
3	851.0625	851.0500
4	851.0875	851.0625
...	...	...
76	852.8875	851.9875
77	852.9125	852.0125
78	852.9375	852.0375
...	...	...
114	853.8375	852.4875
115	853.8625	852.5125
116	853.8875	852.5375
...	...	...
152	854.7875	852.9875
153	854.8125	853.0125
154	854.8375	853.0375
...	...	...
228	856.6875	853.9625
229	856.7125	853.9750
230	856.7375	853.9825
231	856.7625	854.0125
232	856.7875	854.0375
233	856.8125	854.0625
...	...	...
400	860.9875	858.2375
401	861.0125	858.2625
...	...	...
599	865.9625	863.2125
600	865.9875	863.2375
601	866.0125	863.2625
602	866.0375	863.2875
603	866.0500	863.3125
604	866.0625	863.3375
...	...	...
830	868.9875	868.9875

To summarize, the existing (old) channel plan uses the following spacing:

Mobile/Base Frequency Range	Spacing
806-820/851-865	25 kHz
821-824/866-869	12.5 kHz

The rebanded (new) channel plan uses the following spacing:

Mobile/Base Frequency Range	Spacing
806-809/851-854	12.5 kHz
809-824/854-869	25 kHz

Scanner Updates

Modern scanners are controlled by microprocessors, which execute a set of instructions originally created by the manufacturer. These instructions, among other things, tell the scanner how to interpret the messages it receives on trunked system control channels. On relatively recent scanners, these instructions can be changed through a process called *re-flashing*.

The scanner owner downloads a new set of instructions (called a *firmware load*) from the manufacturer's web site and runs a loading program. The loading program then transfers the firmware load via a connecting cable from the owner's computer to the scanner. When this process is completed successfully, the microprocessor inside the scanner executes the new instructions. In this way new features and corrective "bug fixes" can be made without having to repair or replace the scanner.

Being able to track Motorola systems using the new channel plan is certainly a desirable new feature; however, not all scanners are capable of being re-flashed.

Keep in mind that only Motorola systems using the 3600-baud control channel will be problematic to track. EDACS and LTR systems can resume tracking by simply reprogramming the frequency lists in Logical Channel Number order.

Project 25 systems that use the new 9600-baud control channel (the so-called "pure P-25" systems) should also track just fine. Project 25 standards already contain a provision for new channel spacing.

Uniden

Uniden has already announced that a number of their older trunk-tracking scanners will not correctly track the rebanding channel plan and cannot be re-flashed to do so. Those scanners are the BC-235, BC-245, BC-250D, BC-780, BC-785D, and BC-895.

Scanners that can be re-flashed to track the new channel plan include the BC-246T, BC-296D, BCR-330T, BCD-396T, BC-796D, BC-898T, BCD-996T, BCT-15 and the BCT8.

Uniden intends to make new firmware loads available on their web site as soon as possible after rebanding actually begins. Since the details of exactly how Motorola will adapt to the new channel plan are uncertain and will remain so until a rebanded system goes operational, we will all have to wait to upgrade.

Radio Shack

Only two Radio Shack trunking scanners are capable of being re-flashed to support the new channel plan, namely the PRO-96 and the PRO-2096. In addition to supporting firmware updates, these scanners are also capable of using a new channel plan entered via a software program called Win96. Doing this will override the existing channel plan in the scanner and allow the owner to track a rebanded system while waiting for a firmware upgrade.

All of the earlier models, as well as the newer PRO-97 and PRO-2055, do not have the ability to use any other channel plan except what is already in the scanner. They are also incapable of being re-flashed and so will not be able to track rebanded Motorola analog systems. Older trunking scanners that cannot be upgraded include the PRO-90, PRO-91, PRO-92, PRO-93, PRO-94, PRO-95, PRO-2050, PRO-2051, PRO-2052, PRO-2053, PRO-2066 and PRO-2067.

Rebanding Schedule

The Transition Administrator prioritized the rebanding process into four "waves."

Wave 1 are those regions with the highest number of interference complaints, which overlaps with some of the nation's largest population centers. Affected states include California, Colorado, District of Columbia, Illinois, Indiana, Maryland, Nevada, much of New England, New York, Oregon, Pennsylvania, Utah, Virginia and Wisconsin, as well as portions around the Great Lakes.

Wave 2 is composed of the remainder of the country, not including some areas in the southeastern United States and the borders.

Wave 3 is made up of those states most affected by the "Southeastern" band plan. These include the states of Alabama, Florida, Georgia, Mississippi, and the Carolinas, which will transition a greater number of frequencies to ESMR than other parts of the country. Because there is so much reconfiguration to be done, putting them in a later wave allows more time to complete the planning and negotiation process.

Wave 4 covers the border areas adjacent to Canada and Mexico. Since any changes to radio systems close to the borders require international coordination, rebanding will have to wait until diplomatic negotiations can be completed. Until these negotiations are done, existing systems must continue under current international agreements. This affects New England and parts of the Upper Midwest along the Canadian border, as well as more complicated and denser population areas along both the Canadian and Mexican borders. Wave 4 will not be included in the 36-month deadline.

Back at the beginning of 2005 the TA had hoped to have Wave 1 start reconfiguration by June of that year, with subsequent Waves following every three months or so.

Unfortunately, this did not happen – not even close.

As of May 2007, not a single public safety agency has been rebanded.

Foot-dragging

The FCC is currently considering a combined request from public safety representatives and Sprint Nextel that would authorize the TA to produce a new schedule, most likely extending the start dates out another two years.

Complaints from a number of public safety agencies give some insight into why the rebanding process is taking so long. Because the FCC Report and Order requires Sprint Nextel to pay for the cost of relocation, each agency must document the costs they will incur to move. Paragraph 198 of the R&O states that the agency must certify that "the funds requested are the minimum necessary to provide facilities comparable to those presently in use."

Apparently Sprint Nextel is interpreting this paragraph to mean the "absolute lowest cost" and is spending an inordinate amount of time demanding and reviewing funding requests, arguing each expense, dollar by dollar. As you can imagine, this type of negotiation can take a very long time.

Nearly every negotiation has required mediation, further slowing the process. The FCC itself has been slow to respond to appeals and requests for modification, sometimes taking months to produce an answer.

What has been lost in all of this argumentation and delay is the original problem. Public safety agencies are struggling with increasing levels of interference that jeopardize lives and property. The Communications Act of 1934, which created the FCC, includes the responsibility for the Commission to "promote safety of life and property through the use of wire and radio communication." Until the FCC regains a sense of urgency and uses its regulatory power to resolve the interference problem, its primary obligation remains unfulfilled.

Radio Communications with Amelia Earhart: July 2, 1937

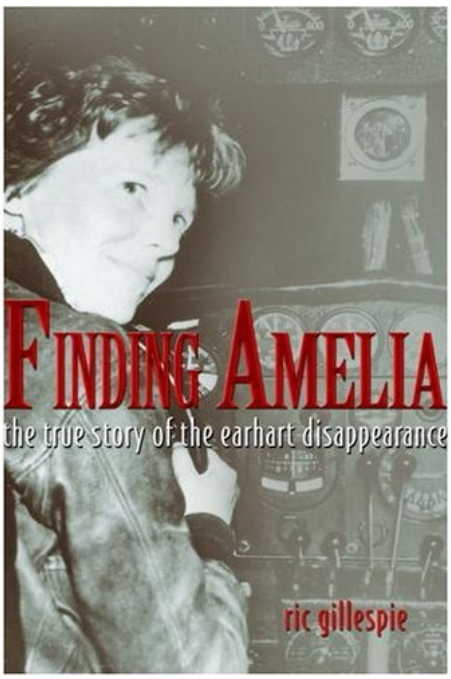
By Arthur R. Lee, WF6P

The Pacific is a big ocean and radio aids to navigation were her only hope of finding so small an island.

It has been nearly 70 years since world-renowned aviatrix Amelia Earhart attempted her highly publicized globe-circling flight. Then, on July 2, 1937, she vanished. Her flight leg from Lae, New Guinea, to tiny Howland Island, a speck of an atoll in the vast Pacific, was to be her last.

While placing her hope on homing in on the radio signals from the U.S. Coast guard vessel *Ataska* and the able skills of crack navigator Fred Noonan, she failed to locate the island. Frantic calls from her for assistance were heard as she flew the remaining minutes and the fuel in her tanks ran low.

Finally, with only a half hour's fuel remaining, she ran north and south in a vain attempt at locating the island. Radiomen aboard *Ataska* constantly attempted communications with the aircraft as it approached their Longitude and Latitude. While they could hear her, it soon became evident that she was not hearing them. Constant mix-ups in frequencies and contact schedules added to the confusion on the final and most crucial leg of her journey.



Nothing but the Deep Blue Sea

It is a wide expanse of empty ocean out there in the vicinity of Howland Island, the island on which a coral landing strip had been especially prepared for her. As a former flight engineer, I have flown to many tropical islands in the Pacific. At an altitude of 10,000 feet from the islands of Midway or Wake, there is nothing to be seen but deep blue water in any direction.

On one occasion while passing over Johnson Island, our pilots pointed it out. Expecting to see something large, I finally spotted a coral atoll, seemingly not much larger than the flight deck of an aircraft carrier. From the air, it looked like a tiny chip of wood or sawdust suspended on the water. I was happy that twenty years after Amelia Earhart's loss, we had modern radio communications, highly trained pilots, navigators, and especially, LORAN (Long Range Aids to Navigation).

Most transpacific aircraft today fly at over 30,000 feet using GPS and have modern radios using large antennas or satellite communications. They cruise above the clouds on autopilot at Mach 0.8 or faster, while being constantly tracked by RADAR. Passengers sleep or view the latest Hollywood movies, totally unaware of the endlessness of the sea below.

Compare the state of the art in radio communications and navigation in 1937. Amelia Earhart's twin-engine aircraft, a Lockheed Model 10E, cruised at a speed of 150 miles per hour or less and at an altitude of below 10,000 feet. Higher altitudes would require oxygen. There was no cabin pressurization and the sextant used by Fred Noonan was hand-held and fixes were shot through cabin windows. Military or commercial aircraft using sextants in more recent years (before GPS) utilized fixed mounts with the sextant projecting, periscope fashion, through a fuselage mount.

Ill-Equipped Communications

In 1937, transmitters and receivers used vacuum tubes and were of low power. Condensers (now capacitors) and resisters were as big as a thumb and reliability was not one of their strong points, due to heat, humidity and vibration. Then there was the matter of antennas. Variable length trailing wire antennas were common in aircraft in the 1930s and worked well. Shorter, fuselage mounted antennas were of fixed length and, therefore, limited as to usable frequencies.

Crystal controlled transmitters were good, but changing frequencies was a more onerous chore than tuning a dial on our modern transistorized rigs equipped with variable frequency oscillators. Being crystal controlled, Amelia had only two frequencies for her communications: 3105 and 6210 kilocycles, and she could use voice only.

The standard high frequency (HF) means of communications in the 1930s was that of Morse code or CW. Ham, commercial, and military operators communicating from ship-to-ship, shore-to-shore, or anything long range used the old straight key – or in some cases, a bug. The use of CW was a sure way of getting a message through. Modulated carrier waves (voice) just didn't have the clarity of the good old, crisp (we hoped) dits and dahs.

In some of my maritime mobile communications work in the 1980s, getting a position report from a sailboat at sea was important to the crew. If anything happened to them, we would at least know where to begin a search. On many nights, I had the skipper repeat his position over and over on voice, but I could not copy it for my log entry. Switching to CW, it came through loud and clear.

Unfortunately, neither Amelia Earhart nor Fred Noonan was proficient in the use of Morse code.

What Really Happened?

In his fascinating book, *Finding Amelia, the true story of the Earhart disappearance*, Ric Gillespie traced the Earhart flight from its start to its disappearance. Hundreds of hours of research of National Archive records and volumes of correspondence with associates of Amelia, Fred and others, plus interviews with her maintenance or refueling crews, put many of the pieces of the puzzle into place. Logbooks from the Navy and Department of the Treasury were sifted through to try to determine which transmissions were actually received.

Of high interest to me as a ham radio operator was the reported receipt of Amelia's trans-

missions by amateur and shortwave listeners both in the air and later, *after* she was presumed to have run out of fuel and crash landed. The author takes the position that the aircraft made an emergency landing on a reef or a deserted island. Weird and oddly sent transmissions believed to have emanated from one of the islands in the Phoenix group were picked up and homed in on by beam antennas of Navy and commercial radios on Oahu, Midway and Wake Islands.

Hams and shortwave listeners know that radio waves bouncing off the various layers of the ionosphere on long skip could easily explain reported signal reception in California and Florida. A researcher found that sun spot conditions in 1938 were high and very favorable for long-range radio wave propagation. (As of this writing in California, Radio Moscow booms in on 40 meters in the hours just after dawn. A few months ago it was Japanese broadcast stations.)

The Search Continues

As a young boy, I arrived in Honolulu in the summer of 1937 when the search for Amelia Earhart was in full swing. This was big news both on the radios and in newspapers of the day. Being on an island ourselves and standing on the beach in the black of night looking at the horizon under the Southern Cross, the saga seemed even more of a mystery. Was she down at sea and in a life raft? Lockheed officials stated that with empty fuel tanks, the aircraft could float for days, or longer. Years later, both commercial and military airplanes forced down at sea with empty fuel tanks floated for days and had to be sunk by the Navy or Coast Guard as hazards to navigation.

Author Gillespie, co-founder of the International Group for Historic Aircraft Recovery, TIGHAR (**www.TIGHAR.org**), thoroughly researched the capabilities of the twin engine Lockheed Electra. Calculations and technical notes showed that the aircraft was equipped with antennas and radio equipment that were extremely limited and inadequate for the task. Worse, Earhart had lost her trailing wire antenna in an earlier crash at Ford Island at Pearl Harbor and it apparently was not replaced. On takeoff from Lae, a film clip did not show her receiving antenna attached to the belly of the aircraft. It was believed to have been scraped off in the rough, bumpy takeoff. This left her with only an upper fuselage transmitting antenna and her Radio Direction Finder (RDF) loop antenna. This antenna problem was partially overcome by use of the loop antenna for receiving.

Gillespie meticulously traces all the logs and messages dealing with official communications. Urgent telegrams to and from Earhart were slow to be delivered, many arriving too late to help; others were sent by Amelia with confusing or conflicting information pertaining to frequencies and schedules.

As an amateur radio operator, I have always been intrigued by the reports that hams had heard transmissions from the aircraft. Had they really? Gillespie explored these reports, finding several to be false. At least one received by a shortwave listener in Florida was extremely interesting and seemed to be valid. Equally intriguing were the unusual signals reportedly received by tracking stations. These reports of keyed microphone signals as coming from an aircraft on land or a reef sounded plausible.

In the 1950s, I made an air cargo delivery to a ship at Canton Island. This island, just below the equator and also part of the Phoenix group, is similar to the one Amelia was attempting to reach and is extremely small. Like most coral atolls, Canton Island is only a few feet above sea level. While standing on the wing of my aircraft while refueling, once again I found the vast expanse of the southern ocean to be quite impressive. Being lost at sea is not a happy thought.

If you love a mystery, have a high rate of interest in early radio communications, and wish to read what I consider the most comprehensive report of Amelia Earhart's disappearance, Gillespie's book is for you.[1] The author was careful to not draw any conclusions of his own, leaving that to the reader. Further search expeditions are being planned in the future by the TIGHAR group. The book has many interesting photos and charts of the route of the aircraft. A compact disk containing additional charts and copies of letters and other intriguing reference material accompanies the book.

(Footnotes)

[1] Available through the US Naval Institute at www.navalinstitutepress.org and other booksellers such as Amazon.com

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DIY Satellite Radio: *Taking it to the Limit*

Last month I showed how to set up a stand-alone Ku-band dish to receive World Radio Network and Radio Netherlands Worldwide among others. This month I'll show you how to find it all, from BBC World Service to Radio Classica, the excellent classical music station from Spain.

❖ C-Band Still Rules

Long believed to be as dead as a bad '80s sitcom, the big, black mesh dish is still where the action is. From little known stations in the domestic portion of the Clarke Belt to interesting foreign broadcasters at the edges of both oceans, C-band satellites still hold the bulk of satellite radio signals of interest to the radio hobbyist.

While there are very few analog radio stations to be heard via C-band, there are a few which I've included in the list. Most stations are MPEGII FTA (free to air), the reception of which I discussed in detail in last month's column. There is one other reception standard worth noting: DigiCipherII (DCII) which is an MPEGII format different from the Digital Video Broadcast (DVB) standard explained last month. However, any Motorola 4DTV receiver will be able to receive DCII FTA radio broadcasts for free once the receiver is authorized, which is done by calling an 800 number. No fees are required for authorization. The Motorola 4DTV cannot receive MPEGII FTA signals in the DVB standard.

To be able to fully explore the complete range of the broadcast satellite belt, here's what you'll need: a minimum 10-ft dish with motor drive (actuator) and a C/Ku-band feed horn with as low a noise figure in C and Ku-band LNBs as you can get. This need not be an expensive set-up. As I've stressed many times over the last several years, you can find entire satellite systems free for the asking virtually anywhere in the U.S. (Just ask *MT*'s Kevin Carey who went from *Below 500 kHz* to over 11 GHz by taking over a neighbor's orphan dish).

10' Black mesh dish still delivers the goods on C and Ku-band. Tune in to a world of news, entertainment and music for free. New dishes like this one are available from Skyvision for about $700. You might find ones like it in your neighborhood for free if you look around. (Courtesy: Skyvision)

Motorola 4DTV receiver tunes analog and DigiCipherII channels and costs $439 new from Skyvision when you purchase programming from them. They have a limited number of refurbished units for $449.95 without programming purchase. (Courtesy: Skyvision)

If the dish you're getting doesn't have a receiver, you can find used ones from nearly any satellite dealer in the U.S. I've gotten good deals from a local dealer who doesn't charge more than $50 for used, tested C/Ku-band receivers with remote controls. Used and discontinued NOS (New Old Stock) receivers can be found anywhere. Reputable dealers such as Skyvision have a wide selection of new, used and NOS receivers available and they have a great tech support line for their customers.

MPEGII FTA receiver such as this Traxis 1500, also from Skyvision, costs $99.99 it has 4,000 channel capacity and many features you'll find on more expensive receivers. (Courtesy: Skyvision)

❖ What You'll Hear

The range of programming available to big dish users is astounding. You can tune in to many local radio stations from all over North and South America and several interesting European stations as well. Why wait for DRM to finally take off and the availability of cheap DRM receivers? Who cares whether Sirius merges with XM and goes up to $20/month for subscriptions? These satellite stations are up 24/7 in stereo!

Take a look at the list of broadcasters below and you'll know why this is an exciting part of the radio monitoring hobby. I've tried to list all the MPEGII, DCII and analog audio services available on C and Ku-bands. All of these services are free; at the time this is written there are no subscription fees for any channels listed. I've also included the web sites for the related radio service. You can learn more about each service by visiting their home page. Many of these services also post their schedules on-line.

C/KU-BAND SATELLITE RADIO STATIONS

Station
Transmission Type/Satellite, Transponder/ Programming

3ABN Radio **www.3abn.org/radio**
MPEGII FTA AMC4*, 6

BBC World Service **www.bbc.co.uk/worldservice.com**
MPEGII FTA G13,5

BYU Radio Utah **www.byuradio.org**
MPEGII FTA T5, 11

Cable Radio Network **www.crn.com**
(CRN1) DCII G23, 15 Talk radio
(CRN2) DCII G23, 15 Talk radio
(CRN3) DCII G23, 15 Talk radio
(CRN 4) DCII G23, 15 Talk radio
(CRN 5) DCII G23, 15 Talk radio
(CRN 6) DCII G23, 15 Talk radio
(CRN 7) DCII G23, 15 Talk radio

CNN Radio en Espanol **www.cnn.com/espanol/radio**
Analog G14, 17 News (Spanish)

Deutsche Welle Radio **www.dw-world.de**
(1) MPEGII FTA AMC1, 2
(2) MPEGII FTA AMC1, 2
(7) MPEGII FTA AMC1, 7

DMX **www.dmxmusic.com**
50's Rock DCII G16*, 6
60's Rock DCII G16*, 6
70's Rock DCII G16*, 6
80's Rock DCII G16*, 6
Adult Contemporary DCII AMC10, 2
Adult Contemporary DCII G16*, 6
Album Rock DCII G16*, 6
Alternative Rock DCII G16*, 6
Acid Jazz DCII AMC10,2
Acid Jazz DCII G16*, 6
Beautiful Instrumental DCII G16*, 6
Blues Rock DCII G16*, 6
Children's DCII G16*, 6
Classic Jazz DCII G16*, 6
Classic R & B DCII G16*, 6
Classic Rock DCII AMC10, 2
Classic Rock DCII G16*, 6
Coffee House Rock DCII G16*, 6
Contemporary Christian DCII G16*, 6
Dance DCII G16*, 6
Fiesta Tropical DCII AMC10, 2
Gospel DCII G16*, 6

Great Standards DCII G16*, 6
Hard Rock DCII G16*, 6
Holidays & Happenings DCII G16*, 6
Hottest Hits DCII G16*, 6
Jazz Vocal Blends DCII G16*, 6
Latin Contemporary AMC10, 2
Latin Jazz AMC10, 2
Lite Classical DCII AMC10,2
Lite Classical DCII G16*, 6
Modern Country DCII G16*, 6
Music de las Americas AMC10, 2
New Age DCII G16*, 6
Rap DCII G16*, 6
Regional Mexican AMC10,2
Reggae DCII G16*, 6
Retro Dance DCII G16*, 6
Rock 'n' Roll Oldies DCII AMC10, 2
Rock en Espanol DCII AMC10, 2
Salsa DCII AMC10, 2
Soft Hits DCII G16*, 6
Smooth Jazz DCII G16*, 6
Swing DCII G16*, 6
Symphonic DCII G16*, 6
Tejano DCII AMC10, 2
Traditional Country DCII G16*, 6
Trends DCII G16*, 6
Urban Adult Contemporary G16*, 6
Urban Beat DCII AMC10,2
Urban Beat DCII G16, 6

Energie 94.3 Montreal **ww.radioenergie.com**
MPEGII FTA F1R, 2 **w**

EWTN Global Catholic Radio **www.ewtn.com/radio**
Analog G15, 11 Relgious

EWTN Radio Catolica Mundial
Analog (Spanish) **www.ewtn.com/spanish/radio**

Futbol de Primera **www.laradiodelmundial.com**
MPEGII FTA G25*, 8

KEXP-FM Seattle **www.kexp.org**
MPEGII G10*, 6 Rock Public

KHTE-FM Little Rock, AR **www.hot965.com**
MPEGII, G10*, 6 Hip Hop

KSL Radio (Utah) **www.radio.ksl.com**
MPEGII FTA T5, 11

KTBN Trinity Broadcasting Radio
Analog G14, 3 Religious **www.tbn.org**

KWBF-FM Little Rock
MPEGII G10*, 5

KWHR Asia **www.kwhr.com**
MPEGII FTA G16, 15

KWHR South Pacific **www.kwhr.com**
MPEGII FTA G16, 15

Latin Broadcasting Corp.
DCII AMC1, 5 **www.radiopaz.org**

Life Talk Radio Network **www.lifetalk.net**
MPEGII FTA AMC4*, 14

Narodni Radio (Bosnia) **www.narodni.hr**
MPEGII FTA AMC4*, 21

Nebraska Public Radio
DCII T5, 2 **www.netnebraska.org/radio**

Polskie Radio Trojka **www.polskieradio.pl/trojka**
MPEGII FTA G25*, 21

Polskie Radio Jedynka **"/jedynka**
MPEGII FTA G25*, 21

Pulse FM South Bend, IN **www.pulsefm.com**
MPEGII FTA G16, 15 Religious

Radio Capital (Mexico)
MPEGII FTA M5, 3

Radio Centro (Mexico)
MPEGII FTA M5, 3 **www.radiocentro1030.com.mx**

Radio 74 Internationale **www.radio74.net**
MPEGII FTA AMC4*, 6

Radio Maryja **www.radiomaryja.pl**
MPEGII FTA AMC4*, 21

Radio Mexiquenses (Mexico)
MPEGII M5, 17 **www.edomexcio.gob.mex**

Radio Netherlands WorldWide **www.wereldomroep.nl**
(1) MPEGII FTA G25*, 21
(2) MPEGII FTA G25*, 21
(3) MPEGII FTA G25*, 21

Radio Punjab International **www.radiopunjab.com**
G25, 14 MPEGII FTA

Radio Senegal International **www.rts.sn/default-rsi.htm**
G25*, 22 MPEGII FTA

Radio Vlaanderen International
G25*, 21 **www.rvi.be**

Republic Broadcasting Net. **www.republicbroadcasting.org**
Analog G15, 17 Talk Radio
MPEGII FTA G25, 5

RNE1 Radio Classica (Spain)
MPEGII FTA G23, 10 Classical music

RNE3 Radio 3
MPEGII FTA G3, 10 Variety music

REE Radio Exterior Espana
MPEGII FTA G23,10 Spanish world service

RNE Radio 5 Todo Noticias
MPEGII FTA G23,10 Spanish news

Rock Detente 107.3 Montreal
MPEGII FTA F1R, 2 **www.rockdetente.com**

Spirit 93.3 Little Rock, AR **www.spirit933.com**
MPEGII FTA G10*, 5 Religious

TalkStar Radio Network **www.talkstarradio.com**
MPEGII FTA G27*, 14

TNT Radio **www.radiotiengnuoctoi.com**
MPEGII FTA AMC4*, 21

Top Albania Radio **www.topalbaniaradio.com**
MPEGII FTA G25*, 8

Tunisia National Radio
T5*, 5 **www.radiotunis.com**

Vietnamese Public Radio **www.radiohaingoai.com**
(1)MPEGII FTA AMC4*, 21
(2) MPEGII FTA AMC4*, 21

Voice of Turkey Worldwide **www.trt.net.tr.voiceofturkey.vot**
MPEGII FTA G25, 14

WACC-AM Miami, FL **www.radiopaz.org**
DCII FTA AMC1, 5

WCPE-FM Wake Forest, NC **www.wcpe.org**
Analog G14, 8 Classical Music
Analog G14,14 Classical Music
MPEGII FTA AMC1*, 12

WHRI **www.whri.com**
Africa & Middle East MPEGII FTA 16, 15
Central & South America MPEGII FTA G16, 15
Europe & Russia MPEGII FTA G16, 15

World Radio Network **www.new.wrn.org/listeners/station/station.php?stationID=50**
(1) NA G25*, 27
(2) Multilingual NA G25*, 27
(3) French NA G25*, 27

XEGLO Oaxaca, Mexico **www.cortv.com.mx**
MPEGII FTA M5, 22

** Denotes Ku-band - otherwise C-Band*

OK, I couldn't actually list them all! Yes, there are dozens more radio services to be found on the big dish, but I've run out of room in this issue. No room to list the 41 commercial free channels from Music Choice on G25 Ku-band, or the radio stations from Central America or Arabia or Asia.

This is just to demonstrate that without a big investment you can have a whole universe of radio entertainment from all over the world to enjoy. All it takes is a little effort to locate the equipment, install it, and start exploring the world of big dish satellite radio.

MT READERS ONLY

To access the restricted website for the month of July, go to www.monitoringtimes.com, click on the key, and when prompted, enter "mtreader" under the user name. Your password for July is "interop" – Check in each month for new material!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
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Q. *Can I use satellite dish coax and connectors for scanner antenna transmission line? (Donato Alonzi, N1MK)*

A. Sure; satellite TV systems use a rugged, low loss RG-6/U and F connectors. It will work just fine.

Q. *For scanner reception, what is the practical difference between RG-6/U, RG6, and RG8/X? (Danny Batdorf, Brenham. TX)*

A. RG-6 and RG-6/U are the same thing; the "U" is sometimes left off casual references, but all coax with the military RG (Radio Guide) designation has the /U suffix ("Utility" or "Universal").

RG-6/U has less loss than RG-8/X, on the order of 3-4 dB per 100 feet at 1000 MHz. This would be discernible on weak 800 MHz signals, progressively less discernible as you go lower in frequency.

Q. *I'm a newcomer to shortwave radio. Would you mind answering a few questions for me? (Gail Padilla)*

A. Many of our new readers are newcomers, and I'm sure they would benefit as well from your excellent questions:

(1) Is it true that current amateur radio licensing does not require Morse code?

Absolutely correct. As of February 2007, no knowledge of the Morse code is needed to pass an amateur radio exam. That announcement was in our February issue.

(2) What is the difference between shortwave radio and amateur radio?

Shortwave radio is very general reference to all users of the high frequency (HF) spectrum (3-30 MHz). Above that are very high frequency (VHF) from 30-300 MHz, and ultra high frequency (from 300-3000 MHz). The microwave services are even higher in frequency.

Amateur ("ham") radio, on the other hand, is a specific licensed radio service which has frequency bands found throughout the radio spectrum, from the low frequency LF range well into microwave.

(3) What are the advantages/disadvantages of shortwave radio?

Shortwave frequencies carry signals quite far, the signals may propagate over mountain ranges, radios to hear them are readily available, and simple wire antennas are all that are necessary to receive them.

The HF spectrum, however, is vulnerable to severe electrical interference from power lines and electrical appliances, noise from electrical storms over considerable distances, severe signal attenuation during low sunspot cycles, radio interference from distant stations on the same frequencies ("skip"), and blackouts from solar flares.

(4) What types of stores sell shortwave radios?

Radio Shack sells multiband shortwave portables; amateur radio stores, if you have any nearby, have more sophisticated receivers for monitoring signals other than conventional broadcasting stations. Check your copy of *Monitoring Times* for ads from the better radio stores, some of whom advertise on the Internet as well.

But you will have to decide if all you want is to hear traditional AM international broadcasters, or some of the two-way users, which require additional reception modes such as single sideband, found in the better radios. And you will need to decide if you want a portable shortwave radio or more serious desktop receiver.

(5) Are there programs on shortwave, as there are programs on regular radio, or do people just talk back and forth?

There are both. Take a look at the latest copy of *Monitoring Times* for an exhaustive, accurate listing of schedules for English language programming broadcast on shortwave. *MT* also covers many two-way "utility" users of the shortwave (and higher) radio spectrum, including federal government, military, airlines, maritime services, Coast Guard and many more.

(6) If there are programs, how does one obtain permission to have a program, and what determines who and how far away the program will be heard?

Most shortwave broadcasters are either evangelical, using the airwaves to propagate their religious views, or government sponsored, propagating their political views. There are also entertainment segments as well as educational and informational. As with commercial broadcasters on your cable, satellite or local AM/FM/TV, programs are mostly sponsored by the organizations you hear broadcasting. (*But a few SW stations also sell air time; see the May Beginner's Corner column.)*

The distance a signal will carry is determined by its frequency, the antenna array (directivity), power output, and time of day or night.

Q. *I often record signals off the air on a microcassette tape recorder, but if the signal is weak, the tape hiss masks the audio. Would a digital tape recorder be the answer? (Scott D'Amico)*

A. I suspect it would be one answer, but it would seem to me that if the signal was strong enough for you to hear the modulation, and the audio level were adjusted high enough, it should overcome the tape hiss.

In any case, you might try recording the signal in question on your computer's Windows digital Sound Recorder to see if that works.

Q. *I read that by using an antenna coupler, the resistance of the tuning circuit is decreased, thus improving selectivity. Why is there less resistance in the tuning circuit, and how does it improve selectivity? (Alexander Tudor)*

A. It's not resistance (which is an opposition to electron flow at any frequency), but reactance, which is a frequency-dependent opposition to currents imposed by a combination of coils and capacitors. Properly tuned, a receiving-antenna transmatch (tuner) selectively adjusts the reactance so that desired signal frequencies are efficiently passed to the receiver, while off-frequency signals are impeded, lessening the likelihood of their causing interference.

Q. *My Garmin Etrex Legend GPS receiver has a screen that tells the best hunting and fishing times. Is this random or somehow calculated? (Mark Burns, Terre Haute, IN)*

A. Judging from user comments, it seems to integrate known optimum conditions based upon positions of the sun and moon, the season (date), your geographical location, and the time of day.

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.)

MT HELP DESK

SPECIFIC FREQUENCY AND EQUIPMENT QUESTIONS

Larry Van Horn, N5FPW
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Government Interoperability Nationwide Listings

Special Emergency Disaster Relief Operations 47.420
National Search and Rescue Common 155.160
Law Enforcement Mutual Aid/Inter-system
155.370 220.8025-220.8475 (Channels at 5 kHz intervals)
460.5250/465.5250 460.5500/465.5500

Special Emergency Paging 152.0075 <1EMS-6>
Special Emergency Inter-system 155.340 <1EMS-14> 155.3475 <1EMS-15>

Medical Hospital to Paramedics Base/Mobile
463.0000/468.0000 <Med 1> 463.00625/468.00625 <Med 11>
463.0125/468.0125 <Med 12 > 463.01875/468.01875 <Med 13>
463.0250/468.0250 <Med 2> 463.03125/468.03125 <Med 21>
463.0375/468.0375 <Med 22 > 463.04375/468.04375 <Med 23>
463.0500/468.0500 <Med 3> 463.05625/468.05625 <Med 31>
463.0625/468.0625 <Med 32 > 463.06875/468.06875 <Med 33>
463.0750/468.0750 <Med 4> 463.08125/468.08125 <Med 41>
463.0875/468.0875 <Med 42 > 463.09375/468.09375 <Med 43>
463.1000/468.0000 <Med 5> 463.10625/468.10625 <Med 51>
463.1125/468.1125 <Med 52 > 463.11875/468.11875 <Med 53>
463.1250/468.1250 <Med 6> 463.13125/468.13125 <Med 61>
463.1375/468.1375 <Med 62 > 463.14375/468.14375 <Med 63>
463.1500/468.1500 <Med 7> 463.15625/468.15625 <Med 71>
463.1625/468.1625 <Med 72 > 463.16875/468.16875 <Med 73>
463.1750/368.1750 <Med 8> 463.18125/468.18125 <Med 81>
463.1875/468.1875 <Med 82 > 463.19375/368.19375 <Med 83>
462.9500/467.9500 <Med 9> 462.95625/467.95625 <Med 91>
462.9625/467.9625 <Med 92 > 462.96875/467.96875 <Med 93/EMS UTAC>
462.9750/467.9750 <Med 10> 462.98125/467.98125 <Med 101>
462.9875/467.9875 <Med 102> 462.99375/467.99375 <Med 103>

Fire Inter-system
39.480 <3FIRE-2> 45.860 <3LAW-3> 45.880 <3FIRE-4> 154.265 <1FIRE-7> 154.2725 <1FIRE-8> 154.280 <1FIRE-9> 154.2875 <1FIRE-10> 154.295 <1FIRE-11> 154.3025 <1FIRE-12>

Law Enforcement Inter-system
39.460 <3LAW-1> 155.4750 <1LAW-16> 155.4825 <1LAW-17>

Public Safety Interoperability
(all agencies including local, state and federal agencies)
155.7525 <1CALL-18/VCALL>
151.1375 <1TAC-05/VTAC-1> 154.4525 <1TAC-13/VTAC-2>
157.2250 <1TAC-21D> 157.2500 <1TAC-19D> 157.2750 <1TAC-20D>
158.7375 <1TAC-22/VTAC-2> 159.4725 <1TAC-23/VTAC-3>
161.8250 <1TAC-25> 161.8500 <1TAC-24> 161.8750 <1TAC-26>

453.2125/458.2125 <UCALL/4CALL-27D> 453.4625/458.4625 <UTAC-1/4TAC-28D>
453.7125/458.7125 <UTAC-2/4TAC-29D> 453.8625/458.8625 <UTAC-3/4TAC-30D>
458.2125 Mobile <4CALL-27> 458.4625 Mobile <4TAC-28> 458.7125 Mobile <4TAC-29>
458.8625 Mobile <4TAC-30>

NPSPAC 800 MHz International Mutual Aid (All 156.7 Hz PL)
866.0125/821.0125 <I-TAC5/USA-6>
866.0125/821.0125 <8CAL-90D/8CALL/I-CALL/USA-1>
866.5125/821.5125 <8TAC-91D/8TAC-1/I-TAC1/USA-2>
867.0125/822.0125 <8TAC-92D/8TAC-2/I-TAC2/USA-3>
867.5125/822.5125 <8TAC-93D/8TAC-3/I-TAC3/USA-4>
868.0125/823.0125 <8TAC-94D/8TAC-4/I-TAC4/USA-5>

821.0125 <8CAL-90> 821.5125 <8TAC-91> 822.0125 <8TAC-92>
822.5125 <8TAC-93> 823.0125 <8TAC-94> 866.0125 <I-CALLD>
866.5125 <I-TAC1D> 867.0125 <I-TAC2D>
867.5125 <I-TAC3D> 868.0125 <I-TAC4D>

Government Itinerant
Short distance, low-power service simplex 27.575 27.585
Local-area, common use simplex 163.7125 168.6125 412.8750 412.8875 412.9000 412.9125
Wide-area, common use simplex 412.8250 412.8375 412.8500 412.8625
Wide-area, common use repeaters 163.1000/168.3500 409.0500/418.0500 409.3375/418.3375
Local-area, common use repeaters 173.6250/167.1375 407.5250/416.5250 409.0750/418.0750

Interagency VHF/UHF Incident Response
169.5375/164.7125 <NC-1 Calling>
170.0125/165.2500 <IR-1> 170.4125/165.9625 <IR-2>
170.6875/166.5750 <IR-3> 173.0375/167.3250 <IR-4>
164.7125 <1FCAL-40> 165.2500 <1FTAC-41>
165.9625 <1FTAC-42> 165.5750 <1FTAC-43>
167.3250 <1FCAL-44> 169.5375 <1FCAL-40D/IR-5>
170.0125 <1FTAC-41D/IR-6> 170.4125 <1FTAC-42D/IR-7>
170.6875 <1FTAC-43D/IR-8> 173.0375 <1FTAC-44D/IR-9>

410.2375/419.2375 <NC-2 Calling>
410.4375/419.4375 <IR-10> 410.6375/419.6375 <IR-11>
410.8375/419.8375 <IR-12> 419.2375 <4FCAL-52>
419.4375 <4FTAC-53> 419.6375 <4FTAC-54>
419.8375 <4FTAC-55> 413.1875 <IR-13/4FTAC-56>
413.2125 <IR-14/4FTAC-57> 410.2375 <IR-15/4FCAL-52D>
410.4375 <IR-16/4FTAC-53D> 410.6375 <IR-17/4FTAC-54D>
410.8375 <IR-18/4FTAC-55D>

Interagency Law Enforcement VHF/UHF Interoperability
167.0875 National Calling Channel <LE-A/1FCAL-35D>
167.0875/162.0875 <LE-1> 167.2500/162.2625 <LE-2>
167.7500/162.8375 <LE-3> 168.1125/163.2875 <LE-4>
168.4625/163.425 <LE-5> 162.0875 <1FCAL-35>
162.2625 <1FLAW-36> 162.8375 <1FLAW-37>
163.2875 <1FLAW-38> 163.4250 <1FLAW-39>
167.2500 <1FLAW-36D/LE-6> 167.7500 <1FLAW-37D/LE-7>
168.1125 <1FLAW-38D/LE-8> 168.4625 <1FLAW-39D/LE-9>

414.0375 National Calling Channel <LE-B/4FCAL-45D>
409.9875/418.9875 <LE-10> 410.1875/419.1875 <LE-11>
410.6125/419.6125 <LE-12> 419.9875 <4FLAW-46>
419.1875 <4FLAW-47> 419.6125 <4FLAW-48>
414.0625 <LE-13/4FLAW-49> 414.3125 <LE-14/4FLAW-50>
414.3375 <LE-15/4FLAW-51> 409.9875 <LE-16/4FLAW-46D>
410.1875 <LE-17/4FLAW-47D> 410.6125 <LE-18/4FLAW-48D>

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

For 700 MHz interoperability channels, see page 13.

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Scanning Oklahoma, Oregon, and Delaware

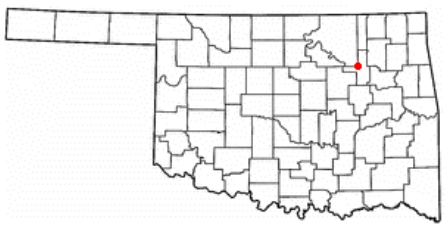
The dog days of summer are a good time to sit back in the shade and catch up on your reading. This month brings us a mailbag question about police activity in Oklahoma and a discussion concerning a very expensive Oregon radio proposal. In case you're headed to a mid-Atlantic beach, we finish up with some details about Delaware's statewide radio network.

❖ Tulsa, Oklahoma

Hi Dan,

I live in Tulsa and listen to the Tulsa Police on the scanner. Can you tell me why I can't hear the officers when they get into a pursuit? Dispatch says they are going to patch "east side" and "south side." Do you know if there is a hidden frequency that I could use to hear them?

Griffith in Tulsa



Tulsa, Oklahoma

Tulsa is located in northeastern Oklahoma, smack in the middle of Tornado Alley. It is the second-largest city in Oklahoma with almost 400,000 residents. In conjunction with the Oklahoma Department of Public Safety (DPS), the city operates a two-site, 28-channel Motorola trunked radio system. One repeater site is a tower located on East 61st Street near Shadow Mountain Park. The other site is downtown, on top of a building at the corner of East Second Street and South Cincinnati Avenue.

Depending upon where you're located, you may be able to hear one or both repeaters. Since the system is *simulcast*, meaning the same information is simultaneously broadcasted, as long as you can hear one of the repeaters you will receive all of the traffic.

The twenty-eight frequencies (MHz) used by the system are:

856.4625, 856.7625, 856.9375, 856.9625, 856.9875, 857.4625, 857.7625, 857.9375, 857.9625, 857.9875, 858.4625, 858.7375, 858.7625, 858.9375, 858.9625, 858.9875, 859.4625, 859.7375, 859.7625, 859.9375, 859.9625, 859.9875, 860.4625, 860.7375, 860.7625, 860.9375, 860.9625, 860.9875

Traffic on the system is mostly analog, although it is capable of carrying APCO-25 digital voice as well. Talkgroups in use include:

Decimal	Hex	Description
11696	2DB	Police (Investigations)
12240	2FD	Police (Tactical)
26000	659	City Hall (Maintenance)
26032	65B	City Hall (Security)
26064	65D	City Hall (Operations)
26128	661	City Hall (Services)
30736	781	Police Uniform Division (Dispatch East)
30768	783	Police (North)
30800	785	Police (Car-to-Car South)
30960	78F	Police (Records)
31024	793	Police (Dispatch South)
31120	799	Police (Special Investigations)
31152	79B	Police (Tactical East)
31216	79F	Police (Records)
31248	7A1	Police (Dispatch North)
31280	7A3	Police (Street Crimes)
31312	7A5	Police (Tactical South)
31344	7A7	Police (Alerts)
31408	7AB	Police (Car-to-Car North)
31472	7AF	Police (Tactical North)
31600	7B7	Police (South)
31632	7B9	Police (Car-to-Car East)
32432	7EB	Police (Special Operations)
33808	841	Sheriff (Tactical 2)
33840	843	Sheriff (Tactical 3)
35344	8A1	Airport Authority (Channel A)
35376	8A3	Airport Authority (Channel B)
35408	8A5	Airport Authority (Channel C)
35440	8A7	Airport Authority (Channel D)
35472	8A9	Airport Authority (Channel E)
35504	8AB	Airport Authority (Channel F)
35856	8C1	Fire (Dispatch)
35888	8C3	Fire (Non-emergency)
35920	8C5	Fire (Tactical District 1)
35952	8C7	Fire (Tactical District 2)
35984	8C9	Fire (Tactical District 3)
36016	8CB	Fire (Tactical District 4)
36048	8CD	Fire (Tactical District 5)
36080	8CF	Fire (Hazardous Materials Team)
36112	8D1	Fire Department (Tactical Airport)
36368	8E1	Transit Authority
36400	8E3	Transit Authority
36432	8E5	Transit Authority
36464	8E7	Community College (Metro)
36496	8E9	Community College (Northeast)
36528	8EB	Community College (Southeast)
36560	8ED	Community College (West)
36592	8EF	Community College (Supervisors)
36624	8F1	City Zoo
36688	8F5	Radio Services
36720	8F7	Oklahoma State University (Tulsa campus)
36752	8F9	Oklahoma State University (Tulsa campus)
36880	901	Fire (Training)
36912	903	Fire (Training)
36944	905	Fire (Training)
36976	907	Fire (Training)
37008	909	Fire (Training)
37040	90B	Fire (Training)
37264	919	Fire (Administration)
37296	91B	Fire (Administration)
37328	91D	Fire (Administration)
37648	931	Special Events
37680	933	Special Events
37712	935	Special Events
37776	939	Convention Center
37808	93B	Convention Center
37840	93D	Convention Center
38032	949	Emergency Management Agency
38064	94B	Emergency Management Agency
38096	94D	Emergency Management Agency
38128	94F	Emergency Management Agency
38416	961	Medical Helicopters
38448	963	Medical Helicopters
38608	96D	United States Secret Service
38640	96F	United States Secret Service
38704	973	Mayor's Office
39056	989	Tulsa Park & Recreation Department
39088	98b	Tulsa Park & Recreation Department
39184	991	Tulsa River Parks Authority
39216	993	Tulsa River Parks Authority
39248	995	Tulsa River Parks Authority
39344	99B	Violent Crime Task Force
39952	9C1	Building Inspections
39984	9C3	Public Works (Inspections)
40016	9C5	Public Works (Engineering)
40048	9C7	Street Maintenance
40080	9C9	Traffic Engineering
40112	9CB	Public Works (Maintenance)
40144	9CD	Public Works (Administration)
40176	9CF	Public Works (Customer Service)
40240	9D3	Public Works (Traffic)
40432	9DF	Public Works (Supervisors)
40464	9E1	Public Works (Garbage Collections)
40496	9E3	Public Works (Water Supply)
40528	9E5	Public Works (Water Drainage)
40976	A01	Sheriff (Dispatch)
41008	A03	Sheriff
41040	A05	Sheriff (Car-to-Car)
41072	A07	Sheriff (Tactical 1)
41104	A09	Sheriff (link to Highway Patrol

		Helicopter)
41136	A0B	Sheriff

Besides the trunked radio system, it may be worth checking the NPSPAC (National Public Safety Planning Advisory Council) channels. These are nationwide analog frequencies set aside for mutual aid and interagency coordination.

Frequency	Description
866.0125	Calling
866.5125	Tactical 1
867.0125	Tactical 2
867.5125	Tactical 3
868.0125	Tactical 4
867.7875	Nationwide Law Enforcement

If a pursuit involves the Oklahoma Highway Patrol (OHP), you can try the following low band frequencies around Tulsa. These are often used when coverage from the trunked system is poor.

Frequency	Description
44.70	Car-to Car and Dispatch-to-Car (Simplex)
44.90	Car-to-Dispatch
45.18	Car-to-Dispatch
45.22	Car-to-Car and Dispatch-to-Car (Simplex)
44.84	Car-to-Car

There are also OHP car-to-frequencies in VHF (154.935 MHz) and 800 MHz (855.9875 MHz).

If you don't have your scanner handy but you're in front of a computer with an Internet connection, the Tulsa Police Department has a rather progressive web site at **www.tulsapolice.org**. One of the links on the site is labeled "*Live calls near you*" and takes you to a screen with a list of current and outstanding police calls, taken from the Department's Computer-Aided Dispatch (CAD).

Even if you do have your scanner handy, the web site might help make sense of some of the radio traffic you're hearing. Matching up radio call signs and street addresses with the description and location information from the web site can paint a more detailed picture than either the scanner or the web site could by themselves.

If you're concerned that your scanner might not be catching all of the action, you can listen in on Tulsa-area incidents via Internet-based live streaming audio. Go to **http://tulsametromedia.net** and click on the "*Scanner*" selection at the top of the page. From there you can listen to local area VHF and UHF transmissions.

❖ Oregon Sticker Shock

Oregon State officials suffered sticker shock in May when they were presented with a $665 million proposal to build a statewide radio network. A dozen other states have built similar public safety networks, but only New York's $2 billion OpenSky network has a higher price tag.

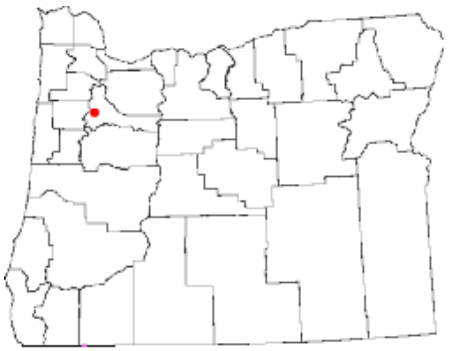
The Oregon Wireless Interoperability Network (OWIN), like other state networks, is intended to provide seamless communications between agencies and departments at the federal, state, and local levels. At present, public safety personnel are not always able to communicate among themselves due to poor radio coverage. Agencies cannot easily communicate with other agencies due to aging and incompatible technology.

Oregon residents are at risk, according to the proposal, due to these and other shortcomings of the state's existing radio infrastructure. Even the Oregon Legislature noted in 2005, "The deteriorating condition of our public safety radio systems is of immediate concern because it compromises the safety and well-being of the citizens of the State of Oregon." The Legislature went on to note that "the majority of the communications systems in Oregon are unreliable, greatly increasing the danger to first responders and law enforcement officers in carrying out their duty to protect the citizens and property of the State of Oregon."

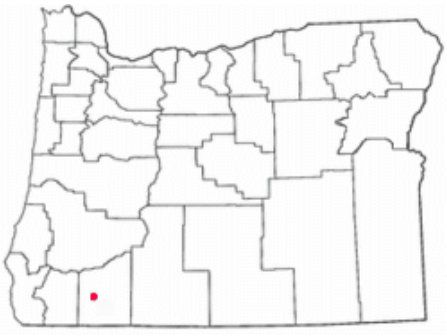
The proposal also cites an FCC mandate as an additional reason for immediate action. Due to a lack of available frequencies, the FCC is requiring that land mobile radio users operating below 512 MHz switch from "wideband" to "narrowband" equipment by January of 2013. Older radio equipment requires 25 kHz of bandwidth in which to operate effectively and the FCC made many previous spectrum allocations with that limitation in mind. Improvements in technology now allow radios to operate in only 12.5 kHz of spectrum, making it possible to pack twice as many narrow channels in the same amount of consumed by wide channels. The FCC intends to re-allocate portions of the spectrum with narrower channels, hoping this will ease the current spectrum shortage.

To add to the time crunch, the FCC will not allow the purchase of wideband equipment after next January, in hopes this will encourage users to transition to narrowband sooner. This means Oregon will have a much more difficult time in locating replacement equipment and will be unable to expand their existing infrastructure. This will be a challenge for local agencies as well, since more than 80% of them report using frequencies below 512 MHz.

Because the proposed radio system is expected to take at least six years to build, the state must get started immediately in order to meet the FCC deadline. However, it doesn't look like construction will begin any time soon. The proposal, as it stands now, was rejected as too expensive and too poorly defined. Officials involved in planning for the new radio network are hoping to have an alternative for the Legislature to review next year.



Salem, Oregon



Central Point, Oregon

OWIN, as proposed, is a high-tech network of repeater sites that will support high speed wireless data, Voice over Internet Protocol (VoIP), Geographic Information Systems (GIS) based on the Global Positioning System (GPS) and digital maps, as well as digital images and even situational video feeds. The core of the network is to be a trunked, digital Project-25 voice dispatch system operating in VHF and 700 MHz frequencies. VHF is to be used in remote, rural, and lightly populated areas where coverage is more important than capacity. 700 MHz frequencies would be used in the cities and other population centers where many simultaneously active channels will be needed.

The proposal makes the claim that more than 80% of the existing antenna towers are either unsafe or inadequate to support newer equipment, and will have to be replaced. In addition, fewer than 6% of the existing repeater sites have reliable backup electrical power.

Oregon currently has four independent radio systems. The Oregon State Police operate the largest system, with 103 repeater sites operating in the VHF band. The system covers about 80% of the 98,000 square miles of land and water that make up the state.

Other systems include the Oregon Department of Transportation (with 96 sites and 69% state coverage), the Oregon Department of Forestry (55 sites, 45% coverage), and the Oregon Department of Corrections.

The Oregon State Police (OSP) have two dispatch facilities, the Northern Command Center in Salem and the Southern Command Center in Central Point. Over the last two years these centers handled nearly 415,000 calls for service and just over 400,000 traffic stops.

The OSP is organized into four districts with the following borders:

District	Borders
1	West of the Cascades, north of Salem
2	West of the Cascades, between Salem and Cottage Grove
3	West of the Cascades, south of Cottage Grove
4	East of the Cascades

The following table lists the frequencies and the locations where they are used. Notice that some frequencies are used in more than one location.

Frequency	District	Location
154.650	4	Umatilla
	4	Milton Freewater
154.665	2	Albany
154.680	3	Medford
154.695	3	Klamath Falls
154.770	2	Blue River
154.785	2	Florence
	3	Grants Pass
	4	Bend
154.815	3	Roseburg
154.845	2	Springfield
154.860	1	Tillamook
	2	Mill City
	3	Coos Bay
	4	Burns
154.905	1	Columbia City
	2	Cottage Grove
	4	LaGrande
	4	Enterprise
	4	Pendleton
154.920	3	Roseburg
154.935	1	Portland
	2	Newport
	4	Ontario
	4	Gilcrest
	4	Fossil
155.910	2	Salem
	3	Gold Beach
	4	Baker
	4	John Day
	4	The Dalles
	4	Arlington
156.150	1	Astoria
156.225	1	McMinnville

You may also find law enforcement related activity on these frequencies:

Frequency	Description
155.475	Oregon Police Emergency Network
156.030	Tactical Repeater
158.895	Tactical Repeater

You can also listen to live Oregon police calls via the Internet by going to **www.oregonlive.com/policescanner** and clicking on the "*Listen live here*" selection.

❖ Delaware

Fourteen years ago the State of Delaware contracted with Motorola to build a statewide trunked radio system. The system uses APCO (Association of Public Safety Communications Officials) Project 25 (P-25) digital standards, making it compatible with any other federal and adjacent state radio systems.

In 2004 the State again contracted with Motorola, this time to perform a number of upgrades. The list of things to do this time around included the construction of additional repeater sites to improve in-building coverage and the replacement of the City of Wilmington's analog trunked system with digital hardware integrated to the state network.

The Delaware system currently serves a number of state agencies as well as county and local public safety departments. It is made up of three different regions corresponding to the three counties in the state.

New Castle County frequencies are 866.2375, 866.4875, 866.5625, 866.7250, 867.0375, 867.2375, 867.4875, 867.7125, 867.7375, 868.2125, 868.3875, 868.7125, 868.9375 and 868.9625 MHz.

Kent County uses 866.0750, 866.1625, 866.6500, 866.6750, 866.7625, 867.1250, 867.6500, 867.6750, 867.9500, 867.9750, 868.6125, 868.6500, 868.7500, 868.8625 and 868.9000.

Sussex County transmits on 866.1000, 866.3625, 867.0875, 867.3500, 867.6000, 867.8375, 868.0875, 868.1125, 868.3500 and 868.5875 MHz.

Additional repeater sites in various towns fill in some of the coverage gaps left by the main sites. These sites include:

Hartly in Kent County operates on 866.1625, 866.7625, 867.9750, 868.6125 and 868.86250 MHz.

Wilmington in New Castle County transmits on 866.3000, 866.6500, 866.8250, 867.1250, 867.3000, 867.6625, 868.3250 and 868.5000 MHz.

Hockessin in New Castle County uses 866.5375, 866.7875, 867.2625, 867.4250, 867.7750, 868.0875 and 868.5750 MHz.

Rehoboth Beach in Sussex County uses 866.1000, 866.3625, 867.0875, 867.3500, 867.6000, 867.8375, 868.0875, 868.1125, 868.3500 and 868.5875 MHz.

Additional sites are expected to come online as Motorola completes their upgrades.

There are a large number of talkgroups in use on the system, including:

Decimal	Hex	Description
2320	091	Kent County State Police (Dispatch)
2352	093	(Tactical 1)
2384	095	(Tactical 2)
2448	099	Sussex County State Police (Dispatch)
2480	09B	(Tactical 1)
2512	09D	(Tactical 2)
3152	0C5	Fire (Statewide)
3184	0C7	New Castle Fire (Dispatch)
3216	0C9	(Tactical)
3248	0CB	(Tactical)
3280	0CD	(Tactical)
3312	0CF	(Tactical)
3856	0F1	New Castle Emergency Medical Services (Dispatch)
3344	0D1	Kent County Fire (Dispatch)
3376	0D3	Tactical 1
3408	0D5	Tactical 4
3440	0D7	Tactical 5
3472	0D9	Tactical 6
3504	0DB	Sussex County Fire (Operations)
3536	0DD	(Operations)
3568	0DF	(Operations)
3600	0E1	(Operations)
3632	0E3	(Operations)
3824	0EF	Emergency Medical Services (Statewide)
4176	105	Kent County Emergency Medical Services (Operations 1)
4432	115	Sussex County Fire and Emergency Medical Services (Dispatch)
4464	117	Sussex County Emergency Medical Services (Operations)
4496	119	(Operations)
4688	125	Traffic Management Center (Statewide)
4720	127	(New Castle)
4848	12F	(Kent)
4944	135	Tr affic (Sussex)
5712	165	Delaware National Guard (Statewide)
5744	167	(New Castle)
5776	169	(Kent)
5808	16B	(Sussex)
6224	185	New Castle County Police (Dispatch 1)
6256	187	(Dispatch 2)
6288	189	(Tactical 1)
6320	18B	(Tactical 2)
6352	18D	(Tactical 3)
6384	18F	(Tactical 4)
6704	1A3	(SWAT)
9296	245	Mutual Aid (Statewide)
11536	2D1	Kent County Emergency Medical Services (Dispatch)
11568	2D3	(Operations 2)
18288	477	Emergency Management Tactical 1 (Digital)
18320	479	Tactical 2 (New Castle)
18352	47B	Tactical 3 (New Castle)
18384	47D	Tactical 4 (New Castle)
18416	47F	Tactical 1 (Kent)
18448	481	Tactical 2 (Kent)
18480	483	Tactical 3 (Kent)
18512	485	Tactical 4 (Kent)
18544	487	Tactical 1 (Sussex)
18576	489	Tactical 2 (Sussex)
18608	48B	Tactical 3 (Sussex)
18640	48D	Tactical 4 (Sussex)
18672	48F	Tactical 1 (Statewide)
18704	491	Tactical 2 (Statewide)
18736	493	Tactical 3 (Statewide)
18768	495	Tactical 4 (Statewide)

That's all for this month. You can check my website at **www.signalharbor.com** for more detailed information on scanners, frequencies and other radio-related material. I also welcome electronic mail addressed to *danveeneman@monitoringtimes.com*. Until next month, happy scanning!

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Size: 6 15/16" Wide x 6 9/16" Deep x 2 3/8" High

Frequency Coverage: 25.000-512.000 MHz., 806.000-956.000 MHz. (excluding the cellular & UHF TV band), 1,240.000-1,300.000 MHz.

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

Bearcat® BCT8 Trunk Tracker III

Manufacturer suggested list price $299.95

CEI Special Price $169.95

250 Channels • 5 banks • PC Programmable

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

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

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

Bearcat® BCD396T Trunk Tracker IV

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

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

Frequency Coverage:

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

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

More Radio Products

Save even more on radio scanners when purchased directly from CEI. Price includes delivery in the continental USA excluding Alaska.

Bearcat 898T 500 channel Trunktracker III base/mobile	$209.95
Bearcat 796DGV 1,000 channel Trunktracker III base/mobile	$519.95
Bearcat BCD396T APCO 25 Digital scanner with Fire Tone Out	$519.95
Bearcat 246T up to 2,500 ch. Trunktracker III handheld scanner	$214.95
Bearcat Sportcat 230 alpha display handheld sports scanner	$184.95
Bearcat 278CLT 100 channel AM/FM/SAME WX alert scanner	$129.95
Bearcat 248CLT 50 channel base AM/FM/weather alert scanner	$104.95
Bearcat 92XLT 200 channel handheld scanner	$109.95
Bearcat 72XLT 100 channel handheld scanner	$99.95
Bearcat BR330T up to 2,500 ch. Trunktracker III with Tone out	$274.95
Bearcat BCT8 250 channel information mobile scanner	$169.95
Bearcat 350C 50 channel desktop/mobile scanner	$104.95
AOR AR16BQ Wide Band scanner with quick charger	$199.95
AOR AR3000AB Wide Band base/mobile receiver	$1,079.95
AOR AR5000A+3B Wide Band 10 KHz to 3 GHz receiver	$2,599.95
AOR AR8200 Mark IIIB Wide Band handheld scanner	$594.95
AOR AR8600 Mark II Wide Band receiver	$899.95
AOR AR-ONE Goverment/Export sales only 10 KHz-3 GHz	$4,489.95
Scancat Gold For Windows Software	$99.95
Scancat Gold for Windows Surveillance Edition	$159.95

Bearcat® BC246T Trunk Tracker III

Suggested list price $399.95/**CEI price $214.95**

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:

25.0000-54.0000 MHz., 108.0000-174.0000 MHz., 216.0000-224.9800 MHz., 400.0000-512.0000 MHz., 806.0000-823.9875 MHz., 849.0125-868.9875 MHz., 894.0125-956.000 MHz., 1240.0000 MHz.-1300.0000 MHz.

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

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US Coast Guard May Drop HF Broadcasts

The United States Coast Guard has posted notice in the April 26 Federal Register that it is taking comments from users of all its weather and warning broadcasts on the high-frequency (HF) band (3-30 megahertz). The future of all USCG HF weather frequencies and modes is completely in question here.

The worst case scenario, however unlikely, is that the Coast Guard would drop all of its HF weather services. There would be no more faxes, no more voice from "Perfect Paul" or "his" computer successors, and no more narrowband direct teleprinting. All gone.

NAVTEX, Navigational Telex, a medium-frequency service required by international treaties, is not mentioned, and it would presumably continue. Here is the summary from the Federal Register:

"The Coast Guard is soliciting public comment on the need to continue providing high frequency (HF) radio broadcasts of weather forecasts and warnings. Public comment is necessary in order to assess the demand for the HF radio broadcasts of weather forecasts in each of three forms: (1) Radiofacsimile; (2) voice; and, (3) Simplex Teletype Over Radio (SITOR), also known as Narrow Band Direct Printing (NBDP). The infrastructure necessary to provide these services has exceeded its life expectancy; the equipment is no longer manufactured, repairs are difficult to accomplish, and spare parts generally are not available. Because of the very significant costs involved to continue these specific HF radio services, the Coast Guard requires information on the extent to which these services are used by the public and what alternative services are being used or are available to obtain weather forecasts and warnings."

The full Coast Guard announcement is available online, at **www.nws.noaa.gov/om/marine/waisgate.pdf**

Briefly, the issue is that the Coast Guard's 24 HF transmitters are becoming unreliable, and the only solution is to replace them. In order to justify this expense, the Guard is soliciting written comments from users of its services.

As hobbyists, we're not really considered users. Fair enough. Most of us are not on the navigation bridge of a supertanker looking for information on where the hurricane is. However, plenty of users do read this column, and we hope they will respond.

Comments are being sought on a number of specific questions pertaining to who you are, where your vessel operates, how you use the service, what alternatives you have available, and how you would be affected by the loss of HF. Comments must have the Federal docket number, which is USCG–2007–27656. They can be submitted over the World Wide Web, by mail, by fax, or hand delivered. The deadline is August 24, 2007. Full instructions and details are at the web link mentioned earlier.

❖ Air Force MARS Change

The US Air Force MARS (Military Affiliate Radio System) is a quasi-amateur service involved in morale patches and emergency preparedness for the US Air Force. Recently, it announced that it will change all of its frequencies slightly.

For reasons that were never well understood by non-members, the Air Force MARS moved all of its frequencies up by one tenth of a kilohertz (kHz) a year or two ago. For example, the busy patching frequency of 13927.0 kHz upper sideband (USB) became 13927.1. Its alternate became 14606.1. Perhaps this was intended to offset slightly from interfering pirate and bootleg operations, which tend to set frequencies on even kilohertz. Perhaps not.

In any event, by the time anyone reads this, the AF MARS will have gone back to frequencies ending in .0 and .5. It's a little thing, but if you've noticed they're a bit off lately, this is why.

❖ DX Tuners Closes

Many utility fans were somewhat dismayed to find out that DX Tuners, a Swedish web site which enabled Internet users to connect to many radios worldwide, has ceased operations.

This network had become really useful for a number of important utility functions, such as determining where stations were loudest, finding more favorable locations, or just finally hearing some elusive catch. A few radios were in quiet, rural locations, with large wire antennas the rest of us could only dream of. They had chat boxes where you could occasionally meet their operators or swap frequencies with other users.

DX Tuners will refund the unused subscription amount. There's a link at their usual web address. In my case, though, I'm letting them keep it. They helped me a lot over the years, and they deserve it.

❖ Cuban PSK Testing

PSK stands for Phase-Shift Keying. Ham radio operators, especially in Europe, have been experimenting with different data rates and encoding schemes. Now it appears as if the Cuban agency responsible for the voice and Morse code numbers transmissions is doing the same thing.

It began on the new frequencies of 17478 kHz at 1600 Coordinated Universal Time, and on 17436 at 1700. Some of these broadcasts were suddenly in PSK31, a popular, 31.35-baud, direct printing mode. It's audible on 14070 kHz just about any time the band is open. Just about any free or cheap ham program will decode it.

At press time, the format seems to be settling down. Messages are still in threes, but now they are sent both as numbers and as letters in the weird, Cuban "cut" format, delimited by lines of 1's and sometimes 2's. "Cutting" Morse code numbers (by substituting letters for numbers) saves a huge amount of time. In PSK31, however, it only saves a few seconds. It makes little sense, unless existing computer software expects to see the copy this way. In fact, this may very well be the case.

More recent transmissions have also come at other times, and in modes such as PSK220F and PSK125. It's as if someone has distributed MultiPSK, a European ham shareware that can handle most of these, and now they are pushing buttons and deciding which one they like best.

ENIGMA 2000, the online European Numbers Information Gathering and Monitoring Association, has already designated this one SK01 (the first PSK numbers station). It should be reported as such.

That's enough strangeness for this month. Have a nice beginning-of-summer.

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 Command System
CAMSLANT.....Communication Area Master Station, Atlantic
CAMSPAC.....Communication Area Master Station, Pacific
CW.....On-off keyed "Continuous Wave" Morse telegraphy
E07.....Russian numbers in English, ends "000 000"
EAM.....Emergency Action Message
FAX.....Radiofacsimile
FEC.....Forward Error Correction
FEMA.....US Federal Emergency Management Agency
HF-GCS.....High-Frequency Global Communication System
LSB.....Lower Sideband
M08a.....Cuban 3-msg CW, ANDUWRIGMT = 1-0
M12.....Russian CW numbers, T=0
M24a.....Russian 2-message CW numbers, sent very fast
M51.....French military or intelligence, coded CW messages
MARS.....Military Affiliate Radio System
Meteo.....Meteorological
PACTOR.....Packet Teleprinting Over Radio
PSKx.....Phase-Shift Keying, numbers after are baud rates
Selcal.....Selective Calling
SITOR-B.....Simplex Telex Over Radio, FEC teleprinting mode
SK01.....Cuban "numbers" in PSK teleprinting
Unid.....Unidentified
US.....United States
USCG.....United States Coast Guard
UK.....United Kingdom
V02a.....Atencion" Spanish numbers, 3-msg format
V21.....Cuban live voice, barely intelligible numbers
VOLMET.....Formatted "Flight Weather" broadcast

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 ().

2311.0 Arklow Shipping Net-Maritime station making daily position check with vessels *Arklow Rose*, *Arklow Rock*, *Arklow Fortune*, and *Arklow Willow*, at 1915. (Patrice Privat-France)

2414.0 CL1AR-New Hampshire emergency net, Clarendon, ALE sounding at 2342. (Ron Perron-MD)

4081.4 Hotel Foxtrot-US Navy, tactical data link coordination net with Delta and Juliet, at 1121. (Mark Cleary-SC)

4331.0 4XZ-Israeli Navy, Haifa, coded 5-letter CW messages at 0013. (Tom Sevart-KS)

4490.0 KGC253-US General Services Administration, DC, calling NCS015, a SHARES (US government SHAred RESources) Coordinating Station, ALE at 1949. (Perron-MD)

4506.0 Red Cloud 144-Nebraska Civil Air Patrol net control at 0031. (Sevart-KS)

4516.3 NNN0SCV-US Navy/Marine Corps MARS, logging onto NNN0DVA PACTOR system, at 0025. (Sevart-KS)

4536.0 PRT-US Army National Guard, Portsmouth, VA, ALE sounding at 0040. (Jack Metcalfe-KY)

4562.0 PUL-US Army National Guard, Emporia, Pulaski, VA, ALE sounding at 2352. (Metcalfe-KY)

4585.0 043MERCAP-Civil Air Patrol Middle East Region, ALE sounding at 0915. (Perron-MD)

4724.0 Platinum-US military, with a 28-character EAM simulcast on 8992 and 11175, at 0200. (Jeff Haverlah-TX)

4837.0 EMP-US Army National Guard, Emporia, VA, ALE sounding at 0049. GTC, Gate City, VA, sounding at 2323. (Metcalfe-KY)

5100.0 VMC-Australian Weather East, Charleville, weak FAX chart at 0830. (Ron Tull-Canada)

5125.0 VAB-US Army National Guard, Virginia Beach, VA, ALE sounding at 2047. (Metcalfe-KY)

5135.0 SEMOHQ (NY State Emergency Management Office, Albany): 2141 USB/ALE sounding. (Perron-MD)

5505.0 Shannon VOLMET, Ireland, aviation weather broadcast at 0840. (Tull-Yukon, Canada)

5598.0 Europa 064-Flight working Santa Maria, at 0642. (Privat-France)

5616.0 Shanwick-North Atlantic air route control, selcaling FH-EK, Northwest 32, an A330 with registration N806NW, at 0644. (Privat-France)

5708.0 R05198-US Army helicopter, ALE sounding at 0358. (Cleary-SC)

5717.0 Rescue 915-Canadian rescue helicopter, patch via Halifax Military to Halifax Search, for tasking in fishing vessel search, at 2352. (Cleary-SC)

5748.6 WNG764-US Department of State, DC, calling AAA9USA, US Army MARS headquarters, ALE at 1104. (Perron-MD)

5799.0 Cuban CW "cut number" station (M08a), in progress at 1432. (Sevart-KS)

5881.5 R10240-US Army, calling T5B159, 5-159th Aviation (Heavy Lift), VA, ALE at 0010. (Perron-MD)

6501.0 NOJ-USCG, Kodiak, AK, coastal weather at 0245. (Tull-Canada)

6529.0 The Babbler-Cuban fast-talking, barely intelligible, Spanish numbers (V21), at 1315. (Sevart-KS)

6532.0 Tokyo-Central/West Pacific air route net, Japan, working aircraft at 0854. (Tull-Canada)

6676.0 Sydney-Sydney VOLMET, Australia, aviation weather at 0730. (Tull-Canada)

6697.0 Domicile-US military, EAM at 2211. (Cleary-SC)

6715.0 Halifax Military-Canadian Forces, calling Pathfinder 36, at 1112. (Cleary-SC) MOBD14DAT-possible US Air Force Mobile Data Link, calling MOBDAT, ALE at 2001. (Perron-MD)

6721.0 UKE301-UK Royal Air Force E-3D AWACS, ALE-initiated patch via Andrews AFB, MD, to Tinker AFB, OK, at 2207. (Cleary-SC)

6739.0 Andrews-US Air Force HF-GCS control station, Andrews AFB, MD, Skyking broadcast, also 8992, at 0528. (Tull-Canada)

6761.0 Grits 35-US Air Force C-17A, calling Tazz 50 (US Air Force Reserve tanker), at 1458. (Cleary-SC)

6854.0 Cuban CW "cut number" station (M08a), messages in progress at 2226.. (Sevart-KS)

6855.0 Cuban AM Spanish "numbers" (V02a), callup 88553 51913 87763 and messages, at 2101. (Sevart-KS)

6911.5 T5B159-US Army 5-159 Aviation, Ft. Eustis, VA, ALE sounding at 2228. (Larry Van Horn-NC)

6932.0 Cuban CW "cut number" station (M08a), messages in progress at 2100. (Sevart-KS)

6949.9 Unid-Unknown CW "numbers" station, 5-figure groups in progress, then "QTH" *[Usually international "Q" signal for "my position is... ." -Hugh]*, then "26M0402731 [missed character] 53198V," at 0027 and still going at 0106. (Greg Smith-NJ) *[Long-time frequency for a French station with ENIGMA designator M51. The text string fits their format where 26=message serial number, M=May, 04=day of month, 027 approximately = time, 31=seconds. If so, nice catch. -Hugh]*

7527.0 USCG Cutter *Harriet Lane*, radio check with US Customs Service Center, at 1320. (Cleary-SC)

7554.0 Cuban CW "cut number" station (M08a), callup 24093 93171 48552 and messages, at 2000. (Sevart-KS)

7650.0 R24499-US Army helicopter, calling KGEZNG, IN National Guard, ALE at 1943. (Perron-MD)

7697.1 ATTHIGHPORT204-Unknown AT&T, calling ATTKSCY-BASE225, Kansas City, MO, ALE at 1312. (Perron-MD)

7710.0 VFF-Canadian Coast Guard, Iqualuit, weather FAX at 0745. (Tull-Canada)

7772.0 BENIN-Nigerian oil net, Benin City Depot, Nigeria, ALE sounding at 2227. (Perron-MD)

7849.0 SCLC222M-Venezuelan Army 222nd Infantry Mobile Command Post, calling CLC22M, 22nd Infantry, also on 8060, ALE at 0201. (Perron-MD)

7887.0 Cuban PSK (probably SK01), testing various simultaneous modes/rates starting with PSK125 (125 baud), then adding several different PSK31 (31.35 baud) modes on varying audio tone centers, all with the same message, finally

switching to plain old V2a in AM, all starting at 2000. (Sevart-KS) *[Must have sounded like some old-movie space ship. -Hugh]*

7920.0 Unid-Fast Russian CW hand-sent "numbers" (M24a), callups 642/52 and 102.65, 5-figure groups, ended with usual "00000" (as 5 long dashes), at 1900. (Mike L-West Sussex, UK)

8037.0 GTC-VA National Guard, Gate City, ALE sounding at 1550. (Perron-MD) HAM-VA National Guard, Hampton, ALE sounding at 2320. (Metcalfe-KY)

8047.0 HQ703N-US Army National Guard Readiness Center, VA, calling V021IN at 0018; calling M030DN (MD) at 0027; calling A040LN (AL) at 0057; and calling K040YN (KY), all in ALE, at 0147. (Van Horn-NC)

8060.0 SCLC222M-Venezuelan Army 222nd Infantry, calling CLC23M, 23rd Special Operations Brigade, ALE at 2339. (Perron-MD)

8097.0 Radio Havana Cuba in AM at 1907, replaced by Cuban CW numbers station (M08a), in progress at 1914. (Sevart-KS)

8125.0 INGLATERRA-Probable Mexican military "countries" net, calling ITALIA, ALE at 0037. (Perron-MD)

8171.5 KGEZNG-Indiana National Guard, Shelbyville, ALE sounding at 1442. (Perron-MD) KMUING, PA, ALE sounding at 2139. KBNWNG, IA, ALE sounding at 2200. (Van Horn-NC)

8181.0 SCLC222M-Venezuelan Army, calling CLC22M, in ALE, also 7849 and 10600, at 1138. (Perron-MD)

8181.5 R26658-OH National Guard helicopter, calling T1Z151 (SC National Guard 1-151st Aviation), ALE at 1455. (Perron-MD)

8184.5 R23930-Possible helicopter, calling T6JRTC, US Army, ALE at 0033. (Perron-NC) STPOPS-US Army National Guard, St. Paul, MN, ALE sounding at 2012. (Van Horn-NC)

8280.0 1F5G-Venezuelan Navy/ Coast Guard/ Riverine, calling T8R1, also 8500 and 9075, LSB ALE at 0048. (Perron-MD)

8297.0 2TB9-Venezuelan Navy, calling T5L1, possible headquarters, LSB ALE at 0811. (Perron-MD)

8337.6 Shark 11-USCG Cutter *Forward*, setting radio guard with Stingray 02, at 1931. (Cleary-SC)

8340.0 Y5RT-Venezuelan Navy, calling 1PZ2, LSB ALE at 0358. (Perron-MD)

8415.0 NMC-USCG CAMSPAC Pt. Reyes, CA, SITOR-B maritime weather at 0755. (Tull-Canada)

8500.0 CGA-Venezuelan Navy headquarters, calling F24 (Frigate *General Soublette*), ALE at 0057. (Perron-MD)

8595.0 UFL-Vladivostok Radio, Russia, SITOR-B maritime information at 0800. (Tull-Canada)

8682.0 NMC-USCG, Point Reyes, CA, FAX Pacific satellite image 2112. (Sevart-KS)

8810.0 3K5I-Venezuelan Coast Guard, calling T8R1, LSB ALE at 0430. (Perron-MD)

8828.0 Auckland VOLMET, New Zealand, aviation weather at 0740. Tokyo VOLMET, Japan, aviation weather at 0905. (Tull-Canada)

8867.0 Auckland-South Pacific air route net, New Zealand, selcalling DF-JR, Virgin Blue Boeing 737-8FE registration VH-VUA, at 0630. (Privat-France)

8912.0 Coast Guard 1503-USCG HC-130, patch to E-City Air, NC, at 1833. (Cleary-SC)

8983.0 CAMSLANT-USCG, VA, working Rescue 320 (Canadian Forces CC-130), at 1254. (Cleary-SC) CAMSLANT, taking ops-normal message from "Bravo-9-Whiskey," at 1349. CAMSLANT, ops-normal with aircraft Coast Guard 2120, an HU-25 Falcon Jet, at 1750 (Allan Stern-FL)

8992.0 Dependent-US military, with two 28-character EAMs simulcast on 4724, and exercise sign-off "Standing by for traffic," at 0240. (Haverlah-TX)

9007.0 Canforce 2305-Canadian Forces aircraft getting weather from Trenton Military, at 2111. (Cleary-SC)

9017.0 1GTG7-Venezuelan Navy, calling T8R1, LSB ALE at 0309. (Perron-MD)

9025.0 ICZ-US Air Force, Sigonella, Italy, calling JDG, Diego Garcia, ALE at 2210. (Perron-MD)

9143.5 NRK-US Army National Guard, Norfolk, VA, ALE sounding at 0024. (Metcalfe-KY)

9153.0 Cuban AM Spanish "numbers" (V02a), in progress at 1314. (Sevart-KS)

9190.0 T5L1-Venezuelan Navy, calling 6GY2, also 9380, LSB ALE at 1036. (Perron-MD)

10057.0 San Francisco-Central/East Pacific air route net, CA, working aircraft at 2039. (Tull-Canada)

10126.0 Cuban AM Spanish "numbers" (V02a), in progress at 1400. (Sevart-KS)

10128.0 Russian "English Man" computer-voice numbers (E07), callup/preamble "105-1 256/42," at 2000. Same message on 9069 at 2020, 7519 at 2040. (Mike L-UK)

10588.0 WGY901-FEMA Region 1, Maynard, MA, weekly radio check, at 1616. (Cleary-SC)

10600.0 SCLC222M-Venezuelan Army, calling CLC22M, ALE at 0009. (Perron-MD)

10993.6 Shark 57-USCG Cutter *Sawfish*, taking guard for helicopter Dolphin 62, at 1419. (Cleary-SC) Shark 29-USCG Cutter *Decisive*, getting position from "Payback 2 Sierra," in probable US Customs operation, at 1900. Payback 2 Sierra, relaying status of Omaha 54 (Customs aircraft), at 2013, then securing guard with CAMSLANT at 2044. (G. Jackson-OH)

11175.0 Hot Spot-US military, with two 28-character EAMs and exercise sign-off "Standing by for traffic," simulcast on 8992, at 0041. Beef Cake-US military, same net, 98-character EAM simulcast on 8992, probably another exercise message, at 0210. Offutt-US Air Force HF-GCS, long (207-character) EAM with apparent exercise related formatting, at 2210. (Haverlah-TX) Offutt, patching Lima Lima 25, a Navy P-3C, to Brunswick Naval Air Station for weather, at 1419. Offutt working Dark 42 (US Air Force B-1B), at 1443. (Stern-FL) Ascot 7008-UK Royal Air Force E-3D AWACS, patch via Puerto Rico HF-GCS to Tinker AFB meteo office, at 2143. (Cleary-SC)

11205.0 Reach 2858-US Air Force C-130E, checking in with Smasher, US Joint Task Force, Key West, FL, at 2210. (Cleary-SC)

11217.0 4960WGY-Unknown FEMA, calling 908WGY (FEMA WGY 908, CO), ALE at 1412. (Perron-MD)

11220.0 Death 13-US Air Force B-2A, clear and secure radio checks with Andrews, at 1948. (Cleary-SC)

11244.0 Door Bell-US Military "Nightwatch" net, EAM simulcast on 6697 and 8776, at 0121. (Cleary-SC)

11282.0 San Francisco-Central/East Pacific air route net, CA, position check with American 253, at 2046. (Tull-Canada)

11439.5 KGEZNG-Indiana National Guard, ALE sounding at 1552. (Perron-MD)

12083.0 Unid-Russian CW 5-figure groups (M12), signed "000 000," at 1923. (Sevart-KS)

12164.0 119CDCS05-US Centers for Disease Control, ALE sounding at 1504. (Perron-MD)

12191.0 SCLC514-Venezuelan Army, 514th Jungle Infantry, calling CLC51, 51st Jungle Infantry, ALE at 2140. (Perron-MD)

12750.0 NMF-USCG, Boston, MA, FAX schedule at 1436. (Sevart-KS)

12870.0 V021IN-US Army National Guard, calling HQ703N (VA), ALE at 0018. (Van Horn-NC)

13282.0 Honolulu VOLMET, HI, aviation weather at 0300. Tokyo VOLMET at 0310. (Tull-Canada)

13524.0 R24629-ND National Guard, calling T2Z28, Bismarck, ND, ALE at 2355. (Perron-MD)

13927.1 AFA2HS-US Air Force MARS, FL, patching AWACS Sentry 60 to Tinker AFB ops, at 1434. AFA6PF-US Air Force MARS, Los Angeles, CA, patching Rocco 62, an Air Force Reserve tanker, to McGuire AFB, NJ ("Torch Control"), at 1704. (Stern-FL)

14606.1 AFA6PF-US Air Force MARS, CA, patching Shark 21 to Davis-Monthan weather office, at 1712. (Stern-FL)

15043.0 PLA-US Air Force, Lajes Field, Azores, calling JDG, Diego Garcia, at 1648. (Perron-MD)

16326.0 NWS1-US Army Corps of Engineers Northwest District, WA, ALE sounding at 2115. (Perron-MD)

16716.0 6GY2-Venezulan Navy, calling T5L1, LSB ALE at 2348. (Perron-MD)

17436.0 Cuban PSK numbers (SK01), modified M08a format alternating cut and straight numbers, in PSK220F at 1700. (Sevart-KS) *[PSK220F is 220.5 baud varicode, convolution coded. -Hugh]*

17478.0 Cuban PSK numbers (SK01), callup and messages in PSK31, at 1600. SK01, next week with same format in PSK220F, at 1600. (Sevart-KS)

18666.0 SF1- US Federal Bureau of Investigation, San Francisco CA, calling LA2, Los Angeles, at 1851. (Perron-MD)

20810.6 KWG41-US State Department, DC, ALE sounding at 1051. (Perron-MD)

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Up and Running with Hoka Code300-32

My venerable Code30 data decoder had provided sterling service since 1994, but the decade-long gap in technology was beginning to show and I was very pleased to be able to make the jump to the latest Hoka software recently.

I will be reporting on various aspects of the new software over the coming months, but to begin with, here are some details on my installation (a bit out of the ordinary as you'll find out) and first impressions.

❖ Basics and Installation

The old Code30 ran under DOS and I've used Windows 95 and booted into DOS using the F8 key at boot time for many, many years in order to use it. The Code30 "machine" itself is a pretty substantial ISA-bus card with a screened metal box with audio in and out connectors. What was inside the box was basically an early incarnation of the DSP soundcard. Now, a decade later, a budget PC has a soundcard that at least equals that dedicated hardware in terms of performance.

The Code300-32 arrives in a large ring binder complete with CD and training manual. A security "dongle" is used to authenticate the program and must be plugged into a free USB port. The system itself consists of Windows-based software and operates using most versions of that operating system and most standard soundcard devices.

Now, here I faced a challenge. I've been a very satisfied Apple Mac user for many years, which until now had kept me using the old setup for monitoring work. However, with the advent last year of Intel CPU-based Macs and the release of Apple's "Boot Camp" software that allows their machines to run Windows and OS X on the same machine, I was wondering if I had the answer to my dilemma: I could run OS X for all my regular work and Windows for the decoder. A quick check with Horst Diesperger at Hoka not surprisingly revealed that this would be a pretty unusual configuration among the Hoka users.

Anyway, taking my chances, rather than upgrade the old 350MHz Pentium-II desktop for another Windows box, I opted for an Intel-based 17in iMac. I installed Boot Camp and Windows XP Home Edition on 25Gb of the IMac's 160Gb drive, added the drivers for the Mac's hardware and with fingers crossed installed the Code300-32. To my delight the setup works flawlessly. Most helpfully, OS X mounts the whole Windows filesystem on the desktop: accessing saved decoder text and audio from within the Apple environment is a snap.

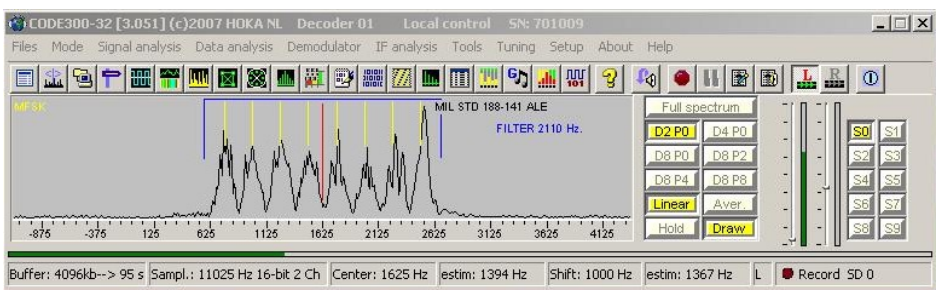
❖ Up and Running

So, after a few hours of installation, the Code300-32 was listening to the radio. On starting the software for the first time, I must admit to feeling more than a little overwhelmed. A decade of operating skills will have to be relearned, not least of which is the ability to open multiple windows to work on different aspects of a signal instead of going through the old routine to save audio to a file and work on it module by module (though you can still do that, too, of course!).

Below you can see a screenshot of the Code300's main operating display which shows the real-time signal spectrum, in this case with tuning bars for lining up a MIL-188-141A ALE signal, in addition to menu items for selecting various systems. The row of buttons at the top provides one-click access to the most commonly used analysis functions that do everything from measure speed and shift to displaying a PSK signal's constellation.

In the center you see the spectrum of the signal. You can also use the mouse here. Setting the center frequency of the decoder at any point requires just a right click, making retuning a snap. Holding the mouse at any point shows a little "tooltip" displaying the frequency and if you continue to hold and move the pointer, the shift is displayed, too. The vertical row of large buttons are used to zoom, hold, and average the signal, then you can see the level meter and buttons to select multiple sound inputs if you have them. The green line at the bottom of the display is the temporary "bit buffer" which holds a continuous 95 seconds (in my case) slab of saved audio that can be replayed.

More on the decoder over the coming months. Now, on to some HF digital goings-on.



❖ Siemens CHP200

Sometimes you have one of those days at the radio when you just seem to hear the same unusual signal again and again. It was just such an occasion a few days ago when CHP200 (sometimes listed as CHX200) seemed to appear everywhere.

From the US these signals are usually weak, being mostly mobile installations in South American countries like Argentina. CHX200 is a fast FSK ARQ system operating at 250bd and 170Hz shift. It has two modes of operation: non-frequency hopping (where it occupies the same channel for the duration of the message) and frequency hopping (where the system changes frequency quickly). CHX200 is one of those unmistakable sounds, the combination of speed and narrow shift giving a "zip, zip, zip" cadence. The majority of signals are centered on a 0.6 kHz offset. When sending traffic, the system shows an autocorrelation function (ACF) of 75 or 150.

Here are some recent frequencies to try: 5281.6, 6749.6, 6786.6, 6968.6, 8057.1, 8121.6, 9051.6, 9136.6, 10201.6, 14354.6, 15004.6 and 20386.6 kHz

By programming these frequencies into consecutive memories, you can easily tell that a number are part of the same system's frequency pool: for example, the 14 and 20MHz channels in the above list. CHP200 appears to have an ALE mechanism which you can hear testing frequencies in sequence. Leif Dehio's excellent site (see below) has clips of the system in operation.

Until next time, enjoy your digital listening. Finally, if you are interested in providing a loving retirement home for my Code30 (requires Windows 95 or 95SE/DOS and a relatively low-powered but ISA-bus equipped PC) please contact me via the *MT* address at the top of the column.

RESOURCES:
Hoka Code300-32 **www.hoka.net/code300-32/code300-32.htm**
CHP200 Audio Clip **www.signals.taunus.de/WAV/250Bd_ARQ.HTML**

GLOBAL FORUM

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WHRI Usurps Canadian Time Signals from CHU on 7335

CHU had just survived a possible closure, and then it faced a new threat. Neighbors to the south, hardly good ones, were ignoring its existence and firing up 250 kW on its 7335 frequency. The A-07 FCC and HFCC schedules showed WHRI, South Carolina at 0600-1100 on 7335 with a 152-degree beam for zones 10-15, i.e. México, Caribbean, Central and South America – and with 100 kW the rest of the 24 hours on 260 degrees to Mexico. Fortunately, the latter usage had not yet materialized, but CHU's time signals at 0600-1100 were blasted away by WHRI, which puts plenty of signal back into North America.

In the previous B-06 season, WHRI had been on 7315 during this time, and 7315 still is registered though not used, as Kai Ludwig points out. There does not appear to be any interference reason for shifting from 7315 to 7335. Why such an arrogant slap in the face to our northern neighbor, which is providing a real public service not only to all of Canada, but most of the USA in its official coverage area? And has been using 7335 for decades.

How would we like it if RCI decided to run a 250 kW transmitter on a WWV frequency? We spearheaded a campaign to get WHRI off 7335, resulting in letters to the FCC and to WHRI. Canadian DXers seemed apathetic about this, but then the Ontario DX Association decided to back CHU. No responses whatsoever from WHRI or FCC were received by CHU or listeners at press time, other than WHRI continuing to use 7335 as of mid-May. The FCC has ordered other US SW stations off other frequencies for obscure reasons when there was no such obvious interference collision.

Some e-mail addresses for comments about this, suggested by Wolfgang Büschel: *tpolzin@fcc.gov* and *thomas.lucey@fcc.gov* and *lsarkisian@lesea.com* with copy to *raymond.pelletier@nrc-cnrc.gc.ca* One could also complain to some of the ministries WHRI is broadcasting on 7335. Check the schedule at **http://www.whri.org** and contact info at **http://www.whr.org/index.cfm/fa/links**

Raymond Pelletier of the agency running CHU, Institute for National Measurement Standards, National Research Council Canada, was grateful for listener support, while pursuing a resolution through official channels.

Just this season, CHU started to be registered with HFCC as a broadcast station from OTT on 3330 and 7335, 10 kW, 24 hours, non-directional. But that obviously did not help. 7335 is now considered to be in a broadcast band, which means even more broadcasters are likely to try to use it. Vatican Radio has also interfered with CHU for years, earlier in our evenings, but at least its broadcasts are aimed north or east, and without the nearby overpower of WHRI.

The short term solution is surely for the frequency-agile WHRI to go to an alternate frequency such as 7315 and stay there. We hope this has happened by the time you read this. A long-term solution might be for CHU to find another less threatened frequency. 7500 would be a nice standard place, but program broadcasters are already there and on each side of it, far outside their own bands.

ALASKA KNLS never answered my inquiry about their conflicting frequencies for English at 1200, but more than a month after A-07 began, their English, Chinese and Russian schedule versions finally agreed on 9780, along with 7355 (gh)

ALBANIA [and non] R. Tirana resolved the collision with Cairo 9460, which has English to NAm at 2300-2430, by switching to 9410, for Albanian during the same sesquihour, // 7425. Now both are in the clear. We also suggested some new times for R. Tirana to try English for North America, and these started April 25, daily except Mondays: 1300-1330 on 13750, 2000-2030 on 13720. They are audible in Oklahoma on good days, and presumably more often further east; also serve WEu more reliably, but there are issues with audio quality as for other RT broadcasts, noted by Noel Green in UK, and Wolfgang Büschel in Germany. English at 0145-0200 shifted from 6115 to a clearer frequency, 6120, but at 0230-0300 remains on 6115, both // 7425 (gh, *WORLD OF RADIO*)

ANGOLA Rádio Nacional heard at various times between 0001 and 0030 in mid-April on 7216.7, easy listening songs and music with brief announcements in Portuguese // 4950, but 7245 blocked (Arthur Miller, Wales, World DX Club *Contact*)

ANTARCTICA In May, LRA36, 15476, began to be heard during the 1800 UT hour (by Jim Evans, TN, NASWA *Flashsheet*, and Célio Romais, Brasil, *Panorama*), so Gabon apparently was no longer on 15475 until 1900; we also heard a carrier only on 15476 (gh, OK)

ARGENTINA R. Nacional, Buenos Aires heard on unlisted 6280 at 2129 with local music and ads (Rubens Ferraz Pedroso, Paraná, *radioescutas*) Also heard on 6280 at various times only when there is football, // 6060; goes off as soon as game is over (Alfredo Locatelli, Uruguay, *DX LISTENING DIGEST*) Not in SSB? Could be another LTA relay like on 15820, etc. (gh)

AUSTRALIA Add another country with DRM on SW: Radio Australia using DRM mode on 5995 at 1200-1400, 23.4 kbit rate audio, undecodable here due to interference on 5990 & 6000. Site presumed Brandon; not heard on very weak 12080 (Chris Mackerell, NZ, *HCDX*) Brandon, Queensland DRM: 1200-1400 10 degrees to PNG, 1100-1200 12080 80 degrees to SW Pacific. RIZ transmitters, nominal 8 kW, but could be as little as 2-3 kW in DRM, decoding difficult, brief snatches of audio only at 1245, SNR 12 dB (Craig Seager, NSW, *Australian DX News*)

ABC Radio National's *Late Night Live* is an excellent interview show, carried on RA 9580 and others, M-F at 1205-1300 (gh) Always required listening in this household. RN is a jewel amidst a sea of mediocrity on our local media scene. The political and social views of LNL host Phillip Adams are among the many things at the ABC that get under the skin of our current conservative government, which perceives the broadcaster to be a hotbed of lefties, and accordingly starves it of funding and openly stacks its board with sympathizers to the conservative agenda. Oddly, Adams also writes a column in *"The Australian"* newspaper, our only national broadsheet, which is a right-wing shocker belonging to the Murdoch stable. A token dissenting voice, perhaps (Craig Seager, Australia, *DXLD*)

BELARUS Radiostation Belarus with powers and azimuths: 1400-2300 7390, 75 kW, 270; and 7440, 150 kW, 244; 1705-2300 7105, 250 kW, 252 degrees. Belorusskoe Radio [domestic relays]: 0400-0700 11930, 250 kW, 72; 1500-1700 7105, 250 kW, 72 (Alexsey Soldatenko, Belarus, *RUS-DX*)

BOLIVIA Radiodifusora Trópico, Trinidad, Depto. Beni, heard on new 4958.1v, ex-6037v at 1755 with program of messages (Rogildo F. Aragão, Bolivia, *WORLD OF RADIO*)

CANADA Stumbled on an unID station in Spanish on 4877.5 at 0256-0300* (Alex Vranes, Jr., WV, *DXLD*) It's RCI, poor to fair on one half of fundamental 9755 (Rich D'Angelo, PA, NASWA *Flashsheet*)

CENTRAL AFRICAN REPUBLIC Checking for R. ICDI, Bangui between 1600 and 1800 on three consecutive days in late April, only heard Chinese stations on both 6030 and 7160 (Vashek Korinek, RSA, via *BC-DX*) And still no other reports this is on. Unfortunately there are no known active DX listeners in central Africa (gh)

CHAD On April 20 at 0511, I found an extremely distorted, squealing broadcast in French centered at approximately 7313. Subsequent nightly monitoring showed it varying a few kHz, and causing heavy interference to stations on 7310: Channel Africa until 0500, R. Netherlands 0500-0557, and DW via Portugal 0557-0630. On UT Sun and Mon WHRI is also active on 7315 until 0600. It was extremely unpleasant to listen to, trying to pull a definite ID out of the mess. Tuning in earlier, I found it coming on at 0430, and Thorsten Hallmann in Germany heard it going off at 2230. This pointed to the schedule of Rdif. Nationale Tchadienne (RNT) on 6165, rather than some 7 MHz transmitter off-frequency. Wolfgang Büschel asked DW Monitoring to check it, and they got a bearing of 165 degrees from Cologne, which fits for Chad, but several other African countries, too. Ehard Goddijn of Radio Netherlands

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; B-06=winter season; A-07=summer season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated

monitoring then recognized it as RNT, as previously heard but now missing from 6165. Then there was the problem of contacting RNT and getting them to fix it. Finally by May 13 the signal seemed to have disappeared, more than three weeks after this mystery first showed up, but was it back to normal on 6165? (gh)

CHILE On 6089.87, Radio Esperanza, Temuco, at 0805-0905, Spanish sermon and religious music, mentions of Esperanza. Good, audible with Anguilla 6090 off the air May 12 (Brian Alexander, PA, *WORLD OF RADIO*)

CHINA [and non] In early May, Firedrake musical jamming appeared on 15150 at 0000 under VOA in Chinese and another station; also on 18160 except for a 5-minute break at 0000, presumably against Sound of Hope (Ron Howard, CA, *DXLD*) 24-hour Firedrake on 9200, 10300, 13970, 15150 (ex-14500) and 18160. *Cf. Bi List A07* de S. Aoki. Sound of Hope broadcasts two programs now. First program is news and commentary at 1100-1700 and 2200-2400 on 9200, 10300, 15150 via Taiwan. Second program is entertainment on 13970, 18160 via Taiwan. These programs are carried on Eutelsat W5. *Cf.* **http://www.lyngsat.com/ew5.html** (S. Hasegawa, NDXC) Also impacts V. of Indonesia on 15150, one of its three available frequencies (gh)

CROATIA [and non] V. of Croatia, the external service instead of the domestic service CR-1 is now via Deanovec 6165 at 1200-0800 and 9830 at 0800-1200. This includes English: M-F 1000-1003, Mon-Sat 1600-1615, Sun 1600-1605, M-F 1805-1815, Sat 1805-1810, daily 2215-2230, 0200-0215, 0600-0603. At 2215 and 0200 also via Germany on 9925; 0600 also on 9470, 11610 via Germany (Dragan Lekic, Serbia, *DXLD*) 6165 at 0200 blocked by RN via Portugal (gh)

CUBA [non] We expected La Voz de la Fundación to resume at 0000-0100 UT Tue-Sat in late May, on 9955 (Jeff White, WRMI, *DXLD*) Replacing last hour of WRN relay fill on 7385 (gh)

CYPRUS CyBC A-07: Fri, Sat, Sun 2215-2245 on 5930, 7210, 9760 in Greek (Dmitry Mezin, Russia, *WORLD OF RADIO*)

CYPRUS TURKISH NORTHERN On several occasions when Gene Scott via Costa Rica was missing from 6150, R. Bayrak could be heard in the clear: one date also Romania, English at 0300 mistakenly stayed on 5975, the 0200 Spanish frequency, so R. Bayrak was heard at 0328 (Martien Groot, Netherlands, *WORLD OF RADIO*) Also with non-stop English pop songs, best after R. República closes 6155 at 0200 and before Romania 6150 *0300 (Anker Petersen, Denmark, *playdx yg*) With no Costa Rica, Bayrak audible 0130-0240 on 6150.05v, a few IDs (Giampiero Bernardini, Italy, *DXLD*) Also made it to NAm with CR off, 0200 past 0300 music matching live stream, my 215th country heard (Alex Vranes, Jr., WV, *ibid*.)

ERITREA A friend in East Africa says the 7100 signal of V. of Broad Masses disappeared, although 7175 continued. I wonder if following Intruder Watch complaints, they decided to move away from ham band (Chris Greenway, UK, *DXLD*) No, went further into hamband! (gh) Horn of Africa music now on 7090 at 1616-1652, Asmara? (Uli Bihlmayer, DJ9KR, Intruder Bandwatch, via Wolfgang Büschel, *DXLD*) Yes, ID at 1700 (Mauno Ritola, Finland, ibid.) Closed with anthem at 1800, same time and same anthem on 7175 with other program (Jari Savolainen, Finland, ibid.) 7090 also heard 0358-0425 (Brian Alexander, PA, ibid.)

[non] V. of Democratic Eritrea International changed sked in May to Thu 1700-1800 on 15315 via Jülich, Germany, 125 degrees (Wolfgang Büschel, *DXLD*)

Ethiopian frequencies 7164.13 and 9559.71v heard with new democracy service for Eritrea at *0401-0430*; same as in evening, V. of Democratic Alliance at 1500-1600? (Martien Groot, Netherlands, *DXLD*) A friend in East Africa who speaks Tigrinya and Amharic says the 0400 program is an Eritrean opposition one called "Voice of Peace and Democracy of Eritrea." This used to be relayed via V. of the Tigray Revolution, and is separate from VODA at 1500 (Chris Greenway, UK, *ibid*.)

ETHIOPIA Besides 5970 reported last month, the other new frequency for V. of Tigray Revolution is // 6185 (Mauno Ritola, Finland, via Jari Savolainen, *DXLD*) Ex-9650; both sometimes with very nice signals in Germany between 1600 and 1800! (Thorsten Hallmann, *dxing.info*) 6185 from 0357 with distinctive IS, weak under Vatican, // 5970 audible only until 0359 when RN Bonaire opens on 5975 (Brian Alexander, PA, *DXLD*)

[non] Clandestines: R. Xoriyo = Huriyo, for Ogaden in Somali, TDP-brokered on 15260 re-timed to two 30-minute broadcasts Tue/Sat 1600-1630 (Bernd Trutenau, Lithuania, *WORLD OF RADIO*) 15260 via Samara, Russia; was also scheduled 1630-1700 Tue/Fri via Jülich Germany, 11640. Another Somali-language cland on 15455, Mustaqbal Radio, heard at 0603-0618 on a Saturday (José Miguel Romero, Spain, *DXLD*)

New program added to TDP website **http://www.airtime.be/schedule.html** – EPPF Radio, Thu 1600-1700 on 15260. EPPF = Ethiopian People's Patriotic Front, **http://www.eppf.net/EppfRadio.htm** (Bernd Trutenau, Lithuania, *DXLD*) Nothing heard there the following Thursday (José Miguel Romero, Spain, *ibid*.)

FRANCE RFI posted its A-07 schedules in pdf, including English to Africa: (parenthesized are changes from 2 Sept)

0400-0430 9805 11995
0500-0530 13680 15160(11995)
0600-0630 15160 17800 11725(9765)
0700-0800 13675
1200-1230 17800(21620)
1600-1700 15605 17605 15160

Sites not specified, but apparently all France except 15160 at 1600, South Africa. Morning broadcasts probably still M-F only. Don't you believe out-of-date frequencies on the more easily accessible English service page (gh)

[non] RFI heard at 1338 on 15795 strong in French via Guiana, but not daily; conflicting schedules show it available 0800-1800 on certain dates in DRM, but in AM when we heard it (gh)

GREECE Olympia Radio Pyrgos relay tests of V. of Greece ended the first week of April (Wolfgang Büschel, Germany, *DXLD*) It's a shame, because they'd ironed out whatever was causing the signal to drop-out, and the signal was quite good at times (Noel Green, NW England, *ibid*.)

The IBB Kavala station, which was closed down in 2006 and handed back to the Greek government, has 10 x 250 kW transmitters and many antennas, the best location anywhere for serving Eastern Europe, Russia and many other places. There is a desire to reopen the station. Darrel Duckworth, who is retired from the IBB, has been appointed to chair this effort and is trying to find interested parties who would like to lease air time on the station (Adil Mina, VP of Continental Electronics, USA DRM Group, NASB, via Adrian Peterson, *BC-DX*) Probably religious broadcasters (gh) VOA itself may have occasion to lease back time at Kavala (kimandrewelliott.com)

HUNGARY A message from the English section of R. Budapest mentions: "Unfortunately, it is true that Radio Budapest will discontinue its broadcasts in Spanish and Italian." (Hector Frias, Chile, via José Miguel Romero, *DXLD*) Italian did end in March, but Spanish has continued so far. The Spanish section asked listeners not to protest, because that might backfire? (gh)

ISRAEL Although the nominal schedule of Israeli Defence Forces, Galei Zahal, per *WRTH* is 03-16 on 15785 and 16-03 on 6973, both frequencies and times vary widely. We found it at 2035 on 15780 (gh) 15792.5v at 2140, still drifting upward. How far off frequency will these guys go? // 6976.54 (Brian Alexander, PA, *DXLD*) varying around 15794.12 at 0718 (Wolfgang Büschel, Germany, *harmonics* yg)

ITALY [non] On short notice in mid-April IRRS changed all its frequencies, from out-of-band, to in-band, as if the authority in control of this top-secret transmitter site, believed to be BULGARIA, was told to get in-band, or else. 9510 replaces 9310; 6125 and 7285 replace 5775. It is unbelievable that IRRS would voluntarily invade the bands where they are bound to face greater interference (gh) Fri 1600-1830 7285, Sun 0930-1200 9510, 1300-1330 15750, 1400-1500 6125, 1600-1900 7285 (Ron Norton, NEXUS-IBA) These are via Albania (*DX Mix News*, Bulgaria) Alfredo, Do you broadcast them via Cërrik? (Drita Çiço, R. Tirana, to Alfredo Cotroneo, IRRS) No. Regards (Alfredo E. Cotroneo, CEO, NEXUS-IBA, via *WORLD OF RADIO*)

JAPAN World Interactive, which deleted its DX news segment and was cut to less than 20 minutes, is simply being repeated twice as often to fill up airtime. The A-07 NHK World program schedule in English shows all these times. Consult SWG for the frequencies. Sat 0510, 1010, 1410, 1710, Sun 0010, 0110, 0530, 1030, 1430, 1730, Mon 0030, 0130, Thu 0540, 1040 (gh)

KOREA NORTH [non] Free North Korea Radio in Korean, 100 kW, 002 degrees from Taiwan: 1000-1100 9490, 1900-2000 9780, 2030-2130 9785 (*DX Mix News*, Bulgaria)

KOREA SOUTH [non] Clandestine, Anti-Imperialist National Democratic Front, P'yongyang, announced new times in Korean: 2200-0100 and 0800-1200 UT on MW 1053, SW 3480, 4557 and 4450 kHz. Heard on 4450 opening at *0758 (Takao Miyajima, Japan, DSWCI *DX Window*) Believe this was once called V. of the Revolutionary Party for Reunification (gh)

KUWAIT R. Kuwait can still be heard in English when they turn the 9750 transmitter on early before the 0800 Persian broadcast. Last part of English program, pop music and ID sometimes heard from 0750 (Noel R. Green (NW England), *DXLD*)

LIBYA V. of Africa, English at 1400-1600 moved in May to 17725 // 17870 (Brian Alexander, PA, *DXLD*) Although registered as relays via France, propagational reasons and poor modulation point to direct transmissions from Libya now (Olle Alm, Sweden; Noel Green, UK, *ibid*.) Weak signals here indicative of being in skip zone from France (Wolfgang Büschel, Germany, *ibid*.) 17870 blocked by DRM from Guiana French except on weekends (gh)

NEW ZEALAND RNZI sked as revised in May: analogue: 1300 6095, 1551 7145, 1850 11725, 2051 15720, 2359 13730, 0500 9615, 0700 6095, 1059 9870.

DRM: 1551 6095, 1851 11675, 2051 13730, 2359 15720, 0500 11675, 0659-1300 7145, 1300-1550 no service (RNZI via Wolfgang Büschel)

NIGERIA [non] Radio Saa, 15180, was verified by TDF in France, but said transmissions ended April 11 (Patrick Robic, Austria, May 4, *DXLD*)

PERÚ 5544.6, R. San Andrés, 0130-0150 with comunicados; music by las Campesinas de Cajamarca, announcing 830 and 5545 kHz (Rafael Rodríguez R., Fomeque, Cundinamarca, Colombia, *playdx* yg)

SA'UDI ARABIA 15250, Official ID is "Radio Riyadh" in English and not BSKSA. Heard at 1212 with *Political Week*, 1222 *The Kingdom In Focus*, close/down at 1258 (Rumen Pankov, Bulgaria, *Australian DX News*)

SERBIA International Radio Serbia (IRS) replaced the much interfered frequency 6100 with 7240 on April 21. This should improve reception in Europe, if 7240 is free between 1300 and 2100 UT, including English at 1300 and 1830. Non-directional via mobile 10 kW transmitter in Stubline (Dragan Lekic, Serbia, *WORLD OF RADIO*) New frequency is not clear, and transmitter is unstable (Kai Ludwig, Germany, *DXLD*) varies 5 Hz back and forth every minute. QRM from Tibet until 1730, WYFR via Russia from 1800 (Wolfgang Büschel, *ibid*.)

R. Australia also on 7240, maybe not too big a problem in Europe, but RN Flevo in DRM already on 7235-7240-7245 until 1500! Why in the world did IRS not look for a clearer frequency if they were contemplating a change? That blocks Spanish at 1400 (gh) Can't hear Spanish at 1400 or 1900 (José Miguel Romero, Spain, *ibid*.) 1900 Spanish fairly audible here (Mike Barraclough, England, World DX Club *Contact*)

IRS has a new interval signal, which is totally "Serbian," no more old

Yugoslavian revolutionary tune (Dragan Lekic from Subotica, Serbia, *DXLD*) Contains initial notes from the national anthem of Serbia, *God of Justice* (Ruslan Sakaviec, Belarus, *ibid*.)

SIERRA LEONE [non] Cotton Tree News (CTN): Daily 0730-0800, 9525 via Ascension, in English, Krio, Limba, Mende, Temne. Address: Fourah Bay College, Mount Aureol, P O Box 766, Freetown. *abennett@hirondelle.org* **http://www.hirondelle.org** (*WRTH A-07 Update*) Same transmission as Star Radio to Liberia, now only a semihour at 0700-0730 on same. CTN thus becomes a "station" too (gh) Both easily heard in NAm for those awake. But whence the name? Logo has a tree drawing, but unsure if it's like our cottonwood trees (gh) see **www.cottontreenews.org** (Ron Howard, CA, *DXLD*)

SRI LANKA Which is the oldest transmitter still in use on shortwave? Some suggested it could be RAE, Argentina, but it may well be the 9770 unit of the English service of SLBC. *Saturday Morning Show* presenter Roshan Abhiseka mentioned that the transmitter, usually 100 kW, was at just 10 kW due to a faulty transformer that dates back to 1941! The transmitter is to be retired later this year and will be sent to the Marconi museum. A new 100 kW unit will be put into service.

The 15745 kHz transmitter, frequently off the air, is to be replaced by a 300 kW donated by NHK Japan. Some spares are being purchased before this transmitter can be put into service. A second, donated 300 kW is already used for the Hindi service on 11905. And spares costing 8 million SLR are being purchased to improve the performance of the 35 kW transmitter (presumably 6005 kHz) which is also frequently off air. Roshan also mentioned that the English language evening transmission, suspended a year ago, is to resume (David Woollan, Nepal, *DXLD*)

[non] IBC Tamil R., 7225 until 0100* via Wertachtal, Germany, Tamil talk, address of "Tamil Information" in Toronto, Canada (Anker Petersen, Denmark, via Dario Monferini) Starts at 0000

SUDAN At 1800, Radio Peace, Southern Sudan on 4750 with rather strong signal, the best I've heard for a long, long time, no co-channel interference. Where is Dunamis Shortwave [see UGANDA] now? I think Radio Peace have upgraded or increased power. After R. Peace signed off around 1840 there was a tiny carrier left on 4750, going off around 1901 (Jari Savolainen, Finland, *WORLD OF RADIO*) R. Peace, fair-to-poor on 4750 at 0300-0316 (Giampiero Bernardini, Italy, *DXLD*)

Darfur Salaam A-07, in Darfuri Arabic, daily: 0500-0530 9730 Austria, 12015 Cyprus; 1700-1730 15515 Woofferton UK, 17585 Ascension (*WRTH A-07 update*)

TAIWAN RTI English to Au/NZ from May 1 replaced 08-09 on 9610 with 1100-1200 on 11715, finally acting on my suggestion for a later broadcast for improved reception here (Ian Baxter, Australia, *DXLD*)

For 2007, RTI has a new series of 12 QSL cards depicting puppets. The cards are multi-color, printed on a robust board which has a sheen face side surface to do justice to the high class printing. The pre-printed reverse side includes a space for transmitter site (Ron Brown, World DX Club *Contact*) Earlier reports said they were not filling in transmitter site (gh)

TIBET [non] The Foundation Voice of Tibet launches campaign to protest Chinese radio jamming – Based on the fact that China has systematically jammed Voice of Tibet's and other "foreign" SW radio services for more than 10 years now, we call for action and support internationally to protest and demand an immediate stop to these violating acts. According to the PRC Constitution and numerous UN Resolutions we demand that the Chinese authorities immediately start respecting the rights of the citizens they govern as well as the rights of citizens of other countries (also affected by the Chinese jamming). (VOT via Dale Svetanoff, WA9ENA)

Seven Tibetan Buddhist monks went to Capitol Hill to give Congress a simple message: Restore all funding for Radio Free Asia's Tibetan broadcasts. Zurkhang Karma, the union representative for Radio Free Asia, said the subcommittee's leaders expressed support for putting $1.5 million back into the spending bill for Tibetan broadcasts but made no promises (Jean Chemnick, *Politico.com* via Zacharias Liangas) The story does not say if the monks mentioned VOA's Tibetan Service, also slated for reduction (Kim Andrew Elliott, *kimandrewelliott.com*)

VOA has appointed Losang Gyatso as new chief of Tibetan Service. Gyatso will oversee daily radio and weekly television news and information programs. With a background in media, advertising, and management, Gyatso is currently the director of the Mechak Center for Contemporary Tibetan Art in Boulder, Colorado, a cultural organization that exhibits work of young Tibetan artists around the world. Multitalented, Gyatso played the role of Lord Chamberlain Phala in the Martin Scorsese-directed film, *Kundun*, on the life of the 14th Dalai Lama and is also an acclaimed contemporary Tibetan visual artist (VOA via *Media Network*)

UGANDA NEW!!! Dunamis Shortwave 4.750 MHz – 60 meter band 6 – 10 p.m. local Uganda time! Broadcasting from Mukono, Uganda (Bible Voice Broadcasting, note on A-07 schedule, Toronto, Ont., April 20, via Drita Çiço, Albania, *WORLD OF RADIO*)

The Christian station Dunamis Shortwave has finally started on 4750. Noted here 23 Apr at 1733 after CNR station, China, had closed down. Dunamis Shortwave signed off at 1902. Their schedule is 1500-1900. Bangladesh usually closes 4750 at 1710 but sometimes runs past 1930. R. Peace, Sudan is also on 4750, *q.v.* (Jari Savolainen, Finland, *ibid*.)

UKRAINE In mid-April, RUI suddenly added three more English broadcasts on SW, replacing hours in Ukrainian (parenthesized frequencies planned to replace in Sept): 0500 and 0700 on 9945(7420), 1900 on 7490 (5830) (via Igor, *DXLD*) All to WEu, 100 kW from Kharkiv (*DX Mix News*, Bulgaria)

U K [non] BBC Mundo dropped without notice its only evening broadcast in Spanish on SW. No longer heard at 0300-0400 on 6110 or 7325 (Raul Saavedra, Costa Rica, *DXLD*) Yet this still appeared on their outdated website schedule, along with incorrect info for morning broadcast, which is 1100-1200 on 6095 via WHRI, 11825 via Guiana French, per *WRTH update* (gh)

BBCWS in English at 11-13 via Guiana French from May 2 on 9465 ex-9480; to accommodate KAIJ which needed to open 9480 at 1200 instead of 1300 for 3-hour program; 9465 mediocre here (gh, OK)

U S A The wacky organizational chart of U.S. international broadcasting: ambiguous? On top is the BBG. Under that is the IBB. Under the IBB is VOA and Radio/TV Martí (although the Martís have their own advisory board), but not RFE/RL, RFA, and MBN, which report directly to BBG, although IBB provides certain engineering and administrative services for those three. Although VOA is under IBB, the VOA director is appointed by the BBG, thus circumvents the IBB. And while the IBB is under the BBG, the IBB director is appointed by the President (with Senate confirmation), thus circumventing the BBG. Are you with me so far? (Kim Andrew Elliott, *kimandrewelliott.com*) See also TIBET [non]

In May, WWCR-4 replaced 5765 with 5890 at 0400-1400, so now it collides with VOA in Korean via Tinian during the later hours, instead of AFRTS via Guam all night (gh)

On 9265.04, WMLK, Bethel, Pennsylvania, at 1950-2000*, English religious talk about the teachings of Yahweh. Closing announcements at 1957 giving ID, wrong schedule, wrong frequency announced as 9465. I think they last used 9465 back in 2004. Reception was weak but readable. Monday-Friday only, irregular (Brian Alexander, PA, *DXLD*)

The LDS Church schedule mentioned last month apparently was outdated from 2003-2004 (Bernd Trutenau, Lithuania, *DXLD*) And may not have existed even then (gh)

[non] Family Radio in May added many relays via Wertachtal, Germany site which had lots of time to spare, no longer used by DW (gh) Such as nine 500 kW transmitters at 1600-1700, on 11680, 11730, 11870, 12020, 13620, 13630, 15650, 15705 and 15750.

Also, it appears that Poland never used the Pori, Finland relay on 7140 at all despite schedules, but Nauen, Germany, instead (Kai Ludwig, *DXLD*)

URUGUAY Radiodifusión Nacional SODRE heard on 9620.71, at 2206-2253, Apr 30, with IDs, acoustic ballads, until wiped out at 2253 by Spain carrier. My 166th country heard. But blocked from May 1 during this hour by new Family Radio relay via Wertachtal, Germany (Scott R. Barbour, Jr., NH, *WORLD OF RADIO*) Could still hear SODRE on 9620.7 at 2145 despite DW 9620 QRM; also on MW 650 at 2225 (Carlos Gonçalves, Portugal, *ibid*.) Also called Emisora del Sur (gh)

WESTERN SAHARA [non] Radio Nacional de la República Árabe Saharaui Democrática stayed on 6300, except on April 30 when it jumped to 6378.1, including Spanish at 2300-2400* (Alex Vranes, Jr., WV, *DXLD*) Also same date only, on 6378 in Arabic at 2132-2201, via Algeria? (Sérgio Dória Partamian, Brasil, *ibid*.) For a while their MW // went to 700, then back to 1550. And the Spanish hour shifted briefly to 1700 (Carlos Gonçalves, Portugal, *ibid*.)

ZANZIBAR Heard on R. Tanzania Zanzibar is *Taarab* music, a very distinctive genre played in Zanzibar and the coastal areas of Tanzania and Kenya, a blend of Arabic and Indian influences. You will hear a lot of it on 11735. Taarab songs are always sung in Swahili and generally feature a female singer accompanied by male musicians. A search for taarab will bring you plenty of results. English news at 1800 might only be broadcast Monday-Friday (Chris Greenway, UK, *DXLD*)

ZIMBABWE New external SW service still nowhere to be heard a month after publicized launch date 18 April (gh) Press reports said they were still putting finishing touches on studio, now calling it V. of Zimbabwe. Meanwhile, SW transmitters were not idle, but jamming opposition broadcasts (Andy Sennitt, *Media Network* blog)

[non] In mid-April SW Radio Africa added 11775, 11810, 11975 and 12035 for its 1700-1900 broadcast. The usual 4880 continued, so 5 frequencies in total (Chris Greenway, UK, *DXLD*) The new ones were relayed from Russia, UK and Norway. 11975 was best here but soon dropped, and then 12035 via Norway was best; 11775 blocked by Anguilla. Mostly English, programs heard included *Callback, Newsreel*, *In the Balance, Letter from the Diaspora, Reporters' Forum*. No jamming was heard.

This step-up in SWRA transmissions on short notice eclipsed the much-publicized "News 24" external SW service the Mugabe regime was supposedly starting the very same day, April 18, independence day. None of the press about it ever gave any hint as to frequencies (gh, OK)

On one occasion only, SWRA was heard on 9615 from 1658 // others (Edwin Southwell, UK, May World DX Club *Contact*) Two days later 9615 had Voice of Russia in Polish (Mike Barraclough, *ibid*.) So probably a feed mixup in Russia (gh) Excellent reception of 12035 can also be heard here in Zimbabwe (its target area) from sign-on 1700 // 11775 & 11810 (David Pringle-Wood, Zimbabwe, *DXLD*)

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

0005 UTC on 4925.06
BRAZIL: Radio Educacão Rural. Portuguese commentary to station ID with 352 SIO. (Harold Frodge, Midland, MI) Brazilians in Portuguese; **Radio Florestas** (tentative) 4865.03, *1032-1045. (Chuck Bolland, Clewiston, FL)

0116 UTC on 6950USB
PIRATE: WTCR. Nice show with wide range of music. Tunes included classics from Eric Clapton and Marty Robbins, plus many more. Identification, "this is WTCR-20th Century Radio" as portion of sign-off format. Maildrop noted as "P.O. Box 1, Belfast, NY 14711 USA," plus QSL policy. Signal good-very good. **Wolverine Radio** observed on 6925, 0040-0056.* (Joe Wood, Greenback, TN)

0304 UTC on 4780
DJIBOUTI: Radio Djibouti. Arabic text to station identification at 0310. Recitation by male and Arabic music at 0326. Heavy interference for poor signal quality. Subsequent monitoring on 4780 at 0330-0340 with Middle Eastern music and program commentary amid poor signal. (Wood)

0320 UTC on 15515
AUSTRALIA: Radio Australia. Play-by-play announcers at sporting event, followed by *Football Culture* program, // 15240 (SIO 333) 6080, 1437 (SIO 333); 15515 // 15230 //13630 at 2205. 9580, 1800. (Stewart MacKenzie, Huntington Beach, CA), 5995, 1539 (SIO 444) 6080, 1540 (SIO 444). (Gerald Brookman, Kenai, AK)

0324 UTC on 4800
GUATEMALA: Radio Buenas Nuevas. Spanish programming of local items by announcer and listener call-ins. Lively music with fair-poor signal quality. (Wood) 4799.78, 1201-1218 Spanish religious music and text. (John Wilkins, Wheat Ridge, CO)

0325 UTC on 5014.35
PERU: Radio Altura (Ceeo de Pasco). Spanish announcements to pop music amid poor signals SINPO 24332. Peruvians in Spanish monitored: **Radio Melodia** 5939.3, 0340-0358; **Radio Vision** 4790, 0335-0345. (Jim Evans, Germantown, TN) **Radio Maranon** (tentative) 4835.4, 0206-0223 (Scott Barbour, Intervale, NH) **Radio Huanta 2000** 4746.89, 0117-0123; **Radio Tawantisuyo** 6172.9, 2200-2218; **Radio Paucartambo** 6520.4, 2148-2155. (Nicholas Eramo, Buenos Aires, Argentina)

0350 UTC on 7240
TURKEY: Voice of Turkey. Program line-up and announcer comments. Turkish folk music program past 0355. (MacKenzie) 15350, 1200-1230 in Turkish. Errol J. Urbelis, Kings Park, NY)

0350 UTC on 13635
RUSSIA: Voice of Russia. Interviews on *Russian Economics Worldwide* program. Station identification at 0352. Additional monitoring: 9435, 0435 //9515 (SIO 444); 9860 (SIO 333 via **Vatican relay**) 9880; 13635 (SIO 444) 13635, 0300 //9435; 13755 (SIO 444). (MacKenzie) 11675 at 1708 //9820. (Bob Fraser, Belfast, ME)

0415 UTC on 7440
UKRAINE: Radio Ukraine International. Interesting program covering Ukrainian artists, authors and composers, with good signal quality. (Wood)

0502 UTC on 4052
GUATEMALA: Radio Verdad. English religious text on Book of Revelation. First time I have noted this station using prerecorded material. (Wood, TN)

0552 UTC on 6180
CUBA: Radio Havana. Evening programming with promos and comments to featured piano music. Station ID at 0553. **China Radio Int'l relay** 9790, 0337. (MacKenzie, CA)

0937 UTC on 5960
RUSSIA: Radio Tikhy Okean. Tuned in a few minutes late as announcer was closing Russian newscast. Signal was fair and monitored to 0945 as station ceased program. (Frodge)

1131 UTC on 4910
AUSTRALIA: VL8T-Tennant Creek. Station monitored past 1300, as stated in *WRTH*, Northern Territory stations may extend scheduled hours. First time logged on 4910 with football play-by-play to ABC news and "VL8T" identification. Fairly strong signal mostly readable over KXTR spur. (Wendel Craighead, Prairie Village, KS)

1145 UTC on 15700
BULGARIA: Radio Bulgaria. Special Bulgarian folk music program. SIO 554. (Fraser). Bulgaria's **Radio Varna** 9900, *2050-2110+. Abruptly on with local pop music and ballads. Canned identification at 2054 to time pips signal and national anthem at 2100. News in presumed Bulgarian to ID. Very good signal on Sundays only. (Alexander)

1300 UTC on 9485
CLANDESTINE: Shiokaze. Poor at tune-in, improved to fair quality by 1315 amid long commentary about North Korea. Transmission opened and closed with lady announcer comments and usual background piano music, email and postal address in English. Fifteen minute Korean program followed at 1330, to 1345.* Monitored next day *1300-1315 with opening interval signal, announcer in Japanese or Korean to piano music. Additional clandestines: **Hmong Lao Radio** via WHRI 11785, 1301-1315 in Hmong. **Tensae Ethiopian Voice of Unity** (tentative) 15600, 1459-1518 in unid language; **Radio Saa** 15180, 1603-1611 under BBC Arabic service; **Sagalee Bilisammaa Oromoo** via Jülich, Germany, T-Systems 13830, 1721-1759.* (John Wilkins, Wheat Ridge, CO)

1409 UTC on 7295
MALAYSIA: RTM/Traxx FM. Sports news, followed by DJ Navsta with his *Rock It* program (scheduled for Fridays 1415-1700 UTC). Classic rock, heavy metal and hard rock. Promo for upcoming music event in Kuala Lumuar presented by FYI Entertainment. "Assalamu Alaikum" greeting, to "the news at eleven." Fair signal. **RTM Suara Malaysia** 15295, 1552-1612 in vernacular. Subsequent **Traxx FM** log on frequency 1518-1551. (Howard)

1426 UTC on 15310
THAILAND: BBC World Service. Announcer comments on death of Kurt Vonnegut, author of *Slaughter House Five*. BBCWS *World News* program at 1433. **Radio Thailand** relay via Greenville 5890 at 0045. (MacKenzie) 15310, 0427 (SIO 232); 5975, 1538; 6195, 1541 (SIO 455) (Brookman)

1800 UTC on 11765
CANADA: Radio Canada International. Dedication of the World War I, Vimy Battlefield. SIO 543. (Fraser) 17740, 1822 with listener letters. (Wood) **China Radio Int'l** Canadian relay 6039.97, 1015; **Radio Japan** Canadian relay 6119.96, 1020 with excellent signal. (Brian Alexander, PA)

2100 UTC on 9703.99
NIGER: LV de Sahel. French and vernacular talk. Variety of Afro pops, French pops, local tribal rhythms and an occasional U.S. pop tune. Qu'ran at 2153 to sign off with national anthem. Fair signal covered by WYFR 9705 at 2000-2100.* Lately noted on 9705, but drifted to 9704.99. Normal sign-off is 2300, except Sundays at 2200. (Alexander)

2149 UTC on 13362 USB
GUAM: AFN/AFRTS. *All Things Considered* program with 152 SIO, // 12133 via **Key West, Florida**, SIO 2+33 with swiper and trill interference. (Frodge) 6350, 1145-1230. (Urbelis)

2200 UTC on 9990
EGYPT: Radio Cairo. Item on Israeli-Palestinian meeting. SIO 353. (Fraser) 12050, 2300-2345. (Wood)

2208 UTC on 9445
INDIA: All India Radio (Bangalore). Newscast to identification at 2210. Commentary on Chinese defense budget to regional music, // 11620 (Bangalore). 10330 (Bangalore) at 1703 (Frodge)

2240 UTC on 6125
CHINA: China Radio International. **China Drive** program with very annoying background music (presume a relay via Spain?) SIO 454. Frequency rechecked at 1000, and noted weak Chinese station. (Frodge)

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

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

Fred Waterer
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www.doghousecharlie.com/radio

More DX Shows

In the April edition of *Programming Spotlight* I featured some of the DX programs one can hear on shortwave, concentrating on the more "famous" ones.

This month we look at some more programs, or more properly, program segments, via international broadcasters. Once upon a time, these were vital programs for the avid listener.

Those of us who have been around the hobby for more than a few years (I prefer to think of myself as a veteran listener rather than an old fogey, but that's just me ☺) can remember a time before the internet and all its instant information, when we hung on every word of these programs for the latest news.

I've referred in a past column to my "eureka moment" back in 1978 when I pushed a button on an old radio, turned the dial and was shocked and exhilarated to hear Radio Sofia, Bulgaria. From that moment on I was hooked.

My next problem was how to get information about when and where to listen. I bought a (largely useless, out of date) book at Radio Shack, which helped a bit. Tuning around, I would copy down addresses and schedules where possible, and I stumbled onto the odd DX segment. I would copy down every possible scrap of information.

My next big discovery was the *World Radio Television Handbook*. Sadly, it was in the reference section of the library and couldn't be signed out, so I photocopied some pages…and again made extensive notes on stations I hoped to try to hear.

Fast-forward a year or so…I was a regular letter writer to many radio stations and built up a healthy supply of program schedules. The *WRTH* led me to more information (eventually I got my own copy; no more trips to the library).

And I had started a regular routine, noting down when the various DX segments would be on, keeping copious notes (some of which I still have). I spent many hours listening to these…*DX Partyline* from HCJB in Ecuador, *DX Jukebox* (which became *Media Network*) from Radio Netherlands, *Swiss Shortwave Merry Go Round* with the two Bobs. Some even had clubs. ANDEX at HCJB, The Radio Budapest Short Wave Club (wouldn't you know the Berlin Wall fell just as I would have become a lifetime member – 20 years…alas my lifetime membership was another casualty of the cold war!)

Later I would tape these shows. Somewhere I have quite the archive of *Media Network, World of Radio, Sweden Calling Dxers* and others.

Although the internet allows us almost instantaneously to call up all kinds of information, these programs can still be a good source of information with one proviso. Verify the accuracy. Occasionally information can be out of date or inaccurate, but then, that is true with just about any source.

❖ Programs morphed into websites:

Media Scan

MediaScan started out life as the *Sweden Calling Dxers* program in 1948. It was the first show of its kind on the shortwave bands. Initially hosted by the late Arne Skoog, it was taken over by George Wood when Arne retired in 1978.

Over the years, the program evolved to include coverage of such diverse topics as satellite radio and cyberspace.

The program itself last aired on July 17, 2001. According to the website, "The original Sweden Calling DXers bulletins were replaced by the MediaScan Online Edition and e-mail newsletter. Since September 2005, MediaScan has been reborn as a blog and RSS feed. The short address remains: **MediaScan.org**"

Media Network

Media Network was the acclaimed, long running DX program of Radio Netherlands. When the program ended, it morphed into a website. In most cases the same quality information is available on the website as was available from the former radio program. The effort is maintained by Andy Sennitt and is very user friendly. You can subscribe to an RSS feed, or the weekly e-mail newsletter: check out the *Media Network* weblog or peruse the extensive archives at: **www.radionetherlands.nl/features/media/**

Kim Andrew Elliott

I first came in contact with Kim way back in the early eighties when he was involved with a fantastic show on WRNO, during the *Radio Earth* programming block. *Shortwave Pandemonium* was a hoot. (I even seem to recall Kim or someone playing the Radio Tirana interval signal on a trumpet…funny that that sticks in my mind). From his bio:

"Kim Andrew Elliott is an audience research analyst in the U.S. International Broadcasting Bureau. From 1995 to 2002, he was producer and host of *Communications World*, a popular weekly Voice of America program about electronic media and international broadcasting.

"Before he came to the Voice of America in 1985, Dr. Elliott was on the faculties of communication at the University of Massachusetts and the University of Wisconsin-Stevens Point.

"He has a B.A. (1974) in international affairs from the George Washington University and an M.A. (1977) and Ph.D. (1979) in communications from the University of Minnesota"

More recently he is an occasional guest on VoA's *Talk to America* program. Kim also maintains a highly interesting website "discussing International Broadcasting and Public Diplomacy." The website is well worth a look. It's one of a number I have book marked. **www.kimandrewelliott.com/**

❖ DX Segments still on shortwave:

World Interactive – NHK Radio Japan

Actually this item is misfiled: NHK's DX segment is apparently the latest shortwave casualty.

"*World Interactive* is exactly that – interactive with the world. Our program includes e-mails and letters from the listeners around the world. We'll bring you special segments featuring Haiku and other Japanese traditional culture. While responding to listeners' questions, we'll also present various aspects of Japanese society and people's lives."

As reported on Glenn Hauser's listing of DX Programs, *World Interactive* has dropped the DX segment; however, listeners are being encouraged to write in and ask that it be re-instated.

Argentina – RAE

Argentina's RAE apparently has a DX segment; however, I haven't heard it. In fact, I have rarely heard RAE over the last few years. If anyone has any experience of hearing this program please let me know via e- or p-mail.

Try UTC Saturday and Thursday at 0245 on 11710 kHz, Friday at 1845

on 15345 and 9690 kHz

Bulgaria – Radio Bulgaria

"To mark the 70th anniversary of Radio Bulgaria, the English Section offers a series of interviews with and statements by staffers, former and present, on what Radio Bulgaria and the English Section have amounted to in their personal lives. We are opening the door to what it has been like to make good, English-speaking international radio in Sofia and lure great numbers across the world to wish to discover more and more about Bulgaria.

"Following listeners' questions about Amateur radio in Bulgaria in November 1957, then Radio Sofia's English staff men visited the Central Radio Club in Sofia to gather some information. Dimiter Petrov happened to be there and told them about the hobby along with live demonstrations. They asked him to write about it in English for the Radio himself. Listeners' response was very favourable and thus the DX programme was born November 17, 1957 as a monthly feature. Due to popular request, in June 1961 it became a weekly.

"As a matter of fact Radio Bulgaria's English DX programme has been not only the longest running programme in the history of Bulgarian broadcasting but in world terms too, notably second only to late Alistair Cook's 58-year running 'Letter from America'.

"Its writer and editor has invariably, for nearly fifty years, and without fail, been Dimiter Petrov, a most handsome man, well read and bred, soft-spoken, but always keeping at it hammer and thongs, radiating calm and confidence, aristocratic looking Dimiter Petrov, LZ1AF, an industrial designer by profession, whom we have been calling lovingly "DX Petrov".

www.bnr.bg/RadioBulgaria/Emission_English/Theme_70RB/Material/DXPetrov.htm

UTC Saturday 0235 on 11700, 9700 kHz

Maple Leaf Mailbag, RCI

"This pastiche of Canadiana focuses on you, the audience! Ian reads your letters, answers your questions, and shares your impressions of Canada with listeners from around the world. There's always lots fun, along with special guests, short-wave news, contests and giveaways.

"If you want to hear what the international community thinks about Canada this is the place to be." (MLMB website) A couple of recent listens found little "short-wave news." Still, it's a very entertaining show.

Maple Leaf Mailbag transmissions can be heard on Sunday (local) and Sunday Night/Monday Morning UTC broadcasts from RCI.

www.rcinet.ca/rci/en/emissions/emission_1450.shtml

DX Corner – Radio Budapest

The *DX Corner* is just that, a brief segment at the end of the program. It's a shadow of past efforts from Hungary, and speaking of shadows, the theme music sounds like some sort of sixties, Shadows tune (back up band for Cliff Richard) or music from those "Supermarionation" kids shows of that era (Fireball XL5, for instance). Sadly, the music is almost as long if not longer than the *DX Corner*. A recent episode featured the re-allocation of FM frequencies in Europe.

You can hear the *DX Corner* via the World Radio Network (**www.wrn.org**). Listen to or download a copy of the Friday program.

Or try UTC Saturday at 0122 on 6040 kHz; 0252 on 6195 kHz.

Worldwide Friendship – KBS World

"Letters and emails from KBS WORLD Radio's listeners around the globe are featured every Saturday on *Worldwide Friendship*. This 50-minute feedback show features comments and responses from listeners in addition to discussion on the week's hottest topics in Korea. The programs two hosts, So-yeon Kim and Sean Heaney, welcome all comments from listeners, complimentary or critical, and happily share them with a worldwide audience. All are welcome to forward any feedback to So-Yeon and Sean at *english@kbs.co.kr*"

There have also been DX segments from a number of contributors, including Victor Goonetilleke and the New Zealand DX League. Not sure if these continue to be heard. **http://rki.kbs.co.kr/english/program/program_we.htm#**

Listen online, or try UTC Saturday at 1210 on 9650 via Sackville, Canada

Multimedia – Polish Radio

This interesting little program is hosted by Slawek Szefs (who, in my opinion, has one of the smoothest voices in radio…but I digress).

Radio Polonia – oops, Polish Radio External Service as it now styles itself – is a difficult catch most times, but thanks to the internet and satellite, daily programs can be heard via the World Radio Network (**www.wrn.org**). Listen to or download a copy of the Wednesday program. *Multimedia* starts at about 29 minutes in.

Multimedia is a decent effort…each week one can hear news on developments in the media in Poland and Eastern Europe.

In May, *Multimedia* started a series on the history of radio in Poland. "The mini-series is based on archive recordings by the late Professor Maciej Kwiatkowski." Spanning over several weeks, the programs *may* still be online by the time you read this. Check the program archive at:

www.polskieradio.pl/zagranica/gb/archiwum.aspx?s=163&k=149

Otherwise, the current program, or the archive will have programs on such diverse topics as media news, podcasting, new products and DX tips.

Try UTC Tuesdays at 1730 on 7265 and 7140 kHz, UTC Thursday at 1230 on 11850 and 9525 kHz

❖ DXing with Cumbre Update

When I did the first column on DX Programs, Marie Lamb of Cumbre DX was a bit under the weather. I've been corresponding with her and she adds this about the program:

"…the show is no longer being produced at Syracuse University, but at WCNY, which is another public radio station. If anyone wants to reach me, they should use THIS e-mail address, and not my old one. Also, here is the new mailing address (no reception reports, please; those should go to World Harvest Radio as they have the logs):

Marie Lamb
c/o WCNY Classic FM
P.O. Box 2400
Syracuse NY 13220-2400

"*DXing with Cumbre* is also available now on iTunes as a podcast. Programs are free, and you may also subscribe to them, so that you'll get them sent to you each week for your iPod, or for hearing on your computer. To find out more, you can go to:

www.apple.com/itunes/store/

"The show is now active on iTunes and is in the Games and Hobbies section. If an iTunes user searches for SWL, the show will turn up as one of the options. (Note: You can also find it if you search for the title "DXing with Cumbre." The logo for the show features the title of "DX'ing with Cumbre with Marie Lamb," and shows a picture of a microphone on a desk stand.)

"For those not using iTunes, there is a podcast web site at **http://cdxpodcast.ralabs.com/** and the old site for streaming audio of the show at **http://cs3.ralabs.com/streams/** will remain active and continue to be updated with new shows as they become available.

"Thanks very much to Bob Arnold for his help in making *DXing with Cumbre* available to listeners in a new way; it's much appreciated, and I'm sure it'll make listening easier for a lot of busy people."

Thanks for that, Marie.

❖ World of Radio

A final reminder – as I mentioned in the April article, I have long relied on the excellent list of DX programs as compiled by Glenn Hauser and John Norfolk. You can access it at: **www.worldofradio.com/dxpgms.html**

That's a wrap for another month. Enjoy your summer!

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

Clearing Out the In-Basket

It's sizzling July again, and by now most *QSL Report* readers know what that means. This is the month when I reshuffle my in-basket of QSL contributions, forego the usual QSLing tips, and instead devote the column to *nothing but* QSLs!

While you're waiting for the prime DX season to return, July remains a month for cleaning out your own in-basket, or see if follow-ups are needed for those wandering reception reports. July may have high static levels present on the radio, but there remains plenty to hear from the broadcast bands, utility, medium wave and amateur radio...and to verify!

Contributions are always welcomed via email or snail mail, with an SASE if a personal reply is requested. Good luck with your July QSLing.

AMATEUR RADIO

Belize V31MD, 40 meters SSB. Full data color photo card. Received in nine days for report to QSL Manager NM2D, Robert A. Fix, 51 Clubview Dr., Novato, CA 94949. (Larry Van Horn N5FPW, NC)

Canary Island EC8AUZ, 10 meters SSB. Full data two color card. Received in 100 days via ARRL bureau. (Van Horn)

Revillagigedo XF4DL (IOTA NA-030) 20 meters SSB. Full data color card. Received in 97 days for report to QSL Manager N6AWD Fred K. Stenger, 6000 Hesketh Dr., Bakersfield, CA 93309. (Van Horn)

AUSTRALIA

CVC Christian Voice via Darwin 23635 kHz. Full data (w/site) multicolored card, plus schedule. Received in 21 days for an email posted at **www.cvc.tv** (Ed Kusalik, Alberta, Canada)

COLOMBIA

La Voz de tu Conciencia/Marfil Estereo, 5910 kHz. Nice QSL card signed by Martin Stendal, plus souvenir CD via registered mail. Received in 30 days for a CD report. Station address: Calle 44 No. 13-67, Bogota D.C., Colombia. (Patrick Martin, Seaside, OR)

CZECH REPUBLIC

Radio Prague 6200 kHz. Full data card, plus station sticker, program schedule and souvenir coaster. Received in 11 days for an email report to *english@radio.cz*. Station address: Vinohradská 12 12099 Prague 2 , Czech Republic. Web: **www.radio.cz** (Kraig Krist KG4LAC, Manassas, VA) 7345 two week email report. (Dan Mallory, Everett, WA)

GERMANY

Freie Volksmission Krefeld 11640 kHz, via DTK-Telekom. Email verification from Walter Brodowsky. Received in six days for email report to *walter.brodowsky@t-systems.com* . Web: **www.freie-volksmission.de/sprache/deutsch/** (Kusalik)

GREECE

SVO Olympia Radio 15630 kHz Relay of ERA-5. Initial "thank you"email response. Fourteen days later received full data computer generated QSL of studio/transmitter/map card via I. Fitouris-Station Manager, for report to *radiosva@olenet.gr* and *olymprad@otenet.gr*. Station address: 153 42 Agia Paraskevi, Athens, Greece. (Kusalik)

INDIA

All India Radio, Panaji, 9820 kHz. Full data *Temples* card, signed by Y.K. Sharma-Director, Spectrum Management & Synergy. Received in 107 days for an English report and two IRCs. Station address: All India Radio, Room 204, Akashvani Bhawan, New Delhi, India 110 001, India. (Bill Wilkins, Springfield, MO)

LITHUANIA

Radio Vilnius 9875, via Sitkunai. Full data QSL card. Received in eight weeks for email report to *radiovilnius@irt.lt* Station address: Lietuvos Radijas, Konarskio 49, LT-2600 Vilnius, Lithuania Web: **www.lrt.lt** (Mallory)

MEDIUM WAVE

CFTR 680 kHz AM. Full data signed by Ron Combden-Chief Engineer. Received in 90 days for a CD report. Station address: 777 Jarvis St., Toronto, Ont., Canada M4Y 3B7. Ontario QSL # 32. (Martin)

CKSB 1050 kHz AM. Friendly verification letter signed by Paul Burnabe. Received in 45 days for an AM report. Station address: 607 Langevin St., Winnipeg MB Canada R2H 2W2. (Martin)

KGYN 1210 kHz AM. Partial data verification on station letterhead, signed by Richard Ryther-Operations Manager, plus two window stickers. Received in 35 days for an AM report, one US dollar and address label. Station address: 2300 N. Lelia, Guymon, OK 73942 USA. (Wilkins)

KMTI 650 kHz AM . Full data building/antenna card, signed by Les Rayburn, NRC/IRCA Broadcast Test Coordinator. Received in 18 days for a taped report of DX Test, and SASE, QSL address: Les Rayburn, 100 Centerview Dr., Suite 111, Birmingham, AL 35216 (Wilkins)

KNBO 1530 kHz AM. Full data verification letter signed by Carmen Johnson-General Manager, plus coverage map. Received in 115 days after follow up AM report. Station address: 1198 Daniels Chapel Rd., New Boston, TX 75570 USA. (Jim Pogue, Memphis, TN)

KPHT 1210 kHz AM. Full data WCAU transmitter card, signed by Dave Skalish-Chief Engineer, plus magnet and key chain. Received in 49 days for an AM report. Station address: 2 Bala Plaza, Suite 800, Bala Cynwyd, PA 19004 USA. Email: *TheBigTalker1210@cbsradio.com* Web: **www.thebigtalker1210.com/** (Pogue)

KTZN 550 kHz AM. Email reply via Mark Murphy-Program Director. Received in 11 days after follow ups from 2005. Email: *markmurphy@clearchannel.com* (Martin)

MEXICO

XEPU 9600 kHz. Full data QSL card signed by Lic Teófilo Huerta Moreno, plus a CD of poetry. Received for an email report to *teohm@servidor.unam.mx*. Station address: XEPU, Radio UNAM, Universidad Nacional Autónoma de México, Adolfo Prieto No. 133, Col. Del Valle, Código Postal 03100, Del. Benito Juárez, Ciudad de México, México. (Arnaldo Slaen, Buenos Aires, Argentina)

USA

Radio Martí 11930 kHz. Partial data letter on Office of Cuba Broadcasting letterhead, signed by Michael Pallone-Director Engineering & Technical Operations. Received in 57 days for an English report. Station address: Office of Cuba Broadcasting, 4201 N.W. 77th Ave., Miami, FL 33166 USA. (Wilkins)

UTILITY

TAH Istanbul Radio 8434 kHz. Date/frequency verification letter signed by Ülker Acarer-Director of Turk Radio. Received in 85 days for a utility report and mint stamps. Station address: Kiyi Emniyetive Gemi Kurtarma, Ýþletmeleri Genel Müdürlüoü, Telsiz Isletme Müdürlüoü, 34630 Sefaköy/ Istanbul, Turkey. (Pogue)

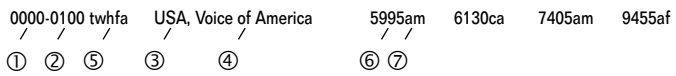
QT 334 kHz Thunder Bay (Non-Directional Beacon) (500 watts). Full data prepared QSL card verified with illegible signature. Received in 36 days. QSL address: Nav Canada Technical Operations, Thunder Bay TSB. 343 Hector Dougall Way, Thunder Bay, ON P7E 6M5 Canada. (Pogue)

SYW 428 kHz Greenville, TX (Non-directional Beacon) (25 watts). Prepared QSL card verified by Jim Folks-Airport Manager. Received in nine days. QSL address: Majors Field, Greenville, TX 75402. (Pogue)

VATICAN STATE

Radio Vaticana 7370 kHz DRM. Full data card, plus stickers and program schedule. Received in 16 days for an email report to: *sedoc@vatiradio.va* Station address: 00120 Cittá del Vaticano, Vatican City State. Web: **www.vaticanradio.org** (Krist)

How to Use the Shortwave Guide



Convert your time to UTC.

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Daylight Saving Time) 4, 5, 6 or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all *dates*, as well as times, are in UTC; for example, a show which might air at 0030 UTC *Sunday* will be heard on *Saturday* evening in America (in other words, 8:30 pm Eastern, 7:30 pm Central, etc.).

Find the station you want to hear.

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

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

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

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
oc:	Oceania
pa:	Pacific
sa:	South America
va:	various

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Thank You ...

Additional Contributors to This Month's Shortwave Guide:

Rich D'Angelo/*NASWA Flash Sheet*; Rachel Baughn/MT; Alokesh Gupta, New Delhi, India; Anker Petersen/*DSWCI-DX Window*; Frank Hillton, SC; Bernd Trutenau, Lithuania; Ivo Ivanov; Jose Jacob, India; Jose Miguel Romero; Adrian Sainsbury/R.NZ Intl; Tom Taylor, UK; Harold Sellers/*ODXA/DX Ontario*; Sakthi Vel, India; Wolfgang Bueschel, Germany; Andreas Volk, Germany*; BCL News; Cumbre DX; BDX Club; DX Mix News, Bulgaria; Hard Core DX; NASWA Journal/NASWA Flashsheet; World Wide DX Club-Top News*.

Shortwave Broadcast Bands

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

Notes

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

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

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

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

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

0000	0005		Greece, Voice of	7475eu	9420eu	15640eu
0000	0015		Japan, Radio Japan/NHK World			13650as
			17810as			
0000	0027		Czech Rep, Radio Prague	7345na	9440na	
0000	0030		Australia, HCJB Global	15525va		
0000	0030		Australia, Radio	9660as	12080as	13690as
			15240pa	17715as	17750va	17775va
			17795va			
0000	0030		Burma, Dem Voice of Burma	5955eu		
0000	0030		Egypt, Radio Cairo	9460na		
0000	0030		UK, BBC World Service	3915as	5970as	
			17615as			
0000	0030		USA, Voice of America	7555as		
0000	0045		India, All India Radio	9690as	9705as	
			11620as	11645as	13605as	
0000	0045		USA, Family Radio Worldwide FL			17805am
0000	0056		Romania, Radio Romania Intl	9775na	11790na	
0000	0057		Canada, Radio Canada Intl	11700as		
0000	0058		Germany, Deutsche Welle	7245as	13730as	
			15595as			
0000	0059		Spain, Radio Exterior Espana	6055na		
0000	0100		Anguilla, University 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		Canada, CFRX Toronto ON	6070na		
0000	0100		Canada, CFVP Calgary AB	6030na		
0000	0100		Canada, CKZN St John's NF	6160na		
0000	0100		Canada, CKZU Vancouver BC			6160na
0000	0100		China, China Radio Intl	6020na	6075as	
			7180as	9570as	9725as	11885as
			13750as	15115as		
0000	0100		Costa Rica, University Network			5030va
			6150va	7375va	9725va	
0000	0100		Guyana, Voice of 3291do			
0000	0100		Japan, Radio Japan/NHK World			6145na
0000	0100		Malaysia, RTM/Trax FM	7295as		
0000	0100		Netherlands, Radio	9845na		
0000	0100		New Zealand, Radio NZ Intl	13730pa		
0000	0100	vl	Papua New Guinea, Wantok R. Light			7120va
0000	0100		Russia, Voice of	7250na	9665na	12755na
0000	0100		Singapore, MediaCorp Radio	6150do		
0000	0100		UK, BBC World Service	6195as	9580as	
			9740as	11955as	15335as	15360as
0000	0100	f	UK, Bible Voice BC	5980me		
0000	0100		Ukraine, Radio Ukraine Intl	7440eu		
0000	0100		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
0000	0100		USA, Family Radio Worldwide FL			6065am
			9595am	11835am		
0000	0100		USA, KAIJ Dallas TX	5755va		
0000	0100		USA, KTBN Salt Lake City UT	7505na	15590na	
0000	0100		USA, WBCQ Monticello ME	5110am	7415na	
			9330na			
0000	0100		USA, WBOH Newport NC	5920am		
0000	0100		USA, WEWN Vandiver AL	5810va		
0000	0100		USA, WHRA Greenbush ME	7520na		
0000	0100	mtwhfa	USA, WHRI Cypress Creek SC			9515am
0000	0100	Sun	USA, WHRI Cypress Creek SC			7490am
0000	0100		USA, WINB Red Lion PA	9265am		
0000	0100		USA, WRMI Miami FL	9955va		
0000	0100		USA, WTJC Newport NC	9370na		
0000	0100		USA, WWCR Nashville TN	5070na	7465na	
			13845na			
0000	0100	mtwhfa	USA, WWRB Manchester TN	5745am		
0000	0100		USA, WWRB Manchester TN	3185va	5050va	
			6890na			
0005	0100		Canada, Radio Canada Intl	6100na		
0030	0045	Sun	Germany, Pan American BC	6165as		
0030	0100		Australia, Radio	9660as	12080as	13690as
			15240pa	15415as	17715as	17750va
			17795va			
0030	0100		Lithuania, Radio Vilnius	11690na		
0030	0100		Thailand, Radio	5890na	9570af	skd0607
0030	0100	Fri-Sun	UK, Bible Voice BC	5955as		
0030	0100		USA, Voice of America	9715va	9780va	
			11725va	15185va	15205va	15290va
			15560va	17820va		
0035	0058	Sun/Mon	Austria, Radio Austria Intl	9870am		
0043	0058	twhfa	Austria, Radio Austria Intl	9870am		
0055	0100		Italy, RAI Italia	11800na		

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

0100	0104		Canada, Radio Canada Intl	6100na		
0100	0115		Italy, RAI Italia	11800na		
0100	0127		Czech Rep, Radio Prague	6200na	7345na	
0100	0128		Hungary, Radio Budapest	6040na		
0100	0128		Vietnam, Voice of	6175na		
0100	0130		Slovakia, Radio Slovakia Int	5930na	9440sa	
0100	0200		Anguilla, University Network	6090am		
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek			4910do
0100	0200		Australia, Radio	9660as	12080as	13690as
			15240pa	15415as	15515as	17715as
			17750va	17795va	21745va	
0100	0200		Canada, CFRX Toronto ON	6070na		
0100	0200		Canada, CFVP Calgary AB	6030na		
0100	0200		Canada, CKZN St John's NF	6160na		
0100	0200		Canada, CKZU Vancouver BC			6160na
0100	0200		China, China Radio Intl	6020na	9470eu	
			9535as	9570na	9580na	9725eu
			9790na	11870as	15115as	15785as
0100	0200		Costa Rica, University Network			5030va
			6150va	7375va	9725va	
0100	0200		Cuba, Radio Havana	6000na	6180na	
0100	0200		Guyana, Voice of 3291do			
0100	0200		Indonesia, Voice of	9525as	11785pa	
			15150al			
0100	0200		Japan, Radio Japan/NHK World			5960va
			11780as	11935na	15235as	15325as
			17560va	17685pa	17810as	17825va
0100	0200		Malaysia, RTM/Trax FM	7295as		
0100	0200		Netherlands, Radio	9845na		
0100	0200		New Zealand, Radio NZ Intl	13730pa		
0100	0200		North Korea, Voice of Korea	3560as	7140as	
			9345am	9730am	11735ca	13760ca
			15180ca			
0100	0200	vl	Papua New Guinea, Wantok R. Light			7120va
0100	0200		Russia, Voice of	7250na	9665na	12775na
0100	0200		Singapore, MediaCorp Radio	6150do		
0100	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0100	0200		Taiwan, Radio Taiwan Intl	11875as	15465na	
0100	0200		UK, BBC World Service	6195as	9410as	
			9580as	11750as	11955as	15310as
			15335as	15360as		
0100	0200	f	UK, Bible Voice BC	5945me		
0100	0200		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
0100	0200		USA, Family Radio Worldwide FL			6065am
			9595am			
0100	0200		USA, KAIJ Dallas TX	5755va		
0100	0200		USA, KTBN Salt Lake City UT	7505na		
0100	0200		USA, KWHR Naalehu HI	17655as		
0100	0200		USA, Voice of America	7430va	11705va	
0100	0200		USA, WBCQ Monticello ME	5110am	7415na	
			9330na			
0100	0200		USA, WBOH Newport NC	5920am		
0100	0200		USA, WEWN Vandiver AL	5810va		
0100	0200		USA, WHRA Greenbush ME	5890na		
0100	0200		USA, WHRI Cypress Creek SC			7490am
0100	0200		USA, WINB Red Lion PA	9265am		
0100	0200	sm	USA, WRMI Miami FL	9955va		
0100	0200	twhfa	USA, WRMI Miami FL	7385na		
0100	0200		USA, WTJC Newport NC	9370na		
0100	0200		USA, WWCR Nashville TN	5070na	5935na	
			7465na			
0100	0200	mtwhfa	USA, WWRB Manchester TN	5745am		
0100	0200		USA, WWRB Manchester TN	3185va	5050va	
			6890na			
0100	0200		Uzbekistan, CVC International			11790as
0105	0128	Sun/Mon	Austria, Radio Austria Intl	9870am		
0113	0128	twhfa	Austria, Radio Austria Intl	9870am		
0115	0130	Sat	Australia, HCJB Global	15405va		
0130	0200		Iran, Voice of the Islamic Rep	7235na	9495na	
0130	0200		Sweden, Radio	6010na	11675va	
0130	0200	twhfa	USA, Voice of America	13740va		
0140	0200		Vatican City, Vatican Radio	5915va	7335va	
0143	0158	twhfa	Austria, Radio Austria Intl	9870am		
0145	0200	twhfas	Albania, Radio Tirana	6120eu	7425na	

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

0200	0215		Croatia, Croatian Radio	6165na	9925eu	
0200	0230		Iran, Voice of the Islamic Rep	7235na	9495na	
0200	0230		South Korea, KBS World Radio			15575sa
0200	0245		USA, Family Radio Worldwide FL			11835na
0200	0300		Anguilla, University Network	6090am		
0200	0300	twhfa	Argentina, RAE	11710am		
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	9660as	12080as	13690as

			15240pa	15415as	15515as	17750va
			21725va			
0200	0300		Bulgaria, Radio	9700na	11700na	
0200	0300		Canada, CFRX Toronto ON	6070na		
0200	0300		Canada, CFVP Calgary AB	6030na		
0200	0300		Canada, CKZN St John's NF	6160na		
0200	0300		Canada, CKZU Vancouver BC			6160na
0200	0300		China, China Radio Intl	11770as		13640as
0200	0300		Costa Rica, University Network			5030va
			6150va	7375va	9725va	
0200	0300		Cuba, Radio Havana	6000na		6180na
0200	0300		Egypt, Radio Cairo	7270na		
0200	0300		Guyana, Voice of 3291do			
0200	0300		Malaysia, RTM/Trax FM	7295as		
0200	0300	DRM	Netherlands, Radio	9405va		
0200	0300		New Zealand, Radio NZ Intl	13730pa		
0200	0300		North Korea, Voice of Korea	4405as		13650as
			15100as			
0200	0300	vl	Papua New Guinea, Wantok R. Light			7120va
0200	0300		Philippines, Radio Pilipinas	11880va		15285va
			15510va			
0200	0300		Russia, Voice of	9665na	9860na	13635na
			13775na			
0200	0300		Singapore, MediaCorp Radio	6150do		
0200	0300		Sri Lanka, SLBC	6005as	9770as	15745as
0200	0300		Thailand, Radio	5890na		
0200	0300		UK, BBC World Service	6030af		6195as
			11750as	11955as	15310as	15335as
			15360as	17790as		
0200	0300		USA, American Forces Radio	4319usb		5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
0200	0300		USA, Family Radio Worldwide FL			5985am
			11855am			
0200	0300		USA, KAIJ Dallas TX	5755va		
0200	0300		USA, KJES Vado NM	7555na		
0200	0300		USA, KTBN Salt Lake City UT	7505na		
0200	0300		USA, KWHR Naalehu HI	17655as		
0200	0300		USA, WBCQ Monticello ME	5110am		7415na
			9330na			
0200	0300		USA, WBOH Newport NC	5920am		
0200	0300		USA, WEWN Vandiver AL	5810va		
0200	0300		USA, WHRA Greenbush ME	5890na		
0200	0300		USA, WHRI Cypress Creek SC			7490am
0200	0300		USA, WINB Red Lion PA	9265am		
0200	0300	sm	USA, WRMI Miami FL	9955va		
0200	0300	twhfa	USA, WRMI Miami FL	7385na		
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WWCR Nashville TN	3215na		5070na
			5935na	7465na		
0200	0300	mtwhfa	USA, WWRB Manchester TN	5745am		
0200	0300		USA, WWRB Manchester TN	3185va		5050va
			6890na			
0200	0300		Uzbekistan, CVC International			11790as
0200	3000		Taiwan, Radio Taiwan Intl	5950na		9680am
0215	0230		Nepal, Radio	3230as	5005as	6100as
			7165as			
0230	0258		Hungary, Radio Budapest	6195na		
0230	0258		Vietnam, Voice of 6175na			
0230	0300	twhfas	Albania, Radio Tirana	6115eu		7425eu
0230	0300		South Korea, KBS World Radio			9560na
0230	0300		Sweden, Radio	6010na		
0245	0300		India, All India Radio	7420as		
0245	0300		Myanmar, Radio	9730do		
0250	0300		Vatican City, Vatican Radio	6040va		7305va
0255	0300	vl	Rwanda, Radio	6055do		

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

0300	0320		Vatican City, Vatican Radio	6040va		7305va
			15560va			
0300	0327		Czech Rep, Radio Prague	7345na		9870na
0300	0330		Egypt, Radio Cairo	7270na		
0300	0330		Myanmar, Radio	9730do		
0300	0330		Philippines, Radio Pilipinas	11880va		15285va
			15510va			
0300	0330		USA, KJES Vado NM	7555na		
0300	0330		USA, Voice of America	4930af		6080af
			7340af	9885af	12080af	15580af
0300	0330		USA, WBCQ Monticello ME	9330am		
0300	0330		Vatican City, Vatican Radio	9660af		
0300	0355		South Africa, Channel Africa	5960af		
0300	0356		Romania, Radio Romania Intl	6150va		9645na
			11895va	15220va		
0300	0359		South Africa, Channel Africa	3345af		
0300	0400		Anguilla, University 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	9660as	12080as	13690as
			15240pa	15415as	15515as	17750va
			21725va			
0300	0400	twhfas	Canada, CBC NQ SW Service			9625na
0300	0400		Canada, CFRX Toronto ON	6070na		
0300	0400		Canada, CFVP Calgary AB	6030na		
0300	0400		Canada, CKZN St John's NF	6160na		
0300	0400		Canada, CKZU Vancouver BC			6160na
0300	0400		China, China Radio Intl	9690na		9790na
			11770as	15110as	15120as	15785as
0300	0400		Costa Rica, University Network			5030va
			6150va	7375va	9725va	
0300	0400		Cuba, Radio Havana	6000na		6180na
0300	0400		Germany, Deutsche Welle	11695as		13810as
0300	0400		Guyana, Voice of 3291do			
0300	0400		Japan, Radio Japan/NHK World			21610pa
0300	0400		Malaysia, RTM/Trax FM	7295as		
0300	0400		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0300	0400		New Zealand, Radio NZ Intl	13730pa		
0300	0400		North Korea, Voice of Korea	3560as		7140as
			9345as	9730as	11735ca	13760ca
			15180ca			
0300	0400		Oman, Radio Oman	15355as		
0300	0400	vl	Papua New Guinea, Wantok R. Light			7120va
0300	0400	DRM	Russia, Voice of	15735as		
0300	0400		Russia, Voice of	9435na	9515na	9665na
			9860na	9880na	12065na	13635na
0300	0400	vl	Rwanda, Radio	6055do		
0300	0400		Singapore, MediaCorp Radio	6150do		
0300	0400		Sri Lanka, SLBC	6005as	9770as	15745as
0300	0400		Taiwan, Radio Taiwan Intl	5950am		15215sa
0300	0400		Turkey, Voice of	5975va	7270va	
0300	0400	Sun	UK, BBC World Service	11760as		
0300	0400		UK, BBC World Service	3255af		6005af
			6030af	6190af	6195as	9750af
			12035af	15310as	15360as	15575as
			17760as	21660as		
0300	0400		Ukraine, Radio Ukraine Intl	7440na		
0300	0400		USA, American Forces Radio	4319usb		5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
0300	0400		USA, Family Radio Worldwide FL			6065na
			9505na	11740na	15255na	
0300	0400		USA, KAIJ Dallas TX	5755va		
0300	0400		USA, KTBN Salt Lake City UT	7505na		
0300	0400		USA, KWHR Naalehu HI	17655as		
0300	0400		USA, WBCQ Monticello ME	5110am		7415na
0300	0400		USA, WBOH Newport NC	5920am		
0300	0400		USA, WEWN Vandiver AL	5810va		
0300	0400		USA, WHRA Greenbush ME	5890na		
0300	0400	Sat/Sun	USA, WHRI Cypress Creek SC			7315am
0300	0400	mtwhf	USA, WHRI Cypress Creek SC			5835am
0300	0400		USA, WINB Red Lion PA	9265am		
0300	0400		USA, WRMI Miami FL	9955va		
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WWCR Nashville TN	3215na		5070na
			5765na	5935na		
0300	0400		USA, WWRB Manchester TN	3185va		5050va
0300	0400		Uzbekistan, CVC International			13680as
0300	0500	vl/mtwhf	UK, Sudan Radio Service	7120af		
0330	0335		Bahrain, Radio Bahrain	6010as		
0330	0345		Israel, Kol Israel	9345eu	11590va	17600va
0330	0357		Czech Rep, Radio Prague	6080as		9445as
			11600as			
0330	0358		Vietnam, Voice of 6175am			
0330	0400		UK, BBC World Service	15420af		
0330	0400		USA, Voice of America	4930af		6080af
			9885af	12080af	15580af	
0330	0400	twhfas	USA, WBCQ Monticello ME	9330am		

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

0400	0430		Australia, Radio	9660as	12080as	13690as
			15240pa	15515as	17750va	21725va
0400	0430	mtwhf	France, Radio France Intl	9805af		11995af
			13675af			
0400	0430		Sri Lanka, SLBC	6005as	9770as	15745as
0400	0430		USA, Voice of America	4930af		6080af
			9575af	11835af	12080af	15580af
0400	0430	Sat/Sun	USA, WWRB Manchester TN	5745am		
0400	0445		USA, Family Radio Worldwide FL			6065na
			9505na			
0400	0458		New Zealand, Radio NZ Intl	13730pa		
0400	0500		Anguilla, University Network	6090am		
0400	0500		Armenia, CVC International	15515as		
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		China, China Radio Intl	6020na	6080as		
			13750as	15120as	15785as	17725as	
			17855as				
0400	0500		Costa Rica, University Network				5030va
			6150va	7375va	9725va		
0400	0500		Cuba, Radio Havana		6000na	6180na	
0400	0500		Germany, Deutsche Welle		7225af	7245af	
			12045af	15445af			
0400	0500		Guyana, Voice of 3291do				
0400	0500		Malaysia, RTM/Trax FM		7295as		
0400	0500		Malaysia, RTM/Voice of Malaysia				6175as
			9750as	15295as			
0400	0500		Netherlands, Radio		6165na		
0400	0500	vl	Papua New Guinea, Wantok R. Light				7120va
0400	0500		Russia, Voice of	9435na	9515na	9860na	
			9880na	13635na	13775na		
0400	0500	DRM	Russia, Voice of	15735as			
0400	0500	vl	Rwanda, Radio	6055do			
0400	0500		Singapore, MediaCorp Radio		6150do		
0400	0500	vl	Uganda, Radio	4976do	5026do		
0400	0500		UK, BBC World Service		3255af	6005af	
			6190af	7120af	7160af	9410eu	
			11760as	12035af	12095eu	15310as	
			15360as	15460af	15565eu	15575as	
			17760as	17790as	21660as		
0400	0500		USA, American Forces Radio		4319usb	5446usb	
			5765usb	6350usb	7811usb	10320usb	
			12133usb	13362usb			
0400	0500		USA, Family Radio Worldwide FL				6855na
			7780va	9715am			
0400	0500		USA, KAIJ Dallas TX		5755va		
0400	0500		USA, KTBN Salt Lake City UT		7505na		
0400	0500		USA, KWHR Naalehu HI		17655as		
0400	0500		USA, WBCQ Monticello ME		5110am	7415na	
0400	0500		USA, WBOH Newport NC		5920am		
0400	0500		USA, WEWN Vandiver AL		5810va		
0400	0500		USA, WHRA Greenbush ME		5890na		
0400	0500	mtwhf	USA, WHRI Cypress Creek SC				5835am
0400	0500	Sat/Sun	USA, WHRI Cypress Creek SC				7315am
0400	0500		USA, WHRI Cypress Creek SC				7355am
0400	0500		USA, WMLK Bethel PA		9265va		
0400	0500		USA, WRMI Miami FL		9955va		
0400	0500		USA, WTJC Newport NC		9370na		
0400	0500		USA, WWCR Nashville TN		3215na	5070na	
			5890na	5935na			
0400	0500		USA, WWRB Manchester TN		3185va	5050va	
			6890na				
0400	0500		Uzbekistan, CVC International				13680as
0430	0500		Australia, Radio	9660as	12080as	13690as	
			15240pa	15415as	15515va	17750va	
			21725va				
0430	0500		Nigeria, Radio/Kaduna		6090do		
0430	0500		Swaziland, TWR	3200af	4775af		
0430	0500		USA, Voice of America		4930af	4960af	
			9575af	11835af	12080af	15580af	
0430	0500	Sat	USA, WWRB Manchester TN		5745am		
0445	0500		Italy, RAI Italia	6110af	6145af	7235af	

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

0500	0507	twhfas	Canada, CBC NQ SW Service				9625na
0500	0515	Sun	Sri Lanka, SLBC	6005as	9770as	15745as	
0500	0530	mtwhf	France, Radio France Intl		13680af	15160af	
			13680af				
0500	0530		Germany, Deutsche Welle		5945af	9700af	
0500	0530		Vatican City, Vatican Radio		4005eu	7250eu	
			9660af	11625af	13765af		
0500	0555		South Africa, Channel Africa		9685af		
0500	0559		South Africa, Channel Africa		7240af		
0500	0600		Anguilla, University Network		6090am		
0500	0600		Armenia, CVC International		15515as		
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		Australia, Radio	9660as	12080as	13690as	
			15160as	15240pa	15515as	17750va	
0500	0600		Bhutan, BBS	6035as			
0500	0600		Canada, CFRX Toronto ON		6070na		
0500	0600		Canada, CKZN St John's NF		6160na		
0500	0600		Canada, CKZU Vancouver BC				6160na
0500	0600		China, China Radio Intl		6020na	6190na	
			11710af	11880as	15350as	15465as	
			17505as	17540as	17725as	17855as	
0500	0600		Costa Rica, University Network				5030va
			6150va	7375va	9725va		
0500	0600		Cuba, Radio Havana		6000na	6060na	
			6180na	9550va	9600va	11760va	
0500	0600		Germany, CVC Intl/Voice Africa				9430af
0500	0600		Guyana, Voice of 3291do				
0500	0600		Japan, Radio Japan/NHK World				5975eu
			6110na	7230eu	15195as	17810as	
			21755pa				
0500	0600		Malaysia, RTM/Trax FM		7295as		
0500	0600		Malaysia, RTM/Voice of Malaysia				6175as
			9750as	15295as			
0500	0600		New Zealand, Radio NZ Intl		9615pa		
0500	0600	DRM	New Zealand, Radio NZ Intl		11675pa		
0500	0600		Nigeria, Radio/Kaduna		4770do	6090al	
0500	0600		Nigeria, Voice of/ Ext. Svc Lagos				15120va
0500	0600	vl	Papua New Guinea, Wantok R. Light				7120va
0500	0600		Russia, Voice of	17635pa	21790pa		
0500	0600	DRM	Russia, Voice of	15735as			
0500	0600		Singapore, MediaCorp Radio		6150do		
0500	0600		Swaziland, TWR	3200af	4775af	9500af	
0500	0600	vl	Uganda, Radio	4976do	5026do		
0500	0600		UK, BBC World Service		3255af	6005af	
			6190af	6195af	7160af	9410eu	
			11695af	11760as	11765af	11955as	
			12095eu	15310as	15360as	15420af	
			15565eu	17640af	17760as	17790as	
			17885af	21660as			
0500	0600	vl/ mtwhf	UK, Sudan Radio Service		9525af		
0500	0600		Ukraine, Radio Ukraine Intl		9945eu		
0500	0600		USA, American Forces Radio		4319usb	5446usb	
			5765usb	6350usb	7811usb	10320usb	
			12133usb	13362usb			
0500	0600		USA, Family Radio Worldwide FL				6855na
			9355va				
0500	0600		USA, KAIJ Dallas TX		5755va		
0500	0600		USA, KTBN Salt Lake City UT		7505na		
0500	0600		USA, KWHR Naalehu HI		11565as	13650am	
0500	0600		USA, Voice of America		4930af	6080af	
			12080af	15580af			
0500	0600		USA, WBCQ Monticello ME		5110am	7415na	
0500	0600		USA, WBOH Newport NC		5920am		
0500	0600		USA, WEWN Vandiver AL		5850va		
0500	0600		USA, WHRA Greenbush ME		6145na		
0500	0600		USA, WHRI Cypress Creek SC				7355am
0500	0600		USA, WMLK Bethel PA		9265va		
0500	0600		USA, WRMI Miami FL		9955va		
0500	0600		USA, WTJC Newport NC		9370na		
0500	0600		USA, WWCR Nashville TN		3215na	5070na	
			5890na	5935na			
0500	0600		USA, WWRB Manchester TN		3185va		
0500	0600		Uzbekistan, CVC International				13680as
0500	0600		Zambia, CVC International		9430af		
0505	0520	m	Austria, Radio Austria Intl		17870me		
0505	0530	Sat/Sun	Austria, Radio Austria Intl		17870me		
0515	0530	vl	Rwanda, Radio	6055do			
0525	0600	vl	Ghana, Ghana BC Corp		4915do		
0530	0556		Romania, Radio Romania Intl		9655va	11830va	
			15435va	17770va			
0530	0600	vl	Rwanda, Radio	6055do			
0530	0600		Thailand, Radio	17655eu			
0535	0600	Sat/Sun	Austria, Radio Austria Intl		17870me		
0545	0600	twhf	Austria, Radio Austria Intl		17870me		

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

0600	0603		Croatia, Croatian Radio		6165eu	9470eu	
			11610eu				
0600	0615	Sat/Sun	South Africa, TWR	11640af			
0600	0630		Australia, Radio	9660as	12080as	13690as	
			15160as	15240pa	15515as	17750va	
0600	0630	mtwhf	France, Radio France Intl		11725af	15160af	
			17800af				
0600	0630		Germany, Deutsche Welle		7310af	15275af	
0600	0630		Nigeria, Radio, Natl Svc/Abuja				7275do
0600	0645	mtwhf	South Africa, TWR	11640af			
0600	0655		South Africa, Channel Africa		15255af		
0600	0658		New Zealand, Radio NZ Intl		9615pa		
0600	0658	DRM	New Zealand, Radio NZ Intl		11675pa		
0600	0700		Anguilla, University Network		6090am		
0600	0700		Armenia, CVC International		15515as		
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		Australia, CVC International		15335as		
0600	0700		Canada, CFRX Toronto ON		6070na		
0600	0700		Canada, CFVP Calgary AB		6030na		
0600	0700		Canada, CKZN St John's NF		6160na		
0600	0700		Canada, CKZU Vancouver BC				6160na
0600	0700		China, China Radio Intl		11710af	11870as	
			11880as	13660as	15140as	15350as	

			15465as	17505as	17505as	17540as	17710as
0600	0700		Costa Rica, University Network				5030va
			6150va	7375va	9725va	11870va	
0600	0700		Cuba, Radio Havana		6000va	6060va	
			6180na	9550va	9600va	11760va	
0600	0700		Germany, CVC Intl/Voice Africa				15640af
0600	0700	vl	Ghana, Ghana BC Corp		4915do		
0600	0700	mwhfas	Greece, Voice of	11645eu			
0600	0700		Guyana, Voice of	3291do			
0600	0700		Japan, Radio Japan/NHK World				7230eu
			11740as	11760as	13630va	15195pa	
			17870pa	21755pa			
0600	0700	vl	Liberia, ELWA	4760do			
0600	0700		Malaysia, RTM/Trax FM		7295as		
0600	0700		Malaysia, RTM/Voice of Malaysia				6175as
			9750as	15295as			
0600	0700		Nigeria, Radio/Kaduna		4770do		6090al
0600	0700		Nigeria, Voice of/ Ext. Svc Lagos				15120va
0600	0700	vl	Papua New Guinea, Wantok R. Light				7120va
0600	0700		Russia, Voice of	17635pa	21790pa		
0600	0700		Singapore, MediaCorp Radio		6150do		
0600	0700	vl	Solomon Islands, SIBC		5020do	9545al	
0600	0700		Swaziland, TWR	3200af	4775af	9500af	
0600	0700	Sat/Sun	UK, BBC World Service		17885af		
0600	0700		UK, BBC World Service		6005af	6190af	
			7320eu	7475eu	9410va	9860af	
			11695as	11760as	11765af	11955as	
			12095af	15310as	15360as	15400af	
			17640af	11760as	17790as	21660af	
0600	0700		USA, American Forces Radio		4319usb	5446usb	
			5765usb	6350usb	7811usb	10320usb	
			12133usb	13362usb			
0600	0700		USA, Family Radio Worldwide FL				6000am
			7780va	9680na	11530af	11580va	
0600	0700		USA, KAIJ Dallas TX		5755va		
0600	0700		USA, KTBN Salt Lake City UT		7505na		
0600	0700		USA, KWHR Naalehu HI		11565as	13650am	
0600	0700		USA, Voice of America		6080af	6180af	
			12080af	15580af			
0600	0700		USA, WBCQ Monticello ME		5110am	7415na	
0600	0700		USA, WBOH Newport NC		5920am		
0600	0700		USA, WEWN Vandiver AL		5850va	7570va	
0600	0700		USA, WHRA Greenbush ME		7490na		
0600	0700		USA, WHRI Cypress Creek SC				7335am
			7365am				
0600	0700		USA, WMLK Bethel PA		9265va		
0600	0700		USA, WRMI Miami FL		9955va		
0600	0700		USA, WTJC Newport NC		9370na		
0600	0700		USA, WWCR Nashville TN		3215na	5070na	
			5890na	5935na			
0600	0700		USA, WWRB Manchester TN		3185va		
0600	0700	vl	Vanuatu, Radio	4960do			
0600	0700		Yemen, Rep of Yemen Radio		9780me		
0600	0700		Zambia, CVC International		13650af		
0630	0700		Australia, Radio	9660as	12080as	13690as	
			15160as	15240pa	15415as	15515as	
			17750va				
0630	0700		Bulgaria, Radio	9600eu	11600eu		
0630	0700		UK, BBC World Service		11990af		
0630	645	mtwhfa	Vatican City, Vatican Radio		4005va	6185eu	
			7250eu	9645eu	11625eu	11740eu	
			13765eu	15570af	15595af		
0645	0700	Sun	Albania, TWR Europe		11865eu		
0645	0700	Sun	Monaco, TWR Europe		9800eu		
0659	0700	DRM	New Zealand, Radio NZ Intl		7145pa		

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

0700	0705		UK, BBC World Service		6005af		
0700	0727		Czech Rep, Radio Prague		9880eu	11600eu	
0700	0730		France, Radio France Intl		13675af		
0700	0730		Slovakia, Radio Slovakia Int		9440pa	15460pa	
0700	0745		USA, Family Radio Worldwide FL				7780va
0700	0800	mtwhfs	Albania, TWR Europe		11865eu		
0700	0800		Anguilla, University 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, CVC International		15335as		
0700	0800		Australia, Radio	9660as	9710as	12080as	
			13630as	15160pa	15240pa	15415as	
			17750va				
0700	0800		Canada, CFRX Toronto ON		6070na		
0700	0800		Canada, CFVP Calgary AB		6030na		
0700	0800		Canada, CKZN St John's NF		6160na		
0700	0800		Canada, CKZU Vancouver BC				6160na
0700	0800		China, China Radio Intl		11880as	13660as	
			13710as	15450as	15465eu	17490eu	
			17540as	17710as			
0700	0800		Costa Rica, University Network				5030va
			6150va	7375va	9725va	11870va	
0700	0800		Germany, CVC Intl/Voice Africa				15640af
0700	0800	vl	Ghana, Ghana BC Corp		4915do		
0700	0800		Guyana, Voice of	3291do	5950do		
0700	0800	vl	Liberia, ELWA	4760do			
0700	0800		Liberia, Star Radio		9525af		
0700	0800		Malaysia, RTM/Trax FM		7295as		
0700	0800		Malaysia, RTM/Voice of Malaysia				6175as
			9750as	15295as			
0700	0800	mtwhf	Monaco, TWR Europe		9800eu		
0700	0800		Myanmar, Radio	9730do			
0700	0800		New Zealand, Radio NZ Intl		6095pa		
0700	0800		New Zealand, Radio NZ Intl		6095pa		
0700	0800	DRM	New Zealand, Radio NZ Intl		7145pa		
0700	0800		Nigeria, Radio/Kaduna		4770do		6090al
0700	0800		Nigeria, Voice of/ Ext. Svc Lagos				15120va
0700	0800	vl	Papua New Guinea, Wantok R. Light				7120va
0700	0800		Russia, Voice of	17495pa	17635pa	21790pa	
0700	0800		Singapore, MediaCorp Radio		6150do		
0700	0800	vl	Solomon Islands, SIBC		5020do	9545al	
0700	0800		Swaziland, TWR	4775af	6120af	9500af	
0700	0800		Taiwan, Radio Taiwan Intl		5950am		
0700	0800	DRM	UK, BBC World Service		9470eu		
0700	0800		UK, BBC World Service		6190af	7320eu	
			9470eu	9860af	11695as	11760me	
			11765af	11955as	12095af	15310as	
			15360as	15400af	15575as	17760as	
			17830af	21660as			
0700	0800	Sat/Sun	UK, BBC World Service		17885af		
0700	0800		Ukraine, Radio Ukraine Intl		9945eu		
0700	0800		USA, American Forces Radio		4319usb	5446usb	
			5765usb	6350usb	7811usb	10320usb	
			12133usb	13362usb			
0700	0800		USA, Family Radio Worldwide FL				5985na
			6855na	9505am	9715am	9930af	
0700	0800		USA, KAIJ Dallas TX		5755va		
0700	0800		USA, KTBN Salt Lake City UT		7505na		
0700	0800		USA, KWHR Naalehu HI		11565as	13650am	
0700	0800		USA, WBCQ Monticello ME		5110am	7415na	
0700	0800		USA, WBOH Newport NC		5920am		
0700	0800		USA, WEWN Vandiver AL		5850va	7570va	
0700	0800		USA, WHRI Cypress Creek SC				7335am
			7365am				
0700	0800		USA, WMLK Bethel PA		9265va		
0700	0800		USA, WRMI Miami FL		9955va		
0700	0800		USA, WTJC Newport NC		9370na		
0700	0800		USA, WWCR Nashville TN		3215na	5070na	
			5890na	5935na			
0700	0800		USA, WWRB Manchester TN		3185va		
0700	0800	vl	Vanuatu, Radio	4960do			
0700	0800		Zambia, CVC International		13650af		
0715	0750	Sat	Albania, TWR Europe		11865eu		
0715	0750	Sat	Monaco, TWR Europe		9800eu		
0730	0800		Australia, HCJB Global		11750pa		
0730	0800		Pakistan, Radio	15100eu	17835eu		

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

0800	0900		USA, WWRB Manchester TN		3185va		
0800	0820	mtwhfs	Albania, TWR Europe		11865eu		
0800	0820	mtwhfs	Monaco, TWR Europe		9800eu		
0800	0825		Malaysia, RTM/Voice of Malaysia				6175as
			9750as	15295as			
0800	0830		Australia, ABC NT Katherine		5025do		
0800	0830		Australia, ABC NT Tennant Creek				4910do
0800	0830		Myanmar, Radio	9730do			
0800	0830		Pakistan, Radio	15100eu	17835eu		
0800	0845	Sat	Guam, TWR/KTWR		11840pa		
0800	0845		USA, Family Radio Worldwide FL				9930af
0800	0900		Anguilla, University Network		6090am		
0800	0900		Australia, ABC NT Alice Springs				2310do
			4835do				
0800	0900		Australia, CVC International		15335as		
0800	0900		Australia, HCJB Global		11750pa		
0800	0900		Australia, Radio	5995va	9580va	9710va	
			12080as	13630va	15415as	17750va	
0800	0900		Canada, CFRX Toronto ON		6070na		
0800	0900		Canada, CFVP Calgary AB		6030na		
0800	0900		Canada, CKZN St John's NF		6160na		
0800	0900		Canada, CKZU Vancouver BC				6160na
0800	0900		China, China Radio Intl		11620as	11880as	
			13710eu	15350as	15465as	17490eu	
			17540as				
0800	0900		Costa Rica, University Network				5030va
			6150va	7375va	9725va	11870va	
0800	0900		Germany, CVC Intl/Voice Africa				15640af
0800	0900	vl	Ghana, Ghana BC Corp		4915do		

0800	0900	vl	Greece, Voice of	9420eu	15630eu	
0800	0900	mtwhf	Guam, TWR/KTWR		11840pa	
0800	0900		Guyana, Voice of	3291do	5950do	
0800	0900		Indonesia, Voice of		9525as	11785pa
			15150al			
0800	0900	Sat	Latvia, Radio SWH		9290eu	
0800	0900	vl	Liberia, ELWA	4760do		
0800	0900		Malaysia, RTM/Trax FM		7295as	
0800	0900		New Zealand, Radio NZ Intl		6095pa	
0800	0900	DRM	New Zealand, Radio NZ Intl		7145pa	
0800	0900		Nigeria, Radio/Kaduna		4770do	6090al
0800	0900		Papua New Guinea, NBC		4890do	
0800	0900	vl	Papua New Guinea, Wantok R. Light			7120va
0800	0900		Russia, Voice of	17495pa	17635pa	21790pa
0800	0900	DRM	Russia, Voice of	12060eu	15780eu	
0800	0900		Singapore, MediaCorp Radio		6150do	
0800	0900	vl	Solomon Islands, SIBC		5020do	9545al
0800	0900		South Africa, Channel Africa		9620af	
0800	0900		South Korea, KBS World Radio			9570as
0800	0900		Swaziland, TWR	4775af	6120af	9500af
0800	0900		Taiwan, Radio Taiwan Intl		11715pa	
0800	0900	DRM	UK, BBC World Service		9480eu	
0800	0900		UK, BBC World Service		6190af	7320eu
			9470eu	9740as	9860af	11760me
			15310as	15360as	15400af	15485af
			17760as	17790as	17830af	17885af
			21470af	21660as		
0800	0900	Sat/Sun	UK, BBC World Service		6195as	15575as
0800	0900	f	UK, Bible Voice BC		5945eu	
0800	0900	Sat	UK, Bible Voice BC		5945eu	
0800	0900	Sun	UK, Bible Voice BC		5945eu	
0800	0900		Ukraine, Radio Ukraine Intl		9945eu	
0800	0900		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
0800	0900		USA, Family Radio Worldwide FL			5985na
			6855na			
0800	0900		USA, KAIJ Dallas TX		5755va	
0800	0900		USA, KNLS Anchor Point AK		7355as	
0800	0900		USA, KTBN Salt Lake City UT		7505na	
0800	0900		USA, KWHR Naalehu HI		9930as	11565as
0800	0900		USA, WBOH Newport NC		5920am	
0800	0900		USA, WEWN Vandiver AL		5850na	7570va
0800	0900		USA, WHRI Cypress Creek SC			7315am
			7335am			
0800	0900		USA, WMLK Bethel PA		9265va	
0800	0900		USA, WRMI Miami FL		9955va	
0800	0900		USA, WTJC Newport NC		9370na	
0800	0900		USA, WWCR Nashville TN		3215na	5070na
			5890na	5935na		
0800	0900	vl	Vanuatu, Radio	4960do		
0800	0900		Zambia, CVC International		13650af	
0805	0900	mtwhf	Guam, TWR/KTWR		15170as	
0815	0845	Sat	UK, Bible Voice BC		9655eu	
0830	0900		Australia, ABC NT Katherine		2485do	
0830	0900		Australia, ABC NT Tennant Creek			2325do
0830	0900		Lithuania, Radio Vilnius		9710eu	

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

0900	0900		USA, WBCQ Monticello ME		5110am	7415na
0900	0915	Sun	UK, Bible Voice BC		5945eu	
0900	0927		Czech Rep, Radio Prague		9800eu	21745as
0900	0930		Australia, HCJB Global		11750pa	
0900	0945	Sun	UK, Bible Voice BC		5945eu	
0900	1000		Anguilla, University Network		6090am	
0900	1000		Australia, ABC NT Alice Springs			2310do
			4835do			
0900	1000		Australia, ABC NT Katherine		2485do	
0900	1000		Australia, ABC NT Tennant Creek			2325do
0900	1000		Australia, CVC International		11955as	
0900	1000		Australia, Radio	9580va	9590va	15415as
0900	1000		Bhutan, BBS	6035as		
0900	1000		Canada, CFRX Toronto ON		6070na	
0900	1000		Canada, CFVP Calgary AB		6030na	
0900	1000		Canada, CKZN St John's NF		6160na	
0900	1000		Canada, CKZU Vancouver BC			6160na
0900	1000		China, China Radio Intl		11620as	15210pa
			15350as	17490eu	17690pa	17750as
0900	1000		Costa Rica, University Network			5030va
			6150va	7375va	9725va	11870va
			13750va			
0900	1000		Germany, Deutsche Welle		15340as	17770as
0900	1000	vl	Ghana, Ghana BC Corp		4915do	
0900	1000	vl/Sun	Greece, Voice of	9420eu	15630eu	
0900	1000		Guyana, Voice of	3291do	5950do	
0900	1000	vl	Liberia, ELWA	4760do		
0900	1000		Malaysia, RTM/Trax FM		7295as	
0900	1000		New Zealand, Radio NZ Intl		6095pa	
0900	1000	DRM	New Zealand, Radio NZ Intl		7145pa	
0900	1000		Nigeria, Radio/Kaduna		4770do	6090al
0900	1000		Papua New Guinea, NBC		4890do	
0900	1000	vl	Papua New Guinea, Wantok R. Light			7120va
0900	1000		Saudi Arabia, BSKSA		15250af	
0900	1000		Singapore, MediaCorp Radio		6150do	
0900	1000	vl	Solomon Islands, SIBC		5020do	9545al
0900	1000		South Africa, Channel Africa		9620af	
0900	1000	DRM	UK, BBC World Service		9480eu	
0900	1000	smtwhf	UK, BBC World Service		9605as	
0900	1000		UK, BBC World Service		6190af	6195as
			7320eu	9470eu	9740eu	9860af
			11760me	15310as	15360as	15400af
			15575as	17760as	17830af	17885af
			21470af			
0900	1000		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
0900	1000		USA, Family Radio Worldwide FL			5985na
			6885na	9450va	9755am	
0900	1000		USA, KAIJ Dallas TX		5755va	
0900	1000		USA, KTBN Salt Lake City UT		7505na	
0900	1000		USA, KWHR Naalehu HI		9930as	11565as
0900	1000		USA, WBCQ Monticello ME		5110am	7415na
0900	1000		USA, WBOH Newport NC		5920am	
0900	1000		USA, WEWN Vandiver AL		5850na	
0900	1000		USA, WHRI Cypress Creek SC			7315am
			7335am			
0900	1000		USA, WRMI Miami FL		9955va	
0900	1000		USA, WTJC Newport NC		9370na	
0900	1000		USA, WWCR Nashville TN		5070na	5765na
			5935na	9985na		
0900	1000		USA, WWRB Manchester TN		3185va	
0900	1000	vl	Vanuatu, Radio	4960do		
0900	1000		Zambia, CVC International		13650af	
0930	0945		Israel, Kol Israel		13855eu	15760eu
0930	1000	Sun	Italy, IRRS		9510eu	

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

1000	1003	mtwhf	Croatia, Croatian Radio		9830pa	
1000	1030		UK, BBC World Service		9605as	21660as
1000	1058		New Zealand, Radio NZ Intl		6095pa	
1000	1100		Anguilla, University Network		11775am	
1000	1100		Australia, ABC NT Alice Springs			2310do
			4835do			
1000	1100		Australia, ABC NT Katherine		2485do	
1000	1100		Australia, ABC NT Tennant Creek			2325do
1000	1100		Australia, CVC International		11955as	
1000	1100	DRM	Australia, CVC International		9760eu	
1000	1100		Australia, HCJB Global		15540va	
1000	1100		Australia, Radio	9580va	9590va	15415as
1000	1100	DRM	Austria, CVC International		11815eu	
1000	1100		Canada, CFRX Toronto ON		6070na	
1000	1100		Canada, CFVP Calgary AB		6030na	
1000	1100		Canada, CKZN St John's NF		6160na	
1000	1100		Canada, CKZU Vancouver BC			6160na
1000	1100		China, China Radio Intl		6040as	11610as
			11635as	13590as	13620as	13720as
			15190as	15210as	15350eu	17490as
			17690as			
1000	1100		Costa Rica, University Network			5030va
			6150va	7375va	9725va	11870va
			13750va			
1000	1100	vl	Ghana, Ghana BC Corp		4915do	
1000	1100		Guyana, Voice of	3291do	5950do	
1000	1100		India, All India Radio		7270as	13695va
			15020as	15260as	15410as	17510pa
			17800as	17895pa		
1000	1100	Sun	Italy, IRRS		9510eu	
1000	1100		Japan, Radio Japan/NHK World			6120na
			9650va	9695as	11730as	11890pa
			17585eu			
1000	1100	vl	Liberia, ELWA	4760do		
1000	1100		Malaysia, RTM/Trax FM		7295as	
1000	1100		Netherlands, Radio		13710as	12065as
			13820as			
1000	1100	DRM	New Zealand, Radio NZ Intl		7145pa	
1000	1100		Nigeria, Radio/Kaduna		4770do	6090al
1000	1100		Nigeria, Voice of/ Ext. Svc Lagos			7255af
1000	1100		North Korea, Voice of Korea		3560as	11710am
			11735as	13650as	15180am	
1000	1100		Papua New Guinea, NBC		4890do	
1000	1100	vl	Papua New Guinea, Wantok R. Light			7120va
1000	1100		Saudi Arabia, BSKSA		15250af	
1000	1100		Singapore, MediaCorp Radio		6150do	
1000	1100	vl	Solomon Islands, SIBC		5020do	9545al
1000	1100		South Africa, Channel Africa		9620af	
1000	1100		UK, BBC World Service		6190af	6195as
			7320eu	9470eu	9740as	9860af
			11760me	15310as	15575as	17760as

			17790as	17885af	21470af	
1000	1100	Sat/Sun	UK, BBC World Service		15400af	
1000	1100		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
1000	1100		USA, Family Radio Worldwide FL			5950na
			5985na	6855na	7855am	9450va
			9755am			
1000	1100		USA, KAIJ Dallas TX		5755va	
1000	1100		USA, KNLS Anchor Point AK		6890as	7355al
1000	1100		USA, KTBN Salt Lake City UT		7505na	
1000	1100		USA, KWHR Naalehu HI		9930as	11565as
1000	1100		USA, WBCQ Monticello ME		5110am	7415na
1000	1100		USA, WBOH Newport NC		5920am	
1000	1100		USA, WEWN Vandiver AL		5850na	
1000	1100		USA, WHRI Cypress Creek SC			7315am
			7335am			
1000	1100		USA, WRMI Miami FL		9955va	
1000	1100		USA, WTJC Newport NC		9370na	
1000	1100		USA, WWCR Nashville TN		5070na	5765na
			5935na	15825na		
1000	1100		USA, WWRB Manchester TN		3185va	
1000	1100		Zambia, CVC International		13590af	
1030	1057		Czech Rep, Radio Prague		9880eu	11665eu
1030	1058		Vietnam, Voice of	7285as		
1030	1100		Iran, Voice of the Islamic Rep		15600as	17660as
1030	1100		UK, BBC World Service		9605as	11945as
			15285as	15360as	21660as	
1030	1100	Sun	UK, Bible Voice BC		5950as	
1059	1100		New Zealand, Radio NZ Intl		9870pa	

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

1100	1128		Vietnam, Voice of	9840as	7220as	7285as
1100	1130		Australia, HCJB Global		15540va	
1100	1130		Iran, Voice of the Islamic Rep		15600as	17600as
1100	1145		USA, Family Radio Worldwide FL			9550am
			9755am			
1100	1158	DRM	New Zealand, Radio NZ Intl		7145pa	
1100	1200		Anguilla, University 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		Australia, CVC International		13635as	
1100	1200	DRM	Australia, Radio	12080va		
1100	1200		Australia, Radio	5995va	6020va	9475as
			9560pa	9580va	9590va	12080as
1100	1200	Sat/Sun	Canada, CBC NQ SW Service			9625na
1100	1200		Canada, CFRX Toronto ON		6070na	
1100	1200		Canada, CFVP Calgary AB		6030na	
1100	1200		Canada, CKZN St John's NF		6160na	
1100	1200		Canada, CKZU Vancouver BC			6160na
1100	1200		China, China Radio Intl		5955as	6040na
			11650as	11750na	11795as	13590as
			13645as	13650eu	13720as	17490eu
1100	1200		Costa Rica, University Network			5030va
			6150va	7375va	9725va	11870va
			13750va			
1100	1200	vl	Ghana, Ghana BC Corp		4915do	
1100	1200	Sun	Italy, IRRS	9510eu		
1100	1200		Japan, Radio Japan/NHK World			6120na
			9695as	11730as		
1100	1200	vl	Liberia, ELWA	4760do		
1100	1200		Malaysia, RTM/Trax FM		7295as	
1100	1200		Netherlands, Radio		11675na	
1100	1200		New Zealand, Radio NZ Intl		9870pa	
1100	1200		Nigeria, Radio/Kaduna		4770do	6090al
1100	1200		Nigeria, Voice of/ Ext. Svc Lagos			7255af
1100	1200		Papua New Guinea, NBC		4890do	
1100	1200	vl	Papua New Guinea, Wantok R. Light			7120va
1100	1200		Saudi Arabia, BSKSA		15250af	
1100	1200		Singapore, Radio Singapore Intl			6080as
			6150as			
1100	1200		South Africa, Channel Africa		9620af	
1100	1200		Taiwan, Radio Taiwan Intl		11715as	
1100	1200	Sat/Sun	UK, BBC World Service		9660am	15400af
			15575as			
1100	1200		UK, BBC World Service		6190af	6195as
			7320eu	9465sa	9470eu	9740as
			9860va	11760me	15310as	17760as
			17790as	17885af	21470af	
1100	1200	mtwhf	UK, BBC World Service		15575as	17830af
1100	1200	Sat/Sun	UK, Bible Voice BC		5950as	
1100	1200		Ukraine, Radio Ukraine Intl		15675eu	
1100	1200		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
1100	1200		USA, Family Radio Worldwide FL			5985na
			7780am	9625am		
1100	1200		USA, KAIJ Dallas TX		5755va	
1100	1200		USA, KTBN Salt Lake City UT		7505na	
1100	1200		USA, KWHR Naalehu HI		9930as	
1100	1200		USA, WBOH Newport NC		5920am	
1100	1200		USA, WEWN Vandiver AL		5850na	
1100	1200		USA, WHRI Cypress Creek SC			6095am
			9660am			
1100	1200		USA, WINB Red Lion PA		9265am	
1100	1200		USA, WRMI Miami FL		9955va	
1100	1200		USA, WTJC Newport NC		9370na	
1100	1200		USA, WWCR Nashville TN		5070na	5765na
			5935na	15825na		
1100	1200		USA, WWRB Manchester TN		3185va	
1100	1200		Zambia, CVC International		13590af	
1115	1130	mtwhf	UK, Bible Voice BC		5950as	
1130	1145		UK, BBC World Service		7135as	11920as
1130	1200		Australia, HCJB Global		15400va	
1130	1200	mtwhfa	Australia, HCJB Global		15425va	
1130	1200		Bulgaria, Radio	11700eu	15700eu	
1130	1200		Guam, AWR/KSDA		15435as	
1130	1200	mtwhf	UK, BBC World Service		9660am	
1130	1200		Vatican City, Vatican Radio		15595va	17765va

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

1200	1215	f	UK, Bible Voice BC		5950as	
1200	1230	Sun	Australia, HCJB Global		15425va	
1200	1230		France, Radio France Intl		17800af	
1200	1230		Germany, AWR Europe		15435as	
1200	1245		USA, Family Radio Worldwide FL			5950na
			5985na			
1200	1256		Romania, Radio Romania Intl		11875eu	15220eu
1200	1258		New Zealand, Radio NZ Intl		9870pa	
1200	1259		Canada, Radio Canada Intl		9660as	15170as
1200	1259		Poland, Radio Polonia		9525eu	11805eu
1200	1300		Anguilla, University 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	DRM	Australia, Radio	5995va		
1200	1300		Australia, Radio	5995va	6020va	9475as
			9560pa	9580va	9590va	
1200	1300	Sat/Sun	Canada, CBC NQ SW Service			9625na
1200	1300		Canada, CFRX Toronto ON		6070na	
1200	1300		Canada, CFVP Calgary AB		6030na	
1200	1300		Canada, CKZN St John's NF		6160na	
1200	1300		Canada, CKZU Vancouver BC			6160na
1200	1300		China, China Radio Intl		5955as	9460as
			9730as	9760pa	11650as	11660as
			11690as	11760pa	11980as	13645as
			13650eu	13790eu	17490eu	
1200	1300		Costa Rica, University Network			9725va
			11870va	13750va		
1200	1300	vl	Ghana, Ghana BC Corp		4915do	
1200	1300		Malaysia, RTM/Trax FM		7295as	
1200	1300	DRM	New Zealand, Radio NZ Intl		7145pa	
1200	1300		Nigeria, Radio/Kaduna		4770do	6090al
1200	1300		Nigeria, Voice of/ Ext. Svc Lagos			7255af
1200	1300		Papua New Guinea, NBC		4890do	
1200	1300	vl	Papua New Guinea, Wantok R. Light			7120va
1200	1300		Singapore, Radio Singapore Intl			6080as
			6150as			
1200	1300		South Korea, KBS World Radio			9650na
1200	1300		UAE, AWR Africa	15140as		
1200	1300		UK, BBC World Service		6190af	6195as
			7320eu	9465sa	9470eu	9740as
			9660am	9860af	11750as	11760me
			15310as	15575as	17790as	17885af
			21470af			
1200	1300	mtwhf	UK, BBC World Service		17830af	
1200	1300		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
1200	1300		USA, Family Radio Worldwide FL			17555am
			17750am			
1200	1300		USA, KAIJ Dallas TX		9480va	
1200	1300		USA, KNLS Anchor Point AK		9780as	9920al
1200	1300		USA, KTBN Salt Lake City UT		7505na	
1200	1300		USA, KWHR Naalehu HI		12130as	
1200	1300		USA, Voice of America		6140va	9645va
			9760va	11860as		
1200	1300		USA, WBOH Newport NC		5920am	
1200	1300		USA, WEWN Vandiver AL		5850na	
1200	1300		USA, WHRA Greenbush ME		17650na	
1200	1300		USA, WHRI Cypress Creek SC			9495am
			9660am			
1200	1300		USA, WINB Red Lion PA		9265am	
1200	1300		USA, WRMI Miami FL		9955va	

1200	1300		USA, WTJC Newport NC	9370na		
1200	1300		USA, WWCR Nashville TN	7465na	9985na	
			13845na	15825na		
1200	1300		USA, WWRB Manchester TN	3185va		
1200	1300	DRM	Vatican City, Vatican Radio	13770am		
1200	1300		Zambia, CVC International	13590af		
1205	1220	m	Austria, Radio Austria Intl	6155va	13730va	
			17715va			
1205	1230	Sat/Sun	Austria, Radio Austria Intl	6155va	13730va	
			17715va			
1215	1230	twhf	Austria, Radio Austria Intl	17715va		
1215	1300		Egypt, Radio Cairo	17835as		
1230	1258		Vietnam, Voice of	9840as	12020as	
1230	1300		Bangladesh, Bangla Betar	7185as		
1230	1300		Sweden, Radio	13580va	15240na	15735va
1230	1300		Thailand, Radio	9835va		
1230	1300		Turkey, Voice of	13685eu	15450eu	
1235	1300	Sat/Sun	Austria, Radio Austria Intl	6155va	13730va	
			17715va			
1245	1300	Sat	Australia, HCJB Global	15425va		
1245	1300	twhf	Austria, Radio Austria Intl	6155va	13730va	
			17715va			
1245	1300	m	Austria, Radio Austria Intl	17715va		

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

1300	1329		Czech Rep, Radio Prague	13580eu	17540as	
1300	1330	twhfas	Albania, Radio Tirana	13750na		
1300	1330		Egypt, Radio Cairo	17835as		
1300	1330		Germany, Universal Life	15750as		
1300	1330	Sun	Italy, IRRS	15750as		
1300	1330		Serbia, International Radio Serbia		7240eu	
1300	1330		Turkey, Voice of	13685eu	15450eu	
1300	1400		Anguilla, University Network	11775am		
1300	1400		Armenia, CVC International	15615as		
1300	1400		Australia, CVC International	13635as		
1300	1400		Australia, Radio	5995va	6020va	9560as
			9580va	9590va		
1300	1400	DRM	Australia, Radio	5995va		
1300	1400	Sat/Sun	Canada, CBC NQ SW Service			9625na
1300	1400		Canada, CFRX Toronto ON	6070na		
1300	1400		Canada, CFVP Calgary AB	6030na		
1300	1400		Canada, CKZN St John's NF	6160na		
1300	1400		Canada, CKZU Vancouver BC			6160na
1300	1400		China, China Radio Intl	5955as		9570na
			9650as	9730as	9760pa	9765as
			9870as	11660as	11760pa	11980as
			13610eu	13755as	13790eu	15260na
1300	1400		Costa Rica, University Network			9725va
			11870va	13750va		
1300	1400		Germany, Overcomer Ministries			6110na
1300	1400	vl	Ghana, Ghana BC Corp	4915do		
1300	1400	vl/Sat	Greece, Voice of	9420eu	15630eu	
1300	1400	Sun	Latvia, Radio SWH	9290eu		
1300	1400		Malaysia, RTM/Trax FM	7295as		
1300	1400		New Zealand, Radio NZ Intl	6095pa		
1300	1400		Nigeria, Radio/Kaduna	4770do	6090al	
1300	1400		Nigeria, Voice of/ Ext. Svc Lagos			7255af
1300	1400		North Korea, Voice of Korea	4405na	9335na	
			11710na	13760eu	15245eu	
1300	1400		Papua New Guinea, NBC	4890do		
1300	1400	vl	Papua New Guinea, Wantok R. Light			7120va
1300	1400		Singapore, Radio Singapore Intl			6080as
			6150as			
1300	1400		South Korea, KBS World Radio			9570na
			9770as			
1300	1400		UK, BBC World Service	6190af	6195as	
			7320eu	9740as	9860af	11750as
			11760me	15310as	15420af	17790as
			17885af	21470af		
1300	1400	Sat/Sun	UK, BBC World Service	15575as		
1300	1400	mtwhf	UK, BBC World Service	17830af		
1300	1400		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
1300	1400		USA, Family Radio Worldwide FL			11830na
			11865na	11895na	11910na	17750na
1300	1400		USA, KAIJ Dallas TX	9480va		
1300	1400		USA, KTBN Salt Lake City UT	7505na		
1300	1400		USA, KWHR Naalehu HI	12130as		
1300	1400		USA, Voice of America	9645va	9760va	
1300	1400	w f	USA, WBCQ Monticello ME	9330am		
1300	1400		USA, WBOH Newport NC	5920am		
1300	1400		USA, WEWN Vandiver AL	5850na		
1300	1400		USA, WHRA Greenbush ME	17650na		
1300	1400		USA, WHRI Cypress Creek SC			9495am
			9840am			
1300	1400	Sat/Sun	USA, WHRI Cypress Creek SC			11785am
1300	1400		USA, WINB Red Lion PA	13570am		
1300	1400		USA, WRMI Miami FL	9955va		
1300	1400		USA, WTJC Newport NC	9370na		
1300	1400		USA, WWCR Nashville TN	7465na	9985na	
			13845na	15825na		
1300	1400		USA, WWRB Manchester TN	9385na		
1300	1400		Zambia, CVC International	13590af		
1330	1357	DRM/f-a	Czech Rep, Radio Prague	9850eu		
1330	1400	DRM	Canada, Radio Canada Intl	7240eu		
1330	1400	twhfa	Guam, AWR/KSDA	15275as		
1330	1400		India, All India Radio	9690as	11620as	
			13710as			
1330	1400		Laos, National Radio	7145as		
1330	1400		Sweden, Radio	15240na	15735va	
1330	1400		UK, BBC World Service	7465eu		
1345	1400		Guam, TWR/KTWR	9975as		

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

1400	1415	t h	Germany, Pan American BC	13645me		
1400	1415	twf	Russia, FEBA	9500eu		
1400	1430		Australia, Radio	5995va	6080va	7240as
			9590va			
1400	1430	fa	Guam, TWR/KTWR	9975as		
1400	1430	DRM	Romania, Radio Romania Intl	9600eu		
1400	1430		Thailand, Radio	9805va		
1400	1500		Anguilla, University Network	11775am		
1400	1500		Armenia, CVC International	15615as		
1400	1500		Australia, CVC International	13635as		
1400	1500		Bhutan, BBS	6035as		
1400	1500	Sat/Sun	Canada, CBC NQ SW Service			9625na
1400	1500		Canada, CFRX Toronto ON	6070na		
1400	1500		Canada, CFVP Calgary AB	6030na		
1400	1500		Canada, CKZN St John's NF	6160na		
1400	1500		Canada, CKZU Vancouver BC			6160na
1400	1500		China, China Radio Intl	5955as		9560as
			9765as	9870eu	11675as	11765as
			11775as	13610eu	13710eu	13740na
			13790eu			
1400	1500		Costa Rica, University Network			9725va
			11870va	13750va		
1400	1500	Sat	Germany, Overcomer Ministries			17810eu
1400	1500		Germany, Overcomer Ministries			6110eu
			13810va			
1400	1500	vl	Ghana, Ghana BC Corp	4915do		
1400	1500	mtw	Guam, TWR/KTWR	9975as		
1400	1500		India, All India Radio	9690as	11620as	
			13710as			
1400	1500	Sun	Italy, IRRS	6125eu		
1400	1500		Japan, Radio Japan/NHK World			7200as
			11730as	11840pa		
1400	1500		Jordan, Radio	11690na		
1400	1500		Libya, Voice of Africa		17660af	17870af
			21695af	21870af		
1400	1500		Malaysia, RTM/Trax FM	7295as		
1400	1500		Netherlands, Radio	9345as	9840as	
			11835as			
1400	1500		New Zealand, Radio NZ Intl	6095pa		
1400	1500		Nigeria, Radio/Kaduna	4770do	6090al	
1400	1500		Nigeria, Voice of/ Ext. Svc Lagos			7255af
1400	1500	vl	Papua New Guinea, Wantok R. Light			7120va
1400	1500		Russia, Voice of	6045as	7165as	9745as
			11755as	15695as	15660as	
1400	1500	DRM	Russia, Voice of	9450eu		
1400	1500		Singapore, MediaCorp Radio	6150do		
1400	1500		South Africa, Channel Africa	9620af		
1400	1500		Taiwan, Radio Taiwan Intl	15265as		
1400	1500	Sat	UK, BBC World Service	12095af		
1400	1500	mtwhf	UK, BBC World Service	17830af		
1400	1500		UK, BBC World Service	6190af	6195as	
			7320eu	9740as	9860af	11750as
			11920as	15310as	15575as	21470af
			21660af			
1400	1500	Sat/Sun	UK, Bible Voice BC	11695as		
1400	1500		Ukraine, Radio Ukraine Intl	7530eu		
1400	1500		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
1400	1500		USA, Family Radio Worldwide FL			7320va
			9865eu	11830na	11910na	12150eu
			13695am	17750am		
1400	1500		USA, KAIJ Dallas TX	9480va		
1400	1500		USA, KJES Vado NM	11715na		
1400	1500		USA, KNLS Anchor Point AK	7355as		
1400	1500		USA, KTBN Salt Lake City UT	7505na		15590na
1400	1500		USA, KWHR Naalehu HI	9930as		
1400	1500		USA, Voice of America	4930af	6080af	
			7125va	9760va	13570va	15185va
			15195va	15580af	17685af	17895va
1400	1500		USA, WBCQ Monticello ME	9330am		
1400	1500		USA, WBOH Newport NC	5920am		
1400	1500		USA, WEWN Vandiver AL	9955na		

1400	1500		USA, WHRA Greenbush ME	17650na			
1400	1500		USA, WHRI Cypress Creek SC 11785am				9840am
1400	1500		USA, WINB Red Lion PA	13570am			
1400	1500		USA, WRMI Miami FL	7385na			
1400	1500		USA, WTJC Newport NC	9370na			
1400	1500		USA, WWCR Nashville TN 13845na	9985na	15825na		12160na
1400	1500		USA, WWRB Manchester TN	9385na			
1400	1500		Zambia, CVC International	13590af			
1415	1430		Nepal, Radio 7165as	3230as	5005as		6100as
1415	1445	m	UAE, FEBA	12025eu			
1430	1445	Sun	Germany, Pan American BC	13645as			13820as
1430	1445	twf	UAE, FEBA	12025eu			
1430	1500		Australia, Radio 9475as	5995va	6080va	9590va	7240as 11660pa
1430	1500		Myanmar, Radio	5986as			
1430	1500	DRM	South Korea, KBS World Radio				9770eu

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

1500	1510	mtwhfa	Turkmenistan, Turkmen Radio				5015eu
1500	1528	Sun	Hungary, Radio Budapest	6025eu			9610eu
1500	1528		Vietnam, Voice of 13860va	9550va	9840va		12020va
1500	1530	vl	Eritrea, Bana Radio	5100do			
1500	1530		Guam, AWR/KSDA	11640as			
1500	1530		Nigeria, Radio, Natl Svc/Abuja				7275do
1500	1530		UK, BBC World Service 15420af	9695af			11860af
1500	1545		Sweden, IBRA Radio	7340as			
1500	1545		USA, Family Radio Worldwide FL				15770am
1500	1550		New Zealand, Radio NZ Intl	6095pa			
1500	1555		South Africa, Channel Africa	17770af			
1500	1557		Canada, Radio Canada Intl	11675as			17720as
1500	1559		Germany, Overcomer Ministries				17815na
1500	1559		Libya, Voice of Africa 21695af	17660af	21870af		17870af
1500	1559		South Africa, Channel Africa	9620af			
1500	1600		Anguilla, University Network	11775am			
1500	1600		Armenia, CVC International	15615as			
1500	1600		Australia, CVC International	13635as			
1500	1600		Australia, Radio 9475as	5995va	6080va	9590va	7240as
1500	1600	Sat/Sun	Canada, CBC NQ SW Service				9625na
1500	1600		Canada, CFRX Toronto ON	6070na			
1500	1600		Canada, CFVP Calgary AB	6030na			
1500	1600		Canada, CKZN St John's NF	6160na			
1500	1600		Canada, CKZU Vancouver BC				6160na
1500	1600		China, China Radio Intl 7160as 11775as 13740na	5955as	7325eu 11965eu 17630af	9785as	6100as 9870as 13685af
1500	1600		Costa Rica, University Network 11870va		13750va		9725va
1500	1600		Germany, CVC Intl/Voice Africa				15715af
1500	1600	vl	Ghana, Ghana BC Corp	4915do			
1500	1600		Japan, Radio Japan/NHK World 7200as		9505va	9525na	6190as 11730as
1500	1600		Jordan, Radio	11690na			
1500	1600		Malaysia, RTM/Trax FM	7295as			
1500	1600		Netherlands, Radio 11835as		9345as		9890as
1500	1600		Nigeria, Radio/Kaduna	4770do			6090al
1500	1600		North Korea, Voice of Korea 11710na	4405eu	13760eu	15245eu	9335na
1500	1600	vl	Papua New Guinea, Wantok R. Light				7120va
1500	1600		Russia, Voice of 9625as	4965me	9660as	4975me 11985me	7370eu 12040eu
1500	1600		Singapore, MediaCorp Radio	6150do			
1500	1600		UAE, AWR Africa	11670as			
1500	1600	Sat	UK, BBC World Service	12095af			
1500	1600	mtwhf	UK, BBC World Service	17830af			
1500	1600		UK, BBC World Service 6195as 11750as 15400af	5975as	7320af 11760as 15485af	9740as 11920as 21470af	6190af 9860af 15310as 21660af
1500	1600	vl/ mtwhf	UK, Sudan Radio Service	15575af			
1500	1600		USA, American Forces Radio 5765usb 12133usb	4319usb	6350usb 13362usb	7811usb	5446usb 10320usb
1500	1600		USA, Family Radio Worldwide FL 11830na		11910na	17750am	7320va
1500	1600		USA, KAIJ Dallas TX	9480va			
1500	1600		USA, KJES Vado NM	11715na			
1500	1600		USA, KTBN Salt Lake City UT	7505na			15590na
1500	1600		USA, KWHR Naalehu HI	9930as			
1500	1600		USA, Voice of America 6160va	4930af	7125va	9590va	6080af 12080va
			13735va	15105va	15195va	15550va	
			15580va	17895va			
1500	1600		USA, WBCQ Monticello ME	9330am			
1500	1600		USA, WBOH Newport NC	5920am			
1500	1600		USA, WEWN Vandiver AL	9955na			
1500	1600		USA, WHRA Greenbush ME	17650na			
1500	1600		USA, WHRI Cypress Creek SC 11785am				9840am
1500	1600		USA, WINB Red Lion PA	13570am			
1500	1600		USA, WRMI Miami FL	7385na			
1500	1600		USA, WTJC Newport NC	9370na			
1500	1600		USA, WWCR Nashville TN 13845na	9985na	15825na		12160na
1500	1600		USA, WWRB Manchester TN	9385na			
1500	1600		Zambia, CVC International	15715af			
1505	1520	m	Austria, Radio Austria Intl	13775ca			
1505	1530	Sat/Sun	Austria, Radio Austria Intl	13775ca			
1505	1600	DRM	Canada, Radio Canada Intl	9800na			
1505	1600		Canada, Radio Canada Intl	9515na			
1510	1545		Swaziland, TWR	4760af			
1515	1530	twhf	Austria, Radio Austria Intl	13775ca			
1530	1545		India, All India Radio	7255as			9910as
1530	1550		Vatican City, Vatican Radio 15235va	12065va			13765va
1530	1600		Germany, AWR Europe	15225as			
1530	1600		Iran, Voice of the Islamic Rep	7370as			9635as
1530	1600	mha	UK, Bible Voice BC	12035as			
1530	1600		USA, Voice of America 9590va 15550va	6040va	9760va	11520va	6160va 12080va
1535	1600	Sat/Sun	Austria, Radio Austria Intl	13775ca			
1545	1600	m	Austria, Radio Austria Intl	13775ca			
1545	1600	twhfa	Austria, Radio Austria Intl	13775ca			
1545	1600	Sun	Germany, Pan American BC	13820me			
1551	1600	DRM	New Zealand, Radio NZ Intl	6095pa			
1551	1600		New Zealand, Radio NZ Intl	7145pa			

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

1600	1605	DRM	Canada, Radio Canada Intl	9800na			
1600	1605	Sun	Croatia, Croatian Radio	6165eu			
1600	1615	mtwhfa	Croatia, Croatian Radio	6165eu			
1600	1615		Pakistan, Radio	9380va	11550af		11570va
1600	1620	mtwh	Moldova, Radio DMR Pridnestrovye				5965eu
1600	1628		Vietnam, Voice of 11630va	7280va	9550va	13860va	9730va
1600	1630	vl	Eritrea, Bana Radio	5100do			
1600	1630	h	Germany, Pan American BC	13820me			
1600	1630		Guam, AWR/KSDA	11640as			11805as
1600	1630		Iran, Voice of the Islamic Rep	7370as			7330as
1600	1630		Myanmar, Radio	9730do			
1600	1630	Sat/Sun	Swaziland, TWR	4760af			
1600	1630		USA, Voice of America	6040va			11520va
1600	1640	f	Moldova, Radio DMR Pridnestrovye				5965eu
1600	1645		USA, Family Radio Worldwide FL 11865na		17750am		11830na
1600	1657		Czech Rep, Radio Prague	5930eu			17485af
1600	1700		Anguilla, University Network	11775am			
1600	1700		Australia, CVC International	13635as			
1600	1700		Australia, Radio 9475as	5995va	6080va	9710va	7240as 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		Canada, Radio Canada Intl	9515na			
1600	1700		China, China Radio Intl 11940eu	9570af	11965eu	13760eu	11900af
1600	1700		Costa Rica, University Network 13750va				11870va
1600	1700		Egypt, Radio Cairo	11740af			
1600	1700		Ethiopia, Radio	7165af	9560af		
1600	1700		France, Radio France Intl 17605af		15160af		15605af
1600	1700		Germany, CVC Intl/Voice Africa				15715af
1600	1700		Germany, Deutsche Welle 15640as	6170as			9485as
1600	1700	Sun	Germany, Overcomer Ministries				17815na
1600	1700		Germany, Universal Life	7285va			
1600	1700	vl	Ghana, Ghana BC Corp	4915do			
1600	1700	fs	Italy, IRRS	7285eu			
1600	1700		Jordan, Radio	11690na			
1600	1700		Malaysia, RTM/Trax FM	7295as			
1600	1700	DRM	New Zealand, Radio NZ Intl	6095pa			
1600	1700		New Zealand, Radio NZ Intl	7145pa			
1600	1700		Nigeria, Radio/Kaduna	4770do			6090al
1600	1700		North Korea, Voice of Korea 11545va	3560va			9990va
1600	1700	vl	Papua New Guinea, Wantok R. Light				7120va

1600	1700		Russia, Voice of	6070as	7350as	7370eu
			9405as	9890eu	11985va	12055va
			12115va			
1600	1700	vl	Rwanda, Radio	6055do		
1600	1700		South Korea, KBS World Radio			9515eu
1600	1700		Taiwan, Radio Taiwan Intl		11550as	15515as
1600	1700		UK, BBC World Service		3255af	3915as
			5975as	6190af	6195as	7320eu
			9510as	11760as	11920as	15400af
			15485af	17840af	21470af	21660af
1600	1700	DRM	UK, BBC World Service		7465eu	
1600	1700	mtwhf	UK, BBC World Service		17830af	
1600	1700	Sat/Sun	UK, BBC World Service		9695af	11860af
			12095af			
1600	1700	vl/ mtwhf	UK, Sudan Radio Service		15575af	
1600	1700		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
1600	1700		USA, Family Radio Worldwide FL			6085am
			13630af	13695na	15650af	15705af
			18980va	21455va	21525af	
1600	1700		USA, KAIJ Dallas TX		9480va	
1600	1700		USA, KJES Vado NM		11715na	
1600	1700		USA, KTBN Salt Lake City UT		15590na	
1600	1700		USA, KWHR Naalehu HI		9930as	
1600	1700		USA, Voice of America		4930af	6080af
			12080va	13600va	15580af	17895va
1600	1700		USA, WBCQ Monticello ME		9330am	
1600	1700		USA, WBOH Newport NC		5920am	
1600	1700		USA, WEWN Vandiver AL		9450va	
1600	1700		USA, WHRA Greenbush ME		17640na	
1600	1700		USA, WHRI Cypress Creek SC			9840am
			11960am			
1600	1700		USA, WINB Red Lion PA		13570am	
1600	1700	smtwhf	USA, WMLK Bethel PA		9265va	17495va
1600	1700		USA, WRMI Miami FL		9955va	
1600	1700		USA, WTJC Newport NC		9370na	
1600	1700		USA, WWCR Nashville TN		9985na	12160na
			13845na	15825na		
1600	1700		USA, WWRB Manchester TN		9385na	
1600	1700		Zambia, CVC International		15715af	
1615	1630		Vatican City, Vatican Radio		4005va	7250va
			9645va	15595va		
1615	1645	mtwhf	Swaziland, TWR	6130af		
1630	1700		Guam, AWR/KSDA		6155as	
1630	1700		Slovakia, Radio Slovakia Int		5920eu	6055eu
1630	1700	Sun	Swaziland, TWR	6130af		
1630	1700	Sat	Swaziland, TWR	6130af		
1630	1700	Sun	UK, Bible Voice BC		9460me	
1640	1650	mtwhfa	Turkmenistan, Turkmen Radio			4930eu
1640	1700	mtwhf	UK, Bible Voice BC		9460me	
1645	1700	f	Sweden, IBRA Radio		9830as	
1645	1700		Tajikistan, Tajik Radio		7245as	
1645	1700	Sat	UK, Bible Voice BC		9460me	

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

1700	1704		Canada, Radio Canada Intl		9515na	
1700	1715		Swaziland, TWR	3200af		
1700	1715	mtwhf	UK, Bible Voice BC		9460me	
1700	1727		Czech Rep, Radio Prague		5930eu	17485af
1700	1730		Jordan, Radio	11690na		
1700	1730		USA, Voice of America		6080af	15580af
1700	1745		UK, BBC World Service		9630af	
1700	1755		South Africa, Channel Africa		15235af	
1700	1756		Romania, Radio Romania Intl		9535eu	11735eu
1700	1759		Poland, Radio Polonia		7140eu	7265eu
1700	1800		Anguilla, University Network		11775am	
1700	1800		Australia, CVC International		13635as	
1700	1800		Australia, Radio	5995va	6080va	7240as
			9475as	9580va	9710va	11660pa
			11880pa			
1700	1800	Sat	Canada, CBC NQ SW Service			9625na
1700	1800		Canada, CFRX Toronto ON		6070na	
1700	1800		Canada, CFVP Calgary AB		6030na	
1700	1800		Canada, CKZN St John's NF		6160na	
1700	1800		Canada, CKZU Vancouver BC			6160na
1700	1800		China, China Radio Intl		9570af	9695eu
			11900af	11940eu	13760eu	
1700	1800		Costa Rica, University Network			11870va
			13750va			
1700	1800		Egypt, Radio Cairo		11740af	
1700	1800		Eqt. Guinea, Radio Africa		15190af	
1700	1800		Germany, CVC Intl/Voice Africa			15715af
1700	1800		Germany, Universal Life		7285va	
1700	1800	vl	Ghana, Ghana BC Corp		4915do	
1700	1800	fs	Italy, IRRS	7285eu		
1700	1800		Japan, Radio Japan/NHK World			9535va
			11970eu	15355af		
1700	1800		Malaysia, RTM/Trax FM		7295as	
1700	1800		New Zealand, Radio NZ Intl		7145pa	
1700	1800	DRM	New Zealand, Radio NZ Intl		6095pa	
1700	1800		Nigeria, Radio/Kaduna		4770do	6090al
1700	1800		Nigeria, Voice of/ Ext. Svc Lagos			15120va
1700	1800	vl	Papua New Guinea, Wantok R. Light			7120va
1700	1800		Russia, Voice of	7350as	9405as	9850af
			11510af	11985af		
1700	1800	Sat/Sun	Russia, Voice of	9820eu	9890eu	
1700	1800	vl	Rwanda, Radio	6055do		
1700	1800		Taiwan, Radio Taiwan Intl		15690af	
1700	1800	mtwhf	UK, BBC World Service		17830af	
1700	1800	DRM	UK, BBC World Service		1296eu	7465eu
1700	1800		UK, BBC World Service		3255af	3915as
			5975as	6190af	6195eu	7320eu
			7380af	9410va	9510as	11955as
			12095af	15400af	15485af	17840af
			21470af			
1700	1800	Sat/Sun	UK, Bible Voice BC		9460me	
1700	1800	vl/ mtwhf	UK, Sudan Radio Service		11705af	
1700	1800		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
1700	1800		USA, Family Radio Worldwide FL			13630af
			13690na	15650af	17795am	18980va
			21455va			
1700	1800		USA, KAIJ Dallas TX		9480va	
1700	1800		USA, KTBN Salt Lake City UT		15590na	
1700	1800		USA, KWHR Naalehu HI		9930as	
1700	1800	Sat/Sun	USA, Voice of America		4930af	
1700	1800		USA, WBCQ Monticello ME		9330am	17495am
1700	1800		USA, WBOH Newport NC		5920am	
1700	1800		USA, WEWN Vandiver AL		9450va	15390va
1700	1800		USA, WHRA Greenbush ME		15705na	
1700	1800		USA, WHRI Cypress Creek SC			9840am
			11960am			
1700	1800		USA, WINB Red Lion PA		13570am	
1700	1800	smtwhf	USA, WMLK Bethel PA		9265va	17495va
1700	1800		USA, WRMI Miami FL		9955va	
1700	1800		USA, WTJC Newport NC		9370na	
1700	1800		USA, WWCR Nashville TN		9985na	12160na
			13845na	15825na		
1700	1800		USA, WWRB Manchester TN		9385na	12180na
			15250va			
1700	1800		Zambia, CVC International		15715af	
1705	1800	DRM	Canada, Radio Canada Intl		9800na	
1715	1800	t	UK, Bible Voice BC		9460me	
1730	1745		Israel, Kol Israel	9345eu	11590va	13675eu
1730	1745	mtwhf	UK, United Nations Radio		7130va	
1730	1800		Bulgaria, Radio	5900eu	9600eu	
1730	1800		Guam, AWR/KSDA		9980me	
1730	1800	vl	Liberia, ELWA	4760do		
1730	1800		Swaziland, TWR	9500af		
1730	1800	DRM	Sweden, Radio	5955eu		
1730	1800		Sweden, Radio	6065va		
1730	1800	Sun	UK, Bible Voice BC		9730me	
1730	1800		USA, Voice of America		6080af	15410af
			15580af			
1730	1800	mtwhf	USA, Voice of America		4930af	13755af
			15775af			
1730	1800		Vatican City, Vatican Radio		11625af	13765af
			15570af			
1745	1800		Bangladesh, Bangla Betar		7185as	
1745	1800		India, All India Radio		7410eu	9445af
			9950eu	11620eu	11935af	13605af
			15075af	15155af	17670af	

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

1800	1815	t	UK, Bible Voice BC		9460me	
1800	1815	Sat	UK, Bible Voice BC		7210me	
1800	1828		Vietnam, Voice of	5955eu	7280va	9730va
1800	1830	w	Austria, AWR Europe		15315af	
1800	1830	f	Italy, IRRS	7285eu		
1800	1830		Nigeria, Radio, Natl Svc/Abuja			7275do
1800	1830		South Africa, AWR Africa		3215af	3345af
			9610af			
1800	1830		UK, BBC World Service		5975as	11955as
1800	1830		USA, Voice of America		6080af	15580af
			17895af			
1800	1830	Sat/Sun	USA, Voice of America		4930af	
1800	1845		USA, Family Radio Worldwide FL			17535af
1800	1850		New Zealand, Radio NZ Intl		7145pa	
1800	1850	DRM	New Zealand, Radio NZ Intl		6095pa	
1800	1900		Anguilla, University Network		11775am	
1800	1900	mtwhf	Argentina, RAE		9690eu	15345eu
1800	1900		Australia, Radio	6080va	7240as	9475as
			9500as	9580va	9710va	11880pa
1800	1900		Bangladesh, Bangla Betar		7185eu	
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		Canada, Radio Canada Intl	9530af		11765af
			15235af	17810af		
1800	1900	DRM	Canada, Radio Canada Intl	9800na		
1800	1900		China, China Radio Intl	9600eu		11940eu
			13760eu			
1800	1900		Costa Rica, University Network			11870va
			13750va			
1800	1900		Eqt. Guinea, Radio Africa	15190af		
1800	1900		Germany, CVC Intl/Voice Africa			13820af
1800	1900		Germany, Universal Life	7285va		
1800	1900	vl	Ghana, Ghana BC Corp	4915do		
1800	1900		India, All India Radio	7410eu		9445af
			9950eu	11620eu	11935af	13605af
			15075af	15155af	17670af	
1800	1900	Sun	Italy, IRRS	7285eu		
1800	1900	vl	Liberia, ELWA	4760do		
1800	1900		Malaysia, RTM/Trax FM	7295as		
1800	1900		Netherlands, Radio	6020af		7125af
			11655af			
1800	1900		Nigeria, Radio/Kaduna	4770do		6090al
1800	1900		Nigeria, Voice of/ Ext. Svc Lagos			15120va
1800	1900		North Korea, Voice of Korea	4405eu		7100af
			11900af	15245eu		
1800	1900	vl	Papua New Guinea, Wantok R. Light			7120va
1800	1900		Russia, Voice of	7370eu	9745af	9850af
			9890eu	11510af	11630eu	
1800	1900	vl	Rwanda, Radio	6055do		
1800	1900		South Korea, KBS World Radio			7275eu
1800	1900		Swaziland, TWR	3200af	9500af	
1800	1900		Taiwan, Radio Taiwan Intl	3965eu		
1800	1900	DRM	UK, BBC World Service	1296eu		
1800	1900		UK, BBC World Service	3255af		5995as
			6190af	6195eu	7380af	9410va
			12095eu	15400af	17795af	21470af
1800	1900	mtwhf	UK, BBC World Service	17830af		
1800	1900	DRM	UK, BBC World Service	1296eu		
1800	1900	Sat	UK, Bible Voice BC	9730me		
1800	1900		USA, American Forces Radio	4319usb		5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
1800	1900		USA, Family Radio Worldwide FL			9845af
			13630af	13690af	13730af	13800na
			15650af	17795va	18980va	
1800	1900		USA, KAIJ Dallas TX	9480va		
1800	1900		USA, KTBN Salt Lake City UT	15590na		
1800	1900	smtwhf	USA, WBCQ Monticello ME	7415am		
1800	1900		USA, WBCQ Monticello ME	9330am		17495am
1800	1900		USA, WBOH Newport NC	5920am		
1800	1900		USA, WEWN Vandiver AL	9450va		15390va
1800	1900		USA, WHRA Greenbush ME	15705na		
1800	1900		USA, WHRI Cypress Creek SC			9840am
			11960am			
1800	1900		USA, WINB Red Lion PA	13570am		
1800	1900	smtwhf	USA, WMLK Bethel PA	9265va		17495va
1800	1900		USA, WRMI Miami FL	9955va		
1800	1900		USA, WTJC Newport NC	9370na		
1800	1900		USA, WWCR Nashville TN	9975na		12160na
			13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9385va		12180na
			15250va			
1800	1900		Yemen, Rep of Yemen Radio	9780me		
1800	1900		Zambia, CVC International	5940af		
1805	1810	Sat	Croatia, Croatian Radio	6165eu		
1805	1815	mtwhf	Croatia, Croatian Radio	6165eu		
1830	1858		Serbia, International Radio Serbia			7240eu
1830	1900		Slovakia, Radio Slovakia Int	5920eu		7345eu
1830	1900		Turkey, Voice of	9785eu		
1830	1900		UK, BBC World Service	6005af		9485as
			9630af			
1830	1900	Sun	UK, Bible Voice BC	9730me		
1830	1900	h	UK, Bible Voice BC	9460me		
1830	1900		USA, Voice of America	4930af		15410af
			15580af	17895af		
1845	1900	mtwhfa	Albania, Radio Tirana	6035eu		7465eu
1845	1900		Congo, RTV Congolaise	4765af		5985af
1845	1900	Sat	UK, Bible Voice BC	7210me		
1850	1900		New Zealand, Radio NZ Intl	11725pa		
1851	1900	DRM	New Zealand, Radio NZ Intl	11675pa		

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

1900	1903		Bahrain, Radio Bahrain	6010as		
1900	1905	DRM	Canada, Radio Canada Intl	9800na		
1900	1915		Congo, RTV Congolaise	4765af		5985af
1900	1925		Israel, Kol Israel	9400eu		11590va 15640af
1900	1928		Hungary, Radio Budapest	3975eu		6025eu
1900	1928		Vietnam, Voice of	7280va		9730va
1900	1930		Germany, Deutsche Welle	9895af		11795as
			17820af			
1900	1930		Turkey, Voice of	9785eu		
1900	1930	Sun	UK, Bible Voice BC	6015eu		
1900	1930	Sat	UK, Bible Voice BC	7260af		9460me
1900	1945		India, All India Radio	7410eu		9445af
			9950eu	11620eu	11935af	13605af
			15075af	15155af	17670af	
1900	1945		USA, Family Radio Worldwide FL			6085am
1900	1957	Sat/Sun	Netherlands, Radio	15315na		17660va
			17735af			
1900	200	DRM	UK, BBC World Service	1296eu		
1900	2000		Anguilla, University Network	11775am		
1900	2000		Australia, Radio	6080va	7240as	9500as
			9580va	9710va	11880pa	
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St John's NF	6160na		
1900	2000		Canada, CKZU Vancouver BC			6160na
1900	2000		China, China Radio Intl	7295va		9435va
			9440va	11940eu		
1900	2000		Costa Rica, University Network			11870va
			13750va			
1900	2000		Egypt, Radio Cairo	15375af		
1900	2000		Eqt Guinea, Radio Africa	15190af		
1900	2000		Germany, CVC Intl/Voice Africa			13820af
1900	2000	vl	Ghana, Ghana BC Corp	4915do		
1900	2000	vl	Liberia, ELWA	4760do		
1900	2000		Malaysia, RTM/Trax FM	7295as		
1900	2000		Netherlands, Radio	5905af		7115af
			11655af	17810af		
1900	2000		New Zealand, Radio NZ Intl	11725pa		
1900	2000	DRM	New Zealand, Radio NZ Intl	11675pa		
1900	2000		Nigeria, Radio/Kaduna	4770do		6090al
1900	2000		Nigeria, Voice of/ Ext. Svc Lagos			15120va
1900	2000		North Korea, Voice of Korea	3560va		9975va
			11535va			
1900	2000		Papua New Guinea, NBC	4890do		
1900	2000	vl	Papua New Guinea, Wantok R. Light			7120va
1900	2000		Russia, Voice of	7195eu	7310eu	9890eu
			12070eu			
1900	2000	vl	Rwanda, Radio	6055do		
1900	2000	vl	Solomon Islands, SIBC	5020do		9545al
1900	2000		Swaziland, TWR	3200af		
1900	2000	vl	Uganda, Radio	4976do	5026do	
1900	2000		UK, BBC World Service	3255af		5995as
			6005af	6190af	9410af	9455af
			9485as	9630as	15400af	17795as
1900	2000	mtwhf	UK, BBC World Service	17830af		
1900	2000	Sat/Sun	UK, Bible Voice BC	9470me		
1900	2000		Ukraine, Radio Ukraine Intl	7490eu		
1900	2000		USA, American Forces Radio	4319usb		5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
1900	2000		USA, Family Radio Worldwide FL			7240va
			9610af	13690na	13800na	17795am
			17845af	18930eu		
1900	2000		USA, KAIJ Dallas TX	9480va		
1900	2000		USA, KJES Vado NM	15385na		
1900	2000		USA, KTBN Salt Lake City UT	15590na		
1900	2000		USA, Voice of America	4930af		4940af
			6080af	7480va	9670va	15410af
			15445af	15580af	17895af	
1900	2000		USA, WBCQ Monticello ME	7415am		9330am
			17495am			
1900	2000		USA, WBOH Newport NC	5920am		
1900	2000		USA, WEWN Vandiver AL	9450va		15390va
1900	2000		USA, WHRA Greenbush ME	13710na		
1900	2000		USA, WHRI Cypress Creek SC			9840am
			17650am			
1900	2000		USA, WINB Red Lion PA	13570am		
1900	2000	smtwhf	USA, WMLK Bethel PA	9265va		17495va
1900	2000		USA, WRMI Miami FL	9955va		
1900	2000		USA, WTJC Newport NC	9370na		
1900	2000		USA, WWCR Nashville TN	9975na		12160na
			13845na	15825na		
1900	2000		USA, WWRB Manchester TN	9385va		12180na
			15250va			
1900	2000		Zambia, CVC International	5940af		
1915	2000	f	UK, Bible Voice BC	9470me		
1930	2000	Sat/Sun	Germany, Pan American BC	5850me		
1930	2000		Iran, Voice of the Islamic Rep	6205eu		6255eu
			7205af	9800af	9925af	
1930	2000		Lithuania, Radio Vilnius	6255eu		
1930	2000		Sweden, Radio	6065va		
1930	2000	Sun	UK, Bible Voice BC	7260af		
1935	1955		Italy, RAI Italia	5960eu		9845eu
1945	2000	Sat	UK, Bible Voice BC	6015va		
1945	2000	DRM	Vatican City, Vatican Radio	9800na		
1950	2000		Vatican City, Vatican Radio	4005eu		5885eu
			9645eu			

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

2000	2015	Sun	Germany, Pan American BC	5850me	
2000	2015	Sat	UK, Bible Voice BC	6015va	
2000	2020		Vatican City, Vatican Radio	4005af	5885af
			9645af		
2000	2027		Czech Rep, Radio Prague	5930eu	11600va
2000	2027		Lithuania, Radio Vilnius	6255eu	
2000	2030	twhfas	Albania, Radio Tirana	7465eu	13720va
2000	2030		Egypt, Radio Cairo	15375af	
2000	2030		Germany, AWR Europe	15235as	
2000	2030	f	Germany, Pan American BC	5850me	
2000	2030		Iran, Voice of the Islamic Rep	6205eu	6255eu
			7205af	9800af	9925af
2000	2030		Swaziland, TWR	3200af	
2000	2030		Turkey, Voice of	6195eu	
2000	2030	Sun	UK, Bible Voice BC	6015va	
2000	2030		USA, Voice of America	4930af	4940af
			6080af	15455af	15580af
2000	2030		Vatican City, Vatican Radio	7365af	9755af
			11625af		
2000	2030	DRM	Vatican City, Vatican Radio	9800na	
2000	2045		USA, Family Radio Worldwide FL		17750eu
2000	2050		New Zealand, Radio NZ Intl	11725pa	
2000	2050	DRM	New Zealand, Radio NZ Intl	11675pa	
2000	2057		Germany, Deutsche Welle	7130af	11795af
2000	2059		Canada, Radio Canada Intl	5850eu	7235eu
			15325eu		
2000	2100		Anguilla, University 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		Australia, Radio	6080va	7240as	9500as
			11650pa	11660pa	11880pa	
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	DRM	Canada, Radio Canada Intl	9800na	
2000	2100		China, China Radio Intl	5960eu	7190eu
			7265eu	7295af	9440af	9600eu
			9800eu	11640af	13630af	
2000	2100		Costa Rica, University Network		13750va
2000	2100		Eqt Guinea, Radio Africa	15190af	
2000	2100		Germany, CVC Intl/Voice Africa		13820af
2000	2100		Germany, Deutsche Welle	11865af	15205af
2000	2100	vl	Ghana, Ghana BC Corp	4915do	
2000	2100		Indonesia, Voice of	9525eu	11785eu
			15150al		
2000	2100	vl	Liberia, ELWA	4760do	
2000	2100		Malaysia, RTM/Trax FM	7295as	
2000	2100		Netherlands, Radio	5905af	7115af
			17810af		
2000	2100	Sat/Sun	Netherlands, Radio	15315na	17660va
			17735na		
2000	2100		Nigeria, Radio/Kaduna	4770do	6090al
2000	2100		Nigeria, Voice of/ Ext. Svc Lagos		15120va
2000	2100		Papua New Guinea, NBC	4890do	
2000	2100	vl	Papua New Guinea, Wantok R. Light		7120va
2000	2100		Russia, Voice of	9890eu	12070eu
2000	2100	vl	Rwanda, Radio	6055do	
2000	2100	vl	Solomon Islands, SIBC	5020do	9545al
2000	2100		South Africa, Channel Africa	3345af	
2000	2100	mtwhf	Spain, Radio Exterior Espana	9665eu	11625af
2000	2100	vl	Uganda, Radio	4976do	5026do
2000	2100		UK, BBC World Service	3255af	6005af
			6190af	9410af	9455af	9630af
			15400af			
2000	2100	mtwhf	UK, BBC World Service	17830af	
2000	2100	DRM	UK, BBC World Service	1296eu	
2000	2100		USA, American Forces Radio	4319usb	5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
2000	2100		USA, Family Radio Worldwide FL		3230af
			7430eu	17725am	17845af	18980va
2000	2100		USA, KAIJ Dallas TX	9480va	
2000	2100		USA, KJES Vado NM	15385na	
2000	2100		USA, KTBN Salt Lake City UT	15590na	
2000	2100		USA, WBCQ Monticello ME	7415am	9330am
			17495am		
2000	2100		USA, WBOH Newport NC	5920am	
2000	2100		USA, WEWN Vandiver AL	9450va	15220va
2000	2100	mtwhf	USA, WHRA Greenbush ME	7400na	
2000	2100	Sat/Sun	USA, WHRA Greenbush ME	11885na	
2000	2100		USA, WHRI Cypress Creek SC		17650am
2000	2100	Sat/Sun	USA, WHRI Cypress Creek SC		9840am
2000	2100	mtwhf	USA, WHRI Cypress Creek SC		13670am
2000	2100		USA, WINB Red Lion PA	13570am	
2000	2100	smtwhf	USA, WMLK Bethel PA	9265va	17495va
2000	2100		USA, WRMI Miami FL	9955va	
2000	2100		USA, WTJC Newport NC	9370na	
2000	2100		USA, WWCR Nashville TN	9975na	12160na
			13845na	15825na		
2000	2100		USA, WWRB Manchester TN	9385va	12180na
			15250va			
2000	2100		Zambia, CVC International	5940af	
2005	2100		Syria, Radio Damascus	9330eu	12085eu
2020	2100		Belarus, Radio	7105eu	7390eu	7420eu
			7440al			
2025	2045		Italy, RAI Italia	5970va	11875va	
2030	2045		Thailand, Radio	9680eu		
2030	2056		Romania, Radio Romania Intl	9515va	11810va
			11940va	15465va		
2030	2058		Vietnam, Voice of	7280va	9550va	9730va
			13860va			
2030	2100		Cuba, Radio Havana	9505va	11760va
2030	2100	DRM	Netherlands, Radio	9800na	
2030	2100		Turkey, Voice of	7170va	
2030	2100		USA, Voice of America	4930af	6080af
			7555as	15445af	15580af	
2030	2100	Sat/Sun	USA, Voice of America	4940af	
2045	2100		India, All India Radio	7410eu	9445eu
			9910pa	11620va	11715pa	
2045	2100	DRM	Vatican City, Vatican Radio	9800am	
2051	2100	DRM	New Zealand, Radio NZ Intl	13730pa	
2051	2100		New Zealand, Radio NZ Intl	15720pa	

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

2100	2200	DRM	Canada, Radio Canada Intl	9800na	
2100	2128		Hungary, Radio Budapest	6025eu	9525af
2100	2130		Australia, ABC NT Katherine	2485do	
2100	2130		Australia, ABC NT Tennant Creek		2325do
2100	2130		Austria, AWR Europe	11955af	
2100	2130	Sat	Canada, CBC NQ SW Service		9625na
2100	2130		China, China Radio Intl	5960eu	7190eu
			7285eu	9490eu	9600eu	11640af
			13630af			
2100	2130		Cuba, Radio Havana	9505va	11760va
2100	2130		Nigeria, Radio, Natl Svc/Abuja		7275do
2100	2130		South Korea, KBS World Radio		3955eu
2100	2130		Turkey, Voice of	7170va	
2100	2130		USA, Voice of America	6080af	7555as
			15580af			
2100	2130	DRM	Vatican City, Vatican Radio	9800na	
2100	2145		USA, Family Radio Worldwide FL		13800na
			17795am	18980va		
2100	2157		Germany, Deutsche Welle	15205af	
2100	2159	smtwhf	Germany, Overcomer Ministries		7310eu
2100	2159	Sat/Sun	Spain, Radio Exterior Espana	9840eu	11625af
2100	2200		Anguilla, University Network	11775am	
2100	2200		Australia, ABC NT Alice Springs		2310do
			4835do			
2100	2200		Australia, Radio	9500as	9660as	11650pa
			11695pa	12080as	13630as	15515as
2100	2200		Bulgaria, Radio	5900eu	9700eu	
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, University Network		13750va
2100	2200		Eqt Guinea, Radio Africa	15190af	
2100	2200		Germany, Deutsche Welle	9735af	11865af
2100	2200	vl	Ghana, Ghana BC Corp	4915do	
2100	2200		Guyana, Voice of	3291do	5950do
2100	2200		India, All India Radio	7410eu	9445eu
			9910pa	11620va	11715pa	
2100	2200		Japan, Radio Japan/NHK World		6035va
			6055eu	6180eu	11855af	17825na
			17870pa			
2100	2200	vl	Liberia, ELWA	4760do		
2100	2200		Malaysia, RTM/Trax FM	7295as		
2100	2200		New Zealand, Radio NZ Intl	15720pa		
2100	2200	DRM	New Zealand, Radio NZ Intl	13730pa		
2100	2200		Nigeria, Radio/Kaduna	4770do	6090al	
2100	2200		North Korea, Voice of Korea	4405eu	13760eu	
			15245eu			
2100	2200		Papua New Guinea, NBC	4890do		
2100	2200	vl	Papua New Guinea, Wantok R. Light		7120va	
2100	2200		South Africa, Channel Africa	3345af		
2100	2200		Syria, Radio Damascus	9330eu	12085eu	
2100	2200		UK, BBC World Service	3255af	3915as	
			6005af	6190af	6195as	11675am
			11945as	12095af	13640am	15400af
2100	2200		Ukraine, Radio Ukraine Intl	7510eu		
2100	2200		USA, American Forces Radio	4319usb	5446usb	

			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
2100	2200		USA, Family Radio Worldwide FL			3230af
			7430eu	9610af	11565eu	17795am
			17845af			
2100	2200		USA, KAIJ Dallas TX		9480va	
2100	2200		USA, KTBN Salt Lake City UT		15590na	
2100	2200		USA, WBCQ Monticello ME		7415am	9330am
			17495am			
2100	2200		USA, WBOH Newport NC		5920am	
2100	2200		USA, WEWN Vandiver AL		9450va	15220va
2100	2200	mtwhf	USA, WHRA Greenbush ME		7400na	
2100	2200	Sat/Sun	USA, WHRA Greenbush ME		11885na	
2100	2200	mtwhf	USA, WHRI Cypress Creek SC			13670am
2100	2200	Sat/Sun	USA, WHRI Cypress Creek SC			9840am
2100	2200		USA, WINB Red Lion PA		13570am	
2100	2200	mtwhfa	USA, WRMI Miami FL		9955va	
2100	2200	Sun	USA, WRMI Miami FL		7385na	
2100	2200		USA, WTJC Newport NC		9370na	
2100	2200		USA, WWCR Nashville TN		9975na	12160na
			13845na	15825na		
2100	2200		USA, WWRB Manchester TN		9385va	12180na
			15250va			
2115	2200		Egypt, Radio Cairo		9990eu	
2130	2157		Czech Rep, Radio Prague		9410af	11600na
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, AWR/KSDA		11850as	
2130	2200		Sweden, Radio	6065va	7420va	

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

2200	2210		Syria, Radio Damascus		9330eu	12085eu
2200	2230	DRM	Germany, Deutsche Welle		9800na	
2200	2230		India, All India Radio		7410eu	9445eu
			9910pa	11620va	11715pa	
2200	2230	vl	Liberia, ELWA	4760do		
2200	2230		Papua New Guinea, NBC		4890do	
2200	2245		Egypt, Radio Cairo		9990eu	
2200	2245		USA, Family Radio Worldwide FL			15770af
2200	2256		Romania, Radio Romania Intl		7185va	9675va
			9790va	11940va		
2200	2300		Anguilla, University 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	9660as	13620pa	13630va
			15230pa	15240va	15515va	17785va
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		China, China Radio Intl		7175eu	9590as
2200	2300		Costa Rica, University Network			13750va
2200	2300		Eqt Guinea, Radio Africa		15190af	
2200	2300	vl	Ghana, Ghana BC Corp		4915do	
2200	2300		Guyana, Voice of 3291do			
2200	2300		Malaysia, RTM/Trax FM		7295as	
2200	2300	DRM	New Zealand, Radio NZ Intl		13730pa	
2200	2300		New Zealand, Radio NZ Intl		15720pa	
2200	2300		Nigeria, Radio/Kaduna		4770do	6090al
2200	2300	vl	Papua New Guinea, Wantok R. Light			7120va
2200	2300	vl	Solomon Islands, SIBC		5020do	9545al
2200	2300		Taiwan, Radio Taiwan Intl		15600eu	
2200	2300		Turkey, Voice of	6195va		
2200	2300		UK, BBC World Service		5955as	5965as
			5975am	6195as	7105as	9740as
			12095af	13640am	15400af	
2200	2300		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
2200	2300		USA, Family Radio Worldwide FL			9620af
			11740na			
2200	2300		USA, KAIJ Dallas TX		9480va	
2200	2300		USA, KTBN Salt Lake City UT		15590na	
2200	2300		USA, Voice of America		7215va	7555as
			9415va	11725va	15185va	
2200	2300	mtwhf	USA, WBCQ Monticello ME		5110am	17495am
2200	2300		USA, WBCQ Monticello ME		7415am	9330na
2200	2300		USA, WBOH Newport NC		5920am	
2200	2300		USA, WEWN Vandiver AL		9975va	15745va
2200	2300		USA, WHRA Greenbush ME		11885na	
2200	2300	mtwhfa	USA, WHRI Cypress Creek SC			9515am
2200	2300	Sun	USA, WHRI Cypress Creek SC			7490am
2200	2300		USA, WINB Red Lion PA		13570am	
2200	2300		USA, WRMI Miami FL		9955va	
2200	2300		USA, WTJC Newport NC		9370na	
2200	2300		USA, WWCR Nashville TN		5070na	7465na
			9985na	13845na		
2200	2300		USA, WWRB Manchester TN		6890va	9385va
			12180na	15250va		
2200	2300	Sat/Sun	USA, WWRB Manchester TN		3185na	15250va
			15250va			
2205	2230		Italy, RAI Italia	11895va		
2215	2230		Croatia, Croatian Radio		6165eu	9925eu
2230	2257		Czech Rep, Radio Prague		7345na	9415na
2230	2300		Guam, AWR/KSDA		15320as	
2230	2300		Papua New Guinea, NBC		9675do	
2230	2300		USA, Voice of America		7260va	9570va
			11705as	13725va	15145va	
2245	2300		India, All India Radio		9705as	9950as
			11620as	11645as	13605as	

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

2300	0000		Anguilla, University Network		6090am	
2300	0000		Australia, ABC NT Alice Springs			2310do
			4835do			
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		China, China Radio Intl		5915as	5990va
			6145na	7180as	11685as	13680na
2300	0000		Costa Rica, University Network			13750va
2300	0000		Cuba, Radio Havana		9550va	
2300	0000		Egypt, Radio Cairo		9460na	
2300	0000	vl	Ghana, Ghana BC Corp		4915do	
2300	0000		Guyana, Voice of 3291do			
2300	0000		India, All India Radio		9705as	9950as
			11620as	11645as	13605as	
2300	0000		Malaysia, RTM/Trax FM		7295as	
2300	0000		Papua New Guinea, NBC		9675do	
2300	0000	vl	Papua New Guinea, Wantok R. Light			7120va
2300	0000		Singapore, MediaCorp Radio		6150do	
2300	0000	vl	Solomon Islands, SIBC		5020do	9545al
2300	0000		UK, BBC World Service		3915as	5965as
			6195as	9740as	11945as	11955as
			12010as			
2300	0000		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7811usb	10320usb
			12133usb	13362usb		
2300	0000		USA, Family Radio Worldwide FL			15255am
			17750am			
2300	0000		USA, KAIJ Dallas TX		9480va	
2300	0000		USA, KTBN Salt Lake City UT		15590na	
2300	0000		USA, Voice of America		7260va	7555as
			9570va	13755va	15145va	
2300	0000		USA, WBCQ Monticello ME		5110na	7415am
			9330am	17495am		
2300	0000		USA, WBOH Newport NC		5920am	
2300	0000		USA, WEWN Vandiver AL		9975va	15745va
2300	0000		USA, WHRA Greenbush ME		7520na	
2300	0000	mtwhfa	USA, WHRI Cypress Creek SC			9515am
2300	0000		USA, WINB Red Lion PA		9265am	
2300	0000		USA, WRMI Miami FL		9955va	
2300	0000		USA, WTJC Newport NC		9370na	
2300	0000		USA, WWCR Nashville TN		5070na	7465na
			9985na	13845na		
2300	0000		USA, WWRB Manchester TN		3185na	5050na
			6890na	15250va		
2300	2300		Bulgaria, Radio	9700na	11700na	
2300	2315		Nigeria, Radio/Kaduna		4770do	6090al
2300	2330		Australia, Radio	9660as	12080as	13630pa
			13690pa	15230pa	15240va	17785va
			17795va			
2300	2345		USA, Family Radio Worldwide FL			11740na
2300	2345	DRM	Vatican City, Vatican Radio		7370am	
2300	2358	DRM	New Zealand, Radio NZ Intl		13730pa	
2300	2358		New Zealand, Radio NZ Intl		15720pa	
2305	0000		Canada, Radio Canada Intl		6100na	
2305	0000		Greece, Voice of	7475eu	9420eu	15650eu
2330	0000		Australia, Radio	9660as	12080as	13620pa
			13690pa	15230pa	15415va	17750va
			17785va	17795va		
2330	0000		Burma, Dem Voice of Burma		5955eu	
2330	0000		Lithuania, Radio Vilnius		9875na	
2330	0000		UK, BBC World Service		9580as	
2330	0000		USA, Voice of America		15340as	
2330	2358		Vietnam, Voice of	9840as	12020as	
2330	2359	DRM	Sweden, Radio	9800na		
2359	0000		New Zealand, Radio NZ Intl		13730pa	
2359	0000	DRM	New Zealand, Radio NZ Intl		15720pa	

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Monitoring the U.S. Army

As we move deeper into what is predicted to be an active hurricane season, the chances of a powerful storm causing major damage somewhere along the US coastline is fairly significant, if the government forecasters are to be believed. Anyone who monitored the Hurricane Katrina disaster in August and September 2005 knows that the National Guard and other military units, including U.S. Army aviation assets, played a major role in the rescue and recovery effort.

Several years ago, in an early edition of the *Grove Shortwave Directory on CD-ROM*, I published for the first time a comprehensive list of U.S. Army HF communications networks. This was at the dawn of the ALE (Automatic Link Establishment) era, and the mode was just starting to get a foothold in the radio monitoring hobby. Watching these evolving ALE transmissions was invaluable in discovering and sorting out the wide variety of new radio networks being put up in the HF spectrum.

Since that initial list was published, more information has been gleaned from monitoring the HF bands on these government/military networks. In this month's *Milcom* I will present a brief overview of some of these nets. If you want to follow the action during the next major crisis, keep a radio watch on these frequencies, all recently monitored here in Brasstown or recently reported via internet radio newsgroups.

❖ US Army Command Emergency Operations Net

This network appears to include stations associated with the top of the Army Chain of Command structure. The frequencies that are known to be a part of this network include (ALE/USB): 3275.0 3285.0 5066.5 5088.5 6698.5 6767.5 6985.0 7448.5 7510.0 8047.0 9119.5 kHz.

Voice calls used in the net are of the tri-graph variety (i.e. A2Z, H0E, etc) and are not static. ALE Addresses that have been observed on this network include:

USAAAD	US Army	Unknown
USACE1010	US Army Corp of Engineers (USACE) Headquarters	Washington, DC
USACE1220	US Army Corp of Engineers (USACE)	Fort McPherson, GA
USADA1010	Department of the Army - Pentagon	Washington, DC
USAF1250	US Army Command Emergency Net: DA COOP Net	Unknown
USAFC1220	US Army Forces Command (FORSCOM)	Fort McPherson, GA
USAFC1250	US Army Forces Command (FORSCOM)	Fort McPherson, GA
USAIS1002	US Army Intelligence and Security Command	Unknown
USAIS1010	US Army Intelligence and Security Command	Unknown
USAIS1012	US Army Intelligence and Security Command	Fort Belvoir, VA
USAMC2120	US Army Material Command	Alexandria, VA
USAMC2123	US Army Material Command	Unknown
USAMC4123	US Army Material Command	Unknown
USAMC4124	US Army Material Command	Unknown
USAMD1010	US Army Space & Missile Defense Command	Arlington, VA
USAMT102	US TRANSCOM	Bayonne, NJ
USAMT1212	US TRANSCOM	Southport, NC
USAMT1213	US TRANSCOM	Compton, CA
USAMT1611	US TRANSCOM	Oakland, CA
USAMT1613	US TRANSCOM	Seattle, WA
USANG2409	National Guard Bureau Headquarters	Arlington, VA
USANG2410	National Guard (DE) STARC Headquarters	Wilmington, DE
USANG2412	National Guard (VA) STARC Headquarters	Fort Pickett, VA
USANG3411	National Guard (MS) STARC Headquarters	Jackson, MS
USANG3414	National Guard (KY) STARC Headquarters	Frankfort, KY
USANG3416	National Guard (NC) STARC Headquarters	Raleigh, NC
USANG6415	National Guard (MT) STARC Headquarters	Helena, MT
USAPC1001	US Army Pacific Command	Unknown

❖ National Guard Nationwide Network

The U.S. Army is a major player in the HF radio spectrum. One net that stands out is a National Guard nationwide network. This network supports various state level stations such as their headquarters and WMD-CST teams.

Frequencies to monitor include (ALE/USB): 4924.5 5847.0 8047.0 10816.5 12087.0 13722.0 14653.0 16338.5 17485.5 20906.0 kHz

ALE addresses commonly viewed on this nationwide network include:

A040LN	National Guard (AL) Montgomery, AL
A060RN	National Guard (AR) Camp Joseph T. Robinson, Little Rock, AR
A090ZN	National Guard (AZ) Phoenix, AZ
A100KN	National Guard (AK) Fort Richardson (Anchorage), AK
C010TN	National Guard (CT) Hartford, CT
C080ON	National Guard (CO) Centennial, CO
C090AN	National Guard (CA) Sacramento, CA
D030CN	National Guard (DC) Washington, DC
D030EN	National Guard (DE) Wilmington, DE
F040LN	National Guard (FL) St. Augustine, FL
G040AN	National Guard (GA) Atlanta (Ellenwood), GA
G090UN	National Guard (GU) Tamuning, Guam
H090IN	National Guard (HI) Honolulu, HI
HQ701N	National Guard Bureau HQ Crystal City, Arlington, VA
HQ703N	National Guard Readiness Center Arlington, VA
HQ704N	Unknown
I050LN	National Guard (IL) Camp Lincoln, Springfield, IL
I050NN	National Guard (IN) Indianapolis, IN
I070AN	National Guard (IA) Camp Dodge, Johnston
I100DN	National Guard (ID) Boise, ID
K040YN	National Guard (KY) Lexington, KY
K070SN	National Guard (KS) Topeka (Forbes Field), KS
L060AN	National Guard (LA) Jackson Barricks, New Orleans, LA
M010AN	National Guard (MA) Milford, MA
M010EN	National Guard (ME) Camp Keyes, Augusta, ME
M030DN	National Guard (MD) Baltimore, MD
M040SN	National Guard (MS) Jackson, MS
M050IN	National Guard (MI) Lansing, MI
M050NN	National Guard (MN) St. Paul, MN
M070ON	National Guard (MO) Jefferson City, MO
M080TN	National Guard (MT) Helena, MT
N010HN	National Guard (NH) Concord, NH
N020JN	National Guard (NJ) Fort Dix, NJ
N020YN	National Guard (NY) Latham, NY
N040CN	National Guard (NC) Raleigh, NC
N060MN	National Guard (NM) Santa Fe, NM
N070EN	National Guard (NE) Lincoln, NE
N080DN	National Guard (ND) Bismark, ND
N090VN	National Guard (NV) Carson City, NV
O050HN	National Guard (OH) Columbus, OH
O060KN	National Guard (OK) Oklahoma City, OK
O100RN	National Guard (OR) Salem, OR
P020RN	National Guard (PR) San Juan, PR
P030AN	National Guard (PA) Fort Indiantown Gap, Annville, PA
R010IN	National Guard (RI) Cranston, RI
S040CN	National Guard (SC) Columbia, SC
S080DN	National Guard (SD) Rapid City, SD
T040NN	National Guard (TN) Nashville, TN
T041NN	National Guard (TN) Unknown, TN
T060XN	National Guard (TX) Austin, TX
U080TN	National Guard (UT) Draper, UT
V010TN	National Guard (VT) Camp Johnson. Colchester, VT
V020IN	National Guard (VI) Estate Bethlehem, St. Croix, VI
V021IN	National Guard (VI) Unknown, VI

V030AN	National Guard (VA) Fort Pickett, VA
W030VN	National Guard (WV) Charleston, WV
W050IN	National Guard (WI) Madison, WI
W080YN	National Guard (WY) Cheyenne, WY
W100AN	National Guard (WA) Tacoma, WA

❖ National Guard State Networks

There are also a number of National Guard state networks. Some of these involve not only ground units, but aviation networks as well. I will cover the aviation networks in a future *MT Milcom* column. The state frequencies (where known) are covered below (frequencies below in kHz):

Alabama	4724.5 4924.5 8047.0 8622.0 9141.5 10233.5 12087.0 13722.0 14653.0 17458.5 20906.0
Alaska	8047.0 13722.0 14653.0 17458.5 20906.0
Arizona	8047.0 13568.0 13722.0 14653.0 17458.5 20906.0
Arkansas	4867.0 4924.5 5847.0 5878.5 7648.5 8047.0 9121.0 10816.5 12057.0 12087.0 13568.0 13722.0 14653.0 17458.5 20906.0
California	4924.5 8047.0 10816.5 13722.0 14653.0 17458.5 20906.0
Colorado	5205.0 5217.0 7648.5 8047.0 8093.0 13568.0 13722.0 14653.0 17458.5 20906.0
Connecticut	4924.5 8047.0 13722.0 14653.0 20906.0
D.C.	4536.0 4780.0 5817.0 6766.0 8047.0 13722.0 14653.0 17458.5
Delaware	5817.0 6766.0 8047.0 13722.0 14653.0 20906.0
Florida	4745.0 4924.5 5205.0 5847.0 6766.0 8037.0 8047.0 8093.0 9141.0 10233.5 12057.0 12087.0 13722.0 14653.0 16338.5 20906.0
Georgia	4250.0 8037.0 8047.0 13722.0 14653.0 20906.0
Guam	4924.5 8047.0 13722.0 14653.0 20906.0
Hawaii	8047.0 9357.0 13722.0 14653.0 20906.0
Idaho	4860.0 8047.0 13722.0 14653.0 20906.0
Illinois	4610.0 5848.5 8047.0 8093.0 9121.0 10691.5 10740.0 12058.5 13722.0 14653.0 20906.0
Indiana	4607.0 4780.0 4924.5 5299.5 7648.5 8047.0 8093.0 9017.0 9121.0 12087.0 13722.0 14653.0 20906.0
Iowa	4296.0 4776.0 8047.0 9143.5 12087.0 13722.0 14653.0 20906.0
Kansas	4924.5 8047.0 9143.0 9143.5 10816.5 12087.0 13722.0 14653.0 20906.0
Kentucky	2237.0 2317.0 4517.0 4745.0 4827.0 4924.5 5061.0 5232.0 5777.0 5847.0 5848.5 6010.0 6766.0 8037.0 8047.0 8056.0 9141.0 9141.5 10233.5 12087.0 13722.0 14653.0 20906.0
Louisiana	4035.0 4924.5 5877.0 8047.0 12087.0 13722.0 14653.0 20906.0
Maine	4517.0 7648.5 8047.0 10670.5 12087.0 13722.0 14653.0 20906.0
Maryland	4536.0 4837.0 4867.0 4924.5 5817.0 6760.0 8047.0 13722.0 14653.0 20906.0
Massachusetts	4517.0 4577.0 4924.5 7648.5 8047.0 13722.0 14653.0 20906.0
Michigan	4445.0 4924.5 5202.0 6910.0 8047.0 8093.0 9120.0 9121.0 12087.0 13722.0 14653.0 17458.5 20906.0
Minnesota	4924.5 5299.5 8047.0 8093.0 9017.0 9121.0 13722.0 14653.0 20906.0
Mississippi	4960.0 5847.0 8047.0 9121.0 9141.5 10796.0 10816.5 12087.0 13722.0 14653.0 20906.0
Missouri	4001.5 4776.0 4924.5 4950.0 5282.0 8047.0 8168.5 9143.0 10816.5 13722.0 14653.0 20906.0
Montana	5045.0 5217.0 6318.5 7648.5 8047.0 8093.0 9141.5 13722.0 14653.0 20906.0
Nebraska	4607.0 4776.0 5282.0 8047.0 9143.5 12087.0 13568.0 13722.0 14653.0 20906.0
Nevada	8047.0 13722.0 14653.0 20906.0
New Hampshire	4490.0 4577.0 4607.0 4608.5 5232.0 7648.5 8047.0 9106.0 13722.0 14653.0 20906.0
New Jersey	2312.0 3175.0 4520.0 4680.0 5432.5 8047.0 8093.0 12087.0 13722.0 14395.0 14653.0 20906.0
New Mexico	4555.0 7648.5 8047.0 9121.0 13722.0 14653.0 20906.0
New York	4562.0 4924.5 5429.0 5432.5 5434.0 5817.0 5847.0 8037.0 8047.0 8093.0 9295.0 10690.0 10816.5 12087.0 13568.0 13722.0 14653.0 16338.5 20906.0 25350.0
North Carolina	3032.0 4745.0 4924.5 5203.5 5777.0 8037.0 8038.5 8047.0 9121.0 9141.0 9141.5 10796.0 10816.5 13722.0 14653.0 16338.5 20906.0
North Dakota	8047.0 8056.0 8093.0 13722.0 14653.0 17458.5 17485.5 20906.0
Ohio	4882.0 4926.0 4927.5 5209.5 5299.5 7361.0 8037.0 8057.0 8058.5 8093.0 9145.0 13722.0 14653.0 20906.0
Oklahoma	4927.5 4972.5 8047.0 9121.0 13722.0 14653.0 20906.0
Oregon	7648.5 8047.0 8180.0 13722.0 14653.0 20906.0
Pennsylvania	4536.0 4840.0 4924.5 5817.0 6089.0 6766.0 8047.0 10816.5 12087.0 13722.0 14653.0 20906.0
Puerto Rico	5062.0 8047.0 8093.0 9141.5 13722.0 14653.0 20906.0
Rhode Island	4517.0 5878.5 6910.5 7648.5 8047.0 13722.0 14653.0 20906.0
South Carolina	4240.0 6910.0 8047.0 8093.0 9141.0 9141.5 10233.5 13722.0 14653.0 20906.0
South Dakota	4520.0 8047.0 9141.5 12087.0 13722.0 14653.0 20906.0
Tennessee	3032.0 3255.5 4244.5 5063.5 5088.5 5126.0 5203.5 5233.5 5283.5 5301.0 5430.5 5431.0 5778.5 5818.5 5848.5 5851.5 5878.5 6766.0 8047.0 8056.0 8058.5 8093.0 9121.0 9141.5 9145.0 10816.5 12057.0 12087.0 13568.0 13722.0 14653.0 20906.0
Texas	4441.5 5821.5 6907.0 7648.5 8047.0 8158.5 8161.5 9121.0 10690.0 12087.0 13722.0 14653.0 20906.0
Utah	4924.5 8047.0 12087.0 13722.0 14350.5 14653.0 17458.5 20906.0
Vermont	6910.0 8047.0 8057.5 13722.0 14653.0 20906.0
Virginia	4437.0 4536.0 4562.0 4777.0 4837.0 4924.5 5125.0 5215.5 5817.0 5877.0 6766.0 7469.0 8037.0 8047.0 9043.0 9143.5 13722.0 14653.0 16338.5 17458.5 20906.0
Virgin Islands	8047.0 10816.5 12087.0 13722.0 14653.0 20906.0
Washington	4520.0 4580.0 6906.5 8047.0 13722.0 14653.0 20906.0
West Virginia	4536.0 4837.0 5817.0 6766.0 8047.0 13722.0 14653.0 20906.0
Wisconsin	4607.0 5087.0 8047.0 8056.0 8093.0 13722.0 14653.0 20906.0
Wyoming	5108.5 8047.0 8056.0 8093.0 13722.0 14653.0 20906.0

❖ SHARES

Another set of U.S. Government network frequencies to watch closely during emergencies and one that has a lot of government, military, civilian, and military affiliated stations is the SHARES (Shared Resources) HF network. Below is my latest list of known SHARES frequencies.

4490.0	SHARES SCN ALE Net <SCN Channel 03>
4517.0	Reported SHARES net
4573.5	SHARES SCN voice check-ins <Alternate SCN Channel 1>
5211.0	FEMA Primary /State EOCs/ARC/US&R
5236.0	SHARES SCN Voice Net <SCN Channel 01> [Also Region I/II/III (Northeast) Net]
5711.0	SHARES SCN ALE Net <SCN Channel 04>
6765.0	SHARES Region V/VII/VIII (North) Net
6800.0	SHARES SCN BBS Net <SCN Channel 09>
6910.0	SHARES Region VI (South) Net
6996.0	Reported SHARES net
7320.0	SHARES Region IX (Southwest) Net
7632.0	SHARES Region IV (Southeast) Net
9064.0	SHARES Region X (Northwest) Net
9106.0	SHARES SCN ALE Net <SCN Channel 05>
10767.6	SHARES Data Frequency
11217.0	SHARES SCN ALE Net <SCN Channel 06>
13242.0	SHARES SCN BBS Net <SCN Channel 10>
14396.5	SHARES SCN Voice Net <SCN Channel 02> [Also National Central, National Gulf Coast, and National West Nets]
14898.5	SHARES AMTOR FEC broadcast frequency/SHARES SCN voice check-ins <Alternate SCN Channel 2>
15094.0	SHARES SCN ALE Net <SCN Channel 07>
17487.0	SHARES SCN ALE/STI Net <SCN Channel 08>

And, as the hurricane season progresses, visit **www.ofcm.gov/nhop/07/pdf/entire-nhop07.pdf** for more information. Also, be sure to check the *MT Blogs* and our Readers Only section of the *MT* website for late breaking information and frequencies. That does it for this month: Until next time, 73 and good hunting.

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On the Campaign Trail with the Secret Service

Even though it is over a year until the next presidential election, political campaign activity is already underway. Primary elections are being pushed ahead and political candidates are out pounding the pavement much earlier than in past presidential election seasons. And with increased travel by these candidates, there will be additional requirements for security protection by the US Secret Service.

Once part of the US Treasury Department, the Secret Service is now under the umbrella of the Department of Homeland Security. The Secret Service also does more than just protect political figures. They are often involved in protecting foreign leaders and dignitaries, as well as investigating federal crimes, including counterfeiting and computer crimes. Local Secret Service field offices are often much busier with criminal investigations than protective details. You can find more about the Secret Service at **www.secretservice.gov/**.

Secret Service protection also covers former presidents, vice presidents and their families. The Secret Service is facing an unprecedented situation after President Bush (43) leaves office, with more former US leaders needing protective details than at any other time. The Secret Service is expecting to spend over $85 million next year for protecting all the 2008 presidential candidates. This is in addition to the $22 million spent so far in Secret Service protection for the current and former presidents and their families.

The Secret Service did not always offer protective details to political candidates, but started doing so after the assassination of presidential candidate Bobby Kennedy in 1968. The decision as to which candidates receive Secret Service protection and when is determined by the Secretary of Homeland Security, Michael Chertoff, along with input from congressional leaders. Protection usually starts during the first two months of the election year, but that is not carved in stone. Protective details may be assigned earlier if a threat to a candidate is perceived.

Some presidential candidates will have Secret Service protective details long before the first primary elections. Senator Hillary Clinton has always had Secret Service protection as a former First Lady. And Senator Barack Obama was suddenly given Secret Service protection in the first week of May 2007, with no explanation given by the DHS.

With this increase in Secret Service activity coming soon, let's cover some basics of monitoring this elusive agency. The first hurdle is the fact that they know we are listening: Much of the agency's radio communications will be encrypted. That's not to say that you'll never hear anything "in the clear" on a Secret Service channel. Often you will hear some clear communications prior to and after the departure of the person being protected.

Many hobbyists often confuse or combine the Secret Service with their military associates in the White House Communications Agency, or WHCA. The WHCA is staffed with active-duty military personnel whose primary responsibility is to keep the President and Vice President in communications with the world at all times. There will probably be little WHCA activity at political events that do not involve the president or vice-president. However, there is some crossover between the Secret Service and the WHCA as far as radio channels. WHCA radios have some Secret Service channels in them and Secret Service radios have some WHCA channels. It's all about being able to talk to each other.

Over many years, the Secret Service protective details have stuck to a pretty predictable radio frequency channel plan. I was able to first start monitoring Secret Service radio transmissions back in the early 1980s, before cell phones and widespread use of encryption. However, there have been some recent changes within the Secret Service communications sphere, most notably the reassignment of the Secret Service Uniformed Division from UHF to VHF frequencies. In the Washington, DC area, the uniformed division of the Secret Service is responsible for security patrols for all the foreign embassies and missions in the Capitol Region.

Another change is the move from analog to P-25 digital radios. There was a bulk purchase of new P-25 radios by the Secret Service a few years ago. However, I have encountered some analog with encryption on some WHCA frequencies within the last year, so they may have not switched completely to P-25 digital yet. I have also seen information that indicated most P-25 Secret Service radios still have their channels available in the analog mode, too.

Both Secret Service and White House Communications Agency frequencies are often noted with channel names from the standard phonetic alphabet used by the military and other radio operators. The former US Secret Service Uniformed Division UHF channels are denoted by colors.

There are also a number of channels that fall into a pool of frequencies referred to as "X-RAY." These frequencies are often used when the normal channel lineup is full or already in use. Large events such as political conventions or debates (where multiple candidates may be attending) sometimes require additional frequencies. Some Secret Service Field Offices use the "X-RAY" channel for their own local operations and that frequency varies from city to city. These frequencies were allocated to the Treasury Department, but are still in use by the Secret Service.

Besides conventional VHF and UHF frequencies, the Secret Service has some trunked systems available for its use. At the James J. Rowley Secret Service Training Center in Laurel, Maryland, there is reported to be a VHF trunking system in use. I have also confirmed that there are portable UHF trunked systems that can be used by the Secret Service or White House Communications Agency at some Executive Branch events. At least one of these systems is housed in an un-marked motor home with a pneumatic mast that lifts the antennas up to working height. Reports seemed to indicate that a UHF trunked system might have once been in use on Air Force One when parked on the ground, but there are no current reports of that still being the case.

As mentioned earlier, the Uniformed Division operations have all moved to VHF channels, so the current use of their former UHF channels is unknown. Please let us know if you hear anything on them. Also, the WHCA 407.85 / 415.7 "ECHO / FOXTROT" frequencies are no longer in use. The ECHO / FOXTROT system was a nationwide UHF communications system used by

Air Force One and other Executive flights. The system was dismantled about 10 years ago.

Here is my best estimate of current Secret Service (USSS) and White House Communications Agency (WHCA) frequencies on which you might catch some activity if a political leader or candidate drops in for a visit near you: This is by no means a complete list of possible Secret Service frequencies, but it will certainly get you started

US SECRET SERVICE VHF ALLOCATIONS

162.0750	USSS Uniformed Division
162.2875	Laurel, MD Trunked System
162.3125	USSS Uniformed Division
163.3125	USSS Uniformed Division
163.4500	Laurel, MD Trunked System
164.1000	X-RAY, New York City Field Office 1
164.1750	USSS Uniformed Division
164.4000	PAPA
164.4375	USSS Uniformed Division
164.6500	TANGO
164.7500	X-RAY
164.8000	X-RAY
164.8875	OSCAR
164.9875	
165.2125	MIKE
165.2625	X-RAY
165.3375	X-RAY
165.3625	
165.3750	CHARLIE
165.3875	
165.4125	X-RAY
165.4875	
165.5125	X-RAY
165.5250	Laurel, MD Trunked System
165.6500	X-RAY
165.6875	X-RAY - Washington DC Field Office
165.7875	BAKER
165.8500	X-RAY
165.9000	X-RAY
166.0000	Dignitary Protective Division 5
166.0250	Laurel, MD Trunked System
166.0500	X-RAY
166.2000	X-RAY - USSS Uniformed Division
166.2625	Laurel, MD Trunked System
166.4000	GOLF
166.4625	DHS Common
166.4875	
166.5625	X-RAY
166.5875	X-RAY
166.6375	X-RAY
166.6500	Laurel, MD Trunked System
166.8000	X-RAY
167.0125	Reported POTUS / VPOTUS Protection Details
167.0375	Reported POTUS / VPOTUS Protection Details
167.4000	Laurel, MD Trunked System
167.9000	X-RAY – Dallas Field Office
168.0000	
168.1250	
168.2375	Diplomatic Protection Division 1
168.5875	Diplomatic Protection Division 2
169.9375	USSS Uniformed Division
170.0000	JULIET – Washington DC Field Office Alternate
170.0875	Diplomatic Protection Division 3
170.4375	USSS Uniformed Division
170.9875	USSS Uniformed Division
171.3875	New York City Field Office 2
171.7625	USSS Uniformed Division
172.0625	Diplomatic Protection Division 4
172.2250	New York Field Office 3
172.5625	USSS Uniformed Division

US SECRET SERVICE UHF ALLOCATIONS

406.2750	
407.6750	WHITE
407.7500	GRAY
407.8000	
407.8750	GREEN
407.9000	
407.9250	INDIA
408.0250	
408.5000	
408.9750	
414.6750	YELLOW
414.8000	BLUE
414.8500	BROWN – Technical Security Division
414.9500	ORANGE – Technical Security Division
415.1000	BLACK
415.6500	SILVER
415.6750	GOLD – Technical Security Division
415.7500	GREEN
415.8000	VIOLET
415.9750	RED
418.1250	LAVENDER
418.1500	YELLOW
418.3250	BLACK
418.3500	GRAY
418.7750	ORANGE – Technical Security Division
418.8000	BROWN – Technical Security Division
419.0750	GOLD – Technical Security Division
419.1000	SILVER
419.7250	RED

WHITE HOUSE COMMUNICATIONS AGENCY (WHCA) VHF ALLOCATIONS

162.6875	YANKEE
165.2125	MIKE
165.3750	CHARLIE
165.7875	BAKER
166.2000	Reported in use at Camp David Presidential Retreat
166.4625	DHS Common
166.5125	SIERRA
166.7000	NOVEMBER
167.0250	WHISKEY – Paging, reported no longer in use
167.9000	HOTEL
169.9250	DELTA
170.0000	JULIET
171.2875	ZULU

WHITE HOUSE COMMUNICATIONS AGENCY (WHCA) UHF ALLOCATIONS

406.4500	Transportable Trunking System
407.1250	Transportable Trunking System
407.4750	
407.6750	Wideband UHF reported
407.8000	Transportable Trunking System
407.8500	ECHO – No longer in use
408.8500	Transportable Trunking System
408.8750	Transportable Trunking System
408.9250	Transportable Trunking System
415.6750	Wideband UHF reported
415.7000	FOXTROT – No longer in use
415.8000	
418.2750	Transportable Trunking System
418.3750	Transportable Trunking System
418.4000	Transportable Trunking System
418.5000	Transportable Trunking system
418.5250	Transportable Trunking System

And finally, here are some old VHF low-band allocations for the Secret Service and WHCA. These frequencies continue to show up on Internet lists, but I suspect that they are not currently in use by either agency. But by all means, if you hear anything on them, please let us know!

USSS
036.2100
041.1700
041.1900
041.8500
041.8700

WHCA
032.2300 ALPHA
036.2100
041.1700
041.1900
041.8500
041.8700

❖ LA Bureau of Prisons Update

As I have mentioned in past *Fed Files*, I am maintaining a database of Bureau of Prisons radio systems that is available for download on the *Monitoring Times* web site. While we have some great information on some prison radio systems, others are difficult to get information on, due to their locations and lack of listeners in the area.

For a long time I have been wondering about the Los Angeles Metropolitan Detention Center in downtown LA. Whenever I was staying the downtown area, I would search around for any possible frequencies or a trunked system, but always seemed to come up blank. Recently, however, I seemed to have finally found something on that facility.

I was searching the UHF federal band with a small stubby "near field" antenna and found a Motorola control channel on 409.9500 MHz that was definitely coming from somewhere in the downtown LA area. After more searching I found at least two voice channels that were at the same location, all using P-25 digital mode and definitely sounding like a prison operation.

After posting my findings on the *Fed Files* blog, I received some information from a *Monitoring Times* reader in the LA area who provided me with the trunked system information. Karl Dahlquist was kind enough to run the system control channel through the "Trunker" software program and produced this information:

LA METRO DETENTION CENTER
Motorola Type II
System ID: ca0b
Base: 406.0000
Step: 12.5
Offset: 397

406.8125, 409.4125, 409.6750, 409.9500

I'm not sure how long the system has been in operation, but I figured out that one reason I hadn't heard the control channel before is that the frequency that it was on that day (409.9500 MHz) is also used down south of the LA area in the Camp Pendleton 400 MHz trunked system. I usually lock those frequencies out, since I thought I knew where the activity was coming from. I guess I was wrong!

That's all for this month, but we'll back with more in September!

Ron Walsh
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The Changing World of Marine Radio

After I finish writing this column, I am going up to the small town of Elgin to teach a marine radio license course. I am teaching the crews on the boats for the Rideau Canal as they work towards a marine master's certificate. As I monitor a VHF conversation between VBR Prescott radio and an aircraft "Transport 950," I am reminded of how far marine radio communications have come in the past century since Fessenden put the first voice on radio.

In fact, it is forty years since I first put my own voice on commercial marine radio in 1968. The set was a Canadian Marconi Company CN-495-1, 2 MHz HF AM Marine Radio, one of the first hybrid rigs. It used a transistor receiver and basic transmitter circuits. The driver and finals were tubes. I called the *Miss Kingston* from the *Lady Kingston* on 2182 kHz and shifted to 2003 kHz.

I also remember my first phone call to the office of Kingston Excursions Limited through VBH Kingston. The frequency pair was 2118/2514 kHz. VHF radio was not in common use at that time. In fact, the FM rigs on the freighters were as big as the AM radios. I still have this rig now and I am attempting to repair it so I can use the receiver. Unfortunately, I cannot find any manuals to get a circuit diagram.

Now, of course, AM HF is gone on the Great Lakes and even VBH has disappeared, along with all the radio stations along Lake Ontario. Now, we have remote VHF towers, fed by phone line into the central station, VBR, at the Prescott Coast Guard base. My radio license course discusses DSC (Digital Selective Calling), Navtex and EPIRBS (Emergency Position Indicating Radio Beacon System), among other systems.

However, an email from Perry Crabill, W3HQX, who is 82 years of age, reminded me that the 2 MHz AM system evolved from the long wave, CW system. When he was a teenager, Perry used to monitor the long wave frequencies and heard many call-ups prior to the Second World War. Up until 1940, 410 kHz was the emergency frequency on the Great Lakes, but was then changed to the international frequency of 500 kHz. WBL Buffalo and WLC Rogers City used CW long after the other US lake stations went silent. In fact, WBL was listed for CW until 1968.

Thunder Bay radio, VBA, did have 500 kHz CW listed for communications with ocean ships into the 1980s, I believe. Only fairly recently did active use of this frequency and most international marine CW cease. I certainly hope the attempt succeeds to have 500 kHz designated historic and possibly available for amateur use. Again, Tom McKee has been a great source of information on historical Great Lakes radio.

The CW stations on the Great Lakes actually started in response to the *Titanic* disaster. VBH was established here in Kingston and used spark gap equipment for many years. Older residents tell me it could be heard on just about any home radio, whether you wanted to or not!

The station was operating by January 1914 as part of the Great Lakes Wireless chain, which was the longest in the world at the time. The station was designed to reach as far west as Sarnia, Ontario, and as far east as Montreal, so people could connect with the overseas and east coast wireless systems for messages.

Two masts, 185 feet high and 450 feet apart, were erected. The transmitting equipment consisted of two 5-1/2 kW 240 cycle synchronous disc transmitters, each having their own generators, which were powered by a Fairbanks Morse 10 horsepower gasoline engine. The receiving equipment consisted of a tuner for 200 to 3000 meter wavelengths and a carborundum crystal detector. The antenna was a standard double T between the two poles.

This information comes from the book *In the Shadow of the Shield* by Arthur Eric Zimmerman. It covers the history of broadcasting in Kingston and at Queen's University.

History seems to come full circle, since we just had amateur station GB95MGY on the air to commemorate the 95th anniversary of the *Titanic* disaster. They were using an R-8 vertical and a Kenwood TS-570, the same as my radio shack. The MGY *Titanic* call also reminds me of the late Frank Slater, VE3MGY, a friend whom I still miss very much.

In another circular connection, tomorrow I attend the funeral of an aunt who involved me in my first search and rescue (SAR) incident. She was on Amherst Island in Oct. 1972, when she saw flares. She phoned our house and I contacted VBH. The operator there contacted a freighter which was diverted to save the crew of a sinking yacht.

❖ Manitoba and Northern Ontario

While reading the aforementioned book, I came across the mention of two other stations, VBN Port Nelson on Hudson Bay, and VBM, in Le Pas Manitoba. Nor can we neglect the inland and northern areas of the Canadian marine scene. VBA Lakehead still has a remote site in Churchill, which is used during the summer shipping season on Hudson Bay.

Most of us forget the size of Lake Winnipeg, in Manitoba, which can often be referred to as the sixth Great Lake. Recent news reports showed flooding of the Lake Manitoba Maritime Museum.

Checking the present listings, I find that there are continuous weather broadcasts for Lake Winnipeg. Fraserwood broadcasts on 156.950 MHz (ch19) while Jack Head, Long Point and Beaver Creek broadcast on 161.9 MHz (CH 26B).

In Northern Canada, particularly the Lake Athabaska and MacKenzie River Watershed, Yellowknife is listed as broadcasting on 157.275 (ch85A), while Parsons Lake, Enterprise, and Inuvik are listed on channel 26B. Inuvik also has a listing for another tower on 161.650 (ch21B).

❖ VMS

My editor forwarded me an email, which urged the NPFMC (North Pacific Fishery Management Council) and the governor of Alaska to oppose a federal government effort to equip all commercial fishing vessels with a VMS (Vessel Management System). This is a transponder which reports the vessel's position to enforcement agencies. The writer opposed this requirement as an invasion of privacy, unnecessary for the preservation of resources, and the fact that the item costs a minimum of $3000 per vessel. These sets relay information through satellites to the office, etc.

In our area, it is called AIS (Automatic Identification System). It is mandatory on every vessel transiting the St. Lawrence Seaway. In fact, many ports require ships to have this unit for traffic control. If the small tour boat I work

Island Belle, Kingston, one of the local boats I captain on during the summer.

on wants to travel the Seaway or use American waters in this area, we have to add AIS to our vessel. It sends signals on two VHF channels and these give the name, location, course and speed of the vessel. Using a chart program, the vessel can be shown on the actual chart of the area.

I have planned to install a receiver here, but it has been necessary to purchase other things first. The frequencies of 161.975 (ch 87B) and 162.025 (ch 88B) MHz are used in this area. I will look into this service again and prepare for a future article. I know of sets that monitor Montreal, the Detroit River, and Charleston, SC. Hopefully, I can present details and user reports. A receiver for this system costs less than $200 when I last checked. I have had communication with the Katas company in the UK and have been told that they make a great radio. I hope I have room for another antenna!

❖ HF Information

Monitoring this winter has been interesting. 5717 kHz has been active with East Coast SAR activity. This is the primary SAR frequency for the Canadian Armed Forces who are responsible for Canadian SAR activities. Initial contact may be made on 8989 or 11232 kHz. I have also seen mentioned that 5680 kHz will be used for International SAR incidents on the West Coast.

The 2 MHz frequencies have been coming in quite well. For example, Placentia Coast Guard radio has been heard regularly on 2182 and 2598 MHz with broadcasts. The USCG standbys of 5696 and 8983 kHz are very interesting to listen to. WPE Jacksonville has been monitored on 4149, 8294 and 12353 kHz. I have heard traffic on 4125 kHz as well.

I have found the ZBR Bermuda broadcast on 2582 USB at 0035 UTC and every four hours thereafter, making this broadcast schedule a good predictor of HF propagation on this band.

Again, the Maritime Mobile service Net on 14300 USB gives good amateur marine communications to monitor and some interesting contacts. For example, The Gulf Service, which operates in Africa, can often be heard.

I received an email where a reader had entered 2463 kHz into his receiver for Operation Secure and then tuned down to 2462 kHz USB and heard two young males talking about boats, batteries, etc and using very offensive language. Neither the reader nor I have been able to get any info on the use of this frequency. He did say it sounded like the people were on phones, not radios. Even the old cordless phones did not work on these frequencies. Could it be a harmonic, IF overload, etc? I would appreciate any reader input to solve this mystery.

KSM, the restored Maritime Communications Station in California, made an historic contact when at 1906 UTC (GMT) they made contact with the *SS American Victory*, KKUI in Tampa, Florida. I am also informed that when they have a contact, they key all their transmitters so most listeners can hear some of the communications. I have listed their frequencies in previous columns, but you can refresh your memory at **www.radiomarine.org**

❖ EPIRBS

The emergency position indicating radio beacon system has been in service for many years now. All new EPIRBs operate on 406 MHz and are registered to the vessel. The signal sent out in an emergency gives the vessel position accurately and also gives the vessel information. Some have a built-in GPS which give an actual position reading.

Some of the older EPIRBs and ELTs (Emergency Locater Transmitters, used on aircraft) worked on the 121.5 MHz aircraft emergency frequency. As of Feb.1, 2009, the satellite detection capabilities on this frequency will be turned off and 406 MHz equipment will have to be used by vessels, etc.

Since Dec.31, 2006, it has been illegal to use or sell the older units in the United States. The reasons given were poor signal strength, poor location accuracy and time delays for reception of signals. Search areas in a radius of 12 to 15 nautical miles were usually required by these units. The 406 MHz units are detectable in a matter of minutes, they are easy to confirm as a distress situation, and are more accurate, providing a search area of about 2 nautical miles in radius. They also produce very few false signals.

The main reason for discontinuing the 121.5 MHz units was the number of false hits received by the satellites. According to the bulletin I read, the satellites would get hundreds of 121.5 MHz signals a day, 99% of which were false. Surprisingly, the source of these bothersome signals were commercial products like sports score boards, ATM machines, and yes, even pizza ovens. I guess the reception of unwanted signals continues, similar to the early 1900's spark gap transmitters. It also goes to show what an rf-saturated environment we actually live in.

I also received an email from my editor which mentioned a USCG approved lifejacket which has a built-in FRS radio to help in a rescue. We both wondered if the USCG vessels, copters, etc. actually monitor these frequencies.

❖ Reader Reports

Bill Dunn, N1KUG, wrote from the Boston area with kind comments and the following information.

When ships enter the Boston area, they call the pilot on channel 20, 157.000 MHz. Bill also said channel 20 was a repeater channel in that area and had great coverage on the 161.600 MHz frequency. Since I will be visiting Boston Harbor in late September, I plan to monitor this frequency for information.

Bill also mentioned the UHF frequencies that are used for deck work and other operations on board ship. I do not monitor them here, as I believe I am out of range of the handheld units. However, I am double-checking the frequency ranges with my scanner so I can see if there is any traffic. In harbors and canals these should be quite useful.

A website Bill showed me will also be quite useful during a cruise I plan to take this September. Check out **http://home.earthlink.net/~ecps92/cruise_ships.htm** for frequencies in the 450 to 470 MHz range. Anyone in busy shipping areas should scan these ranges for traffic.

John Musgrave in Oona River, BC, Canada, always has some interesting information and pictures. John sent me a picture of the *Spirit of 98* in a bay near Prince Rupert. Surprisingly, that vessel was the *Victorian Empress* when owned by St. Lawrence Cruise Lines on Kingston. I have been aboard that vessel and my late cousin Fred Whitney was the head purser. Readers may also have seen the vessel when it was used in the Wyatt Earp movie.

Spirit of 98 off Butedale Sept 2005

John is also using an AOR 8200 IIIB and says he enjoys the radio, especially when he is on some BC ferry trips.

❖ Kingston Area

Alistair Thomson, now VA3XGM, previously licensed from Scotland with a GM call sign, wrote his exams with me and is now on the air in Canada. He will be installing his 2m amateur rig on his sailboat, so I hope to work him this summer. I make a lot of 2m contacts with boaters during the summer season. Let me remind all boaters to check their antennas and cables before the season.

Locally, the marine VHF is active with Seaway traffic control on channels 11 and 13. Channel 14 is for the Seaway pilots and occasionally has inversion traffic from the Welland Canal.

❖ Final Thoughts

I can still use more marine radio information from your area – wherever you are. Active VHF or HF frequencies, schedules, etc., would be welcome

I am also looking for a source of information on old Canadian Marconi Company Marine Radiotelephones to assist my restoration project. Perhaps a reader may know of some CMC material I could access.

The Radio Amateurs of Canada sponsor the Canada Day radio contest every July 1st. Activity is from 000 to 2400 GMT (UTC). Amateur bands from 160 to 2 metres, exclusive of WARC bands are used. As usual, I plan to operate and would be happy to have a contact with any readers. Look for VE3GO on both CW and SSB.

73 and good DX!

Kevin Carey, WB2QMY
kevincarey@monitoringtimes.com

Housekeeping Tasks

I'm shifting gears this month to talk a little bit about the column itself. I receive many questions about how to submit loggings, when items will appear for publication, how to submit photos and artwork, etc. Hopefully, we can clarify things, provide some tips for keeping the column interesting, and help preserve your column editor's sanity!

First, a quick story. I began writing *Below 500 kHz* in July of 1991—a time when I had far fewer responsibilities in my life. In the 16 years since then my wife and I have added children to our lives, taken on new job responsibilities, joined in numerous volunteer efforts, cared for our aging parents (an ongoing task), and recently, I began a career in freelance technical writing. Had anyone had told me in 1991 just how busy I'd be today, I certainly would not have believed them.

In a way, someone did try to tell me, and it was none other than MT's Editor, Rachel Baughn. I had received my first letter from a reader and wanted to make sure my reply was adequate. It took me two days to compose the letter, and everything was done on paper and with postal mail (no e-mail yet). Rachel approved of my letter but kindly informed me that I may not always have the time to compose such detailed responses. Was she ever right! Within a few months, I was searching for ways to streamline the process and was beginning to struggle meeting all of my other obligations, including column deadlines.

Today, my time has become even more limited, and I've had to make some adjustments to fit everything into a 24-hour day. For instance, some of you may have noticed extended wait times for replies to letters and e-mails, as well as delayed shipments of *BeaconFinder II* and *Sounds of Longwave* orders. I would like to apologize for these delays and want to reassure you that every letter *is* read by me, and questions will be answered, either directly or in a future column. Please be patient, and understand the challenges I am dealing with.

Here are some ways that you can help me streamline my writing process and do the best possible job on the column each month. These are the main issues that seem to come up frequently.

❖ Loggings

Our normal format for loggings is to show (from left to right) the frequency, station ID, location, and who made the logging. You can help by following this format as closely as possible in any log submittals. In fact, I will supply a template in MS Word for anyone who wishes to have a worksheet to follow. I can email the template to you or it can also be downloaded from the Below 500 home page on the MT web site. The file can then be e-mailed to me anytime you have loggings to send in. Even if you're sending typewritten or handwritten logs it will help if you can follow this general order.

❖ Letters

E-mail has become the preferred mode of communication for reaching me, and most other column editors. My e-mail address is shown in the masthead of this and every column. Postal mail letters are still welcome, as always, but it may take me longer to reply to those. Postal address information is provided at the front of the magazine.

When you send a letter or loggings to the column, I assume that it is OK to print your material as space permits. If this is not the case, please state in your letter that you do not wish the material to be published and this will be respected. I have an agreement to reuse material from my columns elsewhere in my writing work, so your loggings, photos and other contributions could end up in other venues. Please let me know if you object to this.

❖ Photos

One thing I'd like to see more of is photos—preferably ones with people in them. Shack pictures, beacon shelters, close-ups of gear and any longwave-related pictures are most welcome. I can deal with most common formats, but the trusty JPEG image seems to work best with a minimum of hassle. It's best if you can supply photos at a minimum resolution of 200 dpi, and images can be color or black & white (pictures will only appear as b/w however). Conventional printed photos via postal mail are also acceptable, but please note if you wish to have such photos returned to you.

❖ Deadlines

Generally speaking, columns are prepared at least two months prior to the date of publication. This is faster than many magazines are able to achieve, but it still introduces some delay, and you should be mindful of this when submitting material that is seasonal in nature or otherwise date sensitive. Plan ahead and make things easier for everyone.

That's about it for column talk. I want to say that I have truly enjoyed the past 16 years as your longwave reporter and I look forward to continued service. Life seems to be on fast forward these days, but it is still a joy to contribute in my own small way to the radio hobby.

❖ Mailbag

Lee Badman, KC2IYK (NY) wrote with a list of newly discovered beacon signals. While traveling in the DC area, he was able to hear several new signals in the longwave band and has continued his hobby back at his home location in Upstate NY.

Lee writes: "I had my trusty Grundig YB 400 PE with me in the (DC) hotel, and stumbled across what would be my first NDB catches (323/GTN Georgetown and 332/DC Washington, DC). Now I'm hooked! I never new how interesting and enjoyable chasing these stations could be. Back home, in the last couple of weeks, I've logged the following stations using the Grundig:

219	FZ	Syracuse, NY
260	PYA	Penn Yan, NY
344	AVN	Avon, NY
216	CLB	Carolina Beach, NC
248	UL	Montreal, QC
342	YY	Mont Joli, QC
303	YPP	Parent, QC
317	ZZR	Severn-Trenton, ON
263	YGK	Kingston, ON

Lee notes that his HF rigs seem to be "deaf as rocks" at these frequencies, even though they readily tune into the band. I believe this is mainly a case of "specsmanship" where manufacturers want to show impressive frequency coverage claims, yet few of these rigs are actually designed to hear anything meaningful on longwave. Some rigs actually have cut-off filters that suppress anything from the AM broadcast band on down.

Sheryl Paszkiewicz (WI) writes: "I have never really listened to longwave, being primarily interested in shortwave. One night I tuned below 500 kHz for the heck of it and heard a Morse signal on 362 kHz. Years ago the Manitowoc, WI lighthouse or some such was on 289. I heard nothing on 289 that night but assume 362 couldn't be too far away. Do you have any idea what this could have been? I don't really know what letter(s) they were transmitting. I know my question is quite vague."

Sheryl, it is difficult to say with any certainty what, or where, this station is without an ID. You could copy down the dots and dashes and looked them up on a Morse chart to help ID this station. Near your location on 362 kHz is BCK/Black River Falls, WI, so that is one possibility. Try to get a positive ID and check back with us to see if we can locate the whereabouts of this station.

George Zeller
georgezeller@monitoringtimes.com

Pirate Radio Gets Headlines

Local FM pirate broadcasting hit the news in both the United Kingdom and Israel during the spring. In London, Ofcom (the FCC of the UK) reported on April 19 that 30 percent of all London residents say that they listen to one of many dozens of FM pirates who are active in that city. *The Times* newspaper and the BBC reported that Ofcom says that the popularity of these stations is related to the fact that they produce the only foreign language programming on the United Kingdom radio airwaves.

As a result of these pirate broadcasts, the BBC and local commercial radio stations have lost 16 percent of their audience ratings to the pirate stations, again according to Ofcom. A short list of these pirates published by *The Times* included **Afrique FM, Déjà vu, Flashback, Lightning FM, Naja, Powerjam, Rinse FM, Station FM, Touch FM, and Vibes FM.**

Pirate broadcasting is illegal in the United Kingdom, under the Wireless Telegraphy Act of 2006. **Whoa FM** used to be an active London pirate, but Ofcom shut this hip-hop station down in 2006. Details on the Ofcom report are available at their web site at **www.ofcom.org.uk**

A lively FM pirate scene is making headlines in Israel, too. The *Jerusalem Post* reported on April 19 that the Israeli Communications Ministry shut down five pirate radio stations in Bat Yam, El ad, Givatayim, and Jerusalem. All five stations were part of the **Voice of Truth** (Ko Ha'emet) network. The stations support Sephardi religious party. Their programming includes discussions of disputes about whether particular commercial food products are kosher, or not. It also claims that it returned to the air within 15 minutes of the Communications Ministry raid.

In the *Jerusalem Post*, Israeli Communications Ministry spokesman denied that this station had been busted for political reasons. He said that pirate radio broadcasters endanger lives because they interfere with aircraft communications, and that the government "acts against" all pirate radio stations, regardless of the politics and religious viewpoints reflected in their programming.

This purports to be the well-hidden transmitter of Euro-pirate WNKR, logged this month.

In the United States, an unusual May article in the *Harvard Crimson* from Massachusetts covered programming notes from **Radio X**, an FM pirate operating on 97.7, 94.9, and 104.5 MHz FM on Long Island in New York. This one uses the same format as MAC Shortwave, with a professionally produced replica of the old Top 40 radio format.

❖ Harry Helms on Tourism

Veteran shortwave radio author Harry Helms has published a new book about **tourism**. It represents a new twist on clandestine issues. *Top Secret Tourism* is a 271 page guide for tourists who may wish to visit more than six dozen of the most secret facilities operated by the United States government. It is probably the first tourist guide to clandestine operations that has ever been published. Therefore, its subject matter is near and dear to unlicensed broadcasting DXers. He moves all the way from Area 51, the fabled UFO site in Nevada, to the Continuity of Government site in Harpers Ferry, WV.

There are secret destinations in 25 states and the District of Columbia. Armed with Harry's book and the maps within the book, you can visit scores of places that the government does not want you to visit. He cautions readers that heavy security is understandably present at most of these sites, but a surprising number actually admit the public to on-site museums and visitors' centers.

Harry reports that he had more fun writing this book than any of the many others that he has written over the years. You will like this book. It is available for $14 from Feral House publishers at **http://:feralhouse.com**.

❖ Greeley "Pirate"

KELS in Greely, CO is among the new licensed low power FM broadcasters operating in the United States, with authorization from the FCC. The station uses 104.7 MHz FM, with a slogan of "Pirate Radio" in Greely. The station's web site has a pirate motif. You can inspect the station staff in their pirate outfits on the station's web site at the **www.pirate1047.com/** URL. This web site also features streaming audio, if you would like to hear what KELS sounds like.

❖ Clandestine QSLs

Martin Schoech, of Clandestine Radio Watch, has posted a variety of clandestine radio station QSLs on line. You can view this interesting collection on the web at the **www.schoechi.de/pic-cla.html** URL. Terry Kreuger reports a very unusual QSL from a Radio Marti airborne relay on 530 kHz via the Pennsylvania Air National Guard's 193rd Special Operations Wing's EC-130J Commando Solo aircraft. Congratulations, Terry!

❖ ARRL Attacks Clandestine

According to the American Radio Relay League, the anti-China clandestine **Sound of Hope** from Taiwan has been causing interference within the Amateur Radio bands on 18160 kHz. Making matters worse, music jammers from the People's Republic of China are also operating on this frequency.

❖ What We Are Hearing

Monitoring Times readers heard nearly thirty 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 such as the 4th of July. You sometimes have to tune your dial up and down through the pirate radio band 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.

Black Lodge Radio Dakota- This new semi-clandestine pirate features American Indian music and related dialog. For a QSL, they say that you have to give your land back to the Indians. (None; requests reports to the FRN web site)

Captain Morgan- The Captain is back with rock music programming. Harald Kuhl heard them from Germany. (None, says to send loggings to the Free Radio Network web site)

Channel Z Radio- They feature a mix of their own rock music programming and relays of other pirates. (channelzradio@gmail.com)

Cupido Radio- Rinus' Dutch Europirate is still being heard from time to time in North America on 15070 kHz and other frequencies around 6265 kHz. (cupidradio@hotmail.com)

Derby Shortwave- This is one of the seasonal pirate stations. This year, as usual, they ran a reply of the Kentucky Derby horse race, complete with a vocal rendition of "My Old Kentucky Home." (derbyshortwave@yahoo.com)

Extreme Radio- George Maroti and Chris Lobdell heard this new Dutch pirate on 6329.4 kHz announcing a 30 watt transmitter. Like most Euros, they program rock music. (extreme.radio@live.nl)

Grasscutter Radio- Classic rock music is the main theme at this friendly pirate, who has been QSLing. (grasscutterradio@yahoo.com)

Ground Zero Radio- Their parody of Girls Gone Wild featured wild women like Wilma and Katrina, the hurricanes. (Announces defunct Elkhorn)

KIPM- Alan Maxwell has announced future plans for additional "Illuminati" existential psychological drama productions in the future. (announces Elkhorn)

MAC Shortwave- Paul Star tribute uses several frequencies such as 3275, 6850, and 6925 kHz for his professionally produced replica of the old top 40 am format

Continued on page 61

T.J. "Skip" Arey, N2EI
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How Green is My Shack?

As I write this month's words of amateur radio wisdom, the 37th celebration of Earth Day has just past. Back on the first Earth Day, my high school art class gathered to clean out old beer cans and tires from Mill Creek behind the school. These days we have become more sophisticated. We talk a lot now about each person's individual "Carbon Footprint" and how we can take small steps to reduce our impact on this situation we are calling Global Warming.

Well, it may surprise you to know that many members of the amateur radio community were involved in being a little bit nicer to Mother Earth as far back as those highly experimental days we now nostalgically call "The Sixties." One of the founding fathers of the Slow Scan Television (SSTV) movement is a gentleman named Copthorne Macdonald (formerly WA2BCW, more recently VY2CM).

Cop was writing about amateur radio and its relationship to the counterculture and ecology movements of the Sixties in a monthly column called *New Directions Radio* in *Mother Earth News* magazine. The column ran for over 10 years through 1983. He also wrote *Cop's Column* in *CQ* Magazine for a number of years. His writings had a great influence on many hams of my generation. No doubt they were in the back of my mind as I jumped into the QRP and alternate power camps with my personal ham station activities.

I have indicated in columns past that my primary HF station set up is QRP or QRPp power levels fed by solar charged batteries. You can't get much greener than that in the ham radio world. Or can you? Let's take a closer look at this and some other environmentally friendly practices that might just enhance your amateur radio fun.

❖ Power to the People

Let's start with a look at that whole idea of power. If you think about it, playing radio is a process of taking some quantity of electrical energy and using it to do the work of transmitting and receiving communications. The less electricity required to perform this task, the higher the level of efficiency you have, ecologically speaking.

So let's start out with, where does your electricity come from to make your radios work? The average ham probably just takes the stuff that comes out of his or her wall sockets and gives it little more thought. That being the case, some power companies now offer various options to allow you to get your electricity from parts of the power grid that use renewable or, at least, cleaner and greener energy production.

I will be the first to tell you that I am not entirely sure how this works out. Voltage is just a bunch of rapidly moving electrons with no visible ID tags. I am not sure how a consumer can be completely clear on where their wall juice is coming from, other than to trust the power company to play fair in this. Still, I know there is enough interest that you may want to look into this more closely, perhaps with the support of local or state consumer affairs and power regulatory agencies.

There are other ways to power your ham station that don't involve having a long talk with your power company. As I mentioned earlier, I run my low power (QRP) station using solar charged batteries. For the cost of the panels and gel cells required to grab some sunshine, I get lots of radio play without generating any greenhouse gases other than the hot air I exhale at the microphone.

At this point in time, moving an average 100 watt ham station off the grid with solar power is still quite an expense. Solar panels, storage, and charging circuit controls will run between $300 and $500 to get in the game. Even running low power, as I do, and scrounging surplus cells and batteries, it was a chore to get the expense under $100 with good reliability and efficiency. That said, playing with solar power is a blast. It is well worth the effort, you will learn new ways to play with technology, and nothing beats being able to tell the station on the other end that your station is 100% solar powered.

Okay, so you have your station running off the grid and on the Sun, now what else can you do about your power?

Most hams' weakest link in getting whatever power they use out into the air is their feedline and antenna. Of course, there is no such thing as a free lunch (as some antenna companies seem to say in their ads) but you can squeeze every watt and decibel out of your skywire system with a little thought and not very much money.

Any good ham radio data source will tell you the inefficiency of buying cheap coaxial cable. A couple of cents per foot more buys you noticeably more power transfer to your antenna's feedpoint. Always buy the best quality coax you can afford and take the time to service the connectors and supports to assure that you get good life out of the feedline for as long as is reasonable. Remember, too, that losses go up as the frequency goes up, so if you plan to play in a VHF way, the cable you buy becomes more critical.

Once you have the best coax you can get your hands on, it is time to turn your attention to your antenna. Many of us live with a basic half-wave dipole and the roughly 2 dB or so gain it delivers. Break out the antenna books, folks! Adding a bit of wire in the right shapes and places can improve upon that basic gain to give you a bit more punch in one or more direction.

We often think of the classic "Yagi" directional beam and the significant gain that can be achieved with its use. If you have the space, you can accomplish the same gain features using wire instead of aluminum rods. Gain antennas can, in some cases, be more practical, and certainly more earth friendly, than putting a linear amplifier into the mix with its comparatively high power consumption.

The only power you don't ever waste is brain power. So have a good look at some antenna designs beyond the basic dipole and see how much more of a signal you can send out to the world.

❖ Recycle Everything

We are all familiar with setting our bottles, cans, and paper out to the curb for recycling. But hams can recycle in a lot of other cool, very earth friendly ways.

I have been doing a series of articles for another magazine on scrounging electronic components out of old radios, TVs, VCRs, etc. This is not just fun, but it is also about keeping some stuff out of the land fills and giving the parts another life. You may not have the desire to go garbage picking for your next radio project, but that doesn't mean you can't think twice about setting old radio gear out to the curb when it has outlived its usefulness. Consider putting old and broken electronics in the hands of folks who do want to give the stuff new life. There are still folks who enjoy this and, no doubt, you can find a few at your local amateur radio club.

I move through a lot of ham gear, but I seldom buy anything new. Used ham gear can almost always get the job done for a lot less initial outlay than buying the latest and greatest from the back pages of any ham magazine. I have taken equipment into my shack second and third hand, used them for a number of years, and then moved them on to yet another ham, either by sale or by donation to groups such as Handi-Hams or the WB2JKJ Group. The only piece of ham gear that probably can't be kept on the air (legally) any more is a Spark Gap transmitter, so do your part to keep old ham gear on the air.

One more point about recycling. Conscien-

tious folks are paying attention to just what ends up in their landfills these days. Batteries with heavy metals in their make-up and electronic devices (especially personal computers) that may also harbor heavy metals in their construction should not be put out to the curb with your other trash. Check with your local authorities about proper recycling of batteries and PCs. For example, my county provides special pick-up dates and sites for getting these things safely disposed of. Most of the "big box" hardware stores provide for rechargeable battery recycling, as do many auto repair centers for lead, acid-based battery systems.

Radio hobby recycling is mostly a matter of just thinking twice before throwing anything out. In the dark days of World War II, in times of heavy rationing of just about everything, folks had a saying: "Use it up, wear it out, make do!" Not such a bad way to look at the world. You'll be a more earth friendly ham and you will save a lot of money in the long run.

WEBSITE OF THE MONTH

Since we have been talking about Copthorne Macdonald, I would be remiss in not mentioning his excellent website **www.cop.com**. Cop has moved on a bit from technology into the world of spirituality, but a bit of digging still turns up a complete bibliography referencing his amateur radio and other technology related writings. A real gift on his site are his *$mart Energy User* newsletters. These can be found at: **www.cop.com/SEUhtmDOCS/conservation.htm**. There's lots to learn from a man who continues to teach hams and other folks how to move gently through the universe.

HAM RADIO BOOK OF THE MONTH

MORE VERTICAL ANTENNA CLASSICS
Compiled by Steve Ford WB8IMY
157 pages, $17.95 plus shipping/handling
The American Radio Relay League
225 Main Street
Newington, CT 06111-1494
www.arrl.org/
1-888-277-5289
ISBN: 0-87259-979-5
ARRL Order No. 9795

We have been talking this month about being "green" in the amateur radio world. Vertical antennas may not be particularly green in nature, but their small footprint is certainly least disruptive to the surrounding scenery. Also, properly constructed and maintained, they are efficient ways of putting out maximum power.

The other well-known joy of vertical antennas is they are DX magnets. Their low angle of radiation makes working the distant ones a breeze.

The staff at the ARRL have compiled over 30 of the best articles on vertical antenna design from the pages of *QST*. There is something in this book for anyone's station. There are articles on portable verticals, multiband verticals, vertical arrays, ground systems (always a point of much mystery and controversy in most ham circles), low band verticals, single band verticals and, of course, vertical antenna theory.

All of the articles are food for thought, but I was most drawn to the series of pieces contributed by Al Chrisman K3LC that studies *Elevated Radio Ground Systems*. This series helped me to better understand alternatives to buried ground systems, which are not always possible or desirable in some locations. It also showed how less than perfect ground radio systems performed when compared to optimum set-ups.

I also really enjoyed Phil Salas AD5X's article called *The Ultimate Portable HF Vertical Antenna* so much I headed for the basement to build one for my up coming summer vacation.

Anyone with an interest in alternatives to the good old dipole will find a wealth of information and ideas in this book.

How green is your ham shack? I'll see you at the bottom end of 40 meters and we can talk it over there. Have fun!

UNCLE SKIP'S CONTEST CALENDAR

RAC Canada Day Contest
July 1 0000 UTC - 2359 UTC

MI QRP July 4th CW Sprint
July 4 2300 UTC - July 5 0300 UTC

QRP ARCI Summer Homebrew Sprint
July 8 2000 UTC - 2400 UTC

IARU HF World Championship
July 14 1200 UTC - July 15 1200 UTC

FISTS Summer Sprint
July 14 1700 UTC - 2100 UTC

North American QSO Party, RTTY
July 21 1800 UTC - July 22 0600 UTC

CQ Worldwide VHF Contest
July 21 1800 UTC - July 22 2100 UTC

RSGB IOTA Contest
July 28 1200 UTC - July 29 1200 UTC

Outer Limits continued from Page 59

from commercial radio. (macshortwave@yahoo.com)

Mystery Radio- This rock music Europirate can sometimes be heard in North America on 6220 kHz just prior to local sunset during openings to Europe. (radio6220@hotmail.com and mysteryradio@hotmail.com)

Radio Ice Cream- The Ice Cream Man's rock music has an interval signal of delighted children who welcome a treat. (Belfast)

Radio Maple Leaf- They sign on with the Canadian national anthem, followed by promotion of pirate radio and rock music. Harald Kuhl also heard this one from Germany. (radio.mapleleaf@gmail.com)

Radio Odyssey- This Greek pirate was still being heard in North America during the early spring with broadcasts from Greece on 6310 kHz. (odyssey.greece@yahoo.gr)

Radio Piraña Internaciónal- The most prominent South American pirate is still being heard occasionally on 6307 kHz around 1100 and 2300 UTC. Their web site at www.geocities.com/radio_piranha/ sometimes provides updates. (Santiago and rpi@radiopirana.com)

Radio 6X- This new one has been using a slogan of "Texas Rock and Roll". (Unknown)

Real Pirate Radio- This new one has a classic rock format. At times they also shift over to digital transmissions. (Unknown)

Research Radio- This new station has an odd interval signal that consists of numerous repeats of their identification. Programming has been rock music. (Unknown)

Sunshine Radio- This rock music pirate is one of the few pirates on the air today with a female announcer. (sunshineradio@yahoo.com)

The Crystal Ship- "The Poet" at the "Voice of the Blue States Republic," still features left wing political commentary and rock music on randomly selected frequencies including 1710, 3346, 3275, 6875, 6925, 7576, and 9057 kHz. Sometimes they use two frequencies in parallel. (Belfast and tcsshortwave@yahoo.com)

United Patriot Militia Bingo- This parody of the old KSMR clandestine station has returned. John Arthur wins all of the bingo games. (None)

Voice of the Runaway Maharishi- This drug advocacy station was also heard in Germany by Harald Kuhl. (Belfast)

WBNY- Commander Bunny still hosts the voice of the Rodent Revolution, with rock music and Easter fare mixed in with slow scan TV images. (Try Belfast)

WEAK- This old timer is back with rock music shows. Hopefully their signal does not match their call letters. (weak-chicago@yahoo.com)

Weekend Music Radio- This Europirate produced surprisingly good reception in North America during the early spring on 6400 kHz. (wmrscotland@yahoo.co.uk)

WNKR- This Europirate's rock music programming with a slogan of Western North Kent Radio was relayed again in North America this month on 6925 kHz, most frequently via the North American version of Channel Z Radio. The station's broadcasts from Europe have been recently heard on 5825 kHz. (wnkr@rock.com)

Wolverine Radio- This one features a classic rock format, with selections not normally heard on pirate radio or commercial radio. (None known yet)

WTCR- Using a slogan of "Twentieth Century Radio," they play rock music from "the 1900's." They were among the amazing logs sent in from Germany by Harald Kuhl this month. (Belfast)

WTPR- Do not confuse this one with WTCR. This one is "Tire Pressure Radio." They warn listeners that if they listen to the program, all the air will go out of the tires in their cars. Caveat emptor! (Belfast)

QSLing Pirates

Three first class stamps for USA maildrops or $2 US to foreign locations. Letters go to these addresses, identified above in parentheses: PO Box 1, Belfast, NY 14895; PO Box 109, Blue Ridge Summit, PA 17214; PO Box 146, Stoneham, MA 02180; Casilla 159, Santiago 14, Chile; and PO Box 293, Merlin, Ontario N0P 1W0. Unfortunately, PO Box 69, Elkhorn, NE 68022 is announced as a no longer valid address, although a few pirates announce it.

Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. Submit your pirate loggings to Free Radio Weekly newsletter (yukon@tm.net) or to the Free Radio Network web site at www.frn.net.

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**:** Kirk Allen, Ponca City, OK; Jerry Berg, Lexington, MA; Artie Bigley, Columbus, OH; Wendel Craighead, Prairie Village, KS; Gerry Dexter, Lake Geneva, WI; Rich D'Angelo, Wyomissing, PA; John Figliosi, Halfmoon, NY; Bill Finn, Philadelphia, PA; Harold Frodge, Midland, MI; Harry Helms, Smithville, TX; John Herkimer, Caledonia, NY; Terry Kreuger, Clearwater, FL; Harald Kuhl, Goettingen, Germany; Ed Kusalik, Coaldale, Alberta; Chris Lobdell, Tewksbury, MA; Bob Lowry, Scottsdale, AZ; Greg Majewski, Oakdale, CT; George Maroti, Mount Kisco, NY; Svenn Martinsen, Norway A. J. Michaels, Blue Ridge Summit, PA; Don Moore, Des Moines, IA; Horacio Nigro, Montevideo, Uruguay; John Poet, Belfast, NY; Martin Schoech, Eisenach, Germany; Lee Silvi, Mentor, OH; Dale Svetanoff, Minticello, IA; Andy Walker, UK; and Joe Wood, Greenback, TN.

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clemsmall@monitoringtimes.com

Tips on Increasing Handheld Performance

One good way to improve your ability to successfully copy weak signals is to improve your antenna's performance. To discuss this we'll need to have a working definition of "antenna gain."

As a simplified definition, let's say that "gain" refers to the relative level of received-signal strength captured by an antenna as compared to a comparison antenna's performance with an identical signal. For transmitting, let's say that "gain" refers to the relative level of signal strength that an antenna launches as compared to a comparison antenna fed the same amount of radio-frequency power.

So, higher antenna gain means greater strength of transmitted signals and greater received-signal strength.

As we discuss the techniques suggested below, keep in mind that your receiver's automatic gain control kicks in when strong signals are received. This reduces the audio output from strong signals, but it is inoperative for weak signals. Thus, changing to a higher-gain antenna when receiving strong signals may show little or no increase in received volume, whereas for weak signals a higher-gain antenna should help.

So, unless your receiver has a signal-strength meter, use only weakly received signals to evaluate your antenna's effectiveness.

The Legendary Rubber Duck

The rubber duck (RD) antenna that comes with your handheld (HH) scanner or HH transceiver has much less gain than many other antennas. We use RDs for three reasons: they are conveniently small, they can take wear and knocks well because they are tough and flexible, and, although very-low in gain, they have enough gain to support much of the communication we want.

Rubber duck antennas (fig. 1A) usually fall into one of three categories: the basic duck, which is a flexible, slender, wire coil about 4 to 6 in long; a shorter "stubby duck"; and an even stubbier, almost button-like antenna an inch or less in length. All are covered with rubber-like plastic insulation. The duck has very low gain, the stubby less, and the button even less than that.

Telescoping Whips

Telescoping whip antennas can often give a boost to your HH's operation. Fig. 1A shows a telescoping whip that can be adjusted to approximately a quarter wavelength for frequencies between 144 and 450 MHz. It will also adjust to a 5/8 wavelength on 450 MHz. Using a quarter-wavelength antenna often gives a worthwhile improvement over a rubber duck.

Fig. 1A shows a 5/8 wavelength telescoping whip for the two-meter ham band. The 5/8 wavelength has more gain than the quarter wavelength antenna. Although at 2 meters its excessive length makes it unwieldy, a 5/8 wavelength whip will sometimes provide solid contacts where smaller antennas fail.

Quarter wavelengths can be determined as: Length (in ft) = 234/frequency (in MHz), or, Length (in m) = 71.3/frequency (in MHz). For example, a quarter wavelength of wire at 200 MHz would be: 234/200 = 1.17 ft, or 14 in. Multiply the answer by 2.5 if you want 5/8 wavelength.

Home-Brew One

It's easy to make your own quarter-wavelength antenna. Use wire stiff enough to hold its shape vertically (fig. 1B). Solder one end to the center conductor of a male coax plug appropriate to your HH antenna socket. If the wire is too thick to fit into the center-conductor terminal, then wrap and solder a very short bit of smaller wire to the end of the large wire. After the center conductor is installed, fill in around it to a level a bit above the top of the plug. For this, use hot glue or other non-conductive filler that will harden to hold the antenna in place. Putting a rounded blob of solder on the top end of the antenna makes accidental injuries less likely.

Give Your Antenna a Tail!

One of the easiest ways to improve your HH's performance is to add a quarter-wavelength radial to your antenna (fig. 1C). The radial is connected at the base of the antenna input socket. Limp, insulated wire is best for the radial: any convenient size (diameter) wire will work. At one end of the wire make a loop, or solder it to a very thin washer.

With the antenna removed, drop the loop or washer over the HH's antenna-input connector socket. The loop or washer must be thin enough to allow the male plug of the antenna to fit back onto the input socket with the loop or washer in place. The loop or washer will then be held tightly in place by the connector.

This technique sometimes results in impressive improvement in signal reception.

Elevating the Antenna

Often, a useful increase in signal strength results from elevating your antenna. A coax dipole (fig. 1D) can help here. For this approach, attach a coax connector appropriate for your HH to one end of a length of up to 30-ft or so of good, small-diameter coax such as RG-58. Then, remove the outer insulation from the antenna end of the coax for an inch longer than a quarter wavelength.

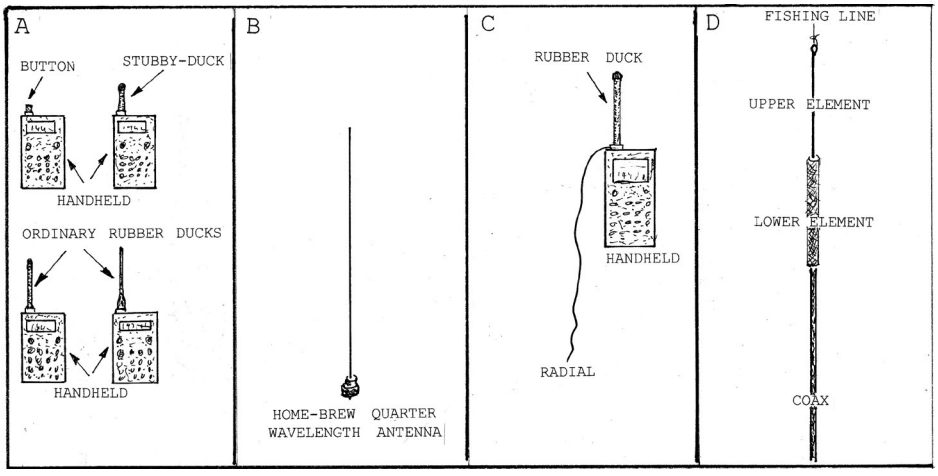

Fig. 1. A sampling of antennas for handheld radios: (A), a home-brew quarter-wavelength antenna for a handheld radio (B), a handheld with a quarter wavelength radial installed (C), and a portable, coaxial, vertical, dipole antenna for a handheld radio (D).

This Month's Interesting Antenna-Related Web site:

Here's comparison study of a number of HH antennas: **www.strongsignals.net/access/reviews/reviews.cgi?type=display&rtype=rev&class=ant&num=003**. Want guidance for making your own 2-meter rubber ducks? **www.arrl.org/tis/info/pdf/9803037.pdf**

Now, if you can, back the shielding down over the remaining outer insulation until the shield is turned completely inside-out and is down around the remaining outer insulation. Remove the inner insulation from the inner conductor. This conductor will be your vertical, quarter wavelength element.

If your braid is the kind that won't fold back down the line, then cut the braid off about 1/4 in above where the outer insulation is cut, and solder four quarter-wavelength wires evenly spaced around the braid there. Run these wires on down the outer insulation and tape them in place. Seal the end of the coax against weather with coax sealant.

Next, make a very small loop in the end of the vertical element, making sure its final length is a quarter wavelength. Tie a length of plastic fishing line or cord (plastic, so it won't get wet and conduct) to the loop. Tie a small weight on the other end of the cord. To erect the antenna, you can toss the weight over a tree limb and pull your antenna high.

For weak signals, this antenna will often improve your communication significantly.

RADIO RIDDLES

Last Month:

I asked: "What happens to the current that is unable to pass from the feedline to the antenna at a poorly-matched feedline-antenna connection? Does it just disappear, turn to heat, fade away, or what?"

Well, that current is reflected back from the connection. It then travels back down the line toward the tuner where it is again reflected and heads up the line toward the antenna again. At the antenna, just as on its first trip, some of the current is accepted onto the antenna and some is reflected back.

On each trip up and down the line, some of the current is converted into heat in the resistance of the feedline, and on poorly shielded feedlines some RF power is also radiated as RF waves. However, if there is a good match at the transmitter end of the line, and the SWR at the mismatched end of the antenna is relatively low, and if you use good-quality feedline that isn't too long, then, even with the mismatch, most of the RF power does eventually reach the antenna.

This Month:

For weak-signal reception, antenna gain is obviously an important consideration. On the other hand, certain kinds of low-gain antennas can often do a much better job of weak-signal reception than will an antenna with much higher gain. Why?

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.

❖ A Useful Technique

A good trick to keep in mind for use at VHF – and especially on even higher frequencies – is that a change in position, even a foot or so, will sometimes make a significant difference in signal strength. So, as you listen to a weak signal on your HH, walk around, and you will often find a location where signal strength improves.

Marc Ellis
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BC-348 Restoration Begins

Last month, we took a first look at our BC-348 project set. At that time, we didn't do much more than remove the receiver from its cabinet and look at the cosmetic issues. The wiring looked relatively undisturbed – which certainly was a plus. On the minus side were various cosmetic problems.

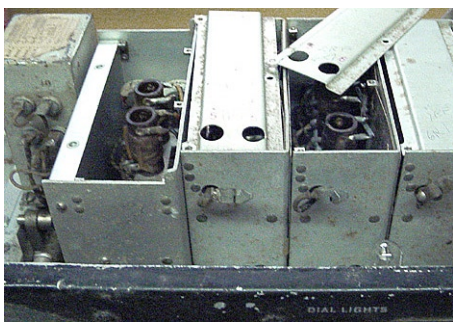
Since the set had been shed-stored without a cabinet for some time, the interior looked rather grimy. However, since most of the metal parts were aluminum, there was no sign of pitting or corrosion. It looked as if going over the surfaces (at least the ones that could be reached) with a damp cloth would result in a significant improvement.

The front panel also had its cosmetic problems. Not only was it quite grimy, but there were numerous small dings where paint was missing as well as a couple of more mysterious issues. For one thing, someone had run a red marking pen over the panel under the bottom of the dial bezel; for another, it looked as if some amateur masking and repainting had been done on the ID plate.

After assessing the situation, I thought I'd begin with some dismantling. For starters, I removed the top and bottom covers from the c.w. oscillator, first and second r.f., and converter modules.

These modules can actually be removed individually from the chassis. It's done by releasing and withdrawing the bandswitch actuating shaft that runs through all the modules, disconnecting a few wires at each module, and removing the mounting screws.

Looking inside each module, I noted that none of the wiring had been disturbed. The only reason for dismounting the modules would be to apply cleaning spray to the bandswitch contacts, which were otherwise inaccessible. So I decided to put off making a decision about removal until the radio was operational and I could see if bandswitch noise was going to be a serious problem.



Disassembly began by removing covers from c.w. oscillator, first and second r.f., and converter modules.

Front Panel Restoration

I definitely *did* want to remove the front panel, however, because of all the cosmetic problems I would have to deal with. It looked, at first, as if this would be a daunting task because of all the controls mounted on the panel. But after reading the maintenance manual on this subject I was reassured.

Once the knobs (Allen wrench required) and mounting nuts were removed, most of the control shafts could be slipped back through the panel, leaving the controls and their wiring attached to the radio. Incidentally, on removing the knobs, I found that most had little leaf springs contacting their inner surfaces. Looks like the intent was to prevent the knobs changing position during combat or simply from the normal vibration of the plane in flight.

I began work on the panel by scrubbing it with a solution of Murphy's oil soap. I used a rag cut from an old bath towel, figuring that the rough texture would help penetrate the pores of the dingy

All knobs were taken off as first step in removing front panel.

black crackle finish. My solution turned black from all the dirt that was removed, though the paint finish was still dull and blotchy looking.

Next I turned my attention to the red outline that somebody with nothing better to do had drawn under the tuning dial bezel (I had removed the latter from the panel to gain better access to the area). Through experimentation, I had found that the red ink or crayon was reasonably soluble in rubbing alcohol – which was not attacking the underlying paint to any great extent.

Using a Q-tip saturated with alcohol, I rubbed along the red line, turning the Q-tip frequently and changing it often. I stopped after more black paint than red material was being picked up. The red outline on the panel was much fainter now and I didn't want to chance exposing bare aluminum under the black finish.

Turning my attention to the many small dings where paint had flaked off, I found that a black felt-tipped "Sharpee" pen could be used to cover the exposed aluminum. This much improved the look of the panel, but I still have to deal with the dullness and unevenness of the finish.

Incidentally, while washing the panel, I noticed that the temporary film of moisture markedly improved the looks of the beat-up ID plate, giving it a much more unified appearance.

Improve Your Library by Sharing!

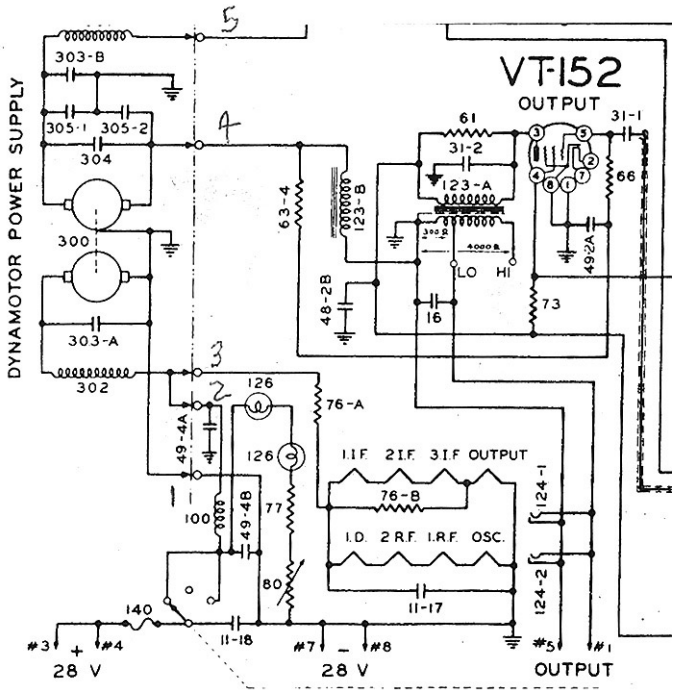
Not long ago, our Editor sent me a book that was reviewed in the December 2006 issue of *MT*. Having finished with it, she wanted me to pass it along to a reader of this column. The book is *Crystal Clear* by Richard J. Thompson, Jr. published in 2007 by the IEEE (Institute of Electrical and Electronic Engineers). It deals with the difficulties of getting the idea of channelized communications accepted by the armed services during World War II and, that accomplished, of arranging for the manufacture of the vast number of crystals that would be required.

If this specialized book would be of interest to you, e-mail me a note telling me why and attach a photo of yourself, perhaps in your workshop or study, for the column. If I've already sent out the book by the time I hear from you, you will receive a Lindsay Publications book instead (see following).

Several years ago, while I was writing an antique radio column for the now-vanished *Popular Electronics* magazine, I received two big boxes of books from Lindsay Publications. Those of you who don't happen to be familiar with Lindsay might like to visit **www.lindsaybks.com** for a peek at the fascinating array of wild and wonderful titles offered by this unique publisher of technical reprints.

The books Lindsay sent all dealt with antique radio or wireless topics. The idea was to get them into the hands of readers of my column to enhance their interest in our fascinating hobby and, at the same time, make them aware of the quality and scope of the Lindsay offerings. As it happens, I wasn't able to use the books in the way I had originally planned, and they've been sitting in a corner of my office ever since.

I'm still not sure of the best arrangement for distributing the books to our readers, but let's try this for now: e-mail me a short biography, to be shared with other readers, describing your history in the antique radio hobby and some of your recent activities and/or restoration projects. Attach a good picture of yourself – perhaps in your workshop with a completed or in-process restoration project. Don't forget to include your address; all submissions will be rewarded with one of the Lindsay Publications books.



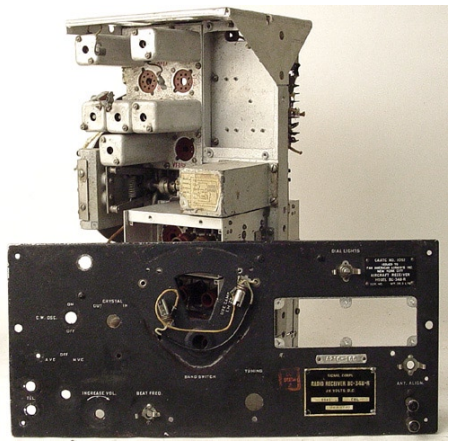
Section of schematic showing dynamotor, audio output and filament circuits. Hand-written numbers correspond to dynamotor terminal strip connections mentioned in text.

Taking my cue from that, I later applied a coat of gloss varnish to the plate and was very much pleased with the result.

❖ Tracing Power Supply Wiring

Also, in this work session, I began to trace the wiring added by a previous owner. Before I get into this, though, let me caution you that you won't necessarily be able to apply directly my experience to a BC-348 you may be working on. Use it as a general guide only.

For one thing, unless you happen to get your hands on a rare mint example (which really ought to be displayed in a museum or collection in untouched condition), your radio will have received various idiosyncratic modifications by hams or SWLs – mostly aimed at changing it over from 28 VDC to 120 VAC operation. For another, there are small differences from model to model and much larger differences between most BC-348 models, including mine, and the BC348-J, -N and -Q. See the May 2007 column for more details.



With the front panel off, restoration work on it could begin (see text).

Before beginning work on your own receiver, I strongly encourage you to get your hands on the military maintenance manual for the model. Without it, you'd be hard pressed to trace changes in the tightly cabled wiring or even identify some of the parts you'll be looking at. As of now, it's easy to get the manual. Go to the Boat Anchor Manual Archive (BAMA) mirror site (seems to work better than the main site) at **http://bama.edebris.com/manuals/** and click on "military-kg7bz," then "bc-358," then right click on the file you wish to download.

The first thing I noticed about my own set was that, as expected, the original 28-volt dynamotor power supply had been removed, leaving a bare, empty well. Originally, somewhere in this well, there had been a strip with five screw terminals for connecting the dynamotor supply to the receiver proper. Mine was gone, but some restorers manage to leave it in place when removing the dynamotor.

If yours is there and unmodified, you have a leg up on identifying the power connections. On my schematic, and probably on yours, the terminal at one end (call it no. 1) is grounded. Counting from that one, no's 2 and 3 (connected together) are wired (via the power switch on the front panel) to the + 28-volt input terminal on the 8-bladed interface plug at the rear of the chassis. No's 2 and 3 are also connected to one side of the tube heater circuit.

Continuing up the strip, no 4 is for the b-minus connection from the dynamotor to the receiver and no 5 is for the b-plus connection.

It's quite important to note, when connecting an a.c. supply to the set, that B-minus is *not* to be grounded, but connected to terminal 4 or to the wire originally attached to it.

Otherwise, at least on my model, you will – among other things – be depriving the 6K6 output tube of grid bias. The friend who warned me about this issue (based on sad personal experience) advised that "quite a lot" of smoke will result.

When I first opened up my BC-348, my eye was immediately drawn to a 17-terminal circuit board (labeled "271" on the schematic) at the back of the chassis just to the right of the interface plug. Hanging off the back of this strip were the cut-off stubs of several wires that had been crudely soldered to various terminals.

That is a sight that no restorer beginning work on a set wants to see! However, acting on the premise that these had been the leads to a previous owner's now-removed power supply, I began examining the board more closely. It turned out that the terminals carrying the cut-off wires had originally been unused. They were now tie points for connecting a power supply to the wires that had originally run to the now-missing dynamotor terminal strip.

After consulting the schematic and making some ohmmeter checks, I was able to identify the b-plus, b-minus, and heater circuit leads, as well as the power input lead from the front-panel switch. I also noted that the heater circuit had been separated from the power input lead so that the switch could be used to control a 120-volt transformer instead of a 28-volt dynamotor. More on this later.

Noted as well was the fact that the tube heaters, formerly connected in series-parallel for nominal 24-volt operation, had been rewired in parallel to operate on 6 volts. Although it's easy to obtain 24-volt transformers these days, I opted to leave the heater circuit as modified. That way, the heaters could run off a standard receiver power transformer.

At first I was puzzled by a fuse on the front panel that wasn't supposed to be there. This is actually a replacement for fuse "140" – seen at the lower left of the schematic section included with this article. Note that it is connected to the contact arm of the front panel power switch. A previous owner had bypassed this fuse, inserted a new fuse holder on the panel, and connected it in series to the lead from the switch arm.

Come back next month, when we'll continue our exploration of the BC-348's wiring.

Monitoring Times HD Radio Report, Part 3
Sangean HDT-1: The Component Approach

By Ken Reitz

While all the other HD Radio manufacturers are introducing HD table radios, Sangean's HDT-1 presents the component stereo approach. This sophisticated looking radio has no built-in amplifier, no speakers, and no antenna. It's intended to be the HD Radio component of your stereo system. This means that your expensive analog stereo receiver won't become obsolete when, or if, a "drop dead" date for analog FM becomes a reality.

Front view of Sangean's HDT-1, the first and, so far, only component HD Radio available. Clean layout design and well-considered functions complement the receiver's capability. (Courtesy: Sangean)

❖ Top Drawer Features

Sangean has designed the tuner to be part of any quality home stereo system and so there's been no effort to cut corners to keep costs down. It has the kind of features many tabletop set manufacturers would like to have, but can't in order to meet discount price points. For instance, the large front panel leaves plenty of room for full sized, generously spaced buttons; the blue LCD display takes advantage of all HD Radio and analog RDS display modes; separate tuning functions for analog and HD Radio lets you automatically tune through the band stopping only on HD Radio signals.

The back panel has the fewest connections possible: two antenna inputs ("F" connector for 75 ohm FM coaxial cable) and spring connectors for AM external antenna, left and right RCA jacks and the AC power connector. That's it. I found the AM connectors perfect for the Radio Shack AM tunable loop antenna. It allowed me to move the loop to a convenient place for tuning and peaking the signal. The tuner generates virtually no heat and could be placed just about anywhere without worrying about air circulation. Of course, you don't want to put it directly on top of a big heat producer such as your stereo amp.

The HDT-1 comes with a credit card sized remote control which duplicates all front panel functions, including the information display, direct frequency entry or preset station recall. You can do HD seek from the remote as well.

As does every other HD Radio made, this radio comes with the standard folded dipole "T" FM antenna and a ridiculous AM loop which is nearly worthless. Of course, we can't expect Sangean (or any other HD Radio manufacturer for that matter) to supply amplified FM Yagis and tunable AM loop antennas, but if you're going to have success tuning HD Radio stations outside of urban locations, that's pretty much what you'll need.

Rear view of the HDT-1. Minimal connections are needed to turn your expensive older stereo into the latest thing. (Courtesy: Sangean)

❖ The HDT-1 at Work

There are 20 FM and 20 AM station presets on the HDT-1 which should be enough in most areas to assign presets for your favorites. Keep in mind that multicasting stations will each need a preset. For example, if your local public station has regular programming on their first channel and news/talk on a second channel, you'll use two presets for that one station and its two signals.

Setting and retrieving the presets is a little quirky. You have to press the "preset" button before actually trying to retrieve a station. It's a cumbersome extra step that takes a little getting used to.

The clock is set manually with the unit plugged in but not turned on, *i.e.* in the "standby" mode. I found that for some reason the clock ran about 5 minutes slow, a peculiarity Sangean was unable to explain. Of course, it's not necessary to have the clock functioning, but it seems odd to me that if you have a digital data stream being transmitted, that a clock setting bit is not part of that stream. No current HD Radios can set their own clocks yet. Perhaps that will be a function in future sets.

The HDT-1 is the most sensitive HD FM receiver I've used. It was able to tune distant HD Radio signals not heard on most tabletop sets using the same antenna. It's hard to know how it will perform on AM, because during the time I had it there were no AM HD Radio stations in my area (there are still only a few hundred nationwide). As an analog performer it did well, especially with the tunable AM loop antenna.

Listening to HD Radio signals on the HDT-1 is a real pleasure, but it will only be as good as the stereo you have it plugged into, and for even better sound I'd like to see a fiber optic output on a next generation receiver. Multicasting is now more common as stations explore the possibilities of having a second program channel at their disposal. During this introductory period, the FCC is not allowing second or third channels to carry commercials, which makes for some truly enjoyable listening. That's not going to last, however, except on the non-commercial stations.

The HDT-1 lists for $199.99 and is one of many HD Radios involved in the national HD Radio rebate program which gives you $40 off the retail price. Full details and a rebate form can be found on the HD Radio web site **www.hdradio.com/2007_HDRadio_Rebate.pdf** The promotion ends 7-3-07.

WHERE TO BUY:
C. Crane: 800-522-8863 **www.crane.com**
Crutchfield: 888-955-6000 **www.crutchfield.com**
Universal-Radio: 800-431-3939 **www.universal-radio.com**

MANUFACTURER SPECIFICATIONS

Frequency range:
AM 520-1710 kHz
FM 87.50-108.10 MHz
Antenna input:
FM 75 coax "F" connector
AM 300 spring terminals
Main Power: 10 watts maximum (120 v AC)
Battery (remote control): 3 v DC (CR2025 battery)
Dimensions: 17" W x 2.75" H x 10" D
Weight: 5.75 pounds

Scanner Programming

Getting the Most from the New Uniden Scanners

By Paul Opitz

Uniden's current crop of scanners uses a radically new programming method. The Dynamic Memory system used in the BC246T, SC230, BCD396T, and BR330T is very different from the banked scanners we've been using for decades. To get the most out of these scanners, you need to unlearn a few old concepts, then learn a couple of new ones. Let's look at how to use the latest scanner technology to get the most out of these new scanners.

To start, we'll introduce some new terminology (see box) and dive right into programming with what has traditionally been the simplest thing to program: *conventional channels*.

Systems contain Channel Groups which hold our Channels. You can assign a Quick Key to a system, and a Group Quick Key to a channel group. Sounds simple enough…

❖ Planning Our System

I cannot emphasize enough the need to do a little homework before you sit down to program the scanner. Programming is pretty straightforward, if you know in advance what you need to program. I use several major internet resources to collect my planning information.

For conventional systems, there are many resources including (home of several regional frequency guides and the now-defunct Police Call), and the FCC's website at **www.fcc.gov.**

To keep our example simple, let's program a system with channels full of stuff we're all familiar with. We'll make a system called "Common Channels," assign it to QK 0 and set up 4 channel groups: FRS as GQK 1, GMRS as GQK 1, MURS as GQK 2, and CB as GQK 3.

See the "Planning" sidebar for all the information we collected to accomplish our task. To keep things a little easier, I've only listed the first 5 channels for each group.

❖ Putting It All Together

I'm going to assume that you have the Owner's Manual for your scanner. So, refer to the manual for such things as how to set alpha tags, and the specific menu sequence to change settings (each scanner is slightly different). I'm also assuming that you delete all other information from the scanner before you start. You can make a backup first, using a free utility from Butel (**www.butel.nl**), if you want to be able to restore settings later.

Power the scanner, and press MENU. The very first option, "Program Systems," is the one we want, so give the scroll control a tap. The scanner now displays the name of one of the systems in the scanner. Give the scroll control a twist and select "New System."

The scanner asks what type of system you want to program. We want "Conventional" for these channels, so select that option and tap the scroll control.

Now, you need to set the system-level settings. These settings are the System Name ("Common Channels"), Quick Key ("0"), System Hold Time (this determines the minimum time the scanner will spend scanning this system before moving on to any other enabled systems), Channel Delay (this determines how long the scanner pauses after a transmission before resuming scanning), and Data Skip (which you should usually turn off).

Next, we need to create a channel group to hold our first set of frequencies. Select "Channel Groups," then select "New Group" to create this group. Name it "FRS" and set the channel group-level settings which includes Group Name ("FRS"), Quick Key ("1"), and Lockout (we'll leave the group unlocked).

Finally, we are actually to the point where we can enter our channel information. Select "Channels," then select "New Channel" to create the first channel. You are prompted to enter the frequency for the channel (start with 462.5625, which corresponds to FRS Channel 1). Then, use the next menu selections to set the channel Name ("FRS 1"), Lockout (we'll leave all the channels unlocked), Alert (which you can turn on if you want the scanner to alert you with beeps when the channel becomes active), Modulation (which you can leave at AUTO for FRS, which will select NFM for this band), Attenuation (turn on only if you get strong-signal interference in your area), CTCSS/DCS (leave turned off), Step (which you can leave at the default), and Priority.

Repeat the above for all the FRS channels, then create the groups for GMRS, MURS, and CB and populate those channels, as well.

Of course, you could have done all of this much faster and easier using software in your PC, but we'll leave that for a future time.

❖ Scanning the Results

Let's see how the scanner behaves with this programming. Press SCAN. The scanner should start scanning through the channels you programmed in. "0" appears on the "SYS" line at the bottom of the scanner (indicating that Quick Key 0 is enabled), and 1, 2, and 3, appear on the "GRP" line (indicating that channel groups 1, 2, and 3 in the current system are enabled). Press 0 – the scanner displays "All Locked" because you've turned off all the programmed systems.

Press 0 again to turn the system back on, then hold F and press 1, 2, and 3, in turn. As you press each button, the corresponding channel group number turns off. When you press 3, the scanner again displays "All Locked" because there are no channels enabled for scanning. Press F+1, 2, 3 again to turn the groups back on.

If you have multiple systems stored in the scanner, operation is a little less straightforward. Enabling/disabling systems works about the same, but to enable/disable a channel group, you must first be sure that the scanner is scanning that group. If it is not, after you press F, you need to scroll to select that system before pressing the channel group quick keys.

PLANNING WORKSHEET

System:	"Common Channels"	
Quick Key:		0
Delay: 2 Seconds		
Hold Time:		1 Second
	Alpha	Frequency
Group:		"FRS"
Quick Key		1
Channels:		
	FRS 1	462.5625
	FRS 2	462.5875
	FRS 3	462.6125
	FRS 4	462.6375
	FRS 5	462.6625
Group:		GMRS
Quick Key		2
Channels:		
	GMRS 1	462.5500
	GMRS 2	462.5750
	GMRS 3	462.6000
	GMRS 4	462.6250
	GMRS 5	462.6500
Group:		MURS
Quick Key		3
Channels		
	MURS 1	151.8200
	MURS 2	151.8800
	MURS 3	151.9400
	MURS 4	154.5700
	MURS 5	154.6000
Group:		CB
Quick Key		4
	CB 1	26.9650
	CB 2	26.9750
	CB 3	26.9850
	CB 4	27.0050
	CB 5	27.0150

A QUICK TRUNKING TUTORIAL

So-called conventional systems are easy to set up and scan, because each frequency in the system typically carries traffic for a single agency or group within an agency. But, while simple, using a discrete frequency for every user group results in either many frequencies to cover all agencies in an area, or the lumping together of agencies onto single frequencies, which could mean that the radio frequency resource is in use by Agency A when Agency B also needs the frequency.

Trunking solves this problem by using a pool of frequencies that is shared by many agencies. The basic concept that lets this work is that any particular agency is typically using a frequency less than 10 percent of the time. With a trunked system, one channel acts as a control channel to assign a frequency to an agency (or, in trunking parlance, a Talk Group) when it needs one, then returns the frequency to the open pool when the agency no longer needs it.

Here's how it works for a typical call. A user in Talk Group A presses PTT on his or her radio. This sends a request to the control channel to assign a frequency. The channel grant for that talk group is then transmitted out on the control channel. This grant tells all the other radios assigned to Talk Group A to tune to the assigned frequency for the duration of the call. The original caller's radio then beeps, and the user can begin the transmission. While it sounds complicated, this all usually happens in a fraction of a second.

For a scanner to follow the traffic for a particular Talk Group, it needs to know the Talk Group ID (a number that identifies the talk group) and the system frequencies. You program in the Talk Group ID (TGID) and system frequencies. The scanner then listens to the control channel data until the TGID you're interested in is granted a channel. The scanner follows that channel grant to the appropriate frequency and you hear the conversation.

VOCABULARY

- First, let's purge a word from our vocabulary: "Bank." Instead, we will use System which is a group of channels and settings that are related by function, geography, or type. All channels in a system must be of the same type.
- Channels are settings that define a specific user. For conventional systems, a channel consists of frequencies, alpha tags, CTCSS/DCS tones, and other associated settings. For trunked systems, a channel consists of Talk Group ID's, alpha tags, and other associated settings.
- Quick Keys (QK) are keys that let you quickly select a system or group of systems. You can assign multiple systems to the same key, giving you the same functionality of combining trunked and conventional systems into one bank on banked scanners.
- Group Quick Keys (GQK) are keys that let you quickly select a group or groups of channels within a system.
- Scroll Control is the rotary encoder knob on the top of the radio used to access many features and settings.

❖ Programming for Trunked Systems

Now that we've looked at how to plan and program conventional channels into a scanner using Dynamic Memory, we'll take it a step further and look at what you need to do to set up a trunked radio system in the BC246T, BR330T, BCD996T, or BCT15.

As with a conventional scanner, a trunked scanner contains system information (things like the system name, system hold time, and, very important, the system frequencies). The system also has channel groups that hold the information about channels you want to listen to.

Unlike conventional scanners, where a channel contains frequency information, a trunked system's channels contain information about the Talk Groups on the system you want to listen to. If you don't know how a trunked radio works, take a moment to read the sidebar "A Quick Trunking Tutorial."

Arlington Fire Talkgroups

DEC	HEX	Zone	Description
53520	d11	1	Fire Dispatch
53552	d13	2	EMS 1
53584	d15	3	FIREGROUND
53616	d17	4	FIREGROUND
53648	d19	5	TRAINING
53680	d1b	6	ADMIN/SUPV
53712	d1d	7	EMS-2
53744	d1f	8	CH-8
53776	d21	9	CH-9 EMS Supv
53808	d23	10	CH-10 TALK
53840	d25	11	CH-11 (Arlington Memorial Hospital)
53872	d27	12	CH-12 (Medical Center of Arlington)
53904	d29	13	CH-13 Training
53936	d2b	14	CH-14
56496	dcb		Arlington Fire Alerting

Arlington Police Talkgroups

DEC	HEX	Zone	Description
53968	d2d	APD NORTH	Arlington Police North Dispatch
54000	d2f	APD WEST	Arlington Police West Dispatch
54032	d31	APD EAST	Arlington Police East Dispatch
54064	d33	APD SOUTH	Arlington Police South Dispatch
54096	d35	CIC 1	Arlington Police CIC Information
54128	d37	North T/A	Arlington Police North Talk-Around
54160	d39	West T/A	Arlington Police West Talk-Around
54192	d3b	East T/A	Arlington Police East Talk-Around
54224	d3d	South T/A	Arlington Police South Talk-Around
54256	d3f	Supervisors	Arlington Police Supervisory
54288	d41	VICE/NARC	Arlington Police Vice/Narc
54320	d43	CID	Arlington Police CID
54352	d45	TACT 1	Arlington Police Tac 1
54384	d47	TACT 2	Arlington Police Tac 2
54416	d49		Arlington Police Ops
54448	d4b		Arlington Police Ops
55088	d73	TACT 3	Arlington Police Tac 3 (Ballpark Details)

❖ Planning Our Approach

Again, even more important than with conventional systems, planning is critical when setting up a trunked system. There are several Internet resources for finding information about trunked radio systems, but by far the most extensive is found in the Database area of **www.RadioReference.com**. I'll use information from this site to create an example of programming frequencies from the Arlington, Texas, area into my scanner.

Here's what you need to find out about your target area:

System Type: The main types of trunking systems are Motorola, EDACS, and LTR. There are subtypes; for example, Motorola 800 MHz, 900 MHz, VHF, UHF, and P25 are all possible system types. You can find the system type by looking at the top part of the system's webpage shown in Figure 1. The system type identified here is Motorola Type II and, since all the frequencies are in the 800-MHz band, we can tell that this is an 800-MHz Type II system.

System Frequencies: These are clearly listed, as shown in Figure 1. For Motorola systems, you only really need the frequencies in red or blue (the possible control channels). For other systems, you will need all the frequencies and their LCN (logical channel numbers); these are indicated on the website by a small number preceding the system frequency as shown below for the Irving, Texas EDACS system. (See Figure 2.)

Talk Group IDs (TGIDs): Identify which groups you want to listen to. It isn't necessary to program in every ID (unless your interest includes listening to the water department and dogcatcher). Each system type uses a different format for TGIDs. For Motorola systems, you need the decimal format for whatever "flavor" of Motorola you're monitoring. Figure 3 shows the data for Arlington FD and PD.

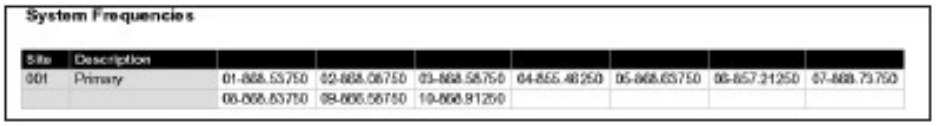
That's it for *collecting* information; now let's organize for our scanning needs. Say I want to be able to independently turn on/off scanning for FD/EMS and for each PD district, I would then create six channel groups as follows:


RadioReference.com
Your Complete Reference Source
Arlington System

System Name:	Arlington System
Location:	Arlington, TX
County	Tarrant
System Type:	Motorola Type II Smartnet
System Voice:	Analog
Sysid:	162A
Connect Tone:	105.88
Last Updated:	09-11-2005 07:35

System Frequencies

Site	Description	Freqs								
001	Primary	856.48750	856.71250	857.48750	857.71250*	858.48750	858.71250*	859.48750	859.71250*	860.48750
		860.71250*	867.56250	868.26250						


System Frequencies

Site	Description							
001	Primary	01-868.53750	02-868.08750	03-868.58750	04-855.48250	05-868.63750	06-857.21250	07-868.73750
		08-868.83750	09-866.56750	10-868.81250				

FD/EMS
Group Quick Key: 1
Channel Tag
53520 FD Dispatch
53552 EMS 1

PD North
Group Quick Key: 2
Channel Tag
53968 North PD Dispatch
54128 North PD T/A

PD West
Group Quick Key: 3
Channel Tag
54000 West PD Dispatch
54160 West PD T/A

PD East
Group Quick Key: 4
Channel Tag
54032 East PD Dispatch
54192 East PD T/A

PD South
Group Quick Key: 5
Channel Tag
54064 South PD Dispatch
54224 South PD T/A

❖ Putting It All Together

Okay, we've collected, planned, and organized, so now it's time to turn on the scanner and load up the system. Again, some details could vary by model, so make liberal use of the Owner's Manual to find out how to enter alpha tags, the specific menu sequence, and so on.

Power the scanner and press MENU. The very first option, "Program Systems," is the one we want, so give the scroll control a tap or press E. The scanner now displays the name of a system programmed into your scanner. Scroll back one to "New System" and press scroll or E to select it.

The scanner asks what type of system you want to program. From our planning above, we know that this is a Motorola 800 Standard system, so select that option and tap the scroll control.

Now, you need to program in the system-level settings. These settings are the system name ("Arlington TRS"), System Options (such as the Quick Key, Hold Time, etc.; we learned about last time), and most importantly for a trunked system, the System Frequencies. Scroll to "Set Frequencies" and follow the prompts to enter all the frequencies for the system. Note that for Motorola systems you only have to enter the Control Channels, but if you opt to enter only these you need to turn on the "Control Channel Only" system option.

Now, use the same method we used last month for conventional systems to create channel groups and enter channel information for this system (select "Edit Group," create a new group, and create channels in that group).

While tedious (entering alpha tags does take some time), since we prepared by learning about our target system and organizing our data before we started programming, this was pretty simple. It also shows off some of the big advantages of Dynamic Memory.

With a banked scanner, even though a bank might have 100 channels for frequencies, since you could only enter one type of system per bank, any unused channels were pretty much wasted. Also, since a banked scanner only has 10 banks, at most you can program and scan 10 systems at a time. With dynamic programming, though, the scanner's memory is completely freed up until you use a channel. A system could have a single channel (which would use up one memory) or 1,000 channels (using 1,000 memories), leaving the rest of the memory completely available for additional systems, up to the scanner's memory limit. It's a much more efficient use of memory.

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MT REVIEW

A "Mounting Problem"

John C Harr

I have a "mounting problem"! I own an assortment of radio and GPS gear that I like to carry around with me – especially on trips. This doesn't sound like much of a problem until I say that I am not always traveling in the same vehicle. I drive my truck back and forth to work each week day and to run errands on the weekends. But, sometimes my wife wants to go along and she prefers not to ride in the truck. So, we take her SUV shopping, out to lunch, and on long trips together.

I like to have at least one of my handheld scanners and sometimes my 2-meter mobile transceiver in the vehicle with me. So, the problem to be solved is how to mount these pieces of equipment so that they are securely fastened and yet can be easily moved from vehicle to vehicle.

Your needs for mounting equipment may differ from mine. Perhaps you always use the same vehicle, but prefer to remove your equipment when you are not there to prevent theft or damage. Maybe you just need a secure method to mount your equipment permanently, yet out of the way of the controls and seating. I have some suggestions and examples that may help you solve your "mounting problem."

What Kinds of Mounts?

For this discussion I have divided mounting solutions into four classes. In times past, the equipment was so large, bulky, and heavy that the only effective method of mounting was with a mounting bracket, usually supplied with the item, securely bolted to the metal of the dashboard. This is the first class of mounting solution – the metal mounting bracket.

Since using metal in dashboards is a thing of the past, a conventional mounting bracket is not always a viable option. Modern equipment is smaller, lighter, and more compact than those old mammoths we used in the past. There is a crop of new mounts to match – many designed for cell phones, personal digital assistants (PDAs), MP3 players, or satellite radios – that will also work just fine for mounting your gear easily, securely, and quickly.

Traditional bracket mounted transceiver and XM radio receiver in the truck

Three suction-cup mounts: Left to Right: RAM-Mount Universal Mount, Bracketron GNSM Flexible Mount, RAM-Mount for eTrex

These mounts can secure your devices to your vehicle's dashboard, cup holder, air vent or other convenient location. Such small, inexpensive solutions constitute the second class of mounting solution.

The third class of mounting solution is the assortment of professional mounting devices designed specifically for your equipment. These devices can be obtained as permanent or temporary mounts attached to the floorboard, dashboard, windshield or other location in your vehicle. They are a bit more expensive than the first two classes, but provide a more secure and durable solution.

The last class is fabricated or homemade mounts. These are usually custom-made by or for the owner to satisfy unique requirements. They may be small brackets fastened to the dashboard for small handheld radios or large racks for multiple radios or gear mounted in tiers on the floorboard. They may be portable or permanent solutions depending on the user's preference and application.

Conventional Mounting Brackets

The conventional metal mounting bracket needs little description. It is supplied with most mobile radios marketed in the U.S. today. The big advantage of this mount is the convenience of having the mount on hand immediately after the equipment is purchased and at no additional cost to the consumer.

The downside is it usually requires holes to be drilled into some part of the dashboard to fasten the bracket in place, and it is a relatively permanent solution. The thumb screws, bolts, or knobs used to hold the equipment in place on the bracket are often awkward to reach and difficult to remove and replace quickly. This option is best suited for permanent mounts where the equipment will remain in place for long periods of time and where the holes drilled in the dashboard will not be an issue. This is the method I use to secure my 2-meter transceiver in my truck. I never move it from vehicle to vehicle and want a very sturdy, durable, and reliable mount.

Small Inexpensive Mounts

A large selection of small mounting devices available for cell phones, mp3 players and other small electronic items are available at many discount stores and can be used to mount small handheld radios and other lightweight equipment to your vehicle. These can be obtained at very reasonable prices and in many different styles. They can be used to fasten your equipment to air vents, windows, cup holders, or just about anywhere there is space. In almost all cases, no permanent damage or alteration to the vehicle's interior is required to use these solutions.

Caution must be used to ensure the mounting device is of sufficient strength to securely hold the piece of gear you are planning to mount. This is crucial, as many of the devices are made of inexpensive materials such as plastic and are designed to support the relatively small weight of a cell phone or mp3 player.

These mounting devices are best used when an inexpensive, lightweight, but very flexible

Bracketron Flexible Mount holding my BR330T in the SUV

RAM-Mount for eTrex mounted to the SUV windshield

mounting solution is required. I found a suction-cup secured, flexible shaft mount in my local Circuit City designed for a satellite radio installation that works great for holding my handheld radios like the BCD396T and BR330T scanners. It is manufactured by Bracketron, LLC.

❖ Professional Mounts

If you are looking for a professional or custom fit solution, there are several manufacturers that can supply you with mounts made for your specific equipment and vehicle. While these mounts can be expensive, they may be worth the extra cost for the professional, finished, secure mount that they provide.

Some manufacturers offer easily removable mounts that can be quickly relocated from vehicle to vehicle by use of suction cup mounting devices. These mounts are not usually available through local suppliers, but must be obtained by ordering over the telephone or from online sources. I have listed several sources at the end of this article and most have catalogs available for browsing on their web site. I use two such mounts from RAM-Mount. They hold my GPS and small radios in place by mounting to the windshield in the SUV or truck.

❖ Make Your Own

If you are not able to find a satisfactory solution among the ones already mentioned, you may have to (or may prefer to) manufacture your own custom solution. This may be less expensive, more convenient, and more effective for you, depending upon your skill level, tools, and materials on hand.

Racks for multiple radios can be manufactured from composition board, plywood, sheet metal, or any other materials you may have on hand. They may be upholstered with vinyl fabric or painted to match the interior color scheme of your vehicle or equipment.

Securing such mounts to the vehicle may be a challenge, but use of L brackets or hinges may do the trick. For a very portable solution, try fastening the mount to a small sandbag made of vinyl fabric. The weight of the sand and the flexibility of the vinyl can provide a relatively secure mount, even on non-flat surfaces such as a transmission hump. This configuration can easily be moved between vehicles.

❖ Find the Right Solution

Finding the right solution or combination of solutions may require some experimentation and patience. However, the use of one or more of these methods may make your enjoyment of your hobby much more satisfying and safe. Fumbling with a handheld radio or GPS unit while trying to navigate traffic is not anyone's idea of safe fun, and having your equipment where you can reach it without being a contortionist is paramount. I hope that after reading this you feel like investigating some of these solutions to enhance your hobby experience and solve your "mounting problem"!

MOUNTING SOLUTION PROVIDERS

National Products, Inc.
RAM Mount Division
(206) 763-8361
www.ram-mount.com

Tessco Technologies, Inc
(800) 508-5444
www.tessco.com

Arkon Resources, Inc.
(800) 841-0884
www.arkon.com

GBX Direct
(800) 571-2551
www.gbxdirect.com

Bracketron, LLC
(800) 660-1784
www.bracketron.com

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That's Still What I Call DX!
Radio Jupiter Pro 3

A few years ago, in March and April of 2003, we looked to the heavens for some real DX. Our target was Jupiter, the largest planet in our solar system. At that time we looked at the physics of the various emissions types in some detail. This month we will revisit monitoring the radio waves that Jupiter emits in the shortwave band. However, we will go lighter on the physics and concentrate more on a very useful program, Radio Jupiter Pro 3, and monitoring tips.

Radio Jupiter Pro 3 is a program that performs many helpful tasks, making monitoring Jupiter much easier. Prediction charts, skymaps with antenna patterns, easy to use observer log, and unattended automated data-logging and antenna rotator control are a few of this program's features.

Of course, you will need a reasonable quality shortwave receiver and at least an outside dipole antenna. That's the RADIO part of this column! Let's get started with a *simple* discussion of the origins of Jupiter's radio signals.

❖ Not Little Green Hams!

Jupiter's radio signals are natural in origin, not the result of life forms on the planet attempting to communicate with us. With the exception of the Sun, Jupiter is the most active radio source in our solar system. When we look at the frequency range of the signals coming from Jupiter, it becomes apparent that three different mechanisms are at work.

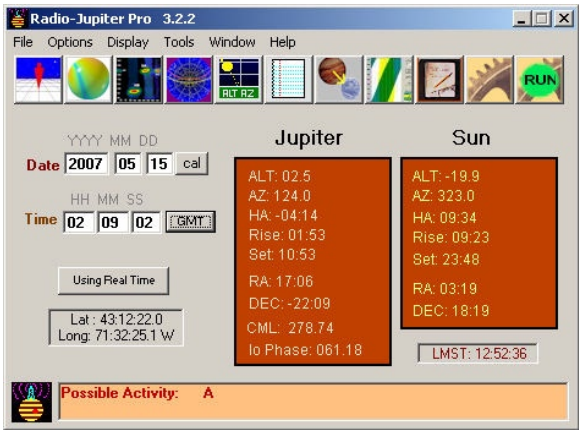


Figure 1 – Radio Jupiter's Main Screen – 11 Function Buttons at top, Jupiter, Sun and observer middle and "alerts" at bottom.

The first two mechanisms of Jovian (from the Greek for Jupiter) radio wave production come from energetic electrons in the atmosphere of the planet. One mode is thermally generated in the atmosphere and the other occurs as a result of electrons "caught" in Jupiter's magnetic field. These signals range from above 1000 MHz to frequencies around 100 MHz.

The key to the third radio signal generation mechanism has to do with Io, one of Jupiter's four largest moons. Jupiter has over 60 moons in total. As Io rotates around Jupiter, it passes through Jupiter's massive magnetic field. As it moves in its orbit, Io accumulates electrical charge – in fact, quite a huge charge. One side of Io can be charged to a half of million volts!

As Io continues its circular journey around Jupiter, at times it suddenly "discharges" itself to the planet. This can result in a "discharge" of over 5 million amps between Io and Jupiter's atmosphere. Can you imagine if our moon acted the same way to Earth? This massive current flow produces a "burst" of electromagnetic emissions in the radio spectrum of 3.5 to 39 MHz.

Let's see, 500,000 volts at 5 million amps [(5 x 10^5x (5 x 10^6)] equals 2,500,000,000 kilowatts of power! In 1955 it was these signals at 22 MHz that proved to astrophysicists that Jupiter had a magnetic field.

Keep in mind, here we have used a much-simplified model of Jupiter's physical processes. See the 2003 article for more details of these processes.

❖ Where to Listen

Now we know that the Jupiter-Io bursts occur in the 3.5 to 39 MHz range. However, below 15 MHz the Earth's ionosphere severely attenuates the signal. So, our best bet for monitoring Jupiter is 15 MHz to 28 MHz.

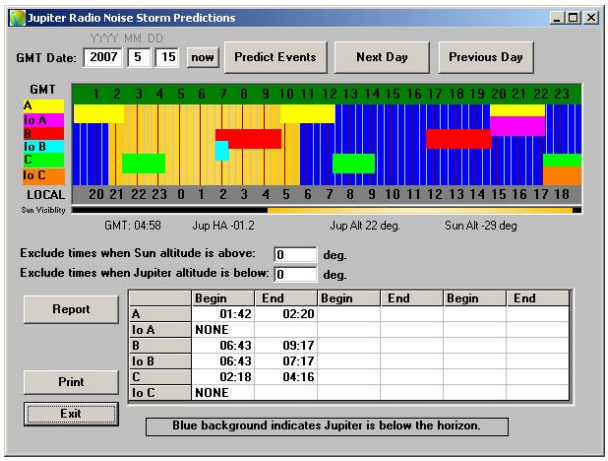


Figure 2 – The Jupiter Radio Noise Storm Predictions display.

❖ When to Listen?

Using real-time orbital positions of Io and other factors, predictions of Jupiter's electromagnetic storms are possible. That is where Radio Jupiter Pro comes in, but the program also adds many other functions, such as geometric calculations of the observer's geographic position on Earth relative to Jupiter's position in the sky. Let's what this program can do for us.

❖ Radio Jupiter Pro 3

This 2.8 MEG program has been tested successfully on PCs with Win98/2000/XP operating systems. PC requirements are minimal, 10MEG of RAM and less than 3MEG of HD space. Even an old 200 MHz Pentium I would do the job. I ran it on a Vista Home Basic PC for this column without problems.

Radio Jupiter's Main Screen, Figure 1, displays the eleven functions buttons along the top, details of the position of Jupiter, the Sun and the observer in the middle and "alerts" at the bottom. The Command menu line, above the function buttons, also allows access to other functions.

Selecting the top left button we can configure the program to our specific geographic location using a number of methods. Placing the cursor over your location on a map of the Earth will input your approximate longitude and latitude into the program. If you know your longitude and latitude exactly you can manually enter them. Alternatively, you can

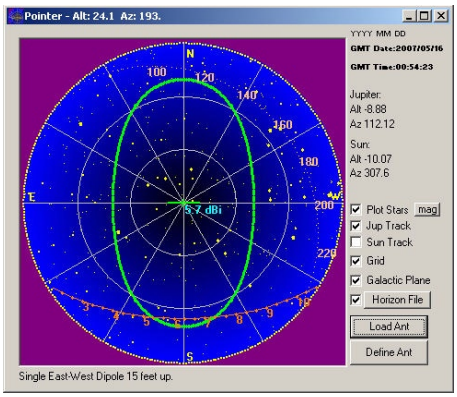


Figure 3 – Sky Map Screen showing at what time Jupiter comes into our antenna pattern 05 to 07 hours (See bottom of screen)

choose a city near to you from the program's database.

Before we do anything, we should enter the basic parameters of our antenna using the fourth button from the left. OK. Now we are ready to use some of the major functions of the program.

❖ Storm Predictions

As we have discussed above, Jupiter's radio signals originate from "storm" events. Pressing the second button from the left displays the "Radio Noise Storm Predictions" screen, the heart of the program. See Figure 2. Let's dig in and try to understand all the data presented on this screen.

This screen is split into the top section, a graphical representation of data, and a summary chart in the bottom section. First let's look at the top section. In the graph "time" is expressed along the top of the chart in GMT and local time along the bottom. Areas of the chart colored blue indicate that Jupiter is not visible from your location. Conversely, in the yellow regions Jupiter is visible.

However, Jupiter is not the only radio source in the sky. So the times when the sun is visible from your location may not be the best times for listening for Jupiter. The line under below the local time tells us the relative position of the Sun. When the line is black, the sun is below the horizon at the observer's location.

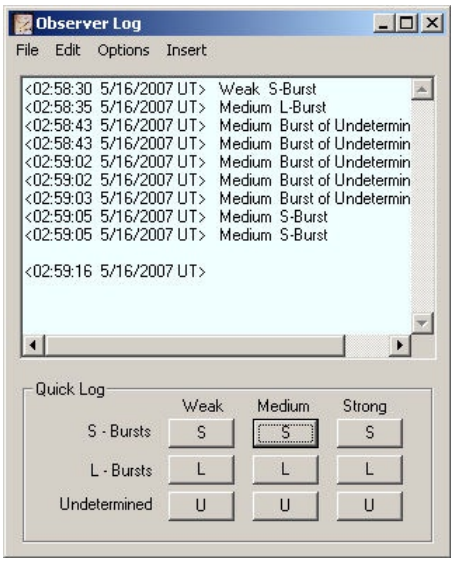


Figure 4 – The very easy to use and very useful typical Observer Log.

At the left of the graph in Figure 2 are shown the different emission modes of Jupiter (A, Io A, etc). For our purposes we will assume any of these modes will produce signals in the shortwave range. Therefore, when any of these bars appear in a non-blue region, we have the *potential* of hearing Jupiter's signals at these corresponding times. These are the predictions we have been looking for! The beginning and ending times for each bar are shown in the summary chart below the graph.

Remember that, although these predictions are based on astrophysical phenomena on Jupiter and Io, they are still only predictions.

❖ Antenna Considerations

Now we know when Jupiter may be "on the air." If it is visible from our location, we should check if our antenna pattern intersects with the part of the sky where Jupiter is located. This is determined using the Sky map, fourth button from the left. Figure 3.

On this display, as a result of us using a single dipole antenna oriented East-West, its reception pattern is displayed superimposed on the sky. Also displayed is the position of Jupiter in "our" sky at various times. The best chance of monitoring the planet is when the track of Jupiter is inside our antenna pattern. This occurs between 05 and 07 hours GMT, as seen at the bottom of Figure 3.

As we have seen from the Sky Plot, the antenna is clearly a limiting factor. A simple homemade dipole antenna cut to 20 MHz is a good candidate. A dual dipole will give greater time period of monitoring Jupiter. Of course a steerable tuned antenna array, or log periodic, would be optimal …if you have the money, real estate and understanding wife.

❖ Radio Requirements

If you have a shortwave receiver similar to an ICOM R-71, Kenwood R-5000 or Yaesu FRG-100, you will have hardware to copy Jupiter signals. But even other receivers such as the old Kenwood R-1000 would also work well.

Since Jupiter's signals are broad-banded, the receiver's frequency stability and selectivity are not an issue. So give whatever tabletop receiver you have a try.

Put your receiver in the AM mode and turn off the automatic gain control (agc). Now check Radio Jupiter Pro 3 for a "good" time to listen.

It's now time to sweep between 15 and 25 MHz and listen …but for what?

❖ What Does It Sound Like?

Hearing what Jupiter's signals sound like so you know what to listen for would be helpful. Wave files of Jupiter's L and S signals can be found at **http://radiosky.com/rjcentral.html**.

❖ It's Your Turn

You now have all the knowledge, equipment and computing power to monitor Jupiter. Add some patience and you'll be rewarded with *real* DX.

A final hint: before you start attempting to monitor Jupiter, check current solar activity. High solar activity causes the Earth's ionosphere to become opaque to radio waves, therefore blocking Jupiter's signals.

❖ Program Summary

We have just looked at a few of the major functions and features of Radio Jupiter Pro 3. Two important features that I used, but have not covered are the very useful and easy to use Observation Log (see Figure 4) and relationship-saving Automated (unattended) Commands.

Other program features we did not have to time to cover:

- "Quick Look" prediction chart helps spot the best storms.
- Customizable prediction reports.
- Yearly Jupiter visibility chart.
- CML Io-Phase chart displays Jupiter's high probability areas.
- Observation records with timestamps, position info, and one click burst notation.
- Chart the Jovicentric declination of the Earth.
- User can write simple plain-language "scripts" to run antenna rotator via the serial or LPT port.

As with all of the functions of the program I tried, these worked great.

Radio Jupiter Pro 3 can be downloaded from the **www.radiosky.com**. The full version is very good value at $19.95. A free 30-day demo is also available. Go for it, reach for the stars. Well, at least listen to a planet.

What's NEW

Tell them you saw it in Monitoring Times

AX-81S Active HF Antenna

The AX-81S antenna is a compact active HF monopole (3.8-ft) antenna, designed to stand up to harsh outdoor conditions, particularly marine environments. The principal elements will resist corrosion and fracturing. The BNC-type coaxial connector inside the mounting base is well-protected from the elements.

The antenna is designed for the frequency range of 2 to 30 MHz, but good reception is possible down to 300 kHz and as high as 50 MHz.

While it has been designed primarily as a marine antenna, the AX-81S can be useful anywhere good HF reception and reliability are required, and where space is at premium. It is especially compatible with the WiNRADiO ***G33EM*** marine receivers and ***G303/G313*** range of HF receivers.

The antenna may be erected on a 1" diameter mast using standard #14 thread or may be mounted using an optional rail or deck mounting base. 12vdc power must be supplied to the antenna via the coax. WiNRADiO recommends using a low noise power supply together with a Bias "T" power injector, both available from WiNRADiO or Grove Enterprises (WR's distributor in the USA). If used with the WiNRADiO ***G33EM*** receiver, no external power supply is needed.

The WiNRADiO AX081S is $189.95 from Grove Enterprises (800-438-8155; **www.grove-ent.com)**

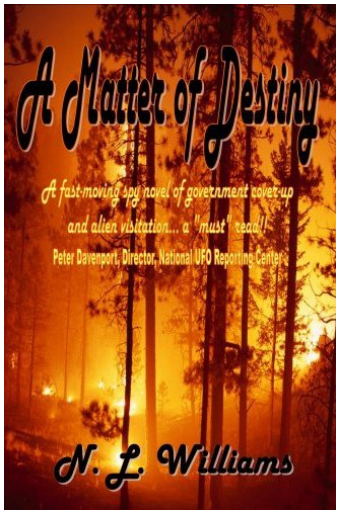
A Matter of Destiny

"Destin pushed through the throngs of people packed against him and groaned. In these crowds, George Eisenhardt would be impossible to find. He'd already blown fifteen minutes, searching the masses of people jammed on the main convention floor of the Orlando, Florida Hamfest, an amateur radio convention...."

If you're looking for some great summer reading, something that catches your imagination, involves communications, and keeps you entertained, *A Matter of Destiny* by N.L. Williams fills the bill! This 210-page paperback volume is perfect for a long weekend at the beach – or better yet, at a cabin in the mountains. The scene for this thriller is set right in *Monitoring Times'* back yard – the author even hand-delivered our review copy.

It seems "Fontana Labs" near the TVA's Fontana Dam is working on a government "black" project, unbeknownst to many of the scientists working there. And someone will stop at nothing to make sure the secret doesn't leak out. In the process of investigating the murder of his best friend, Destin finds friends in other hams and good-hearted people. Gradually, they realize more is at stake than justice for murder – it could mean the survival of the world.

The very real geography and the convincing personalities that populate the book more than make up for any shortcomings in manuscript errors. The heroism of ordinary people like you and me quickly draws you into the story.



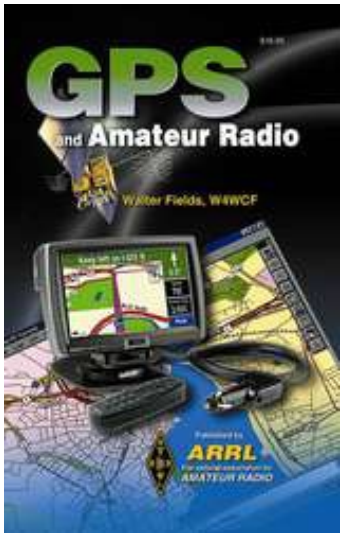
NL Williams also knows her subject matter. Always near aircraft, Williams participated in the Civil Air Patrol and the Air Force, and her husband is a career Air Force man. Both she and her husband are avid ham radio enthusiasts. Her favorite frequency is the 442.550 band owned by Charles Satterfield in Tellico Plains, Tennessee. She also enjoys checking into several group HF nets, especially the RV Service Net.

A Matter of Destiny is available from booksellers such as **Amazon.com**, or you can purchase directly from the author. Mail a check for $14.95 to N. L. Williams, P. O. Box 1477, Robbinsville, NC 28771. To read a chapter from the book, visit her website at **nlwilliamswriter.com**

GPS and Amateur Radio

Global Positioning System (GPS) devices have become commonplace in consumer electronics. GPS units and GPS technology are used in our cars, on our boats, in cell phones, in our personal computers and PDAs. GPS has improved the way we navigate, communicate, and move about the planet.

GPS and Amateur Radio by Walter Fields, W4WCF, explores GPS: its history and how it works, what to look for in a GPS receiver, and navigating with a GPS receiver. He also examines ways in which Amateur Radio operators have made use of GPS technology for communication and recreation.



A popular ham radio application is in the Automatic Position Reporting System, or APRS. By connecting inexpensive GPS receivers to their radio gear, hams transmit their positions and other information, which is then displayed on maps at the receiving stations. The result is an effective method of direction finding for public service activities such as search-and-rescue – and for fun!

GPS and Amateur Radio is available for $18.95 from the publisher ARRL (225 Main Street, Newington, CT 06111-1494; 1-888-277-5289; **www.arrl.org)**

The Secret Wireless War

Possibly the most important United Kingdom wireless traffic in World War II was handled by a unit formed in 1938 by Brigadier Richard Gambier-Parry as part of the communications division of Britain's Secret Intelligence Services ("SIS"). *The Secret Wireless War, The Story of MI6 Communications 1939-1945* by Geoffrey Pidgeon tells of its formation and includes diary entries by one of the founding fathers of this group.

First published by UPSO Limited in East Sussex, England in 2003, the *Secret Wireless War* offers a history of the SIS, its growing use of wireless in the 1930s, its involvement in the dissemination by wireless of Enigma intelligence, and a whole range of secret uses of wireless as part of the successful prosecution of the war. Any shortwave radio listener with an interest in secret communications will find the book very interesting. Shortwave radio communications and the ability to intercept and use enemy information were of paramount importance during World War II.

The *Secret Wireless War* recounts the personal tales of those who were part of this most secret of units, and documents events that helped to win the war: secret agents abroad, wireless operators handling "Ultra" and agent's

traffic, wireless engineers, interceptors, and administrators; the story of Churchill's personal wireless operator; a fleet of more than 70 Packard motor cars and converted Dodge ambulances used as mobile wireless stations; and hams listening to the Abwehr (German secret service) and the Gestapo. This is an extraordinary story that includes hams among those patriots that undoubtedly helped the Allied war effort.

The book is divided into three parts. Part I provides background information about the SIS and the early days of Barnes Station X. Part II describes Whaddon Village, Bletchley Park, the Special Communications Units, Black Propaganda, Mobile Construction and Clandestine Wireless activities. Finally, Part III provides individual stories of the men and woman involved in the Secret Wireless War from 1939 through 1945, including that of the author and his parents.

If you have ever wondered about secret communications activities during the war, this book will reveal the secrets of the professionals responsible for this effort. The *Secret Wireless War* covers a broad range of special topics through individual personal stories of many of the people involved in MI6 Communications. This makes the book highly personalized and generates a sense of being there as these young lads lived the experience. A large array of pictures showing the equipment utilized by these people in conducting their secret communications efforts is almost like strolling through a radio museum. Especially interesting are the transmitters, receivers, aerials, and installations in automotive vehicles.

It's amazing how many of these youthful *volunteers* made it into MI6 as wireless operators. In the late 1930s, wireless radio was still relatively new and its uses were constantly being expanded. If you could operate using Morse code, you were extremely valuable for communications purposes. Therefore, instead of being assigned regular army or navy duties, these highly skilled individuals wound up in the employ of MI6 where their wireless communications skills were extremely valuable.

The *Secret Wireless War, The Story of MI6 Communications 1939-1945* by Geoffrey Pidgeon is 416 pages of fascinating reading and contains 194 black and white illustrations mainly from the war years including many pictures of secret agent's wireless sets. Although the technical side of matters is essential, it was not allowed to dominate the book, making it very easy for the non-technical reader. It is printed on high-quality paper in an oversized hardback size, 12" x 8.5". It is available from Universal Radio, Inc., 6830 American Parkway, Reynoldsburg, OH 43068 (orders at 800-431-3939; information at 614-866-4267) or check out their website (**www.universal-radio.com**), for US$54.95 plus shipping.

— *Reviewed by Richard A. D'Angelo*

Coming (soon?) from GRE

In late-breaking news, GRE America announced at the recent Dayton Hamvention that they will be releasing six new scanners under their own label. Previously, GRE has manufactured products for sale by Radio Shack.

The new units will be:

GRE PSR-100/200/300/400 Analog units
GRE PSR-500/600 Digital units

Some of these no doubt will be equivalent to existing Radio Shack models, but hobbyists are eagerly awaiting specifications on the new digital models.

Most significant is the implication that GRE will be marketing their own products instead of being restricted to selling through Radio Shack outlets.

The first of the GRE-labeled products is not expected until fall of 2007 at the earliest. But stay tuned: anything can happen, since this development was not anticipated, either!

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NON-COMMERCIAL SUBSCRIBER RATES: $.25 per word. All merchandise must be personal and radio-related.
COMMERCIAL, NON-SUBSCRIBER, AND MULTIPLE SALES RATES: $1.00 per word. Commercial line ads printed in bold type.

Ads for Stock Exchange must be received 45 days prior to publication date. All ads must be paid in advance to Monitoring Times.
Ad copy must be typed for legibility.

1-3/4" SQUARE DISPLAY AD:
$50 per issue if camera-ready copy or, $85 if copy to be typeset. Photo-reduction $5 additional charge. For more information on commercial ads, contact Beth Leinbach, 828-389-4007.

Attention all those wanting to know what's going on with ham radio in the New Orleans area, check out: **http://groups.yahoo.com/group/GNOAmateurRadio/**

For Sale: Sony ICF77 and ICF2010 in mint condition. Asking $500 each. Call Ben, 732-238-3438 or cell 646-662-8635.

Blogs offer an opportunity for columnists to share information that does not make their columns. The news might be too timely for deadline, too short, confined to a small geographical area, too far away to be heard in North America, or even off the columnist's regular "beat." Bookmark these blogs for frequent visits!

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