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Early Plastic Radios

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- The Knight-Kit Saga
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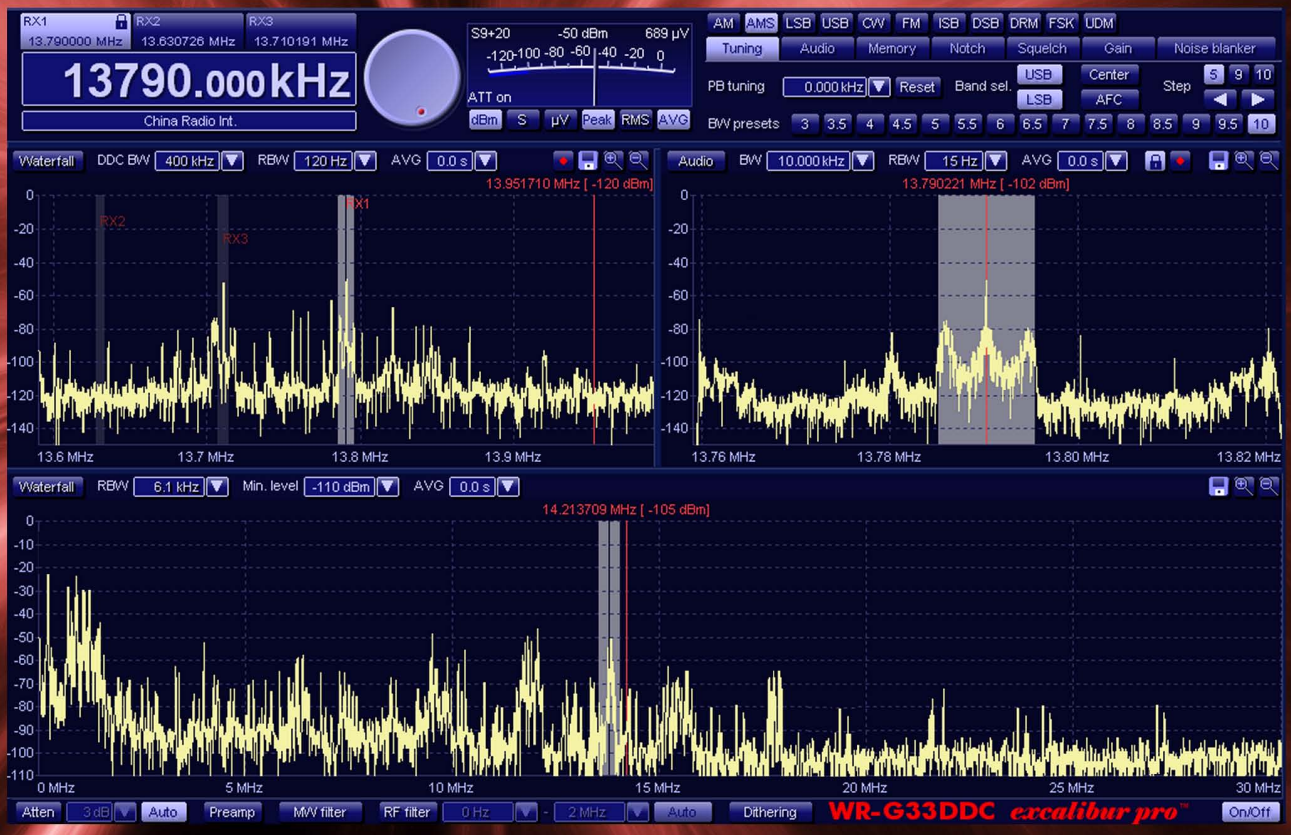

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Monitoring Times

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The Colorful World of Early Plastic Radios.....8

By Merrill Mabbs

The magic of radio broadcasting and the color potential of plastic molding became a retail sensation that swept the industry from the 1930s to the 1950s. Radio designers let their imaginations take over as these amazing radios lit up their owner's living rooms, kitchens and bedrooms.

Merrill Mabbs has a world class collection of these early plastic radios and, in this month's cover story, he shares his passion for collecting them. He also gives readers some insight on how and what to collect as well as tips on restoring the insides and the beautiful outsides of these much sought-after radios.

You'll also learn about the man who started it all: Frank Angelo D'Andrea, founder of FADA Radio. From manufacturing crystal detectors in 1921 to producing the famous FADA 1000 Bullet in 1945 (pictured on the front cover) FADA radios inspired other manufacturers as well.

On Our Cover

From bottom left: GE Jewel Box; FADA 1000 Bullet; Addison 5 AM/SW; Air King 770. (Courtesy: Merrill Mabbs)

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COMMUNICATIONS

by Ken Reitz

AMATEUR RADIO/SHORTWAVE

Deutsche Welle Announces Major SW Reduction

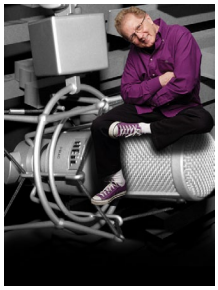
In a press release dated May 15, Deutsche Welle radio announced sweeping changes in their shortwave broadcast schedule. The release read in part, "On November 1, 2011, DW will be discontinuing the shortwave broadcast for German, Russian, Farsi and Indonesian. For English, the shortwave broadcast will be limited to Africa. The broadcasting times for Chinese programming will be reduced from 120 minutes to 60 minutes...Starting in November, DW will only be broadcasting radio programming via shortwave in the following languages: Amharic, Chinese, Dari, English and French for Africa, Hausa, Kiswahili, Pashtu, Portuguese for Africa and Urdu."

Deutsche Welle studios (Courtesy: Deutsche Welle)

DW will cut relay programming as well, "The financial operation is no longer possible and the relay stations will stop being used on November 1, 2011 and closed at the next possible point in time. With the reduction of rental prices and the closing of the two relay stations, DW will be able to save resources that can be reinvested in the further development of its services."

Heil Hosts Ham Program on TWiT

According to a PR announcement from Heil Sound, ham radio audio guru Bob Heil K9EID is hosting a new netcast program on Leo Laporte's TWiT.tv network called "Ham Nation." The show, which debuted May 24, focuses on equipment, applications, tips and general information for all hams. The first guest on the show was legendary guitarist Joe Walsh WB6ACU who also wrote the program's theme music.



The show airs live Saturday evening at 6:00 pm ET. The show will be archived at the TWiT web site **http://live.twit.tv** for viewing on demand. Laporte's "Tech Guy" national radio show on technology airs on more than 100 radio stations nationwide and is heard on XM satellite radio.

Radio Nord Continues MW & SW Tests

Former 1960s Swedish radio pirate Radio Nord, now known as Radio Nord Revival, has received permission to operate 2.5 kW on 1512 kHz and is awaiting permission to broadcast on shortwave in the 31 and 41 meter bands with 10 kW. According to the station's blog (**http://radionordrevival.blogspot.com/2011/05/radio-nord-revival-soon-on-air-on-603.html**), the medium wave transmissions began May 27. They will run nighttime shortwave test transmissions to North America when Swedish authorities grant a license to do so. The station's blog stated, "We are also planning a small Radio Nord exhibition on board and the plan is to build a studio with vintage equipment of the same type that was used by Radio Nord."

DX Partyline Ends

Vintage 1960s HCJB QSL (Courtesy: Ken Reitz KS4ZR)

Long time shortwave broadcaster HCJB announced the end of its popular radio show *DX Partyline* which ended exactly 50 years from the date it began. The move signals the latest in the slow decline of a once powerful and popular shortwave voice which terminated shortwave transmissions in 2009.

In an HCJB press release, current show host, Allen Graham, cited, "gobal change in our ministry priorities as a mission and my increased involvement and work responsibilities in areas very different from those I had when I arrived in Quito as a producer in English Language Service in August 1993," as reasons for the move.

PUBLIC SERVICE

Paper Asks PA to "Pull Plug" on P25 Network

A May 13 editorial in the central Pennsylvania *Patriot-News* titled, "Too Much Static: Statewide radio network proves a bust," began with these words, "Pull the plug on the Pennsylvania Statewide Radio Network." The editorial decried the system that is more than 10 years past its original completion date, at least $320 million dollars over budget, and is "getting failing marks from some agencies that use it."

In addition, the editorial reports that "state police troopers have experienced 161 radio service outages on average each month." The paper also noted that, "even with 931 towers and microcell sites, they are still finding spots where there is no coverage." The editorial reminded readers that, "Just two years ago, New York State canceled a $2 billion contract with M/A-COM, the same company used by Pennsylvania to build a radio network, due to ongoing and unresolved deficiencies with the system."

The scathing editorial concluded that the state legislature should call for an investigation of the original contractor as well as state officials and employees involved in the decision to embark on the system.

AM/FM/TV

FCC Tallies Broadcast Stations

The FCC announced the total number of broadcast stations as of March 31 as 30,643. That includes 4,778 AM; 6,533 commercial FM and 3,417 non-commercial FM as well as 859 low-power FM stations. But the number of FM translators and boosters totaled 6,141. Just under 11,000 FM stations are crowded onto the band, more than double the number of AM stations.

FCC Commissioner Cashes Out

Last month this column reported the career move of former FCC Chairman Michael Powell to head the nation's biggest cable-TV lobby. But, at least he had the cunning to lay low for a few years, toiling in the lush fields of telecommunications law before making his move. Not so with FCC Commissioner Meredith Atwell Baker, who cashed out of the Commission just months after she cast her vote to approve the merger of cable giant Comcast and NBC/Universal.

Her new job? Senior vice-president for government affairs at Comcast. She's no stranger to the FCC's well-oiled revolving door, having earlier worked for the Cellular Telecommunications Industry Association, the cell phone industry's main lobby group. Atwell was the acting administrator for the National Telecommunications and Information Agency during the DTV conversion two years ago.

SATELLITE

XM/Sirius Adds Diversity Channels; Plans Fee Hike

Satellite radio monopoly Sirius/XM announced on April 18 that it would lease 4% of its channel capacity to "diversity" groups in order to comply with conditions the FCC laid out three years ago in the 2008 merger of the two separate satellite radio services, the only two granted licenses by the FCC.

According to a Sirius/XM press release, Washington, D.C.-based Howard University will lease two channels to present one channel of music and talk programming aimed at the African-American community and another that will involve music and talk programming from other historically black colleges and universities.

Eventus-National Latino Broadcasting will also lease two channels, presenting one featuring Spanish language talk and the other Spanish language music. WorldBand Media will also produce a Spanish language talk channel. KTV Radio will originate a combination music/talk channel in the Korean language. And, Salt Lake City-based Brigham Young University, which broadcasts its programming over the air on KBYU-FM, Provo, Utah, will originate a channel of "music and talk programming for the Mormon community."

The diversity programming requirement paves the way for a subscription fee increase which company CEO, Mel Karmazin, told investors in a May conference call would be "more than inflation."

FCC ENFORCEMENT

The FCC's Enforcement Bureau page is starting to look more like a police blotter with radio violations handed out faster than traffic tickets at a deep-south speed trap. This month, EB badges flashed for everything including FM pirates, AM pirates, shortwave pirates and imbeciles making phony marine distress calls.

FM Pirate Busts Galore

For whatever reason, FCC field agents have stepped up enforcement of AM and FM radio piracy in actions that even got the attention of several mainstream news outlets. Field agents seem to be ratcheting up the fines just as pirates seem to be ratcheting up the defiance. But, the pirates are in a losing game as so many found out in the month of May, the last reporting period since the previous *Communications* column.

One operator from Orange Park, Florida admitted to being involved in unlicensed radio for 19 years, an admission that earned an extra $5,000 tacked onto his $10,000 fine. One woman from Miami, Florida who had earlier been issued a Notice of Violation under another name additionally refused to let agents inspect her station on a second inspection. That netted her a total $22,000 fine.

FCC agents issued Notices of Unlicensed Operation (NOUOs) to AM pirate ops in Arizona City and Casa Grande, Arizona (both operating on 1610 kHz); FM pirates in St. Petersburg, Ft. Meyers, Lauderdale Lakes; several from Miami, Florida; and two from Boston, Massachusetts (both hit with $15,000 fines). Repeated operating from a Bronx, New York pirate earned him a $20,000 fine, and one man in California was operating a cell phone jamming device that was splattering over frequencies from 800-2100 MHz; another man had a malfunctioning marine VHF transmitter on channel 16, the distress channel.

Ham Fined for Freeband Operations

According to FCC documents, Jose Torres N3TX was fined $4,000 for operating on 26.71 MHz, the so-called freeband, on three occasions in December 2007 and April and June 2008. Torres, an Amateur Extra Class licensee had been initially issued a warning, following an interference complaint, and then a Notice of Violation after which Torres admitted to operating on the unauthorized frequency, the documents said. But, when the fine came down, Torres met with FCC officials and claimed he was not at his home at the time of the violation, offering cell phone records as proof. He further submitted his last three years federal tax returns in an effort to support his request for a reduction in the fine.

The FCC dismissed the phone records as evidence only that he was not on his landline telephone at the time of the violation, noting, "At no time does Torres claim or provide evidence that someone else in his house was responsible for the unauthorized transmissions." The FCC also rejected Torres' inability-to-pay claim and affirmed the $4,000 fine.

Seattle Man Charged with Fake Distress Calls

The *Seattle Times* reported in mid-May that a federal grand jury had indicted a Seattle man on two counts of making false statements and one count of making a false distress message in November 2009. The article quoted the U.S. Attorney for the Western District of that state as saying the call resulted in a six hour, $54,000 Coast Guard search using two helicopters. The man faces hundreds of thousands of dollars in fines and up to 11 years in prison on the federal charges.

WEAK Radio Disappears

There's always a certain amount of oily film on the murky wavelengths of the HF pirate band (roughly 6,850-6,950 kHz). Self-styled shortwave pirate operators come and go on the bands without, understandably, advance notice. Even the pirate blogs are often a fountain of misinformation both purposely and unintentionally. So, rumors of a bust of WEAK Radio in February of this year, a station which debuted in December of 2008, according to Andrew Yoder's 2010 *Pirate Radio Annual*, had the HF pirate community buzzing like flies.

There was one post that linked to a purported recording of the actual bust as it took place on-air. WEAK Radio's signal on 6930 kHz suddenly stopped and a carrier, with a large amount of hum in the audio, took its place with a voice identifying itself as that of an agent from the Atlanta field

office of the FCC. The agent declared that WEAK Radio did not have a license to operate and was taken off the air.

Various HF pirate web sites noted the bust, but the months passed and there was no official action from the FCC nor were there any more reports of WEAK Radio's on-air activities. As happens with all unlicensed broadcast busts, a warning was first issued and the WEAK Radio operator wisely opted to stay off the air, therefore avoiding a fine and public exposure.

While there are rumors that other HF pirates have been taken down as well, the pirate band is still quite active with long time operators and newcomers on the air almost every evening.

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

The Colorful World of Early Plastic Radios

By Merrill Mabbs
(All photographs courtesy the author)

FADA Colorado 260RG

As far back as I can remember, I have always had a big interest in radio. I remember my father reciting intros from "The Shadow" and other early radio programs. I grew up in a house with no television, so radio was my only source of entertainment.

As a teenager in the mid 1970s, I remember listening to KAAY, Little Rock, Arkansas. At 2:00 a.m. they broadcast "Beaker Theater," airing a variety of early radio dramas each night, including "Suspense," "Escape," "Chandu the Magician," "Tom Corbett Space Cadet" and many more. I rigged up a timer to a cheap tape recorder and listened to them the next day. Also, around this time, an elderly neighbor gave me my first vintage radio, a 1937 Truetone D911, with a colorful dial and pushbuttons in a beautiful wood cabinet, which is still in my collection.

Since then, I have kept an eye open for old radios, but I wasn't actively collecting until the mid-1980s. A friend pointed me to the owner of a storage business that had a garage filled with antique radios on which a customer had stopped making payments. Suddenly, I went from a handful of radios to an instant collection of over 50. I then began reading and learning all about the radios I had just acquired and discovered that radio collecting was very popular with a large network of collectors across the country. I subscribed to magazines published by the antique radio collecting community to learn about these radios, find other radios, and locate parts.

Addicted to Collecting

Collecting radios can be a highly rewarding hobby bringing great satisfaction when you turn the on/off knob for the first time after a restoration and listen to the warm tube sound as you test reception across the dial. Bringing a crusty, dilapidated radio, found in a garage or barn, back to its original beauty and into its role as a living room centerpiece, will bring such a feeling of pride, not to mention the feeling that you've preserved a piece of history – a radio that might've been destined for the city landfill.

I was addicted at this point, searching for radios anywhere I could think of to find them, waking up early every weekend to go to rummage sales, attending auctions and visiting every antique shop I could find. I even posted a newspaper want ad for old tube radios. In the beginning, I was only interested in wood cabinet radios, and I overlooked plastic radios, because I was more interested in the history than design.

My interests have shifted over the years, and now plastic radios from the 1930s and '40s with machine age or deco design are my main focus, although wood radios with nice, colorful dials can still get me excited. Today, the collection has grown to nearly 500 radios, so space has become a problem, and I now limit my collecting to midget sets if possible.

It's natural, as a lover of radios, to find yourself owning a few different kinds of radios, which themselves can easily turn into a collection. You then find yourself thinking about the acquisition of more cool radios to look at, play with, and bring back to life. It's nice to own examples that span the history of radio from the earliest tube radios through the transistor era.

As your collection grows, you may find that you have to specialize to an extent, as space and other criteria can become a factor. Some collect only early 1920s radios, while others specialize in just woods or plastics or only transistors, or maybe only Zenith or FADA radios. You may gravitate towards specializing based on memories, or the appreciation of certain features, style or function. Some collectors are purists and insist on everything being original, while others don't mind a rebuilt or repaint if it's well done.

With the advent of the Internet came a significant change in the radio collecting hobby. The entire world opened up for the collector, who could now communicate easily with collectors around the country and the world. No longer were you confined to finding radios in your area or traveling to swap meets. I found early radio designs from Australia and France that included some exceptionally artistic designs, and soon radios began arriving from around the world. But shipping costs have skyrocketed and have affected what is worthwhile to ship.

There is a very large, avid vintage radio collecting community in Australia. Aussie radios use a 220 volt supply, so are not as popular with US collectors, although some of their designs are world-renowned. French radios from the 1930s and '50s used 120 volt supply, making them more desirable to US collectors.

I also found the internet was a great way to share my collection with the world, rather than a few interested friends and collectors. In the mid-90s I built the website **www.ClassicRadioGallery.com**, one of only a small handful of websites dedicated to vintage radios at the time. Today there are hundreds of antique radio websites to explore, and I receive hundreds of emails from other collectors and people just looking to sell their radios, which has led to some great additions to the collection.

The advent of Ebay again completely changed radio collecting. Some radios that were thought to be one-of-a-kind were found to pop up frequently. Now, sellers could reach more potential customers than ever possible before. Ebay has become the price guide for vintage radios. It has exposed how common some radios are and how scarce others are – some only surfacing once or twice in the last decade. During the recent economic downturn, prices for the more common radios have dropped to levels similar to what you might've found them for at a second-hand shop, whereas it has not affected the incredibly rare radios whose prices continue to increase.

Pursuing additions to your radio collection using online auctions can be a real rollercoaster ride; you'll get some great deals in which radios arrive better than described or turn out to be very hard-to-find. Other buys will disappoint, from radios with undisclosed damage and missing or wrong parts, to poorly packed radios that don't arrive in one piece.

It's always a good idea to suggest specific packing procedures to the seller. Surrounding the radio in large bubble wrap buried in packing "peanuts" and shipped in an oversized box is safest. Bakelite and plastic radios can be very fragile, and many collectors insist on double-boxing radios, especially the expensive Catalin radios that sell for thousands of dollars.

Digital photography was just getting started in the mid-1990s, which was a deciding factor in creating my website. In the beginning, I used an Apple Quicktake 100, one of the first consumer-based digital cameras. It was great, requiring no developing and giving instant results, but it lacked in quality photographs. As new cameras were introduced, I looked for something that would give higher quality results and tried Sony Mavicas for a while.

I ended up using cameras from the Panasonic Lumix line of cameras, the FZ20 and FZ50, which is what I still use today. I'm not a professional photographer and generally have my camera set on automatic, although I've learned so much about angles, reflections, shadows and lighting, and have been able to create some nice radio photos. I then remove the backgrounds on the photos with Photoshop to give all the focus to the radio itself.

Collectors of plastic radios have dramatically increased since I began collecting, driving prices for many models through the roof. Their appeal is easy to understand; just look at FADA radios, for example, well known among vintage radio collectors. FADA has designed some amazing radios throughout its history, many of which are very sought-after by collectors today, even fetching thousands of dollars. In the late 1930s, FADA introduced the plastic "Coloradio" series which incorporated fabulous deco lines, colorful plastics, and chrome and brass trims. Some of their designs have become era icons, such as the 1945 model 1000 "Bullet," a striking design that has been reproduced over the years and become a familiar form in advertising and imitated in other products like clocks, cookie jars and miniatures.

Many collectors only collect plastic radios, some from the "Classic Plastic" era of the 1930s and '40s, which included Catalin plastic radios. Catalin radios are the most expensive radios, and today sell from $500 to $20,000! The Catalin manufacturing process generated some beautiful marbling, with a finish that looks like glass. Red, green and blue Catalin radios bring in top dollar. The slightest damage can reflect a huge difference in value, easily cutting an otherwise perfect example's value in half.

Other types of plastic, such as Plaskon, Beetle and Bakelite are also very popular and much more affordable. Recently, plastic radios from the 1950s with the "Atomic" design have increased in popularity, as have the early plastic transistor radios.

I've come to realize that terms used to categorize and describe plastic radio cabinets are very loosely tossed around. Frequent questions have been asked about the terms used in my radio descriptions, prompting some research.

It turns out most of the terms used are not types of plastics at all, but trade names. Although many radios were made with these particular trade name plastics, other radios were made with trade name plastics that few have heard of, so they may end up listed in a similar, more familiar trade name category. Currently, similar types of plastics are being generalized into a trade name category – confusing to say the least! A full list of plastics trade names from 1939 is long, as new recipes were being introduced almost weekly.

Plastic radios are becoming harder and harder to find in undamaged condition, as the radio collecting community grows and as people finish cleaning out their attics. Unfortunately, damaged plastic radio cabinets can never be brought back to their original state. Any repairs will always be somewhat obvious and will bring little increase in value, compared to an undamaged example.

Getting Started in Plastic Radio

There is a regional aspect to finding plastic radios. The San Francisco-made Remler radios, with their Scotty dog logos, are generally only found on the U.S. west coast. FADA radios are generally found on the east coast because they were made on Long Island. While they are now getting spread out, thanks to the Internet, they usually end up in collections; attic-fresh radios are still only found in the general areas where they were made.

For those of us in more rural areas, Ebay and other Internet websites are the only source for anything other than common radios. Newspaper want ads, second-hand stores, antique shops and rummage sales are still a possible source, but have become a less likely place to find great radios, because many sellers would rather reach thousands of prospective buyers by using Ebay, rather than depending only on walk-ins. Still, occasional stories surface of great finds from a garage sale or shop.

The first things to think about when buying an old radio are: Is it appealing to you? Is it eye-catching? Generally, the first impression "wow factor" you feel is the best guide. It is hard to set a "rule of thumb" as to what to pay for a radio you might find, because values can vary from $25 to hundreds or

THE FADA STORY

Frank Angelo D'Andrea (born 1888, Bronx, New York) was the creator of FADA Radios. He learned about the construction of radios working at the Frederick Pierce Co., which did experimental work for inventors. D'Andrea later started his own business with his 16-year-old brother. Their driving ambition was to get rich and D'Andrea's plan was to create crystal detectors for the radio industry. For the name of his company he adopted his initials: F.A.D.A.

When the radio boom hit in late 1921, FADA couldn't produce crystal detectors fast enough and was soon renting space in three different places on the same street, Jerome Avenue, in the Bronx. Around 1923 FADA started manufacturing radios that were very popular and the company experienced rapid growth.

It seems, though, that D'Andrea's employer-employee relationships were very poor, and in 1926, 500 of his 600 employees went on strike. In 1927, his chief engineer, Lewis Clement, left for a better offer with another company. When his second in command of the company, Dick Klein (who had quarreled with D'Andrea) left shortly thereafter, FADA more or less fell apart. Its production was really small when it was sold in 1932 to a group of Boston businessmen, and two years later the company filed for bankruptcy. FADA was revived by New York interests and continued in business until the late 1940s.

D'Andrea, however, had created a new radio company in 1934, and ran Andrea Radio Corp. until his death in 1965 at the age of 77. His business was taken over by his son F.A.D. Andrea, Jr., and his daughter Camille.

Air King 770

more. There are some price guides specifically for plastic radios that will give a general idea of what you have found and its potential value. For the beginner, I recommended you do some research to determine if you have found a real jewel.

With plastic radios, any damage to the cabinet is most important, because cracks cannot be repaired back to an original state. Condition is paramount. Aside from the cabinet, a broken dial glass is generally something to avoid, although a cracked plastic dial cover is fairly easy to replace. It is good to see that the chassis and speaker are original, complete and restorable. In the case of very rare radios, minor damage can be overlooked, although in most cases, cabinet damage will drop its value dramatically. Missing knobs and operability are not as important, because knobs can be replaced and the radio's electronics can be restored. Tubes are readily available from dozens of sources on the Internet.

Even though the plastic cabinet is the most important consideration, radios with "farm" or battery-powered chassis are generally considered less desirable than their AC counterpart and can bring much less. A painted Bakelite radio's finish is very important. Most collectors can live with a few minor paint nicks, but if the radio needs to be completely repainted, it will never realize the value of one with original paint, even when professionally repainted.

It is important, when restoring a radio's plastic surface to its original glossy finish, to avoid most cleaners, because plastics can be easily, irreparably damaged by many household cleaners. I have found a great cleaner/polish called TR-3, a resin glaze automotive cleaner and polish available at many car part stores; it's something I've used for years. This is a great product for any plastic radio from Catalins and Bakelites to painted radios.

On painted radios, care must be taken not to polish too vigorously or the paint will be removed down to the Bakelite surface. A gentle polishing on painted radios will remove top layer discoloration and dirt and the radio will shine like new.

With Catalin radios, care must be taken to polish the radio evenly. Catalin radios change from their original color over time, caused by oxidation from sunlight or smoke exposure. TR-3 will remove the top layer of discoloration, but care must be taken to polish to a consistent color. It will also bring back the glossy finish to brown or black Bakelite cabinets, if the cabinet has not been exposed to too much sunlight during its life, leaving an unrestorable, porous, or dull finish.

General Electric L622

Sometimes, a layer of dirt or grease will have helped preserve the finish beneath. Detailing a radio by cleaning out the slightest evidence of dirt from every corner and crevice can make a huge difference in how it will display, and I've found that round toothpicks and a toothbrush with the cleaner are the most valuable tools to accomplish this, and they won't scratch the surface.

Great care should also be given when removing screws, knobs and the chassis from plastic cabinets, because many plastics can become very brittle over time. Tube heat from years of use will, in some cases, cause "tube burn" to cabinets, which can cause unrecoverable color change to cabinets made from Catalin, Beetle or white Plaskon. Brown or black Bakelite cabinets are known to withstand the heat better and are not as prone to heat marks.

Catalin and beetle cabinets shrink over time. In some radios the chassis were so closely fitted that the cabinet has shrunk around them, causing them to crack. Cabinets would shrink around tightly fitted dial glass, cracking the glass or, worse, cracking the Catalin next to the dial. Dial glass replacements are available in most cases for these frequently damaged parts. But in some cases the chassis is so tight it is impossible to remove due to the shrinking. I have heard of people softening the cabinet in the oven to free up the chassis, but it's not something I would ever recommend because worse damage could easily result. It's better left alone or to a professional.

Bringing back a plastic radio to a showroom or museum piece can easily take 6-8 hours of cleaning, polishing and detailing. Chassis restoration is additional time. Luckily, schematics for most early radios are still available from many sources on the web.

With a general knowledge of electronics and perhaps the help of a vintage radio repair book, any radio should be able to be restored to playing condition. But, a few things can make this very difficult. Something to watch for when purchasing old radios is power transformer and pot metal pieces that have cracked. They can be very hard to replace. Generally, damage to a power transformer can be identified by insulation wax that has oozed out the bottom from overheating.

A rule of thumb when beginning to restore a radio chassis is to replace the electrolytic power capacitors, of which none have survived over time. This is also the reason to never plug in a radio when first purchased as these failed components can do serious damage to other components and tubes. Some purists insist on leaving the old caps in place to preserve the original look of the chassis and add replacements beneath. Also, it is a good idea to replace the original paper capacitors which also have deteriorated over time. Resistors usually do not need replacement, unless another component has caused one to burn out.

Reflections from a Collector

It's hard to pick a favorite from my collection. I could probably narrow it to a couple dozen, as there are some unique features to each. The eye-catching colorful plastics, unique cabinet designs, models that featured pushbutton tuning or the familiar green glowing tuning "eye" tube have always drawn me to them. I've always loved the wood 1930s Zenith radios which are very popular with collectors due to their beautiful large round black dials. They aren't particularly rare, but the demand for them is so high that their prices continue to rise.

When radio was first introduced to every household in the 1920s, hundreds of new radio manufacturers were springing up, many of which survived only few years. Others continued to flourish and some are still alive today. Many companies offered a full line of radios, introducing 10-25 new models each year. New models would include a wide range: portables, large living room consoles, and economy models. High-end, high tube-count radios for the more affluent of the day were also available [Editor's note: see "Grandpa Walter's Scott," *MT* December 2010]. Many brand names remain familiar today, such as Zenith and RCA, while others have quietly disappeared, most likely eaten up by their larger competitors.

A few plastic radios, such as the 1930s Air King "Skyscrapers" and some Catalin radios, could be considered "Holy Grails" of plastic radio collecting, although some of these radios cannot be realistically purchased because so few are known to exist. A few models should be included in any "complete" plastics collection, including the FADA 1000 "Bullet" and the Canadian Catalin Addisons.

Midget radios usually are considered those from 5 to 7 inches wide. The majority of US-made plastic radios from the 1930s and '40s are mid-sized, ranging from 8 to 12 inches wide. Large Bakelite radios measuring up to 17 inches wide (or tall) are less numerous and are more frequently found in European or Australian collections.

The Air King "Skyscraper" measures 12 inches tall and 9 inches wide. Although quite rare, it does not compare to Air King's earlier 1933 "Skyscraper" models that command prices into the 5 digit range!

About the Author

Born in the Middle East in 1957 to American missionary parents, Merrill inherited the collector gene from his philatelist grandfather. Merrill and his wife Brenda hosted a college radio station blues show for nearly ten years in the 1980s on KTEQ-FM in Rapid City, South Dakota. From his interest in radio he accumulated over 12,000 LPs, after which he shifted his attention to old tube radios.

He has a 25 year career in the IT Department for the Rapid City School District and spends much of his time exploring the deep backwoods of the Black Hills of South Dakota, capturing its beauty with his digital photography – also displayed on his radio web site.

MT

WARTIME VOICES

Early Shortwave Broadcasting on the West Coast
By John F. Schneider, W9FGH

A view of the General Electric station W6XBE (later KGEI) at the Golden Gate International Exposition in San Francisco, 1939 (Photo courtesy of FEBC International)

Shortwave radio broadcasting was still a novelty in the United States in the 1930s. The shortwave frequencies had been in use since the mid 1920s to relay programs from the East Coast to the West Coast and to receive special event broadcasts from Europe. But now, for the first time, manufacturers were selling radios that included a shortwave band and listeners were able to tune to these signals directly. The possibilities of reaching out to the entire world on the airwaves were just beginning to be explored, but no one had yet figured out exactly how to make use of it.

Birth of Shortwave Broadcasting

The first shortwave stations in the United States were all established by private interests. NBC, CBS, General Electric, Westinghouse and Crosley put some of the first signals on the air using transmitters of 10 kW and higher. In those early years, the shortwave bands were relatively empty and interference was low, so a 10 kW transmitter could be heard over great distances.

At first, NBC and later CBS built stations that targeted Latin America, principally rebroadcasting American English-language network programs. There was no defined business model for these stations – they were still exploring the possibility of developing future markets. General Electric, another company entering shortwave broadcasting, apparently viewed it more as a market for the development of commercial shortwave transmitters. They operated W2XAD and W2XAF in Schenectady, which mostly rebroadcast the programs of GE's AM station, WGY.

But there was still no shortwave broadcasting on the West Coast. The East Coast and Midwest shortwave signals could not be easily heard in the far flung countries of the Pacific. A California-born US diplomat stationed in Shanghai, named Addie Viola Smith, decided to do something about this situation. Starting in 1935, she conducted an intense personal campaign to promote the construction of a West Coast shortwave radio station to serve the American expatriate community in the Pacific.

That year, while serving her sixteenth year in China as a trade commissioner working for the Commerce Department, she began writing a series of letters to Washington urging the construction of a station. "I feel certain," she wrote, "That radio interests in China, especially in Shanghai, would welcome the institution of a special directionally beamed program from the United States."

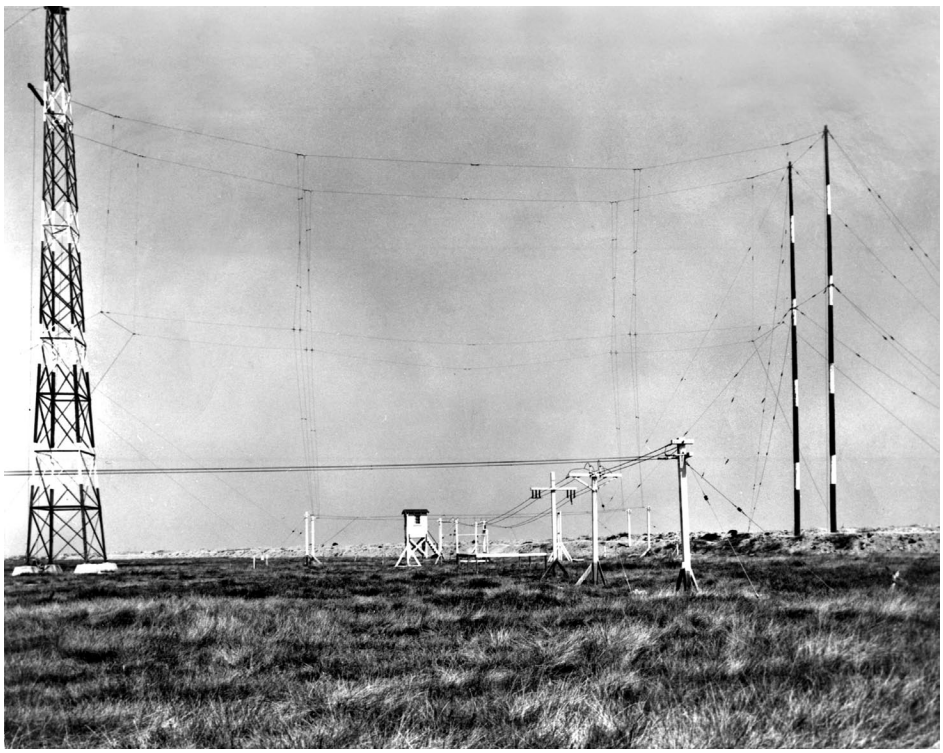
Shanghai, in particular, was the home to a community of 12,000 Americans – public officials, businessmen, missionaries, doctors and journalists – many of whom felt isolated by their great distance from their homeland. In 1937, she complained of the expatriates' inability to receive the broadcast of the second Roosevelt inauguration and the Metropolitan Opera broadcasts.

The First West Coast Station

In the fall of 1937, Smith's pleadings caught the ears of General Electric executives. GE had built pioneer AM station KGO in Oakland, California, but the station had been sold to NBC and so the company no longer had a West Coast radio presence. They decided it was time to re-enter the West Coast broadcast market, and they would do it by building a powerful new shortwave station. Since 1923, GE had been operating two powerful shortwave stations in Schenectady, New York (W2XAD AND W2XAF, later WGEO and WGEA). In its application to the FCC, the company quoted some of the statements that Viola Smith made in her letters as a justification for the license. The Commission, which had also received many pleadings from other sources, quickly approved the application.

GE decided to tie their new station to 1939's planned Golden Gate International Exposition. The big fair was going to be held on Treasure Island in the middle of San Francisco Bay to celebrate the completion of the area's two new bridges – the Bay Bridge and the Golden Gate Bridge.

General Electric planned a big exhibit in the



This 1960s view of the KGEI 9 MHz antenna array was almost exactly as GE constructed them in 1941. The tower on the left is part of the 11 and 15 MHz array, mostly out of view. The guard house building in the center is a remnant of the war. Far East Broadcasting Company (FEBC) later added a number of additional antennas to this field. (Photo courtesy of FEBC International)

Palace of Electricity and Communications, where it would showcase many of its advanced industrial and consumer products, including an all-glass house and new lighting technologies. This was also an excellent chance to demonstrate to the world the progress it had made in the development of shortwave transmitters and transmitter power tubes. The station would also serve as a worldwide goodwill vehicle for the fair by transmitting daily programs originating from the fairgrounds.

A brand new 20 kW G.E. transmitter incorporating the latest technological innovations was shipped to San Francisco and installed at the fair with a compact studio and control room built right next to the transmitter. A newly-designed directional antenna was hung between two poles at the harbor entrance to the island. Its figure-8 coverage pattern created two narrow (30 degree) beams that would provide coverage to both Latin America and Asia.

The staff of the Associated Broadcasters' stations KSFO and KWID poses outside the newly completed transmitter building, 1943. The KSFO tower is on the roof of the building; the transmission lines leaving the building at the left feed the shortwave antennas. (Photo courtesy of Penny Wilkes)

The focus was on making the station into a public demonstration of the company's industrial capabilities, but the actual programming for the station had never been seriously considered. Other than acquiring the rights to rebroadcast some NBC domestic network programs, there were no plans to assemble a program staff.

E. T. "Buck" Harris, a GE public relations manager and former San Francisco newspaperman, dared to ask the question – what did the company plan to broadcast? The next thing he knew, he had the new title of Station Manager. He was instructed to put together four hours of daily programs for Latin America and three hours for Asia. Harris hired Norman Page to be the Chief English Language Announcer, and Carlos Benedetti as the Chief Spanish Announcer. Burt Scoals was the Chief Engineer.

The station was issued an experimental license with the call sign W6XBE, and it began broadcasting on the opening day of the fair February 18, 1939, on 9,530 and 15,330 kHz. For the station's official dedicatory program broadcast on March 4, GE and NBC executives joined local politicians and the foreign consuls of 19 countries to broadcast their greetings to the world.

In the remaining months of 1939, more than 4 million fair attendees passed through the exhibit and marveled at the live broadcasts, which could be viewed through large plate glass windows. Only a railing separated them from the powerful operating transmitter.

In Shanghai, Viola Smith worked hard to promote the new station among the American community. She sent out press releases to the English and Chinese newspapers and local radio stations, and distributed copies of the station's program schedule. When the first broadcasts began, she collected reception reports from friends around China and immediately passed word back to the station that it was being heard loud and clear.

Soon, news, music, and public affairs programs stretched out daily across the oceans, to the delight of the local residents and American expatriates overseas. More importantly, W6XBE was the first American radio signal that could be heard across the Pacific, and so a regular audience quickly developed in the Philippines, China, Malaysia, Australia and other countries around the Pacific Rim.

The station celebrated GE and the fair, as visiting dignitaries, entertainers and ordinary citizens alike marched before the microphone to fill up the broadcast hours. The station offered a commemorative booklet about the fair to any listener who wrote in. The more than ten thousand letters received in response indicated that the station had developed a large and widespread audience around the world.

1939 was also the year that the FCC decided to end the "experimental" character of all shortwave licenses and issue permanent broadcasting licenses. However, while international stations had previously been allowed to operate with as little as 5 kW of transmitter power, the minimum power was now set at 50 kW. Furthermore, stations were required to install directional antennas to increase the effective power in the beam by a factor of ten or more.

As a concession for the hefty expenditures needed to meet these new signal quality requirements, the FCC also relaxed its previous restrictions on advertising. Before that time, an international station could only broadcast advertising messages if they were already incorporated into domestic programs being relayed on shortwave. But now international stations could actively solicit or sell advertising, and messages from American multi-national companies like Firestone, Johnson Wax and the big tobacco companies were being heard for the first time.

Another result of the changing regulations was that the ham-style experimental call signs used by the shortwave stations would be replaced with conventional four-letter broadcast call signs. Thus it was that W6XBE became KGEI in September of 1939. For the live re-christening broadcast, GE hired some dancers from the Folies Bergère to change the big sign in front of the station.

The success of KGEI encouraged GE executives to keep the station on the air once the fair closed. NBC, which still had a close corporate relationship with its former partner GE, offered space for transmitting facilities next to the KPO AM (now KNBR) transmitting plant in the salt flats near Belmont. GE filed for a construction permit in December of 1940 and began building a new transmitter building and antennas. A reinforced-concrete building with 3-foot thick walls would house the transmitter, indicating the concerns about the possible future need for wartime security.

A new 50 kW version of the first G.E. transmitter was delivered. Curtain antennas were built for the 19, 25 and 49 meter bands, aligned to cover Latin America at 126 degrees and Asia at 306 degrees. New KGEI studios were installed in the Fairmont Hotel on Nob Hill in San Francisco. After the fair closed in 1941, the station was soon back on the air from Belmont with an even better signal. In addition to its locally produced programs in English and other languages, many NBC programs from local stations KGO and KPO were also heard.

KGEI Studio A in the Fairmont Hotel, San Francisco, 1941. The control room can be seen in the background. (Photo courtesy of FEBC International)

Despite its reliable international coverage, KGEI was only partially successful in meeting the needs of Americans living overseas and was even less of a success in serving Asian populations. While live American network programs were being relayed to Latin America each evening, the Asian programs needed to be sent out from 4:00 to 7:00 a.m. Pacific

Time, when all the networks were silent. KGEI instead broadcast pre-recorded music and transcription programs which were generally of lower quality.

Eventually, some network programs were recorded and rebroadcast to the Pacific the next morning, but all the programs being heard were still in English. The result was that the station eventually succeeded in serving the American expatriate community overseas, but it did very little to attract an Asian audience or build international goodwill.

It was even less successful when it came to news programs. GE had instructed Buck Harris to only broadcast "unbiased" news reports, so he contracted with the INS –International News Service – to install a teletype news service at the station. Staff announcers would deliver several "rip and read" news broadcasts each day with no additional commentary. However, the INS proved not to be entirely unbiased. The news agency was owned by the Hearst Newspaper chain, and its news stories reflected the conservative slant of owner William Randolph Hearst.

Hearst was an isolationist in those pre-war years, and he firmly believed that the United States should stay out of the overseas wars in Europe and the Pacific. He made certain that the INS news reports reflected his personal views. But the KGEI broadcasts were being heard across the Pacific by the Japanese, who wrongly interpreted those news broadcasts as reflecting the official position of the United States government. As a result, they came to believe that a Japanese war of aggression in the Pacific would encounter little resistance from the United States.

Further, the citizens of the Pacific Rim countries were hearing both the aggressive messages from Radio Tokyo and pacifist non-intervention messages from KGEI. They believed that the United States would not come to their defense in the event of a Japanese invasion.

Actually, there were no broadcasts of the United States government's position being heard anywhere in the world at that time. The isolationist congress of the 1930s, under strong pressure from the National Association of Broadcasters and other private broadcasting entities, had prohibited the US government from conducting any direct broadcasting activities, either domestic or international. There was no way that the US government could directly broadcast its official views and positions to the peoples and governments of the world.

Nevertheless, the Japanese apparently felt that the messages being heard in KGEI's newscasts were biased against them and began to create interference with its signals in May of 1939. They would generally leave the entertainment programs alone, but when the news broadcasts began, Japanese stations XJI and XJZ would begin to transmit on adjacent channels, airing Japanese propaganda in English. Many listeners wrongly interpreted the Japanese programs as coming from San Francisco.

Caesar Romero and Sally Eilers, Hollywood stars, broadcast their greetings to Latin American from station W6XBE, General Electric's international broadcasting station at the Golden Gate International Exposition, on Treasure Island in San Francisco Bay; 1939. (Photo courtesy of FEBC International)

New Government Agencies

With war clouds on the horizon, the federal government began to take the first steps to form a centralized intelligence and propaganda agency. In the spring of 1940, President Roosevelt created a new agency called the Coordinator of Inter-American Affairs (CIAA), headed by Nelson Rockefeller.

Spanish language announcers Juan Trasvina and Carlos Benedetti broadcast over W6XBE from the Golden Gate International Exposition in San Francisco in 1939. (Photo courtesy of FEBC International)

The purpose of this new agency was to strengthen ties among the nations in the Western Hemisphere. International radio was to be a part of this effort, and that responsibility was assigned to a new agency formed in July called the Coordinator of Information, or COI, headed by William "Wild Bill" Donovan. FDR's speech writer, playwright Robert Sherwood, was named to head the Foreign Information Service, or FIS, which was a sub-agency of the COI. Its task was specifically to broadcast news and propaganda to foreign countries.

The administrators of the new COI immediately started receiving reports from their contacts about the KGEI news broadcasts and the erroneous impression they were giving in the Pacific. Suddenly the spotlight focused on a relatively unknown San Francisco news commentator named William Winter.

Winter was a news commentator at KSFO, whose programs were being heard around the West Coast on a regional CBS network starting in early 1941. In the style of the time, a news "commentator" was different from a news reporter. Winter did not report the news; rather he analyzed and explained the background of major stories, unraveling the complex politics behind many of the important issues of the day.

In September of that year, Winter received an unannounced visit from John Dumeresque, a British military officer who was in charge of the Malaya Broadcasting Commission in Singapore. Dumeresque was one of the people focused on the problem of the KGEI newscasts, and he wanted the station to broadcast a more accurate position of the US political position. He had contacts that reached high up into the American government – to Donovan and perhaps as far as FDR himself.

Dumeresque told Winter he had made arrangements for him to broadcast two daily news commentaries over KGEI and that his selection for the position had already been cleared with both CBS and GE as well as with the COI. The broadcasts would originate from KGEI's Fairmont Hotel studios and would be in addition to his daily broadcasts from KSFO in the Palace Hotel, for which he would be paid the nominal sum of $50 per month. He was not to be a spokesman for CBS, GE or any government. He was to explain the American system of government and the rights of the American people to express their own divergent views as guaranteed by the Constitution.

It's interesting to note that Dumeresque did not present this proposal as a request. By appealing to Winter's sense of patriotism, he already knew that Winter would have to accept.

Because of the existing prohibitions against direct government broadcasting, the COI still could not

directly control the content of the programs, but it did have the ability to "suggest" topics. The result was that a private teletype was installed under lock and key at KGEI for Winter's exclusive use. He would come into the studio each morning to find the teletype closet full of "suggested" material. Everything he received was publicly available material – public opinion polls, newspaper editorials, magazine articles, books – all concerning US policy and its position towards Asia. All material was marked "Winter: For your use if desired." It was understood that there would be no attribution to the COI as the source.

Winter's program, called "American Views on the News," was first broadcast on Sunday, September 14, 1941. The fifteen-minute program was heard seven days a week at 6:45 a.m. Pacific Time. The KGEI broadcasts were also being picked up and relayed by Radio Malaya in Singapore. Additionally, Winter's scripts were translated for broadcast in French, Dutch and Spanish.

The Office of War Information

Everything quickly changed after the December 7 Japanese attack on Pearl Harbor, as the entire country shifted to wartime operations. The COI was reorganized and became the Office of Strategic Services or OSS – which would later become the CIA. The FIS became the Office of War Information (OWI) and was given the responsibility of controlling all public information about the war. CBS news commentator Elmer Davis was put in charge of the new agency.

The OWI was instructed to take charge of all shortwave radio stations in the country. The peacetime rules prohibiting government origination of programs were not actually repealed, but they were now largely ignored.

At the start of the war there were only ten shortwave stations in the entire country – all of them privately owned. NBC had WNBI and WRCA in Bound Brook, NJ; CBS owned WCBX and WCRC in Brentwood, NY; General Electric operated WGEA and WGEI in Schenectady and KGEI in San Francisco; Westinghouse ran WBOS in Boston; Crosley had WLWO in Cincinnati, and the Worldwide Broadcasting Foundation owned WRUL, Boston. Collectively these stations broadcast just 35 hours of programs a week – mostly relays of US domestic network programs aimed at Latin America.

On December 15, 1941, just eight days after Pearl Harbor, the COI leased KGEI from General Electric, making it the first international station to be operated under direct government control. It would take another six weeks until the first government broadcasts from New York could be beamed towards Europe. KGEI's new programs in English and Tagalog were targeting the Philippines, which was already under attack from the Japanese. The KGEI broadcasts were being received there and relayed on local AM frequencies. Programs in Japanese were later added, originating from the Press Building at the University of California.

The OWI established radio studios in New York to originate shortwave programs beamed to Europe beginning in February of 1942, leasing time on selected commercial shortwave stations. Radio actor John Houseman was named as the head of radio programming in New York. The BBC received the programs in Europe and relayed them to Germany.

Taking things one step further, on November 1, 1942, the OWI formally leased every shortwave station in the country for the creation of a "Voice From America." All station owners would continue to operate the transmitters, and the government would pay all expenses and provide programming. All the broadcasters except WRUL voluntarily agreed to this plan. The OWI ultimately seized the station by executive order. All transmitter sites were off limits to the public and were guarded by the military as essential national infrastructure.

A view of the KGEI transmitter operator's position sometime before 1950. The original 50 kW transmitter is out of view at the left. To the right is the big 100 kW General Electric shortwave transmitter that was provided by the government during the war and broadcast as KGEX. (Photo courtesy of FEBC International)

Back on the West Coast, KGEI's powerful signal was still the only American voice in the Pacific, and the station had become a lifeline to foreign nationals as well as to American servicemen stationed in the Pacific. KGEI was now on the air twelve hours a day, broadcasting in Japanese, Chinese, Tagalog, and various Chinese and Filipino dialects. At the Fairmont Hotel studios, a superb staff of linguistic and cultural experts had been added to the original KGEI personnel, all of whom now became government employees.

Dr. Owen Lattimore, an expert on Asian culture, was named Director. Lee Raschal became the Managing News Editor. In addition to Winter, other announcers and commentators included Victor Lusinchi, Carlos Benedetti, Sydney Roger, Frank Johnstone, Pat O'Brien, Bill Conine, Bob Goodman and Merrill Phillips. Chinese and Japanese-American announcers were also on the staff, but their messages were not broadcast live – they were recorded and checked by multi-lingual censors before airing.

Surprisingly, most commentators were generally given the freedom to determine their own messages to be heard by foreign listeners. There were only three secrets that could not be broadcast: troop and ship movements, weather conditions or the location of the US president. Also, they were told to never let the Japanese know that the US was hearing their shortwave broadcasts.

This sudden increase in human activity quickly overflowed the single KGEI studio in the Fairmont Hotel. In 1942 the OWI moved temporarily into a new studio complex that was being built for AM station KSFO in the basement of the Mark Hopkins Hotel. At the same time, NBC was moving out of its old West Coast studios at 111 Sutter Street and into its posh new "Radio City" building. The OWI converted the old NBC studios as its headquarters and moved in on January 1, 1944, turning the Mark Hopkins studios back over to KSFO.

MacArthur and the War in the Philippines

Just three days after Pearl Harbor, the Japanese bombed Manila and destroyed most of the American planes and ships stationed at its Philippine bases. Japanese ground forces landed on Luzon Island the same day and began to make their way towards Manila. Outnumbered and outgunned, the American forces, under the command of General Douglas MacArthur, together with the Philippine forces, retreated to the Bataan Peninsula and later to the island of Corregidor.

From his provisional headquarters in Corregidor, MacArthur was listening to William Winter's daily broadcasts over KGEI. MacArthur began to issue military communiqués, which were sent to San Francisco and broadcast back to the Pacific by Winter. What Winter didn't know is that most of these 142 communiqués were just unrealistic promises of an impossible victory, intended to boost morale and disquiet the enemy, but the audience in the Philippines saw the true picture all around them and so the broadcasts were generally discredited.

Before abandoning Manila, the US troops had disassembled a 1 kW transmitter belonging to station KZRH in Manila. It was carried to Bataan in pieces where it was reassembled and put back on the air as "Freedom Radio." The station operated from February to May of 1942, rebroadcasting KGEI programs to the Philippine people and US troops.

When prospects in the Philippines looked their bleakest for the American and Philippine troops, General MacArthur was evacuated to Australia on March 12, 1942. Upon landing there, he made several "I will return" speeches in which he promised to return and recapture the Philippines. One of his speeches was relayed back to the Philippines over KGEI and was heard by

thousands of people now living under Japanese occupation. Even though listening to the radio was punishable by death, many Filipinos defied the Japanese ban and hid radios in their homes which they would use to listen to KGEI.

Finally, on April 9, 1942, 75,000 American and Filipino troops surrendered to the Japanese on Bataan. As POW's, they would participate in the infamous Bataan Death March, one of the most heinous war crimes in the Pacific War.

In December of 1942, eager to be in the center of the action instead of on the sidelines, William Winter quit his jobs at KGEI and KSFO to join the war effort as a newspaper field correspondent. He went on to give a series of speaking engagements all around Australia before being stationed as a reporter in the Philippines. After the war, he received special commendation from the Philippine government in recognition of the importance of his KGEI broadcasts to the Philippine people during the difficult years of the war.

Mr. Dumm Goes to Washington

Even before Pearl Harbor, President Roosevelt was seeing the war clouds on the horizon and recognized that building more shortwave stations would be critical to America's ability to communicate to the rest of the world. Roosevelt was already a big believer in the power of radio broadcasting, having successfully sold his "New Deal" plans for combating the 1930's depression through his famous series of "fireside chat" broadcasts. He knew that the power of radio would be increasingly important during the upcoming war. But, in the days before Pearl Harbor, he needed to find a way around the congressional restrictions on government broadcasting and the unwillingness of the Congress to fund international shortwave radio.

Thus it was that in August of 1941, an emergency meeting was called in Washington by William "Wild Bill" Donovan to plan the construction of new international shortwave stations. Government leaders, major broadcasters and equipment manufacturers were all invited. At that meeting, Donovan and Roosevelt laid out the situation and asked the participants to construct 32 new shortwave stations on the East and West coasts. The money was not available to fund the stations immediately, but FDR promised the broadcasters that he would reimburse them for their construction costs at a future date.

CBS and NBC quickly agreed to turn over all of their shortwave broadcast facilities to the COI. Powel Crosley, the owner of WLW in Cincinnati, also agreed to turn over his shortwave station WLWO to the COI and to build a new high-powered shortwave facility at Bethany, Ohio. San Francisco broadcaster Wesley I. Dumm, president of the Associated Broadcasters, Inc., (AM station KSFO), also agreed to build two new shortwave stations on the Pacific coast. Dumm described this meeting in an April, 1971, letter to this author:

Donovan, made an urgent appeal for me to come to Washington in August of 1941 for a meeting which was called to include President Franklin D. Roosevelt, Robert Sherwood and others for the purpose of organizing a "Voice of America", also attended by representatives of Great Britain and Australia.

During this meeting, not only was the first meeting organized for the birth of the "Voice of America", but also, President Roosevelt asked me if I would build two shortwave stations in San Francisco to serve the Far East. In his plea, he not only stated that NBC and CBS Networks had lost so much money broadcasting into South America with their shortwave stations but that they had refused to consider a station to be located in San Francisco in order to carry out his wishes.

President Roosevelt further informed me that he would reimburse me with emergency funds in his possession if he failed to find support for such an investment out of government funds.

Because of the jamming that KGEI was increasingly experiencing from the Japanese, the new San Francisco station was urgently needed for communications to the Pacific. General Electric agreed to take its big 100 kW transmitter out of service at WGEO in Schenectady and ship it to San Francisco. (A 50 kW transmitter was placed into service in Schenectady until a new transmitter could be built.)

KSFO was in the middle of building a brand new transmitter building on Islais Creek in San Francisco, and the structure was hurriedly expanded to make room for a shortwave transmitter, adding an eleven-acre site west of the transmitter to contain the several curtain array antennas to be aimed at Alaska, the Far East, Australia and Latin America.

Chief Engineer Royal V. Howard and his assistant by Al Towne (later the Chief Engineer of KSFO), planned and built the entire station in

just eleven weeks at a cost of $250,000. The new station's call sign was KWID (taken from the initials of its benefactor, Wesley I. Dumm). Test broadcasts commenced May 5, 1942, just five months after Pearl Harbor, and soon the station was broadcasting in ten languages up to twenty hours a day. With an Effective Radiated Power of several million Watts, the new KWID was said to be the most powerful shortwave station in the world.

KWID's new 100 kW General Electric transmitter is shown installed and ready to turn on; February, 1942. (Photo courtesy of FEBC International)

And Still More Transmitters

As the war progressed, a veritable arsenal of shortwave transmitters was gradually being assembled around the country. In 1943, the government purchased 22 new GE and RCA transmitters, making a total of 36 frequencies aimed at Europe and the Pacific. KGEI received a new 100 kW transmitter, which went on the air as KGEX. A new 50 kW transmitter went to KWID and became KWIX. A Press Wireless transmitter was brought back to the US from England and was installed in the McKay Wireless communications facility in Palo Alto to become KROJ.

Additional stations added in 1945 were KROU and KROZ at McKay Wireless, and KRCA and KRCQ operated from the RCA point-to-point transmitter station in Bolinas.

Further, NBC and CBS both finally agreed to build major shortwave complexes in California. CBS chose Delano as its site location and put stations KCBA, KCBF and KCBR on the air in November 1944. NBC opened its new facility in Dixon on December 27 and opened stations KNBA, KNBC, KNBI and KNBX. Another station, KRHO in Honolulu, had debuted just the day before. In all, seventeen West Coast stations were now rebroadcasting the OWI programs originating in San Francisco.

` Towards the end of the war, as the US was increasingly successful in pushing the Japanese back to their homeland, the purpose of these stations gradually shifted from broadcasting war propaganda to entertaining the American troops stationed in the far-flung corners of the Pacific. Broadcasts of the World Series and college football games helped improve the morale of the many soldiers isolated so far from their homeland. Regular programs broadcast to the troops in 1944 had names like "Command Performance", "The Army Hour", "Your Marine Corps", "G.I. Jive" and "Hymns from Home."

On October 20, 1944, General MacArthur landed on Leyte Island, keeping his promise to the Philippine people. His new message, "I Have Returned", was broadcast from the deck of the Navy vessel "Nashville", picked up in San Francisco and relayed back to the country over KGEI, KWID and their sister stations.

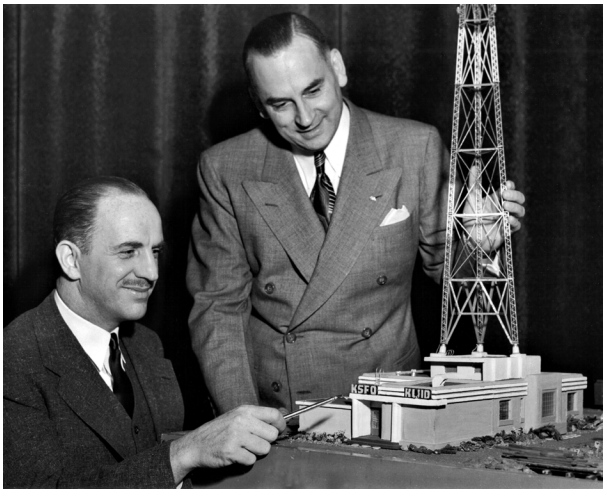
Post War International Broadcasting

V-J Day – August 15, 1945. The war was over, most of the troops would soon come home, and the country could return to its peacetime activities. But – now what was to be done with this huge network of shortwave transmitters that the government had been leasing? It would eventually be transformed by the government into an international communications tool that would try to avoid a repetition of the mistakes of pre-war American isolationism.

On December 31, 1945, the Office of War Information was transformed into the Office of International Information and Cultural Affairs (OIC). The OIC, in turn, created the Voice of America (VOA) as its international broadcasting division.

On the West Coast, the VOA purchased the NBC and CBS sites in Delano and Dixon, and the two networks happily exited the business of shortwave broadcasting for the last time. The VOA also acquired the Crosley site in Bethany, Ohio. Those sites, with the addition of Greenville, North Carolina, in the 1960s, were the principal VOA shortwave sites for the next sixty years. The McKay and RCA stations disappeared without fanfare. KGEI and KGEX continued to relay programs under lease to the VOA until 1948.

The leases of KWID and KWIX continued until 1953, but were terminated by the government at the end of the Korean War. According to one account, the government ended those leases because of the inconvenient proximity of the transmitters to the Hunter's Point Naval Shipyard. The Navy had been required to off-load munitions from ships before they could approach the shipyard because of the risk of explosion caused by the RF radiation from the stations, and they wanted to eliminate the expense and inconvenience of that process. When the VOA leases ended, KSFO made the decision to close the stations.



Chief Engineer Royal V. Howard (left) and Associated Broadcasters president Wesley I. Dumm (right) review plans for the new KSFO/KWID transmitting facility; January, 1942.

Wesley Dumm explained the reasoning in his 1971 letter to this author:

`The Associated Broadcasters, Inc., benefitted from the results of the NBC and CBS Networks and forfeited the operation of these stations when the operating appropriations ceased to be forthcoming, and decided to forfeit the licenses rather than to experience the same type of losses as were reported by NBC and CBS in their programming to South America. Incidentally, the GAO refused to honor the costs advanced for the construction of KWID and KWIX, and President Roosevelt kept his word by giving me an order upon the Treasury Department, reimbursing me completely at the close of the war.

The two powerful stations left the air for the last time on June 30, 1953. The transmitters were sold to Far East Broadcasting Company who moved them to Manila. The antennas were dismantled, and reportedly the wooden masts were sold for firewood.

The only private owner that decided to stay in the shortwave business was General Electric, who continued to operate KGEI as an international goodwill station for eight more years. Thus it was that "The Voice of Freedom" became "The Voice of Friendship." Its flagship program was the "KGEI University of the Air," hosted by Stanford University Professor Ronald Hilton.

In 1956, GE shut down the station and sold it to a group of businessmen who tried unsuccessfully to operate it as a commercial venture until 1959. In 1960 the station was purchased by the Far East Broadcasting Company (FEBC), who in turn operated the station to broadcast religious and cultural programs to Latin America and the Far East for the next 35 years. Facing increasing costs and declining listenership, FEBC decided to close KGEI; the station's last broadcast was heard in July of 1994.

Post Script

Today, there are only a few remnants of the big West Coast shortwave facilities. The VOA site at Dixon was shut down in the 1990s and Delano went into mothball status in 2008. The RCA point-to-point transmitter site in Bolinas was closed in 1973, and the maritime station KPH, also located in Bolinas, is now maintained as an historic site by the National Park Service.

The McKay site in Palo Alto has also been closed. The old KGEI studio/transmitter building is now a church. AM station KSFO still operates from the old KWID transmitter building at Islais Creek, but the former shortwave transmitter area is now a storage room and the antenna site is occupied by a rendering plant.

Very few of the shortwave powerhouses of the 20th Century are still on the air now that satellites and the Internet provide cheaper means of worldwide communications. Our world today is defined in innumerable ways by the outcome of the Second World War. The pivotal role that shortwave broadcasting played in achieving that noble victory must not be forgotten.

The Knight-Kit Saga

By Jim Addie N9SSD

(All graphics courtesy the author)

Showroom: The "New" Knight-Kit showroom at 100 N. Western Ave., Chicago, circa 1955. (1955 Allied Catalog)

With your dad at your side, you've put in hours of careful assembly, followed the written and pictorial instructions, and checked off each step as you progressed. You've just completed the wiring and assembly, put on the bottom cover, and installed the tubes in their sockets.

Now, one hand poised on the control knob, you do one final check of your work. The instructions cautioned that this is your last opportunity to check your craftsmanship before initiating the "smoke" test – or hopefully, the "non-smoke" test. No cold solder joints, no wires touching other wires they shouldn't, all hardware tight. It's the moment of truth. Your father inserts the power cord into an outlet, gives you a wry wink, and you rotate the control knob clockwise.

"Click!" Suddenly, the filament of the 12AX7 tube flashes as bright as a light bulb! Could something be wrong? Have you made a fatal error? Is the tube about to explode? Moments later, you take a deep breath and calm down. You've witnessed the first of several quirks of the Knight-Kit Broadcaster and Amplifier: the filament in-rush flash. But soon all is well, filaments settle into a dull orange glow, and you're on the air.

But now the question is, where is the signal on the dial? Excitedly, you reach for the volume control on the nearby AM radio and turn it up to hear a little static and atmospheric noise in the dead spot you found on the dial. You place a small screwdriver in the slot of the tuning capacitor and turn it slowly. The static on the radio is silenced to a low 60Hz hum. You really are broadcasting! You jam the mic connector into the XTAL Mic input, turn up the Broadcaster's volume control, and speak into the crystal mic, "Hello? Testing? 1, 2, 3?" Your voice is heard coming from the radio, thin and creaky, as only a crystal mic can be, but still audible. Wow. *Wow!*

Quickly, you plug in a phonograph or put the mic in front of a record player speaker, put on a record, grab a transistor radio, and now you are running around the neighborhood to see how far your signal goes. This ritual was no doubt repeated by each and every builder of the Knight-Kit Radio Broadcaster and Amplifier.

Birth of Many Radio Careers

From this humble kit sprang untold careers in radio, communications, broadcasting and electronics. It provided key exposure to these fields. The kit was first produced in 1955 by Allied Radio, Chicago, through its Knight-Kit division in Franklin Park, Illinois. When it was introduced, the kit sold for $9.50, eventually topping out at $12.95 before being discontinued in 1965. The little blue three-tube AM transmitter used a 12AX7 for a preamp and a 50C5 audio power amp and modulator for another 50C5 oscillator tube.

The circuit used "Heising" modulation, basic plate-modulation driven by a Class A audio stage, which also drove an output transformer for a speaker. The claim was "high modulation levels" and low distortion through the use of negative feedback. The final version of the kit was built in an enclosed steel chassis box painted hammer-tone blue with the three tubes, audio transformer, and tuning control mounted to the top surface. The design was simple, yet elegant.

The Broadcaster was just one of many kits, which ranged from the application-specific (a "crystal calibrator" and "grid-dip meter"), to the educational (12-in-1 and 100-in-1 Electronics Labs), to the practical (automotive ignition analyzers, and Vacuum Tube Volt Meter and test gear), to the entertaining (amplifiers, stereo and mono, tube and solid state) to the ambitious: you could actually buy a kit to build your own reel-to-reel tape deck.

One thing every kit had in common – beyond detailed step-by-step instructions with pictorials – was the aspect of electronics education. You *learned* something building these kits! Actually, you couldn't help it. You had to inventory the parts before you started, which meant identifying each one. You had to learn to solder, typically point-to-point, then later, PC boards. You were offered as much theory as you could assimilate in the "How It Works" sections of the manuals. But perhaps most importantly, building a kit taught persistence, patience, diligence, and pride in your work. There was a label included with each kit: "Custom Built By:_____," on which you wrote your name and affixed to the bottom or back of your prized project.

The fact that a kit became the launching pad for a career in electronics, communications, or even broadcasting is confirmed by the stories that flow in via email to the Knight-Kit web site I established: **www.knightkit.com**. Kits seem to have been quite an influence!

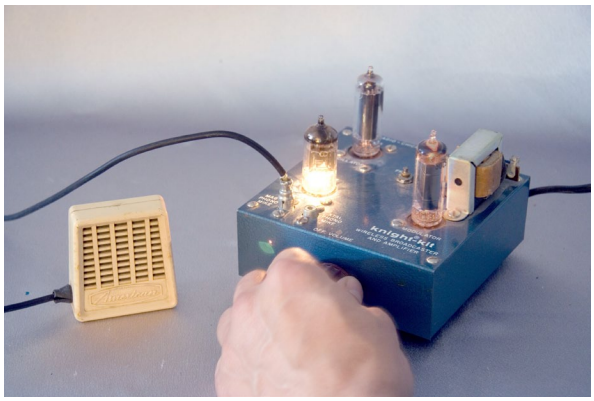
I've heard from broadcast engineers, communications technicians, even a broadcaster who now works for a former employee of Radio Caroline (the real "*Pirate Radio"* ship). My own career path had a big nudge from the Knight Broadcaster, as I have been a broadcast engineer for the past 37 years. Though the broadcast industry of today bears little resemblance to the one I first entered, I can easily point my finger at that little blue hammer-tone box and credit (or blame) it for the direction I took.

Dawn of the Radio Era

Allied Radio was launched back in 1928 by Simon Wexler as a mail-order electronic parts division of Columbia Radio Corporation, and it immediately found favor with experimenters and amateur radio operators. If you're a film buff, the Wexler name should have a familiar ring: Haskel Wexler was an Oscar winning cinematographer ("Who's Afraid of Virginia Wolf?," "One Flew Over the Cuckoo's Nest," and 67 more films); and his son, Jeffrey Simon Wexler, was an Oscar-nominated sound engineer. They are the son and grandson of Sy Wexler, Allied's founder.

Starting a new venture in 1928 could be viewed as the height of bad timing, with the crash of 1929 just a year away. Yet, as the world toughed out the Great Depression, Sy Wexler built Allied into one of the most recognized names in electronics, and he wasted no time in supplying parts and kits to amateur electronics enthusiasts. In fact, it was a newfound fascination with radio communications that kept Allied afloat during those years.

The Knight line of products is traceable back as far as the first year that Allied Radio



Broadcaster turn-on: Current surges through the 12AX7 tube as the Broadcaster is turned on for the first time. (Courtesy: Author)

Span Master: Many young short-wave fans accepted Knight-Kit's invitation to "Log the World" with the futuristically styled Span Master. At $25.95, or financed for "only $2 down" who could resist? (1961 Allied Catalog)

existed, as the company's first house brand. The first radio in their 1929 catalog bears the Knight badge, as do many products in their line-up that year. Though the Knight-Kit name variation wouldn't emerge until decades later, the company produced several kits in their first year.

The post-war 1949 catalog shows a handful of kits, but by the early 1960s, the kit product line was staggering. The company enhanced the desirability by slapping imaginative names on their radios, like "Ocean Hopper," "Space Spanner," and the popular 5-band flagship, "Star Roamer."

Their line of ham radio gear was fairly complete too, if less whimsically named, but some of their designs more than made up for it. The formidable and somewhat daunting T400, for example – a 400-watt transmitter capable of CW, SSB, and AM in the 80, 40, 20, 15 and 10 meter bands – was billed as pumping out up to 600 Watts PEP in SSB mode. It sported an optional three-inch scope for modulation monitoring, and had a special keying network to control the keyed wave envelope shape.

The built-in output matching network was happy to drive any load from 40 to 600 ohms. This beast was a foot high and two feet wide, weighed 140 lbs, and with all four optional modules would have cost $657! That's *if*, in fact, it was ever actually produced. Though it can be seen in at least two years of catalogs in the early 1960s, Knight-Kit collectors suspect that it never made it beyond prototype stage, as there has been only one unit ever reported on the used market.

C11: C11 CB Radio Kit circa 1961. Tunes all "23 channels" continuously, but you get to pick your one favorite transmit channel crystal. (1961 Allied Catalog)

The T-400 may indeed have been a bit rich for the average ham's blood, but the modest and capable T-60 transmitter and R55 receiver were their most popular rigs. The R55 receiver demands respect for its five-band coverage from 530 kHz to 56 MHz, with double slide-rule dials for frequency and band-spread.

For the code-phobic (in those days Morse code was mandatory to get any ham license), there were CB transceiver kits as well. In 1961 you could choose from one base station that had a continuously tuned receiver and a single transmit frequency, and a modest two-channel mobile rig. By 1966 you had a bit more to pick from: four futuristic looking models with all 23 channels that could be used as base or mobile radios, and three different walkie-talkies. The gutsy 1-watt, top-of-the-line unit was so big it was like holding a shoe box full of bricks to your face! And remember, when you brought any of these home and opened the box, all you had was a pile of parts. Your work had just begun!

Behind the Scenes at Knight-Kit

Tremendous effort went into producing a Knight-Kit for sale. A marketable product had to be designed and perfected, with attention to performance and value – with the least possible parts. Prototypes had to be assembled and tested. Then it had to become a kit, which meant writing a manual. For this, expert technical writers teamed with graphic artists to create an easy to follow manual that hit the target of Allied's core marketing strategy, "Electronics for Everyone."

For the first-time kit builder, Allied offered these words of reassurance: "Thanks to Knight construction manuals, even those with no previous experience will find assembly a marvel of simplicity…For proof positive of the clarity of Knight manuals, drop a card to Allied – we'll send you a free copy of the construction manual for the Knight VTVM." Now that's confidence! Seems almost like they were giving away their secrets, but you could buy any manual for ten cents.

New kits were added aggressively in the 1950s and early 1960s. Older, solid sellers continued, some being updated with refinements, and placed alongside new futuristic designs.

The Competition

Knight-Kit was far from the only kit producer. Their most formidable competitor was Heathkit, perhaps an even more familiar name. Heathkit products were more expensive and their designs more refined. Construction was more complex, but reflected depth in engineering and features. For those who were drawn to kit building for economy, Knight-Kits had greater appeal; Heathkit attracted builders wanting higher quality without as much concern for cost. Heathkit was a kit-only company, though, and stores were very sparse. Their catalog could be digested in less than an hour.

Heathkit also enjoyed at least another decade or so of active kit production, crossing into the hobbyist computer age and beyond. Today, Heathkit produces educational and training kits, having left consumer kit products behind in the early 1980s. A search of today's vintage equipment market will turn up hundreds of Heathkit devices, but only dozens of Knight-Kits. Perhaps cost established value and people hung onto their Heathkit products, while the lower cost projects went to the dust bins.

Electronics supply companies such as Lafayette had their own kit products. Other kit companies, such as Eico and Dynaco, narrowed their focus to test equipment or audio equipment. With half a dozen or more prominent kit companies, and dozens of minor players, the kit business was thriving by the early 1960s.

Allied Catalogs: Your Electronics Bible

As the electronics industry developed at the rate of a barely-controlled explosion, Allied added retail stores to cater to hobbyists and burgeoning HiFi and TV market as well. Their annual catalog went from a scant 100 pages to almost 500, fairly bursting with illustrations and detailed write-ups about all things electronic. The catalog itself became a text book of sorts to anyone thirsting for electronic knowledge. Catalog pages included

KIT-RELATED WEB SITES

Knight-Kit
www.knightkit.com
Radio Broadcaster site, plans, collectibles, fan stories

Carl's Electronics
www.electronickits.com
Wide range of kits

Nostalgic Kits Central
www.nostalgickitscentral.com
Virtual Kit Museum, Heathkit, Eico, Dynaco, etc. Be sure to click on General Info, find the Modern Kits link for tons of kit suppliers!

Antique Electronic Supply
www.tubesandmore.com
Tube-centric supplier with some kits

Ramsey Electronics
www.ramseyelectronics.com
AM/FM radio broadcasters, ham and audio kits

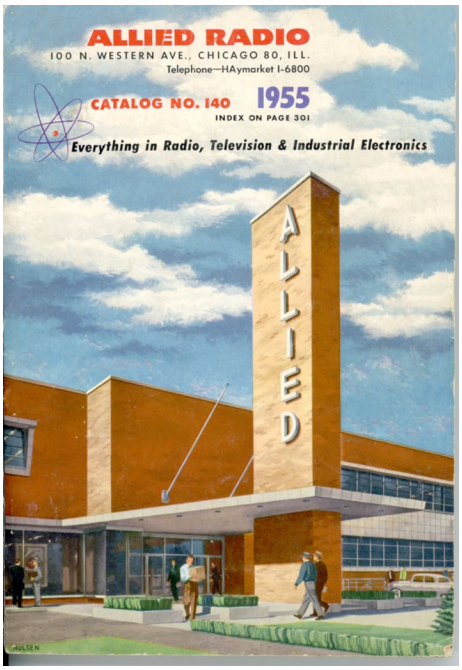
Cana Kit
www.canakit.com
Transmitters, hobby kits, electronics labs

Hobby Engineering
www.hobbyengineering.com
Impressive array of useful items and gadget kits

Vintage Manuals
www.vintagemanuals.com
Source for old kit manuals

Allied Radio
www.alliedelec.com/alliedhistory.aspx
History site of today's Allied Radio (industrial electronic supplies)

Heathkit Educational Systems
www.heathkit.com
What Heathkit has become



1955 catalog: Allied's motto started out as "Everything in Radio and Electronics," then added Television and finally ended as "Electronics for Everyone." The 1955 catalog cover shows the brand-new headquarters and retail store at 100 N. Western Avenue, Chicago. (1955 Allied Catalog)

detailed photos, lengthy descriptions and huge blocks of specifications that included everything from the rather inflated "IHF Music Power" ratings to the exact tube compliment. Yes, there was much to be learned by reading the Allied catalog.

And read it we did, from cover to cover, hardly skipping even the pages of parts listings. The 1949 Knight-Kit section even invited customers to mail in any radio-building problems they may have and receive a personal response from L. M. Dezettel, Chief of Allied's Technical Staff. You may recognize the name as the same Louis Dezettel, as a prolific technical author, who wrote books about electronics, photography, masonry construction and much more. Talk about personal service!

If the catalog was the consumer electronics bible of the time, then the main retail store at 100 N. Western Avenue, Chicago was the Temple of All Electronic Holiness. There, if you planned your pilgrimage, you could spend the day communing with every significant device pictured in the catalog. There were ham shack style displays with the latest transmitters, receivers, keyers, and monitors. There were HiFi demo rooms with the latest components feeding our quest for audio nirvana: stereo systems. There were color TVs (where we learned that NTSC stood for Never Twice the Same Color), and radios of all shapes and sizes. There were rooms with antennas hanging from the ceiling, racks with reels of wire and cable, and of course Knight-Kits for our lusting eyes to devour.

For parts or catalog-only items, there were counters with copies of the catalog next to order forms that could be filled out, then sent via a vacuum-powered message tube to the warehouse in the rear of the store. When your order was ready, your name or number was called over the PA system, and you went to a huge counter to pick up your order.

A repeating tape loop announcement reminded you that there was an "express" counter for tubes, batteries, and self-serve items, though the "express" part of it, on a typical Saturday, was a bit optimistic.

Finally, on your way back to the parking lot, you'd walk through the close-out room, where there were displays of items at reduced prices to tempt one last time before you headed out the door.

But, as you left the building, you walked right past your car, and crossed the street to visit Olson Electronics, their neighbor and an Allied wannabe. Olson was far more densely displayed and carried a noticeably less expensive array, but also did a pretty fair business. Olson carried the new, up and coming product lines from companies in Japan such as Teac and Sony.

Allied, however, seemed to focus on US made products from Marantz, H.H. Scott, Fisher, Dynaco, Hallicrafters, Johnson, Hammarlund and the ubiquitous house brand, Knight. Later there appeared components bearing the Allied brand name, which were actually rebranded Japanese products, but by this point change was in the air of the electronics industry.

So, What Happened?

As the years marched forward, kit popularity declined. The reasons were complex, and no doubt included competition for attention by TV and the higher value and fuller feature sets of pre-made products from overseas. For example, the Knight-Kit receivers were either specialty products for hams or serious shortwave listeners or very simplistic AM radios.

These were in competition with the shortwave crossover radios of the time, the multi-band transistor sets that covered AM and FM with two or three shortwave bands thrown in. While those units didn't live long in the market, bigger multi-band radios began to appear. Then, for the first time in 1970, the police receiver poked its head out, almost simultaneously with the first "police scanners" from Regency and Electra. But Knight never produced a scanner kit and by that time the writing was already on the wall.

Allied was sold to Tandy (LTV) in the late 1960s and the new owners made the decision to terminate the kit portion of the business. There was internal talk about continuing the kit business in Japan, but the idea never materialized.

By 1970 Allied had changed significantly. The annual catalogs started dropping tube-type equipment and adding solid-state gear. Kits began to vanish, too. The Broadcaster was dropped by 1966 and never replaced. All of the kit ham gear was gone by 1970, save a couple of 6 meter rigs. The only shortwave radios left were the nameless R-195 communications receiver and the Star Roamer. The 1970 catalog was perhaps the last of its kind, owing primarily to the sale of the company to Tandy Corp., parent company of Radio Shack.

The industrial division of Allied continued to publish a large annual catalog, but the days of the big Allied Radio consumer catalog were at an end. The smaller retail stores, usually found in malls, became Allied Radio Shack. These were disappointing days. The Radio Shack catalogs were little more than fattened-up circulars containing mostly low-cost electronics of questionable parentage. The quality of merchandise carried in the old Allied stores followed that trend, though for a time the stores still handled some pretty notable brands like Ampex and Wollensak tape decks, and products by Craig, Sony, Drake and Electro-voice. Yet that soon faded, too.

Of all the electronics kits produced by Knight Electronics, the Broadcaster perhaps had more impact on its builders than any of the others. It let you live a dream, and dreams have a way of taking flight. From the young boy barely able to read trying to produce his first newscast by reading a newspaper to his radio audience (parents in the next room), to the teenager who built a complete radio studio with turntable, tape machine, mic and a mixer…to the youthful experimenter creatively ignoring the instruction book to hang a really long, long wire antenna on the Broadcaster in an attempt to extend his signal. FCC? What FCC? The dream was made alive through that simple kit.

Building Electronics Kits Today

Though kit building is far from the popular hobby it once was, it is still possible to build something useful from a kit. In fact, a few of the big kit names are still around, or perhaps around again in a new form. Dynaco amplifier kits are available from Triode Electronics and Dynakit. Not surprisingly, Triode offers a grouping of tube-based audio kits, and replacement parts for original Dynaco products. Dynakit offers replicas of the original Dynaco amplifiers as well, along with replacement parts.

In the high-end audio arena you'll find Audio Note Kits, offering some rather serious audiophile products in kit form. Setting Google loose on the search "ham radio kits" unearthed a surprising list of things to build, even beyond the expected ham transmitters and receivers.

How about building a clock that uses an oscilloscope to display a simulated analog clock? Sound cool? At $24.95, it did to me, too. Clearly, the Internet can open the kit world to you. Though the days of single large suppliers with big retail stores are gone, your virtual world is crammed with interesting projects.

Yes, the nostalgic days of kits in the mainstream may be gone, but the underground is huge. If you have even a mild interest in electronics … oops, this is *Monitoring Times*! Sure you do! … Go find a kit, set aside some quality time with your soldering iron, and build something!

About the Author:

Jim Addie (N9SSD) has been a broadcast engineer for the past 37 years, having worked as Chief Engineer for several major stations in Chicago and as free-lance engineer. He is a technical consultant for radio stations and recording studios. He is CEO of Platinum Home Theaters in Chicago and proud owner of the Knight-Kit Web Site, www.knightkit.com. Contact him at jim@knightkit.com.

SCANNING REPORT

THE WORLD ABOVE 30MHZ

Dan Veeneman
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www.signalharbor.com

Selecting a Scanner for Syracuse

Many factors come into play when selecting a scanner. Coverage, capabilities, ease of use and affordability are all aspects to consider during the decision process. This month we consider some very practical issues that are important to a new scanner listener.

❖ New York

Hi Dan,

I recently read your article on "Buying your first Scanner" from May 2010. I'm interested in obtaining my first scanner. I live in Upstate NY. I would like to monitor police, fire, emergency and also military type action. I am a retired military officer. In your section on "Selecting a Scanner" I agree with all your criteria but would like to add a few more. I definitely want one that can be run easily on AC power even though I would prefer a portable. I'm finding that many of these new scanners "eat" batteries even the rechargeable ones. I would prefer not to have to connect to a computer unless I am going to download the updated frequencies. Also do any of these "portables" have stands that can be used when setting on a table and plugged in AC?

John near Syracuse

One of the primary considerations for a purchase is to be sure that the scanner is able to monitor the local agencies of interest. This means that it must be able to tune to the frequencies used by these agencies and have the capability of converting their radio transmissions into audio. Not all scanner models meet these criteria, so some homework must be done to discover the specific frequencies and types of transmissions used by each of the agencies of interest.

Syracuse is a city of about 150,000 in upstate New York. It is the county seat of Onondaga County, which is to home to nearly half a million people and covers an area of about 800 square miles.

The county is currently moving agencies from older, independent VHF (Very High Frequency) and UHF (Ultra High Frequency) analog radio systems onto a new digital trunked radio network.

Back in 2007, the Onondaga County Legislature endorsed the creation of the Central New York Interoperable Communications Consortium (CNYICC). As originally envisioned, the CNYICC would serve a five-county area including Cayuga, Cortland, Madison, Onondaga and Oswego Counties, providing a common radio infrastructure for local, state and federal users.

Until the other counties catch up, Onondaga County is the primary user of the system and is in the process of moving agencies from their old radio systems onto the new system. Phase I, now complete, saw the cutover of county and local police and fire departments onto the system. Phase II, which is underway, will eventually have non-public safety agencies like highway departments and school districts move over as well. They even maintain a web site at **http://esp.ongov.net/OCICS** that provides information about their portion of the system, called the Onondaga County Interoperable Communication System (OCICS).

The OCICS system uses a set of standards called APCO (Association of Public-Safety Communications Officials) Project 25, or P25 for short. These standards specify in excruciating detail exactly how P25 radios are supposed to communicate with repeater sites, including what is called the Common Air Interface (CAI) and the specifics of how trunking messages should be exchanged. Fortunately, scanner manufacturers have incorporated these standards into newer model scanners, so as a buyer, all you need to do is select a digital-capable scanner that can trunk-track the 9600-baud P25 control channel. Models that are able to do this include:

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

The Federal Communications Commission (FCC) maintains detailed licensing information for public safety agencies, including those in Onondaga County. The FCC Universal Licensing System (ULS) database is available at **http://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp**

Using the FCC search form, we can discover that the Onondaga County system is licensed for fifteen repeater site locations where transmissions are "repeated" out to mobile and portable two-way radios. These repeater sites are located in the towns of Baldwinsville, Cicero, Elbridge, Fabius, Lysander, two in Marcellus, Otisco, Pompey, Skaneateles, and five in various locations around Syracuse. The various locations are intended to provide good signal coverage for most of the county.

The FCC database also reports that frequencies in use on the new system are in the UHF band, specifically: 453.2375, 453.2625, 453.2875, 453.3625, 453.5625, 453.5875, 453.6125, 460.2125, 460.2375, 460.2625, 460.3625, 460.4250, 460.4375 and 460.5000 MHz.

We now have enough information to begin monitoring the system. This is where programming comes into play. It is possible, although tedious and error-prone, to program every frequency into the scanner. Listeners have done that for decades, ever since the first programmable scanner hit the market. However, in those days scanners only had enough memory to hold a dozen or so frequencies, so it wasn't really too difficult to do. These days, with much more memory and so many more capabilities, programming has become quite a chore.

❖ Eliminating Programming

A couple of technological innovations have helped make things easier.

The first innovation was scanner connectivity to a computer. Using a special cable, software running on a personal computer can quickly and reliably load frequencies, talkgroups, and related information into a scanner with just a few clicks of the mouse. The software also allows the listener to organize the thousands of possible frequencies and talkgroups, looking for duplicates and filtering out those systems and users they no longer wish to hear. With such software, listeners can also download data files containing local frequencies and talkgroups, already formatted for loading into their computer. Checking **groups.yahoo.com** for interest groups dedicated to your particular scanner model and scanner clubs operating in your geographic area can often yield a treasure trove of such data.

The second innovation is the recent introduction of scanners that require almost no programming. The introduction of the Uniden HomePatrol-1 (**www.homepatrol.com**) last year made monitoring far simpler. Rather than check frequency lists, push programming buttons hundreds of times or connect special cables, the listener just enters the local zip code. Computer technology has reached the stage where frequencies for the entire country can be factory-loaded into the HomePatrol-1, so it is ready to go when it reaches the listener. If you don't want to enter a zip code, or you're often on the move, the HomePatrol-1 can also accept input from an external GPS (Global Positioning System) receiver and automatically find nearby activity. The HomePatrol-1 was reviewed in the October 2010 issue of *Monitoring Times*.

GRE America introduced the PSR-700 and PSR-800 models, both of which contain a 2 gigabyte SD (Secure Digital) memory card that holds frequencies and talk groups for the entire country. Both models are handheld and can track trunked activity; however, only the PSR-800 can follow digital P25 systems. The PSR-700 is limited to monitoring analog signals.

❖ Batteries

Battery consumption is a continuing challenge for scanner users, just as it is for hybrid automobile owners. While most technology has greatly improved in the past few decades, battery technology hasn't shown a similar improvement. Besides the cost, there are occasional reports of heat-related problems when a handheld scanner is continuously plugged in to a charger. Some owners go so far as to have two sets of rechargeable batteries, which they rotate between the scanner and a separate, external charger.

If you don't need the portability that comes with a handheld, the purchase of a desktop that is designed to run on AC (wall) power might be a good choice.

❖ Stands

Finding a way to hold up a handheld scanner on a desk seems to be a tradeoff between stability and consumption of desk space. Larger, heavier stands may keep the scanner from tipping over, but you lose working space on the desk or table. One interesting idea I've seen is to use the belt clip supplied with many scanners to hold it on a music stand. It keeps it upright, off your desk and out of your way while allowing it to stay within arm's reach.

❖ Onandaga County, New York

The OCICS system is currently set up as a 15-site simulcast ("simultaneous broadcast") system, meaning each repeater site transmits the same information on the same frequency at the same time at the same time. This makes the listener's job easier, since only the information from one repeater site needs to be programmed into the scanner.

ONANDAGA COUNTY TALK GROUPS

Decimal	Hex	Description
1	001	County Fire (Dispatch)
2	002	County Fireground (Tactical 2)
3	003	County Fireground (Tactical 3)
4	004	County Fireground (Tactical 4)
5	005	County Fireground (Command)
6	006	County Fireground (Tactical 6)
7	007	County Emergency Medical Services (Dispatch)
8	008	County Fireground (Tactical 8)
9	009	County Fireground (Tactical 9)
10	00A	County Fireground (Tactical 10)
11	00B	County Fireground (Tactical 11)
12	00C	County Fireground (Tactical 12)
13	00D	County Fireground (Tactical 13)
14	00E	County Fireground (Tactical 14)
16	010	OTAC (All)
17	011	Countywide Interoperable 1
18	012	Countywide Interoperable 2
21	015	Syracuse Fire (Dispatch)
22	016	Syracuse Fire (Operations)
23	017	Syracuse Fire (Operations)
24	018	Syracuse Fire (Operations)
25	019	Syracuse Fire (Command)
26	01A	Syracuse Fireground (Tactical 9)
27	01B	Syracuse Fireground (Tactical 7)
29	01D	Airport Rescue Firefighting (ARFF) Operations
31	01F	Syracuse Police (Control)
32	020	Syracuse Police (Records)
33	021	Syracuse Police (North and East Dispatch)
34	022	Syracuse Police (South and West Dispatch)
35	023	Syracuse Police (Hancock International Airport)
37	025	Syracuse Police (Tactical Operations)
39	027	Syracuse Police (Events 1)
40	028	Syracuse Police (Events 2)
44	02C	Law Enforcement (Common)
45	02D	County Sheriff (Command Talk Around)
46	02E	County Sheriff (Records)
47	02F	County Sheriff (East Dispatch)
48	030	County Sheriff (West Dispatch)
49	031	County Sheriff (North Dispatch)
50	032	County Sheriff (Detectives)
51	033	County Sheriff (Car-to-Car)
60	03C	Syracuse Housing Department (Security)
63	03F	National Incident Management System 1
64	040	National Incident Management System 2
65	041	National Incident Management System 3
66	042	National Incident Management System 4
68	044	NIMS (Administration)
74	04A	Metropolitan Water Board
76	04C	County Parks
81	051	Syracuse Housing Department (Maintenance)

Even with the transition to the new county digital system, there should still be a fair amount of conventional (non-trunked) analog activity that's worth checking out. You may also find some trunked system activity being rebroadcast in analog form here as well.

Frequency	Description
39.46	Emergency Management
45.24	County Civil Defense 1
45.36	County Civil Defense 2
45.40	County Civil Defense 3
47.58	Hospital-to-Hospital (Low Band)
151.8950	TLC Ambulance Service
153.4400	Onondaga County Water Authority
153.4850	Onondaga County Water Authority
153.8900	Wilderness Search and Rescue
153.9500	Fire Dispatch (Simulcast of CNYICC Talkgroup 21)
154.6650	New York State Police (Car-to-Car)
154.6950	New York State Police (Statewide)
155.0400	Syracuse Animal Control
155.0700	Hutchings Psychiatric Center Security
155.2350	GBAC Emergency Medical Service (Baldwinsville)
155.2650	Rural Metro (Dispatch)
155.2800	Rural Metro (Madison County)
155.2950	Rural Metro (Operations)
155.3700	New York State Police (Interagency)
155.3400	Rural Metro (Ambulance to Hospital)
155.3550	Rural Metro (Cayuga County)
155.5050	New York State Police Troop D (Bases)
155.5650	New York State Police (Tactical)
155.5800	New York State Police Troop D (Mobiles)
156.1200	County Department of Transporta-

	tion
165.2375	United States Customs and Border Protection [Project P25]
166.2125	Veterans Administration Hospital Police [Project 25]
172.9000	Transportation Security Administration at Hancock International Airport [Project 25]
417.2000	Federal Protective Service [Project 25]
410.3250	Post Office [Project 25]
451.2250	Syracuse Water Department (Skaneateles)
451.6250	Syracuse Water Department (Syracuse)
451.7875	Wilderness Search and Rescue (Simulcast on 45.96 MHz)
452.0125	Wilderness Search and Rescue (Administration)
452.4500	Wilderness Search and Rescue (Channel 3)
452.6250	Centro Public Bus Service (Oswego County)
452.6500	Centro Public Bus Service (Channel 2)
452.8500	Centro Public Bus Service (Telemetry)
453.0375	EAVES Emergency Medical Service (East Syracuse)
453.1750	Mercy Flight Medical Helicopter
453.2000	Highland Forest (Parks)
453.5750	Hill Net (common interagency in the Hill area of Syracuse)
453.7250	Onondaga Lake Parkway (Parks)
453.8500	County Fire Dispatch (Simulcast of CNYICC Talkgroup 1)
453.9250	Rosamond Gifford Zoo (Parks)
453.1500	Syracuse Department of Public Works (Road Maintenance)
453.2250	Syracuse Department of Public Works (Garbage Trucks)
453.2750	Centro Public Bus Service (Telemetry)
453.3250	Centro Public Bus Service (Channel 1)
453.7000	Syracuse Department of Public Works
453.9000	Centro Public Bus Service (Onondaga County)
453.9500	Centro Public Bus Service (Onondaga County)
460.0250	County Emergency Medical Services Dispatch (Simulcast of CNYICC Talkgroup 7)
460.0500	Public Safety Building Operations
460.0750	Courthouse
460.1500	Justice Center Jail
460.1750	Jamesville Penitentiary
462.6750	Wilderness Search and Rescue (Channel 5)
462.9750	County Emergency Medical Services (Calling channel)
463.0000	Emergency Medical Services (UHF Medical 1)
463.0750	Emergency Medical Services (UHF Medical 4)
463.1250	Emergency Medical Services (UHF Medical 6)
463.1750	Emergency Medical Services (UHF Medical 8)
463.6500	Syracuse University Emergency Medical Service
464.4250	Hutchings Psychiatric Center
851.0375	Mobile Data Terminals
851.4875	Mobile Data Terminals
851.9375	Mobile Data Terminals
853.0375	Mobile Data Terminals

❖ Dispatch Codes

Dan,

I enjoyed the November 2010 edition with the medical dispatch codes. My local fire dispatcher is using additional codes for dispatching fire calls. I've tried to decode some of them by keeping track of the calls and have a few, such as:

52-B-5	*Carbon Monoxide Alarm*
67-D-1	*Grass Fire*
69-D-5	*Structure Fire*
71-A-1	*Vehicle Fire*

I tried to Google and perform other searches for "Fire Dispatch Codes" without much luck. Is there someplace where a person can find them?

Brian in South Dakota

As you've discovered, dispatch codes are not the same from agency to agency. Even within an agency the codes may change over time, so finding a single authoritative list is not going to be possible.

Sometimes the codes don't even start with "10." For instance, the Syracuse Police Department used the following single-number codes for many years:

Code	Meaning
1	Citation Issued
2	Radar Special Detail
3	Parking Citation Issued
11	Report Written
12	Arrest Made
13	Evidence Technician Report
14	Civil Matter
15	General Investigation Report
16	Juvenile Appearance Ticket
17	Vehicle Accident Report
18	Property Report
19	Supplemental Report
20	Suspected Rabies Report
21	Vehicle Report
22	Missing/Found Person Report
23	Open Door/Window Report
24	Firearms Discharge Report
25	Snowmobile Reports
26	Warrant/Summons Attempt
27	Snowmobile Summons
28	Observation Report
29	Appearance Ticket Issued
30	Interdepartmental Memo
31	Crime Lab Request Form
32	Officer Injured/Sick Report
33	Repossession Report
34	Use of Force Report
35	General Message Report
36	Report Mailed
37	Affidavit Made
38	Complaint Information
39	Warrant/Summons Processed
40	Photos Taken
41	Detail Completed
42	Report/Deposition
43	No Police Action
44	M.O. Coding Sheet
45	K-9 Building Search
46	K-9 Directed Search
47	K-9 Person Check
48	K-9 Bomb Detection
51	K-9 Evidence Search
52	Family Offense Notification
53	K-9 Criminal Apprehension
54	K-9 Officer Protection
55	K-9 Demonstration
56	K-9 Narcotics Detection

Some 10-codes were used that are common to other jurisdictions:

Code	Meaning
10-31	Subject Has Prior Record
10-32	Transport within County
10-33	Transport Female Prisoner
10-34	Transport out of County
10-40	Suspicious Person
10-41	Warrant on File
10-42	Vehicle Stop
10-43	Go to Station
10-50	Officer Needs Help
10-78	Ambulance Call
10-79	Accident, No Injuries
10-80	Accident, with Injuries
10-96	Request Tow Truck
10-98	Break

There are also signals and disposition codes that were also used to convey information from an officer to the dispatcher.

Signal	Meaning
27	Drivers License Check
28	Vehicle Registration Check
29	Onondaga Law Enforcement Information System (OLEIS) Check
30	New York Statewide Police Information Network (NYSPIN) Check
31	No Prior Arrests/Wants
32	Confidential Information
50	Officer Needs Assistance
96	Request Tow Truck
98	Personal Break

Disposition Code	Meaning
1	Report Taken
2	Arrest Make
3	Natural Illness
4	Civil Matter
5	Gone on Arrival
6	Settled on Arrival
7	Unable to Locate
8	Referred to Other Agency
9	False Alarm Report
10	Assist

Of course, all of these codes should be a thing of the past, according to the Department of Homeland Security (DHS). They have a policy initiative to migrate public safety agencies from these 10-codes to what is called "plain language." Because the need for interoperability has increased over the years, bringing multiple agencies together who may not be familiar with each other's operational "lingo," DHS has been pushing for the elimination of brevity codes and other shorthand that might lead to confusion and hesitation during a crisis. They want agencies to use straightforward words and phrases that clearly describe the situation and what actions are taking place all the time for every radio transmission, not just during mutual aid events.

According to a recent National Institute of Justice report, "Standardized language across all jurisdictions will remove the confusion that can occur when agencies do not use the same codes and signals. Law enforcement agencies that routinely use codes and reserve plain language for emergencies involving multiple jurisdictions may be more likely to lapse into code, even during emergencies, which could create confusion."

That's all for this month. Get outside and enjoy the summer, but if you do find yourself near a computer, 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 at *danveeneman@monitoringtimes.com*. Until next month, happy scanning!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Q. *Which mobile scanner antenna will work best with my Uniden BCT15X: the Super M Classic or the Super M Ultra? Money is no object. (John Rommelt)*

A. For general purpose listening, I'm sure you'd never hear the difference within those frequency limits. If you're considering multiband VHF/UHF transmitting as well, I'd go with the Ultra for better impedance matching. It also has better microwave frequency response above 1300 MHz.

Q. *How were constant, repeating weather broadcasts recorded in the days before magnetic tape?*

A. Although wire recorders were available, they would require rewinding, and if one broke, they were a nightmare to splice. I know – I had one! Phonograph transcriptions were widely used in the broadcast industry and would work well in such applications. As to whether each airport had its own recording equipment, I don't know. Possibly a central weather station would send out the voice messages on dedicated telephone lines.

Q. *When I bought my first digital-tuner TV a year ago, I remember a setting allowing the user to adjust the audio synchronization. Why wouldn't one naturally assume that with the high-tech digital TV signal the audio sync would be correct? (Judy May, W1ORO, Union, Kentucky)*

A. My limited knowledge of modern broadcast TV causes me to speculate on this. Perhaps my readers will correct me if I'm wrong. (Sometimes they correct me even when I'm right!)

If sound and picture are sent on separate relay routes, they arrive out of synch. We see this commonly on news feeds. Or, as we sometimes see when watching reruns of other programs, perhaps the playback heads are offset by different amounts than on the original recording. These are both guesses. Readers?

Q. *With all of the fiber networks propagating around the globe, what is the future of satellite TV and data services?*

A. Wireless is still the only way to get TV and data signals to mobile terminals and remote regions that have no dependable phone lines. I don't see any substitutions for satellites in the foreseeable future.

Q. *If you change the feedpoint of a random-length shortwave antenna from the end to the center, what does that do to the pattern? At the proper frequencies, would this qualify as a "double Beverage"; that is, a receiving lobe off each end? (John Bishop, Hawthorne, FL)*

A. Where you feed the wire antenna has a negligible effect on its pattern, only its impedance for matching purposes. To qualify as a Beverage, the antenna has to be at least one wavelength long at its operating frequency, preferably multiple wavelengths to favor reception of the end(s).

Q. *With general-coverage communications receivers acknowledged to have poor sensitivity in the AM broadcast band, why do so many DXers use them? Wouldn't they be better off with cheaper, more sensitive, AM/FM stereo receivers?*

A. The low sensitivity is purposely designed to prevent front-end overload from local broadcasters. At these frequencies, signals are limited by atmospheric noise, not receiver design. If a signal's strength is above that of the background noise, it will be heard regardless of the sensitivity of the receiver.

Q. *I'm interested in buying a mobile antenna that uses an NMO mount. Will it hurt to remove the antenna every time I go through the car wash? (John Rommelt)*

A. No, provided you dry off the mount before replacing the antenna section to resist corrosion.

Q. *Will the new scanners that have "Close Call™" and similar features, which automatically report the frequency of nearby transmitters, work for detecting wireless mikes at concerts? (Jason, email)*

A. Yes, with certain limitations. Since these mikes are very low power, and since there are likely several of these wireless mikes being used simultaneously on different frequencies at a concert, you'd have to get quite close, which might be impossible with protective security measures in place. Additionally, the microphones would have to be operating on frequencies covered by the scanner, and some mikes are near TV frequencies.

Q. *I live in a townhouse with antenna restrictions and I can either install an H900 active shortwave antenna on my deck about 4 feet above ground level, or in my second floor window inside the house. Or, I can install an LA390 active loop indoors in my second floor window. If I mount either antenna in the attic it will be near my transmitting antenna (only 5 watts). Your recommendation? (Mike, VE3WDM)*

A. Generally speaking, an ideal HF antenna is high, outdoors, distant from the dwelling, not near power lines, and fed with coax. As each of these parameters is sacrificed, reception gets worse, either by increased electrical noise or decreased received signal strength.

For a loop to be effective, it needs to be rotated for either maximum reception or minimum noise as you change frequencies. Given the selections you have, I'd opt for the H900 in the attic. The nearby 5 watt RF shouldn't cause any harm, but separate the H900 as far as practical just to be on the safe side.

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

UTILITY WORLD

HF COMMUNICATIONS

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Recent Short Wave Military Activity

Listeners on HF (High Frequency/short wave) continue to hear the operations in Libya by the North Atlantic Treaty Organization (NATO). Signals are especially strong in Southern Europe.

4196.0 kilohertz (kHz), in upper-sideband voice (USB), is still very active. Aircraft with the "Magic" call plus two figures are E-3 AWACS (Airborne Warning And Control System). Most other units use the NATO trigraph calls with three alphanumeric characters. Letters are expressed in standard NATO phonetics.

Some listeners have been confused by procedures and code words heard. "Alligator" refers to a US military and NATO standard Tactical Data Link (TDL or TADIL) on another HF frequency. The link uses several data modes, of which the best known is Link-11 or TADIL-A. Standards also define newer systems such as Link-16 and Link-22. All these have the purpose of making target tracks and other position data known to all players in a defined space known as the "Alligator Playground."

Another attention-getter is the reference to "NUCO." Despite sounding unsettlingly like "nuke," it's nothing to get alarmed about. It's a code for passing numeric information. The radio procedure is to say "NUCO," then the code string, then "un-NUCO" (end of code).

The other noteworthy frequency is 10405.0 kHz. This continues to be a psychological operations (PSYOPS) transmission from an unknown source. It's apparently aimed at Libyan sailors, telling them to stay in port or go home, otherwise they will be destroyed. Usually there's a voice loop in Arabic and English, though French has also been heard.

This broadcast is frequently jammed by a potent swept-audio pinging station, presumably in Libya. One frequently reported broadcast time is 0800 UTC (Coordinated Universal Time), which is currently two hours later in Tripoli.

Back in the USA, a lot of listening is focused on a quest to find all the frequencies used by a relatively new station with the ALE (Automatic Link Establishment) identifier of EN875TOC. This is almost certainly the Arkansas National Guard 875th Engineer Battalion Tactical Operations Center, which is in Jonesboro. The 875th served a tour in Iraq, but now it's back home helping with road clearance work in this spring's extreme weather.

Frequencies discovered so far are: 4927, 6985.5, 8058.5, 9065, 9145, 10151.5, 10703, 11998.5, 12087.5, 12163.5, and 16120 kHz USB. Gaps in the 52-second sounding sequence indicate more are out there, but signals are very weak everywhere. This makes it a pretty good catch.

End of WWV "Geoalert"

In April, the Space Weather Prediction Center (SWPC) of the US National Oceanic and Atmospheric Administration (NOAA) issued the following announcement on its web site at **www.swpc.noaa.gov/index.html** :

"On 06 September 2011 the Space Weather Prediction Center (SWPC) will discontinue the broadcast of its synoptic Geo-Alert products on the WWV and WWVH radio stations starting with the 12 UTC products."

These are, of course, the announcements on the standard time and frequency stations of the US National Institute of Standards and Technology (NIST). The reason, according to an SWPC source, is a familiar one. It's the budget.

Fortunately, we will still have the Internet link to what even they call the "WWV product." It's a small, frequently updated text file that lives at **www.swpc.noaa.gov/ftpdir/latest/wwv.txt** . One can also sign up with the SWPC's Product Subscription Service, and have it sent that way. The form is at **https://pss.swpc.noaa.gov**

What's a Geoalert?

So why is this big news, and what's the fuss about? It's because anyone who grew up around HF radio still has the numbers "18" and "45" hard-coded into his or her brain.

18 was the minute after each hour when everyone punched up WWV (Ft. Collins, CO), and 45 was the same for WWVH (Kekaha, HI). This daily ritual obtained the three observation results needed for computer propagation programs and general guidance. These were, and still are, the solar flux, the mid-latitude A index, and the mid-latitude K index. To the radio geek, these are what the daily market indices are to stock traders. They are that important.

The "WWV product" is called a Geoalert (or Geo-Alert, or GeoAlert), because that is the international name for a specifically formatted bulletin containing the underlying data. The Geoalert codes are expressed in text to construct the announcement. Such standardized bulletins have been around at least since the International Geophysical Year (IGY) in the 1950s.

WWV's original format was just a few Morse code characters. These signaled whether a propagation disturbance or world research campaign was starting or in progress. As data sources changed, this evolved slowly into the present-day SWPC format. This will continue on, at least for now, in "www.txt."

It really wasn't that long ago when Internet became the most convenient acquisition tool. Radio people created a dizzying variety of widgets, apps, embedded frames, file grabbers, and programs.

Here, the numbers come from a cool little Firefox add-on called Propfire. They are simply always there, in the status line at the bottom of the window. Other Firefox users similarly seeking a little friend can grab Propfire from the "Get add-ons" link.

What the Numbers Mean

"Solar flux" is a daily flux density measurement of radio noise from the sun at local noon. In this case, the reading is taken at the Dominion Radio Astrophysical Observatory in Penticton, Canada. It is not corrected for the Earth's orbit.

There are a lot of different solar flux observations taken every day, but this one is considered important, due to its frequency of 2800 megahertz (MHz). This is selected because it is emitted by hydrogen in a certain excited state. The resultant reading, in "solar flux units," tracks the sunspot numbers and general solar activity quite well.

Solar flux is on a linear scale. 60 is about as low as it ever gets and represents a quiet sun condition. As we've seen in 2011, 100 is a good number for lighting up HF, especially above 15 MHz. 200 is even better, making skip possible to 50 MHz or higher. There have been brief peaks over 300, which is an extremely active condition.

The "K index" is a single value computed from measurement of the past few hours' motion

in the Earth's magnetic field. Such changes indicate gusts in the "solar wind" flow of charged particles past the planet. It's expressed as a whole number between 0 and 9, without a unit.

K is timely, and is watched closely for trends. Lower is always better. A rising K indicates increased aurora and other phenomena which degrade radio propagation. Things start to get interesting when K hits four. Five is considered a "geomagnetic storm" condition. Seven is a strong storm, eight is severe, and nine is extreme.

Extreme comes only a few times per solar cycle. It's when all those scary stories about magnetic storms actually happen. As far as HF radio is concerned, a 9 in middle latitudes is pretty much game over. Try higher frequencies, or turn it off and go see if Texas is experiencing Northern Lights yet.

The "A index" is massaged from the previous day's K indices. It's rescaled onto a linear value. It starts at zero, with a high end well into the hundreds. Lower is always better, though negative propagation effects start to appear around 20. It's a good indicator of whether recent activity has caused ongoing degradation of radio conditions. These effects are frequent, especially on trans-auroral and trans-polar paths. They can last for days in extreme cases.

The text following these numbers pertains to NOAA's scale for "Space Weather Storms." This follows the planetary (NOT mid-latitude) K index, rescaled to G1 through G5. The interesting part is the prediction. Another good NOAA product is the "Radio Blackout" scale, R1 through R5.

Now go forth and watch the geomagnetic show unfold as Solar Cycle 24 peaks. See you next month.

ABBREVIATIONS USED IN THIS COLUMN

AFB..... Air Force Base
AFRTS ..... US Armed Forces Radio and Television Service
ALE ..... Automatic Link Establishment
AM..... Amplitude Modulation
AWACS ..... Airborne Warning And Control System
CAMSPAC ..... USCG Communications Area Master Station, Pacific
CW..... On-off keyed "Continuous Wave" Morse telegraphy
DHFCS..... UK Defence High-Frequency Communications Service
DSC..... Digital Selective Calling
EAM..... Emergency Action Message
EOC ..... Emergency Operations Center
FAX..... Radiofacsimile
FEMA..... US Federal Emergency Management Agency
G11..... Female "Strich" callup and message in German
G-TOR ..... Golay Teleprinting Over Radio
HFDL ..... High-Frequency Data Link
HF-GCS ..... High-Frequency Global Communication System
LDOC ..... Long-Distance Operational Control
LSB ..... Lower Sideband
M89..... Chinese CW "V ffff de ffff" coded markers
MX..... Generic for Russian single-letter beacons/markers
MARS..... US Military Auxiliary Radio System
Meteo ..... Meteorological; weather office
NAT ..... North Atlantic oceanic air control, families A-F
NATO..... North Atlantic Treaty Organization
NCS..... US National Communications System
NS/EP ..... National Security/ Emergency Preparedness
PACTOR ..... Packet Teleprinting Over Radio, modes I-III
RTTY ..... Radio Teletype
Selcal..... Selective Calling
SESEF..... Shipboard Electronics Systems Evaluation Facility
SHARES..... SHAred RESources (US federal frequency pool).
SITOR..... Simplex Telex Over Radio, modes A & B
UK..... United Kingdom
Unid ..... Unidentified
US ..... United States
USS..... United States Ship
USAF..... US Air Force
USCG ..... US Coast Guard
VC01 ..... Chinese language voice chip robotic "female"
V13..... Taiwan "New Star," music and numbers
V26..... Chinese, some other numbers in broken English
Volmet..... Formatted aviation weather broadcasts

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 ().

502.0 GB4FPR-UK 600-meter CW special event station, Liverpool, listening on 3570 for contacts, at 2115 (ALF-Germany).
502.5 SM6BGP-Swedish 600-meter CW experimental station, all-stations call at 2059 (ALF-Germany).
504.6 DI2AE-German600-meter experimental beacon, CW identifier and grid position at 1106 (ALF-Germany).
2654.5 NNN0AYU-US Navy/ Marine Corps MARS, net at 0121 (Jack Metcalfe-KY).
2899.0 Shanwick Radio-NAT-C, Ireland, selcal MS-KR and position from Lufthansa Cargo 8188, an MD-11 freighter (D-ALCN), at 0239 (Ken Maltz-NY).
2971.0 Shanwick-NAT-D, position from USAF Air Mobility Command Reach 399, gave secondary of 3476, at 0247 (Maltz-NY).
3016.0 Shanwick-NAT-A, position from Air France 3507, at 0324 (Maltz-NY).
3903.0 MOBE3F-French Air Force, Avord Air Base, repeated no-joy ALE calls to 202E3F, an E-3F AWACS, starting at 0602 (Patrice Privat-France).
4196.0 Magic 53-NATO E-3 AWACS/Sentry, "alligator" tracking link coordination with several units using trigraph calls, part of Libya operation, at 0055 (ALF-Germany).
4225.0 QV5B-Chinese military CW calling markers (M89), calling 7NPE, parallel on 5500, at 1056 (Ary Boender-Netherlands).
4239.5 XSS-UK DHFCS, Forest Moor; also 5295, 7535, 10420, and 22571; ALE sounding at 2335 (MPJ-UK).
4410.0 Unid-Chinese Robot (VC01), rapid numbers at 1039, 1435, 1454, 1622, and 1823 (Boender-Hong Kong remote).
4464.5 AFD6RD-USAF MARS, calling 6MU at 0013 (Metcalfe-KY).
4532.0 UN2T-M89, calling JA3L, CW at 1054 and 1624 (Boender-Netherlands).
4557.7 "D"-Russian military CW cluster beacon (MX), Odessa/ Sevastopol, also 10871.7, at 2151 (MPJ-UK).
4592.0 JR5U-Chinese military CW calling markers (M89), calling 9VUP, at 2000 (PPA-Netherlands).
4721.0 PLA-USAF, Lajes Field, Azores, ALE sounding at 2347 (MPJ-UK).
4874.0 TZSL2-Spanish Guardia Civil Maritimo, Algeciras, working TYMG1, Guadalajara, Spain, at 2339 (MPJ-UK).
5250.0 Ambarchik-Aktyubinsk Aero, Kazakhstan, radio checks in Russian with Amba (Samara Aero, Russia), Assistant, (Mosdok Aero, Russia), Sardina (Baku Aero, Azerbaijan), and Ashkhabad Center (Turkmenistan), at 0205 (ALF-Germany).
5500.0 QV5B-M89, calling 7NPE, CW at 1952 (PPA-Netherlands).
5598.0 Santa Maria Radio-NAT-A, Azores, position from Aer Lingus 6963, at 0341 (Maltz-NY).
5616.0 Trans Soviet 594-Transaero Airlines B777 (EI-UNR), working unknown NAT-C station at 0701 (Privat-France).
5687.0 Mineralny Vody Radio-Russian Aero station, radio check with Rostov Radio, at 0131 (ALF-Germany).
5745.0 Defiant Gray-US Navy Guided Missile Cruiser USS ***Vicksburg*** (CG-69), testing many modes with unknown SESEF, at 1219 (Metcalfe-KY).
5765.0 Unid-AFRTS/ American Forces Network, relay of Interruptible Voice Channel via US Navy, Guam, with music at 1935 (PPA-Netherlands).
5815.0 "Strich" family numbers (G11), callup 270/00 and 5-figure groups in German, at 1755 (Mike-West Sussex, UK).
6681.0 APWB-Possible "Echo-Charlie" band pirate, CW all-stations call at 0955 (ALF-Germany).
6733.0 Unid-Possible North African net, male Arabic speakers using traffic procedures and "roger" beeps, possibly also on 7712, at 2240 (ALF-Germany).
6745.5 CB52-Algerian military, calling CB40; similar with some follow-on secure voice on 5708, 5756, 6884, 6955, 7716, 7752, and 14475; ALE at 1917 (Michel Lacroix-France).
6765.0 NNN0EPY-US Navy/ Marine Corps MARS, passing SHARES exercise traffic at 1805 (Metcalfe-KY).
6779.0 NNN0EBC-US Navy/ Marine Corps MARS, SHARES exercise at 1807 (Metcalfe-KY).
6800.0 NNN0ASG-US Navy/ Marine Corps MARS, PACTOR on SHARES BBS (Bulletin Board System), at 1513. NCS311-NCS auxiliary station with SHARES exercise messages in PACTOR and G-TOR, at 1730 (Metcalfe-KY).
6803.1 CHPNSC140M-Telecom company NS/EC, Chapin, SC mobile, ALE with HFESIL160, Hoffman Estates, IL, at 1551 (Metcalfe-KY).
6832.0 3857-Unknown, calling 3854 in ALE, at 0935 (Eddy Waters-Australia).
6861.0 ISLADEPASCUA-Chilean Emergency Management/ Early Warning Center, Easter Island, ALE sounding on this and 16 other frequencies, at 0140 (ALF-Germany).
6876.5 516 Alpha Tullahoma-Probable TN National Guard on tornado recovery, radio checks with EOC and 519 Alpha, at 1552 (Metcalfe-KY).
7039.2 "F"-MX, Vladivostok, also 8495.2 and 10872.2, at 1033 (Boender-Netherlands).
7039.4 "M"-MX, Magadan; also 8495.4, 10872.4, 13528.4, and 16332.4; CW at 1033 (Boender-Netherlands).
7360.0 SAOPS-US military, calling aircraft G23443, ALE at 2009 (Metcalfe-KY).
7371.0 NNN0XAP-US Navy/ Marine Corps MARS, net with NNN0LHR, at 2147 (Metcalfe-KY).
7505.0 Fighting Freddie-US Navy Destroyer USS ***Gonzalez*** (DDG-66), working Norfolk SESEF (shore on 7535), at 1505 (Metcalfe-KY).
7527.0 RUF-USCG Cutter ***Mohawk*** (NRUF/ WMEC 913), ALE sound at 0650. J36-USCG MH-60J helo #6036, ALE sound at 0739 (Lacroix-France).
7535.0 Bowie Knife-Unknown US Navy vessel, testing various radios and modes with Norfolk SESEF, at 1228 (Metcalfe-KY). VMW-Wiluna Meteo, Australia, FAX propagation suggestion list, at 1724 (PPA-Netherlands).
7632.0 AFA4YG-USAF MARS, handing control of SHARES exercise net to AAV4SV, at 1700 (Metcalfe-KY).
7697.1 KSCYMO172-NS/EP, Kansas City, MO, ALE with BLWNMO108, Ballwin, MO, at 1443 (Metcalfe-KY).

7739.0 SP1OZ2-Sonatrach (Algerian government oil company), sounding in LSB ALE from pumping station 1 on the OZ2 pipeline, at 2010 (PPA-Netherlands).
7795.0 JMH2-Japanese Meteo, Kagoshima, two small FAX prognostic charts, at 1841 (PPA-Netherlands).
8023.0 868FEM-FEMA auxiliary station WGY 9868, calling WGY 9030, US National Public Health Radio Network, FL, ALE at 1911 (Metcalfe-KY).
8055.0 Unid-Probable North African net, several males using procedures in Arabic and French, also "roger" beeps, at 2000 (ALF-Germany).
8059.2 "A"-Unknown single-letter CW beacon, possibly unlicensed, at 0118 (Hugh Stegman-CA).
8137.0 Ocean World Shipping-Unknown shore station, calling vessel ***Scaramouche***, at 1148 (Metcalfe-KY).
8143.0 KHAIBAR-Pakistan Navy vessel ***Khaibar***, calling NRS (naval radio center), ALE at 1859 (PPA-Netherlands).
8200.0 HQ1-Libyan Great Man-Made River Authority, ALE link check with MOBILE25, also 9375, at 0030 (ALF-Germany).
8294.0 XVG9-Ho Chi Minh Radio, Viet Nam, Navigational warnings in English and Vietnamese, at 2113 (PPA-Netherlands).
8357.5 URDN-Ukrainian vessel ***Dneprovets-5***, CW duplex with UWS3 (Kiev Radio), at 0448 (ALF-Germany).
8416.5 NMO-USCG, Honolulu, HI, SITOR-B weather forecast at 0740 (PPA-Netherlands).
8725.0 Unid-Fishing vessel working an unknown Vladivostok station in Russian, discussing mechanical problems and fishing, at 1000 (Dean-CA).
8806.0 Unid-Unknown vessel working Vladivostok in Russian, at 1015 (Dean-CA).
8885.0 B-LIC-Cathay Pacific Cargo B747 freighter, flight CPA014, HFDL position for Muharraq, Bahrain at 1924 (MPJ-UK).
8888.0 EXD 014-Export Air Del Peru S.A. freighter, working Luanda, Angola, at 2115 (ALF-Germany).
8891.0 Convoy 3447-US Navy Reserve Fleet Logistics Support, position for unknown NAT-D station at 1855 (Privat-France). FPG 656-Falcon 900EX bizjet, Swiss registration HB-IUX, selcal DE-GP and position for Gander (NAT-D), at 2335 (ALF-Germany)
8894.0 LBT 4181-Nouvelair Tunisie (Tunisia) flight, position for Niamey, Niger, at 0025 (ALF-Germany).
8918.0 GMA 350B-Gama Aviation (UK) flight, position for New York at 2220 (ALF-Germany).
8957.0 "11"-HFDL ground station, Santa Cruz, Bolivia, uplink to Aeroflot A319 (VP-BUN), at 0621 (PPA-Netherlands).
8971.0 Pelican 711-US Navy P-3C/LN, clear and secure with Fiddle (Tactical Support Center, Jacksonville, FL) at 1530 (Allan Stern-FL).
8977.0 G-VYOU-Virgin Atlantic A340 "Emmeline Heaney," flight VS0250, HFDL position for Reykjavik, Iceland, at 1632 (MPJ-UK).
8990.0 BA1SE-Algerian National Police, ALE with TA1MA (Tamanrasset) and BI1SK (Biskra), at 1054 (ALF-Germany).
8992.0 Andrews-Andrews AFB HF-GCS, MD, 32-character EAM and "standing by for traffic," at 0100 (Jeff Haverlah-TX.
9031.0 Ascot 5737-UK Royal Air Force transport, calling Tascomm (Terrestrial Air Sea Communications), at 1903 (PPA-Netherlands).
9065.0 EN875TOC-AR National Guard 875th Engineer Battalion, Tactical Operations Center, Jonesboro; also 6985.5, 8058.5, 9065, 9145, 10151.5, 10703, 11998.5, 12163.5, and 16120; ALE at 0222 (Metcalfe-KY). ***[Possible post-tornado road clearance support. -Hugh]***
9080.0 Unid-Telephone autopatch in English, ended with machine saying, "this call has been completed," at 2206 (PPA-Netherlands).
9084.0 ECO01-Chilean Emergency Management, Region 1, ALE sounding at 2253. ECO06, Region 6, sounding at 2305 (ALF-Germany).
9198.0 FGT-Chilean Navy, ALE link check with TAC, at 0225 (ALF-Germany).
9253.0 NPFRON-Brazilian Navy River Patrol Vessel ***NaPaFlu Rondonia***, CW identifier in G-TOR and calling Manaus (Amazonas Flotilla HQ) in voice, at 0230 (ALF-Germany).
9496.0 DTRTM150-NS/EP, Detroit, MI, ALE with BLWNMO108, Ballwin, MO, at 1415 (Metcalfe-KY).
9725.0 "New Star Radio Station"-Music and Chinese female voice (V13), with "Program Number 4," at 0500, 0600, 1200, and 1300 (Boender-Hong Kong remote).
10066.0 "06"-HFDL ground station, Hat Yai, Thailand, HFDL squitters and uplinks to Aeroflot flights, at 1700 (MPJ-UK).
10087.0 "14"-HFDL ground station, Krasnoyarsk, Russia, uplink to HS-TLD (Thai Airways International A340), at 1848 (PPA-Netherlands).
10090.0 Tashkent Volmet, Uzbekistan, aviation weather at 1941 (PPA-Netherlands).
10150.0 9Z4DH-SailMail, Chaguaramas, Trinidad, CW identifier in PACTOR-III traffic, at 2255 (ALF-Germany).
10176.5 ECO09-Chilean Emergency Management, Region 9, ALE sounding at 0224 (ALF-Germany).
10194.0 FC8FEM-FEMA Region 8 Communications Manager, Denver, CO, ALE sounding at 0812. FR3FEM-FEMA Region 3, Philadelphia, PA, ALE sounding at 0855 (Privat-France).
10255.0 Unid-Vietnamese numbers station, female with usual callup to "Lighthouse" and 5-figure message in Vietnamese, stepped on by a male Vietnamese voice as if they played two recordings at once, at 1600 (Boender-Hong Kong remote).
10405.0 Unid-NATO psychological operation broadcasting warnings in English and Arabic to Libyan armed forces, several nights at 0800. Unid-Probable Libyan jammer, audio sweeps at 0924 (Boender-Netherlands).
10871.9 "S"-MX, Severomorsk, CW at 1838 (MPJ-UK).
10872.1 "A"-MX, Astrakhan/ Baku, CW at 1343 (MPJ-UK).
10872.3 "K"-MX, Petropavlovsk, CW at 1343 (Waters-Australia).
10945.0 CFH-Canadian Forces, Halifax, NS, RTTY all-warships markers at 1928 (MPJ-UK).
11010.0 GWPWF33-Brazilian Navy, Fortaleza, sending ALE text message to GWP-WCO, at 2044 (PPA-Netherlands).
11030.0 VMC-Charleville Meteo, Australia, FAX weather chart at 2037 (PPA-Netherlands).
11175.0 Interlude-US military, 28-character EAM simulcast on 8992 and 15016, at 1731 (Haverlah-TX). Deep Corn-US military, sent to 11220 by Puerto Rico HF-GCS for a patch, at 2237 (Metcalfe-KY).
11184.0 OH-BLP-Blue1 airlines B717, flight KF0828, HFDL position for Reykjavik, at 1602 (MPJ-UK).
11220.0 Deep Corn-US military, came from 11175 for patch via Puerto Rico, at 2238 (Metcalfe-KY).
11285.0 9M-MRB-Malaysian Airlines B777, selcal QR-EG from unknown ground station, at 1837 (PPA-Netherlands).
11288.0 B-2292-China Eastern Airlines A321, flight MU2870, HFDL position at 1735 (PPA-Netherlands).
11387.0 Sydney Volmet, Australia, aviation weather at 1803. G-VNAP-Virgin Atlantic A340 "Sleeping Beauty," flight VS0011, HFDL log-on with Riverhead, NY, at 1818. G-VSHY-Virgin Atlantic A340 "Madame Butterfly," flight VS0009, HFDL position to Riverhead, at 1821 (MPJ-UK).
11451.0 CVTNGA136-NS/EP, Covington, GA, ALE with CHVLNJ124, Cherryville, NJ, at 1642 (Metcalfe-KY).
12133.5 Unid-AFRTS relay via US Navy, Saddlebunch Key, FL, sports at 2004 (PPA-Netherlands).
12225.0 CHPNSC140M-NS/EP, Chapin, SC Mobile, ALE with MDTNNJ188, Middletown, NJ, at 1610 (Metcalfe-KY).
12359.0 XVS-Ho Chi Minh Ville Radio, Viet Nam, female repeating identification at 1833 (PPA-Netherlands).
12365.0 VMC-Charleville Meteo, Australia, storm warnings at 0701 (PPA-Netherlands).
12392.0 DZE-Manila Radio, Philippines, phone patch in Asian language at 1602 (PPA-Netherlands).
12394.5 SSM678-Sailmail, El Gouna, Egypt, CW identifier after PACTOR-III traffic, at 1842 (PPA-Netherlands).
12431.0 TARANTO-Italian Financial Police, calling ANGELINI, a patrol vessel, at 1853 (MPJ-UK).
12576.0 RMBB-Russian Navy vessel, CW message in 5-letter groups, at 1808 (PPA-Netherlands).
12579.0 NRV-USCG, Guam (keyed by CAMSPAC Point Reyes), SITOR-B information at 1936 (MPJ-UK)
12585.0 NRV-USCG, Guam, CW identifier in SITOR-A sync marker, at 1835 (PPA-Netherlands).
12613.0 XSQ-Guangzhou Radio, China, SITOR-A test slip with foxes in English, at 1833 (PPA-Netherlands).
12789.3 NMG-USCG, New Orleans, LA, FAX satellite image of Caribbean, at 2007 (PPA-Netherlands).
12843.0 HLO-Seoul Radio, Korea, CW marker at 1916 (MPJ-UK).
12923.0 HLW2-Seoul Radio, CW marker at 1912 (MPJ-UK).
13092.0 Unid-Weird bilingual Chinese/English numbers (V26), at 1043 (Boender-Hong Kong remote).
13321.1 "08"-HFDL ground station, Johannesburg, South Africa, uplinks to flights KQ617 and SA029, at 1753 (PPA-Netherlands).
13330.0 Kenya 521-Unknown Kenya Airways flight, working Nairobi LDOC, at 1842 (PPA-Netherlands).
13438.6 GWO-US military 3-letter net, calling FCSFEM3 (FEMA Region 3); also calling on 5690, 7325, 8045.6, 9019, 11238, and 12103; at 1309 (Metcalfe-KY).
13900.0 BMF-Taipei Meteo, Taiwan, two small FAX weather charts at 1716 (PPA-Netherlands).
13927.0 AFA5QW-USAF MARS, IN, sending Reach 7027 (USAF C-5B) to 7633.5 for a patch, at 1642 (Stern-FL)
14396.5 KGD34-NCS SHARES Master Control Station, Arlington, VA, went to G-TOR on "Channel 2," at 1615. NCS206-NCS, monitoring SHARES Control Net, at 1724 (Metcalfe-KY).
14450.0 2300MNCAP-US Civil Air Patrol, MN, ALE sounding at 2155 (Metcalfe-KY).
14452.5 CIW321-Canadian Forces, calling several stations at 2207 (Metcalfe-KY).
14512.0 AAN1MHT-US Army MARS, PACTOR at 1616 (Metcalfe-KY).
14615.0 Unid-Unknown South American voice net, also on 16275, at 0230 (Waters-Australia).
15091.0 OFFSPR-USAF Secure Internet Protocol Routed Network, Offutt AFB, NE, calling MOBD22DAT, ALE at 1846 (PPA-Netherlands).
15867.0 OPB-US Customs, Operations, Bahamas and Tortugas (OPBAT), Nassau, calling J23, ALE at 1820 (Privat-France).
15920.0 CFH-Canadian Forces, Halifax, NS, RTTY markers at 1901 (MPJ-UK).
16035.0 9VF-Kyodo News relay, possibly Singapore, FAX Japanese newspaper (60/576), at 1735 (PPA-Netherlands).
16402.0 ABA-Malta Defense, calling AB1, ALE at 0741 (Waters-Australia).
16804.5 003669998-USCG New Orleans, DSC test call to self, at 1828 (PPA-Netherlands).
16976.0 PWZ33-Brazilian Navy, Rio de Janeiro, RTTY weather in Synoptic Code (SYNOP), at 1902 (PPA-Netherlands).
17430.0 9VF209-Kyodo News relay, possibly Singapore, FAX Japanese newspaper (60/576), at 1721 (PPA-Netherlands).
17435.0 2011-Moroccan Police, calling 2412, ALE at 1718 (PPA-Netherlands).
17928.0 "06"-HFDL ground station, Hat Yai, Thailand, uplink to B2292 at 1658 (PPA-Netherlands).
17946.0 New York-NAT-A, turbulence warning for Martinair 623, at 1717 (PPA-Netherlands).
17967.0 UK-32011-Uzbekistan Airways A320, HFDL position for Muharraq, at 1505 (MPJ-UK).
18063.0 CHPNSC140M-NS/EP, ALE with SANATX236, San Antonio, TX, at 1509 (Metcalfe-KY).

DIGITAL DIGEST

DIGITAL MODES ON HF

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Mauritanian Police and other Oddities

This month we tidy-up a few loose ends from last month's column, as well as reporting on some old friends that have been operating digital networks on HF radio for many, many years.

❖ Mauritanian Police on HF?

Following my mention of the mystery ALE network on 16112 kHz USB in last month's column, UDXF listener and frequent contributor Thomas mentioned to me that the text string "gendrim" seen in the login traffic might indicate Mauritanian Police as the source – "gen being short for Gendarmerie and "rim" being the acronym for Republique Islamique de Mauritanie, which is how Mauritanians usually refer to their country in a formal way. Subsequent analysis would seem to back this up.

(Photo of gendarmerie station courtesy Wikipedia)

After extensive monitoring of the network, there are only 13 identifiers in use, as follows:
1001 to 1013
91001 to 913001 (probably virtual addresses for the 1xxx-series identifiers)

There are 12 administrative regions in the country, so it is likely that each of the state capitals has one identifier, with the 13th being the Net Control Station "1001."

Two further channels have also come to light after a plea for more information via the UDXF mailing list: 8055 and 12313 kHz USB.

I have been able to verify 8055 kHz as belonging to the network but both frequencies suffer heavy interference here in Maine – the 8MHz channel due to a NATO Link-11 station and the 12 MHz due to a close-by Globe Wireless ship's channel. Perhaps you will be able to hear these better and report on more activity?

Traffic continues to be mainly ALE link quality assessments between stations and the occasional Codan 16 tone HF modem traffic logging into the central computer system. No voice has been heard thus far.

❖ French Air Force ALE

A number of channels usually busy with French Air Force voice chatter have recently seen ALE activity. 12311 and 16160 kHz USB are frequencies used by the French Air Force extensively for communications between ground stations, fighters, and Boeing E3F AWACS (Airborne Warning And Control System) *aka* "Sentry" surveillance aircraft. These are the rather strange-looking converted airliners with a massive rotating radar disk, much like a flying saucer, mounted atop the fuselage.

The French AWACS aircraft usually use the codename "Cyrano" during voice operations, and these channels have been particularly busy before, during and after the French involvement in enforcing the Libyan "no fly" zone and in conducting or supporting bombing campaigns against Libyan Forces loyal to Muammar Gaddafi.

So far, the only identifiers seen are as follows:

MOBE3F	HQ Net Control Station
202E3F	Tail Number 202/36-CB, Serial Number 24116
203E3F	Tail Number 203/36-CC, Serial Number 24117

It appears that the French have also updated their data communications recently, too. For many years listeners reported 75bd/850Hz encrypted RTTY (aka NATO RATT) at 1.7 kHz above these frequencies when data transfer was necessary. Now, more up-to-date MIL-188-110A high-speed modems are in use.

Judging by past behavior, it may be possible to see ALE activity on the following channels:
4745, 5122, 5707.5, 5714, 6688, 6700, 6712, 6872, 6869, 8192.5, 8573 and 9094kHz USB

There should also be a 201E3F and 204E3F based on the French fleet of E3F aircraft, though these aircraft have yet to be logged in their ALE guise. Perhaps you will be able to find them?

That's all for this month. As ever, please keep your letters and emails with your suggestions for future topics coming.

❖ The Strange Case of the Sudanese Diplomatic Service

Long-time readers of this column will no doubt remember that many HF inhabitants using digital technologies have been operating there for decades. The technologies employed may move on, but the frequencies and operating habits often survive the test of time. In fact, if it weren't for this behavior, we wouldn't be able to trace these movements very well at all.

Last month I came across a network that I hadn't heard for years, which provides a perfect example of these long-established habits. The network has most often been attributed to MFA Khartoum, probably as a result of some DF fixes that were made by the ITU Monitoring Stations in Baldock, England, and Rambouillet, France, years ago. Other speculation has been that these are stations operated by the Iranian Revolutionary Guards, and finally, even that the network belongs to Al Queda.

Whoever may be the real operator, let's stick to what we know. Logs for the station certainly go back to the mid-1990s when it used standard amateur radio 300bd AX.25 Packet Radio from US-made Kantronics TNCs (Terminal Node Controllers). Towards the late 1990s, as Packet Radio ceded ground to PacTOR-I, traffic switched over to that more robust mode. Like many organizations requiring some additional privacy, they often sent PacTOR-I traffic using a non-standard CRC (error check code).

Lately, PacTOR-II has been used, but interestingly, not PacTOR-III. Licensing the 3rd generation protocol for your TNC is rather expensive, so perhaps cost is the reason for not making the switch to the higher speed version?

Messages are encrypted and the MFA and outstations use simple three-digit IDs, the most active of which is "801" and is presumed to be the MFA. Other identifiers are as follows:
101, 261, 500, 612, 666, 701, 702, 711, 731, 761, 751, 832, 851, 863, 901 and 916.

Over the years, listeners have pinned "701" as the London Embassy, Algiers as "761" and Teheran as "901." These all remain active today.

Activity takes place on a number of well-established channels as follows:
10293.7, 11222.2, 11352.2, 12577.2, 13556.7, 13566.7, 14507.2, 14545.7, 14556.7, 14576.7, 14847.2, 14907.2, 15907.2, 15946.7, 16507.2, 18506.7, 18507.2, 18517.2, 19507.2, 19517.2, 19907.2, 20507.2, 20907.2 and 21002.2 kHz (center of data)

The network often uses 18505 USB as a voice coordination channel (see Resources for a recent clip of the chatter). Sometimes chatter takes place 2.2 kHz below the frequencies you see listed above that end in .2, or 1.7 kHz below those ending in .7. Sometimes the end of modem traffic is signaled with the numeric station ID in CW.

My most recent catch of this station was on 14847.2 kHz. As always, any reports or further information on this interesting station will be much appreciated.

RESOURCES

MFA Khartoum Clip
dl.dropbox.com/u/301213/UNID%20Voice%202.wav
dl.dropbox.com/u/301213/UNID-Voice.wav

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

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Affordable High-Tech Test Equipment

The relentless evolution of ham radio transceivers over the past decade is obvious to just about anyone. Software-defined radios now top the performance charts, highly-capable DSP subsystems now come standard on entry-level rigs, and 100-W dc-to-daylight transceivers can now be held in one hand. And all for unimaginably affordable prices!

Unless you're an avid home-builder or professional RF worker, however, you may not know that test equipment that was previously available only to schools, labs or the most fortunate among us, has followed a similar path and is now similarly capable and affordable.

The digital multimeter was probably the first bit of test gear to take the plunge. Twenty years ago a typical multimeter cost $50 to $200. Just the other day I bought three at Harbor Freight Tools for $2.99 each, on sale! Yes, they're disposable and on the cheap side, but for their intended use they work just fine. They also dramatically illustrate how far we've come and how far prices have fallen.

When I worked at ARRL HQ in the late '80s, I was always amazed that I could build a QRP transmitter or a simple receiver and then test it out on a rack of expensive Hewlett-Packard spectrum analyzers, tracking generators and other high-end test gear goodies. Today, I could buy that same stack of mil-spec (but now vintage) HP gear for $500 to $2000. Of course, it's 20-30 years old, needs expert calibration and weighs a ton. Plus, without access to parts and expert technicians, my chances of getting it running, calibrated and doing useful work aren't that good.

It's far from an exact replacement, but the miniVNA vector network analyzer from **www.miniradiosolutions.com** and available in North America from **www.w4rt.com**, is the modern "evolved" equivalent. It retails for less than $400, uses your personal computer as a display, and is about the size of a deck of cards!

Most hams use the miniVNA as an antenna analyzer, and the unit is similar to several commercial and home-brew designs that incorporate DDS (direct digital synthesis) signal sources and logarithmic detectors. A VNA makes the venerable SWR meter seem prehistoric, and, because it has a signal source that can sweep from 100 kHz to 180 MHz, you can "see" what your antenna is doing across a wide range of frequencies (no radio required). Because the miniVNA is a two-port device (one port for the signal generator, one for the detector), it can function like a spectrum analyzer/tracking generator when evaluating filters, feed lines, etc.

As you can see by the photos this month, I got familiar with the miniVNA by evaluating some RF filters I had in my shack. I'm *far* from an expert user, but just from playing around with the unit for an hour or so, I'm very excited about learning how to use it "for real." I plan to cover this and other "now-affordable, now-amazing" test gear in more detail in future columns. Until then, check out this month's screen captures from the "pocket analyzer that could."

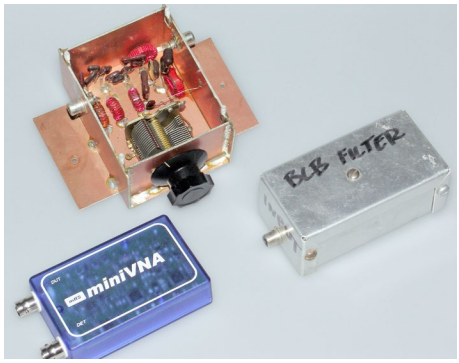


Figure 1 shows the miniVNA (about the size of a deck of playing cards) and two of the filters I evaluated while figuring out how to get the device up and running. At the top is the tunable 80-meter front-end filter from the W7ZOI/K5IRK Progressive Communications Receiver I've been "building" for 20+ years! It peaks desired signals between 3.5 and 4 MHz while attenuating unwanted signals outside that range.

At the right is a broadcast-band rejection filter I built years ago to protect inexpensive SWL and ham receivers from big AM broadcast signals. Not pictured is a Drake low-pass transmitting filter designed to minimize TVI/RFI above 30 MHz.

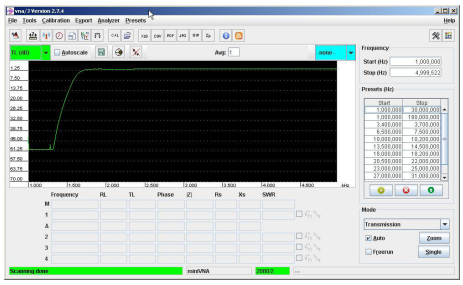
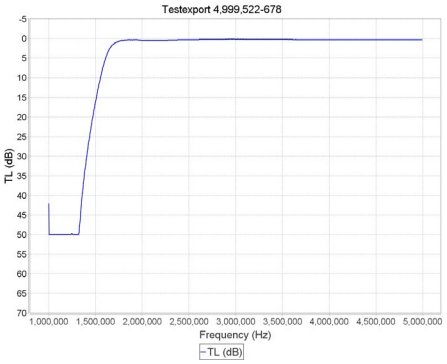


Figure 2 is a screen capture of the latest miniVNA software showing the spectral plot of the BCB filter from 100 kHz to 5 MHz. The filter exhibits classic high-pass characteristics, attenuating signals from 0-1.3 MHz by 51 dB. At 1.8 MHz signals are attenuated only 0.4 dB, and signals above 2 MHz or so are only attenuated by 0.29 dB. An exported plot of the same screen is shown in Figure 3.

From these filter plots, a couple of interesting things are readily apparent. First, the dynamic range of this particular miniVNA is about 50 dB. The filter's actual rejection probably tops out at 60-70 dB. A VNA with greater dynamic range costs a lot more money, and for most uses, 50 dB is more than adequate.

Second, my BCB filter needs to be redesigned! Strong signals at the upper end of the broadcast band aren't fully attenuated, although KLTF, at 960 kHz, a local "offending" station at the time, was nicely "silenced!"

Figure 4 shows the passband of the tunable 80-meter



front-end filter. Notice that below 2.1 MHz and above 4.8 MHz, signals are attenuated by at least 51 dB (probably more). For a receiver that's designed to receive signals between 3.5 and 4 MHz, this is a good-performing filter. Thanks to the filter's variable capacitor, shown in Figure 1, the peak on the right-hand side of the passband is tunable between 3.3 and 4.3 MHz, and when a desired signal is properly "peaked," the filter's insertion loss is only about 3.5 dB. Nice!

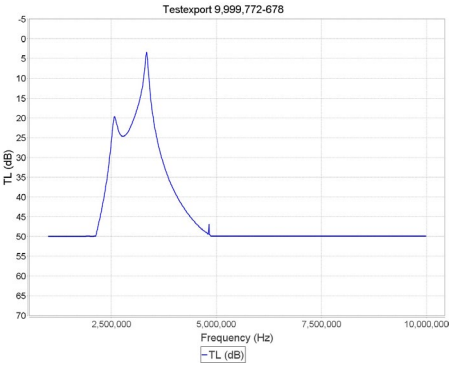
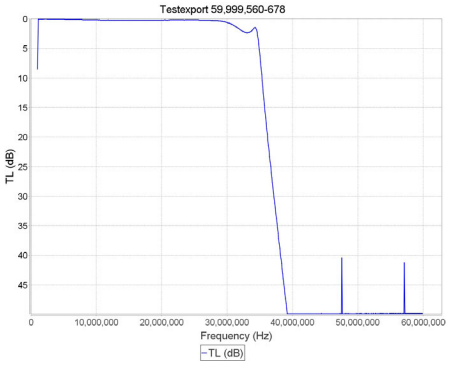


Figure 5 shows the response of my trusty Drake low-pass transmitting filter, designed to attenuate signals above 41 MHz by a whopping 80 dB. I know from experience that this filter works well. I forgot that it was inline one day and tried to work a station on 6 meters. My rig said it was putting out 5 W, but my external power meter read "no power." The filter, between the two, was doing its job!



As shown in the miniVNA plot, the low-pass filter starts attenuating at 30 MHz, and by 40 MHz signals are chopped down by 50 dB (again, probably much more). The two spikes

at 47 and 57 MHz are only 40 dB down. I'm not sure if this is an actual characteristic of the filter or merely a detector/software anomaly.

I haven't yet had a chance to connect the miniVNA to an antenna – one of its primary strengths – but from a hour or so of playing around with the hardware and software, it's clear to me that the miniVNA will be very useful. It won't replace a screen room full of big-bucks RF gear, but it comes pretty darn close. I will report more in future columns.

❖ Q&As: Antenna Tuners

Dann McKee W4DLM, of Windermere, Florida, has a question or two about antenna tuners, which we discussed in the February column:

"Thanks for the outstanding article on antenna tuners. It is a most timely article for me as I contemplate getting back on the air after many years from a deed restricted, small lot and am thinking about possible antenna solutions. I read and re-read your article and I think I understand the information that you presented.

"One question I do have concerns autocouplers vs. balanced-line antenna tuners. When would one be advantageous over the other? I can understand that if coax is to be used, then the autocoupler might have an advantage, but there may be other situations where the autocoupler might have an advantage. I also assume there would be situations where the balanced-line tuner (which I assume resides inside, next to the transceiver) would be of greater value than the autocoupler.

"Can you provide some additional information on which is best, and when?"

Dann: Both solutions – a coax-fed autocoupler at the antenna feed point or an open-wire-fed balanced tuner in the shack – are aimed at minimizing feed line SWR losses for single wire antennas used on multiple bands. As the column described, feeding a single antenna on multiple bands with coax and a shack-mounted antenna tuner can be quite costly when it comes to performance. But choosing one suggested solution over the other isn't always easy.

Because it's fed via coax, an autocoupler at the feed point can make for easier feed line routing and installation. Conversely, dc power is also required at the feed point (some autocouplers can be battery powered, but most cannot). Autocouplers are also recommended for band hoppers because they can provide low-SWR matches, even when switching bands, in a fraction of a second. Just send a couple dits and you're tuned up and ready to roll. Short of matched antennas on every band, nothing is more convenient. Most autocouplers also cover 6 meters, which makes them super accessories for today's crop of 160-6 transceivers. Because they tune only when you transmit, however, an autocoupler is probably not a good choice for SWLing, because you must transmit to tune the antenna system.

When using a shack-mounted balanced-line tuner, switching bands is much slower and more deliberate. My home-brew tuner has 100-turn roller inductors, which can provide a real workout when switching (rolling?) between 160 and 10 meters! If you like to build stuff, it's a lot easier to build and customize your own balanced tuner. And at my QTH, at least, the balanced tuner completely eliminated RF interference to family TVs and stereos and was more effective than the autocoupler in reducing RF pickup from my own PCs and fluorescent lights (same shack, same antenna). Although they offer superior RF (SWR-loss) performance, open-wire feed lines are more challenging to install, especially when it comes to getting them in and out of existing structures.

I covered these topics in much greater detail in "A Balanced, Everyday Approach to All-Band Bliss," in the April 2002 issue of *QST*. If you don't have access to the magazine you can download a PDF copy from **www.net-com.army.mil/mars/training/docs/DOCUMENT%20NUMBER%202%20%202007.pdf** That URL is a real mouthful, so you might find it easier to simply Google "all-band bliss." It's the first search result.

Each situation is unique. I hope this helps a bit with your decision-making process! And, if you want the best possible single wire antenna to go with your new tuner, be sure to check out the horizontal loop in the April and May editions of "On the Ham Bands." – *NT0Z*

❖ Q&As: Loop Antennas

The next questions are about horizontal loop antennas which, as mentioned, were detailed in the April and May issues.

Bob Koechl VE3IXX, of Belwood, Ontario, writes: "Thank you, Kirk, for that great article on loop antennas. In Figure 1 of the article the feed line is shown near – but not on – one of the corners of the loop. Is there any problem with running the feed line right from one of the corners, which will help to support the weight of the feed?

"Also, I have 300 feet of galvanized wire (similar to wire used for electric fencing). Would there be any problem in using this galvanized wire for the antenna?

"And instead of trimming the wire for the 80-meter band, would it work okay if I used the full length with an open-wire feed line? I want to use it as a multiband antenna anyway. I live on a farm, so space is not a problem. Right now I'm using a G5RV dipole with a tuner and I can work 80 through 10 meters, but I imagine that a loop antenna would run circles around that antenna (pun intended!)."

Bob: Horizontal loops are *very forgiving* when it comes to orienting the feed point on the circumference of the loop. Feel free to put the center (feed point) insulator anywhere along the circumference – wherever it works out the best for your particular installation. At some frequencies there is a *slight* pattern/directivity shift with regard to feed point placement, but it's not worth worrying about in the real world and may only be relevant at heights above ground that exceed those found in typical installations.

Uninsulated galvanized wire *will* work, but because it has more resistance than copper wire (or copper-clad steel, which hams often call Copperweld™), it won't work *quite as well* and it might be difficult or impossible to solder, which may force you to be extra creative when attaching insulators and feed lines. If you can't scrounge some of the copper stuff, make sure the entire length of the galvanized wire is free and clear (and not touching trees, branches, etc.) and that you use good-quality insulators. If you have other farm-type hardware and supplies on hand, consider using aluminum electric fence wire, which is super lightweight and has much less resistance when compared to galvanized wire.

There's no problem with using the entire length of your on-hand wire. Within reason, the rule of thumb is to put up as much wire as is required to match your skyhook spacing. A 300-foot horizontal loop will work fine on all bands when fed with open-wire line, and from 80 through 10 when fed with coax.

Your mileage may vary, but over the years my horizontal loops have all outperformed my G5RVs (and other dipoles). I'm sure you will enjoy the performance of the loop. I've never met anyone who hasn't – assuming they actually put one up and tried it! – *NT0Z*

Mike Dice of El Cajon, California, writes: "I just read your informative article in the April issue and I have a couple of questions. Because of stealth circumstances my wire loop will have to lay on the roof of my one-story stick frame house with composition shingles. The peak of the roof is 17 feet. When used for shortwave reception, does it matter that the roof isn't flat, and that the wires that make up the rectangular loop will follow the various angles of the roof? The antenna would be more a rectangle than square, and cut for about 6 MHz.

"Also, if I transmit with the loop at frequencies above the fundamental frequency, will I have to use a tuner, say for 30 meters?

"My main shortwave receiver has a preselector, so I think I'd be okay there. Currently I use a 30/40 meter fan dipole laid on the roof. While I've never transmitted with it, it seems fine for shortwave reception. Thanks for any info you can provide!"

Mike: Many stealth loopers use the rooftop method successfully, and thanks to Southern California's warm and sunny climate (snow and ice would probably interfere), you should see improved performance over the fan dipoles.

The shape is fine for SWLing and reception on all frequencies. It's only when transmitting that you'll probably require an antenna tuner. Although the loop is cut for about 6 MHz, because the wires are in close proximity to the roof and shingles, the antenna's natural resonant frequency may vary considerably from the textbook formula! It may be resonant at 40 or 30 meters, but you will probably want or need an antenna tuner for practical use.

As for the shape, a moderate rectangle is okay, but if the roof is too rectangular I'd suggest using less of the available area and making the rectangle a bit more square. The ups and downs introduced by the roof peaks, etc., are of no real concern.

As with any stealthy installation of this type, be sure to use well-insulated wire and don't run too much power! Some ops have success with building invisible "on the rooftop" antennas from small-diameter, teflon-insulated wire. That stuff is rugged, sun/UV resistant and suitable for temperatures that would have long since started your roof on fire!" – *NT0Z*

GETTING STARTED

THE BEGINNER'S CORNER

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Mobile Shortwave Listening Alternatives

Here's a question I received from *MT* reader Len WA2AMW, "Does anyone make a decent general coverage shortwave receiver for cars/trucks, which fits into the (more or less) standardized dash mount of U.S. cars and light pickup trucks? The little bit of info I've been able to find is rather sparse and/or not worth pursuing further."

Mobile shortwave listening has been a dream pursued by countless hams and shortwave listeners in the U.S. for decades. In 2001 I wrote a three part series on mobile SWL covering all means of tuning in to the HF bands then available. That series can be found on the *MT 10-Year Anthology* 1999-2008 which is available in the Grove catalog. In the June 2006 issue of *MT* I did a review of the Sony XR-CA660X AM/FM/SW cassette car stereo, part of Sony's X-plod series of car stereos. A PDF version of that review is found online at: **www.monitoringtimes.com/html/mtrevujun06.pdf**.

Sony XR-CA660X AM/FM/SW cassette car stereo tuned to an English broadcast of Radio Kuwait on 15.540 MHz. (Courtesy: Author)

The Sony car stereo tunes 2.940-7.735 MHz and 9.500-18.135 MHz with a gap from 10.140-11.575 MHz. I bought mine from The Shortwave Store, a Canadian radio outlet, and paid $189 plus $15 shipping.

Sony discontinued the cassette unit which was replaced by a similar model that featured a built-in CD player instead of cassette. For years these were staple products at The Shortwave Store and at a few online retailers based in the Mideast. In the last few years Sony has discontinued the product and the inventory at all retail outlets has been exhausted. I couldn't even find these receivers used on eBay. The only thing I could find online was a wiring harness for the product and offers for service manuals (available free on the Sony website).

Sony (actual motto: "Make.Believe") never sold these units directly in the states and had no interest in doing so. They've not exactly thrown themselves into the shortwave market – portable, mobile, or desk-top. Here's a suggestion: Make believe there are hundreds of millions of people in the world who still listen to shortwave radio.

Like many modern electronics manufacturers, they've bet on the future: plasma and LED TV sets; Blu-Ray streaming video players; video game devices, high-end car stereos (minus the SW band!) and computers, anything but shortwave radios. Catering to the rich in first-world countries makes companies prosper.

The X-plod models live on in a series of nine models currently available that feature AM/FM/MP3/WMA/AAC playback, USB (1-wire for iPhone and MP3 players), Bluetooth-equipped, satellite radio and HD-Radio ready on a flip-down, detachable faceplate for the same price I paid for a cassette player with 2 bands shortwave. I wouldn't be surprised to learn that the chipsets used in the tuner sections of the new radios are the same as the old in-dash shortwave sets.

Becker, a long-time maker of after-market, in-dash radios, still offers a Euro-styled series of car radios, one of which includes longwave and shortwave bands. The Becker Mexico model BE2340 AM/FM/SW/LW/cassette with AUX input is sold in the U.S. by Becker Autosound.com (201-773-0978), located in Saddle Brook, New Jersey, for about $400 plus shipping (**www.beckerautosound.com**). The person I spoke with at Becker Auto Sound indicated that they had only one such unit left. This model covers longwave (153-283 kHz) and 6 bands shortwave (19, 22, 25, 31, 41 and 49 meters).

None of the in-dash shortwave receivers have SSB capability. Worse, there's nothing on the horizon that may make possible DRM reception in the car which will be even harder to receive than analog shortwave.

❖ Old Mobile Alternatives

The most effective mobile shortwave reception is the most expensive and most risky: Using your HF ham rig as a general coverage mobile receiver. Most modern rigs are designed to operate on 12-13 volts, have great noise suppression and are sensitive enough to work with a typical 29 inch car antenna. The problem here is that most cars made in the last five years don't use 29 inch car antennas. Those modern, stubby little antennas aren't going to bring in much DX. The added problem of trying to mount such a radio in today's reduced dash-space cars, let alone having to disguise your $1,200 radio as a worthless CB set, will take more effort than most will want just to hear shortwave in the car.

Among the alternatives listed ten years ago was the shortwave converter. This is a small, inexpensive device ($95 from Universal Radio) that connects between your car antenna and your in-dash AM/FM radio; it's powered from the car's cigarette lighter. When the converter is turned on, it causes your AM radio to act as an amplifier for the converter which is designed to tune up to four shortwave bands. MFJ makes such a device, the MFJ-306, which has been around for many years.

MFJ-306 SW converter ($95): Turn your in-dash AM radio into a four-band SW set. (Courtesy: Universal Radio)

Reviews on this product are mixed. That's mostly because each installation is different: some cars generate more ignition noise than others and that shows up in the converter, and some cars have pitiful antennas that do little to encourage shortwave signals. As they say in the automotive business, "Your results may vary."

One other source for a shortwave converter is Vectronics (an MFJ company). They offer a kit version, the VEC-101K ($28), which will then have the additional problem of your own assembly skills. Ramsey Electronics no longer makes such a kit.

The portable shortwave radio option should also be considered. Many people have had success using a small portable shortwave radio secured to the dashboard, tucked between the seats or lashed to the center console with a bungee cord. Disadvantages with this method are: worse than ever ignition-noise; poor audio from the speaker output jack into your car stereo, and difficulties attaching an external antenna to the radio without introducing even more noise. The stringing of wires from antennas, audio adapters and power cords makes this setup a hassle as well.

One final problem with shortwave reception in the car is that, unlike even five years ago when I last wrote about the subject, there are even fewer big international broadcasters beaming to North America. Unless you speak Spanish or Arabic, there's less to listen to today. The one huge exception in China Radio International; it comes through like an FM local on my Sony in-dash receiver.

❖ Current Mobile Alternatives

One current option is more or less in its infancy. HD-Radio, the digital alternative to analog FM, has been around for over ten years so it's hard to think of it as something new. Still, more and more broadcasters, particularly non-commercial stations, are using secondary channels to broadcast a mix of BBC and NPR radio programming through Public Radio International. Such programming includes many of the BBCWS programs we've been missing since they stopped transmitting directly to North America on the shortwave bands. You can check (**www2.pri.org/ProgramStationLocator/programlocator.aspx**) and see if one in your area is doing this. If so, you may just want to invest in an HD-Radio for your car.

It's hard to ignore the satellite radio option. Most new cars come with XM or Sirius built-in. All you need to do is call the activation number and you're listening to BBC World Service and the whole line-up of World Radio Network (WRN) international broadcasts. But, using the built-in satellite radio option in your car never made sense: you're actually in your car very little of each day, not enough to warrant the $15 (and expected to increase) monthly fee.

A better option is a moveable XM or Sirius satellite radio receiver such as the onyX XM by Audiovox (see photo). The price is $24 after the $30 mail-in rebate and includes everything you need for the mobile installation. The installation is easy and the reception is perfect. BBC World Service, uninterrupted and full-time, no fading, no frequency changes, and the WRN line-up is fun, too. There's a lot to listen to.

Audiovox onyX XM receiver ($25 after $30 mail-in rebate) comes with complete car kit. (Courtesy: MyRadioStore.com)

Oh, yes, there are some 100 other channels ranging from your favorite music to your favorite sports and news networks. XM/Sirius is expensive but you can get a great teaser rate to start that will make it seem really cheap. You can buy a separate home docking unit that lets you take the receiver out of the mobile dock and pop it into the one connected to your stereo.

By far, the cheapest and easiest current alternative is the MP3 player. You can go top drawer with the original iPod Classic ($250) with 160 GB of audio storage, or the less expensive iPod Nano ($150 for 8 GB or $180 for 16 GB). Cheaper still are any of the hundreds of different brands of plain MP3 players that can be found in any drug store for under $20. The SanDisk Sansa ($50 at BestBuy) holds 4 GB, comes with a USB cable, and got good reviews.

iPad Nano ($150-$180) brings Apple-quality MP3 audio into your car for free. (Courtesy: Apple)

Add a cheap FM modulator and you've got wireless audio directly from your MP3 player into your car stereo. Now all you have to do is go to the BBCWS web site (**www.bbc.co.uk/podcasts/worldservice**) and download their latest podcast. Oh, and you can choose from dozens of other programs and services, including BBC World *Update Daily Commute*, that aren't on BBCWS. But, why limit yourself to BBCWS? With any MP3 player you can download all manner of entertaining programming and it's all free.

Finally, there's the smartphone option. For years, iPhone, Blackberry, and now Droid users have had the option of streaming live radio directly from their smartphones into their car stereo. With a Bluetooth hand-free device you won't even miss a call. If you have an unlimited phone plan this may make the most sense of all. There's little you can't listen to from all over the world while tooling down the road, the phone can charge while you listen, and you take the thing with you when you get out of the car.

❖ Last Word

For anyone wishing to tune in international broadcasters, there's good news and bad. The bad news is that it's harder than ever to do with old-school, in-dash shortwave radios. There's less than ever to choose from and, to make things worse, there are fewer international broadcasters than ever before beaming their signals to North America. I've tried all the options listed above over the years and reported on the outcome in the pages of this magazine. But, maybe your experiences have been different. If so, let me know what's worked for you and what hasn't. I'm sure many other *MT* readers would like to know too.

The good news is that times have changed. Satellite radio, HD-Radio, smartphone streaming and MP3 podcasts are new technologies that have outstripped the need to have a shortwave band on your in-dash radio. Best of all, some of these options are really inexpensive and easier to set up than rigging up a shortwave converter or strapping your ham rig into your car. Still, I wish Sony hadn't stopped production on their in-dash SW models, because it's great fun to hear old-fashioned analog shortwave coming out of the car's speakers as the miles roll away.

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

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Change is in (and on) the Air

It seems like every month now we get the news that a shortwave station is closing, or that a program is being wound down, or a language service is being cancelled, or a relay station is ceasing operation. And yet, thanks to satellite and the internet, there is more programming available live, on demand, or as a podcast than ever before.

Some stations like **China Radio International** buck the trend, but this is a rare exception. At the end of May, **HCJB** was planning on shutting down the ***DX Partyline*** program, ending its run to coincide with the 50th anniversary of the program. Stations like the **BBC** and **Deutsche Welle** have cut, or plan to cut language services and relay transmitters. Many longstanding stations are no more, or a mere shadow of their former selves.

I've stated before that I think of my computer as a powerful, world band radio that happens to do other things. While I still tune the shortwave bands, I also do a lot of listening online, either live or via podcasts and archived programming. Not a day goes by that I am not listening to some program from the vast array of **BBC** stations.

BBC has tweaked its domestic programming in recent months. For instance, **BBC Radio 7** (one of my all time favorites) has become **BBC Radio 4 Extra**. **BBC Radio 7** was launched in 2002 as "the principal outlet for the **BBC**'s archive of speech entertainment, including comedy, drama and readings." **Radio 7** was the place to go to hear classic comedy like ***I'm Sorry I'll Read That Again*** (featuring **John Cleese**, pre-Python), ***Dad's Army***, ***The Navy Lark*** and ***Yes, Minister***. It was also the place for classic drama, including radio adaptations of books such as ***War and Peace***, ***A Night to Remember*** (*Titanic*) and the many works of **Charles Dickens** to name a few. Crime and Thrillers, Science Fiction and Children's programming also found a home here.

Having listened to the new **Radio 4 Extra** for about a month or so, not a lot has changed, but they are introducing some programming that is new. Up until now it has been more of an archive of past programming. They have started airing "extended" versions of some shows that normally are heard on **Radio 4**, which include content that was edited out of the **Radio 4** version due to time constraints. For instance, ***The News Quiz*** with **Sandi Toksvig** (a very funny show by the way), is heard on Fridays in its traditional 30 minute version on **Radio 4**, but a 45-minute version airs on **4 Extra**.

Children's programming has taken a big hit. At one time **Radio 7** carried up to five hours a day of programming just for children. As part of the **BBC**'s Review, it has been decided to focus on "family friendly" programming rather than dedicated children's programming aimed at pre-schoolers.

In place of programs such as ***Cbeebies***, **4 Extra** now broadcasts ***The 4 O'Clock Show*** "aimed at children, their parents and carers." Tuning in, I found it to be aimed at an older audience (the episode I listened to featured a report on The Homeless World Cup, a soccer tournament organized in Scotland for homeless people, and a discussion of the Eurovision Song Contest). People who tuned in for ***Cbeebies*** content would be disappointed. For those people the **BBC** has thrown them a bone with downloadable material at the ***Cbeebies*** website, and the promise that they would make the BBC Children's Archive available to a third party for broadcast, presumably for a price.

On Sundays, at 9am and 4pm local UK time, one can hear ***Young Classics***, "dramas to be enjoyed by all ages" including programs such as ***The Silver Sword*** and ***Chitty Chitty Bang Bang***. To check out what's on offer for youngsters go to **www.bbc.co.uk/radio4extra/features/family-friendly/** And take a wander around the new **Radio 4 Extra** website at **www.bbc.co.uk/radio4extra** Sure, there have been changes, but **4 Extra** still presents a wealth of quality material from the vast **BBC** archive of programming.

❖ Talking to (and about) Americans

Radio 4 presents many of the programs one could hear on the **World Service** in the past. Longtime **World Service** listeners will no doubt remember the iconic ***Letter From America*** presented for almost half a century by the late **Alistair Cooke**. Mr. Cooke was a legend to a couple of generations, because of these broadcasts, not to mention his hosting of Masterpiece Theatre. (In fact, there was even a nod to him on ***Sesame Street***, in which a Muppet called "Alistair Cookie" [The Cookie Monster] hosted "Monsterpiece Theatre")

Following in the footsteps of **Mr. Cooke**, one can hear ***Americana***, hosted mainly by **Matt Frei**, a gentleman who seems to now be the **BBC**'s man in the US. (He can often be seen on **BBC World Television** when events involving the United States take place.) ***Americana*** has been mentioned in this column before. My first impression was sort of negative, but I have grown to enjoy his take on all things American. **Frei** talks to Americans. Famous Americans. Powerful Americans. Quirky Americans. Oddball Americans. Interesting Americans.

A typical episode includes education experts debating the value of a university education, a discussion about why "pulling yourself up by your bootstraps" keeps going in and out of style, an interview with a woman who "fought through the man's world of jazz to be heard and seen as a musician, and woman, of talent in her own right," and a look at the impact of the announcement that Osama Bin Laden was dead and what it means for the security and leadership of the United States.

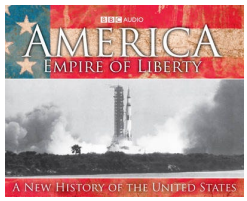
Matt Frei is an engaging interviewer who asks insightful questions with a quirky sense of humor. ***Americana*** is a fascinating insight into life in the United States, from an outsider's view. **Alistair Cooke** would be proud.

One of the neat things about the **BBC** is that with all of the resources at their disposal they can broadcast programs that run for months if not years, allowing them to delve into topics in incredible detail. As a self-proclaimed history geek and music fan, I really enjoy the insight these programs provide and the entertainment value as well. Sometimes, these programs live on for years via the **BBC** websites, often they return again and again, allowing one a second or third chance to hear them again.

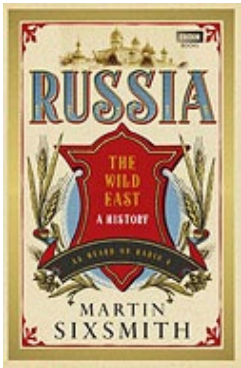
The first such program that hooked me was ***This Sceptred Isle***, a history of Britain from the Roman invasion in 55BC to 2000. It has been on **Radio 7** a few times in the past 8 years. At 15 minutes per day on weekdays, it takes over a year to run (there are 100 episodes just for the 20th century). There is a webpage for the series at **www.bbc.co.uk/radio4/history/sceptred_isle/**.

Another series, which has turned up on both **BBC Radio Ulster**, and **BBC Radio 7,** is ***A Short History of Ireland***. This is a series of 240 (!) 5-minute programs, which again cover the history of Ireland from antiquity to World War II. I used to joke that I can't wait for the long version. **Radio 7** did it two episodes at a time, but that still took 12 weeks. This too has a website at **www.bbc.co.uk/northernireland/ashorthistory/**.

Getting back to our look at things American, in 2008 **BBC Radio 4** ran a fascinating series on the history of America called ***America, Empire of Liberty***. This one ran in ninety 15 minute segments. It is a fascinating look at the history of the United States from its origins to the present day. While this one has not been repeated (yet), much though not all of the audio from the series is available online. As a Canadian, I found the episodes discussing the mid-eighteenth century to be particularly interesting, as it covered that period of time when our two countries slowly diverged on separate paths. Also interesting was the influence of events as far afield as Europe and India that led the citizens of the thirteen colonies to decide to go it alone. Check out the website at **www.bbc.co.uk/radio4/america/**.



Currently, **BBC Radio 4** is airing a series called ***Russia, The Wild East***. It seems to be on the same model as ***America, Empire of Liberty***. It covers the history of Russia from antiquity to the present, with daily episodes on weekdays (15 minutes each) with an "omnibus" edition featuring all that week's episodes, on Fridays, presumably edited down because it is an hour long. Running on the same format as ***America, Empire of Liberty***, they will air two sets of 25 episodes with a break in between. So this program could very well still be running as you read this. At the time I write this, all 20 current episodes are available via the BBC iPlayer. **www.bbc.co.uk/programmes/b010v6p3/episodes/player**



BBC Radio 2 and **BBC 6Music** are also home at times to lengthy documentary music series. **Tim Rice's *American Pie*** just ended a 50-week run on **BBC 2**. Each week, Rice visited a different US state working west to east, from Hawaii to Maine. Each week, he presented an hour of music about a state, by someone from that state, or composed in that state. This series has been followed up almost immediately by a new 50-week odyssey called ***Sounds of the 20th Century***. Each week, starting with 1951, one can hear the music of a particular year, news reports and audio clips from films of that year all woven together to make a sound picture of the year in question. It's a great concept and a good listen.

BBC 6Music is another good source for music documentaries. At 3 am local time, every night/morning, **6Music** broadcasts a music documentary from the archives, making it like the **Radio4 Extra** of music programming. As I am typing this, the 13-part ***Elvis Presley Story*** is running. Other docs heard in this time period have included ***The Beatles Story, The Beeb's Lost Beatles Tapes***, and the 50-part ***Story of Pop***. If I would venture a guess, eventually, **Tim Rice's *American Pie*** and ***Sounds of the 20th Century*** will be re-broadcast at some point in the future, during this time slot.

❖ How Important is Radio?

Recently, we had a reminder here in Southern Ontario, of just how important radio can be. Perhaps the worst windstorm in these parts since Hurricane Hazel blew through in 1954, struck in late April, bringing down trees, power lines, fences, and even taking the roof off a local school. Storms around here rarely include a death toll, but this one did.

After spending most of the morning chasing down garbage cans and recycle bins (of course it was garbage day), the power failed in much of the city shortly after 1pm, and would remain off for the rest of the day (or for many days in some isolated parts of town). The only way to know what was going on was to tune in to the radio.

Last year I had purchased an Eton Microlink FR160 radio. It's a neat little unit, which runs off a small solar panel and/or a hand crank and has AM, FM and weather bands. It's been used rarely since it was purchased. In fact, I was mocked for "wasting" $20 on it when I purchased it. But it paid off during this particular storm.

Without internet or television, there was no way to know what was going on even a block away. After winding up the Eton and tuning to the local radio station, the magnitude of the storm became apparent. Local radio really shines in a situation like this. With so many stations carrying syndicated programming these days, it was a reminder how important it is to have local content and a newsroom that functions for more than a few hours per day.

The experience took me back to January 1977, during the "Blizzard of 77." This freak storm struck the east end of Lake Erie particularly hard. Buffalo, NY and the Niagara peninsula in Canada were buried for days by this tremendous snowfall. Those days made me the radio listener that I am today. I was captivated by the continuous coverage, the stories of people who called in with reports, medical needs, supply needs, the lonely, the frightened, the bored, and the shut in – and, yes, the stupid (a few teenagers discovered that the calls weren't screened too well and decided to demonstrate their ignorance from time to time). The on air host, who was himself snowed in, handled them well.

In retrospect, I realize that since that storm I have never been far from a radio.

❖ Recommended Listening – Desert Island Discs

"The **BBC** is to launch an online collection of more than 500 episodes of ***Desert Island Discs*** alongside the choices of every single castaway, to coincide with the launch of BBC Radio 4 Extra in April.

"The archive will allow fans to download the last 500 complete episodes and will list the choices – music, books and luxury – of every guest since 1942. Classic editions will also be broadcast on **Radio 4 Extra**, curated by Kirsty Young, who will update and contextualise each interview. In addition, the station – the relaunched **Radio 7** – will broadcast special, hour-long versions of episodes from the past year with previously edited material. Both **Radio 4 Extra** and the archive will launch in April.

"***Desert Island Discs*** has a unique place in British cultural life. It was created by **Roy Plomley** in 1942, the first presenter of the programme which now has a weekly reach of nearly three million listeners. Only three other people have presented the programme – **Michael Parkinson**, **Sue Lawley** and the current presenter, **Kirsty Young**. The simple format, inviting guests to choose eight pieces of music they would take with them to a desert island, has often resulted in fascinating and insightful interviews. "

The online archive will be found via the Radio 4 website from April. (**www.bbc.co.uk/radio4**)

This is wonderful news. For many years, ***Desert Island Discs*** was unavailable on the BBC iPlayer due to rights fees for the music played. They must have worked out a deal!

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

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

Firecracker Special 2011

Fireworks, parades, baseball games and fairs from coast to coast will celebrate America's birthday on the Fourth of July. *QSL Report* continues the annual July tradition of the *Firecracker Special,* a month of nothing but QSLs from across the globe. Have a great holiday!

AUSTRIA

Polish Radio/External Service via Moosebrunn, Austria, 9460 kHz. Full data QSL including site, signed by Slawek Szefs, English Service, plus cover letter. Received in 77 days. Station address: P.O. Box 46, 00-977 Warzawa, Poland. (Edward Kusalik, Alberta, Canada). Streaming/on-demand audio **www.polskieradio.pl**

CHINA

Guangxi Beibu Bay Radio via Nanning City, 9820 kHz. Full data QSL sheet. Received in five months for report to: Voice of Guangxi Beibu Gulf/Beibu Bay Radio, 75 Minzu Dadao, Nanning, Guangxi 530022, People's Rep. of China (Wendel Craighead, Prairie Village, KS).

CLANDESTINE

Democratic Voice of Burma, 11515 kHz. Full data verification letter, signed by Nanthikarn Khetcharatsaeng, Executive Admin. Received in 401 days for one IRC. QSL address: P.O. Box 6720, St. Olavs Plass, 0130 Oslo, Norway (Roberto Pavanello, Italy/playdx). Website: **www.dvb.no/**

ETHIOPIA

Oromiya Radio, 6030 kHz. Full data E-QSL from Habtamu Dargie, ORTV Engineering Head. Received in six hours for e-report to: ***habtamu_dargie@yahoo.com*** (Craighead). Streaming/on-demand audio **www.orto.gov.et/**

FRANCE

Adventist World Radio, 17575 kHz via Issoudun, France relay. Full data card signed by Dr. Adrian Peterson. Received in 69 days. Station address: 12501 Old Columbia Pike, Silver Spring, MD 20904-6600 USA (John Wilkins, Wheat Ridge, CO). Email:***info@awr.org*** Streaming/on-demand audio **www.awr.org**

Radio Taiwan International, 12055 kHz via Issoudun, France relay. Full data ***Tainan Confucius Temple*** card with site, unsigned, plus station souvenirs. Station address: 55 Pei' Road, Taipei 10462, Taiwan (Kusalik). Email: ***rti@rti.org.tw*** Streaming/on-demand audio **www.rti.org.tw**

INDIA

AIR-Bhopal, 4810 kHz. Full data E-QSL. Received in 33 weeks for e-reports to ***bhopal@air.org.in*** and ***spectrum-manager@air.org.in*** (Artur F. Llorella, Catalonia, Spain/playdx).

AIR-Khampur, 15050 kHz, DRM transmitter. No-data E-QSL from Prem Singh, Asst. Station Manager. Received for e-report to ***delhi.khampur@air.org.in*** Postal address: All India Radio, High Power Transmitter, Khampur, 110036 Delhi, India (Hans Dieter Buschau, Germany/playdx).

MEDIUM WAVE

BCE, Radio Luxembourg 1440 kHz AM. Full data QSL card and stickers. Received in two years and eight days. Station address: B.C.E., TV & Radio Transmissions, 45 Bd. Pierre Frieden, L-1543 Luxembourg (Mauricio Molano, Spain/DX News). Streaming audio **www.radioluxembourg/co.uk**

CJBC 860 kHz AM. ***Premiére Chaîne***. Hand-written French/English confirmation, signed by Alain Dorion, Chef de l' information, plus business card. Received in 22 days for an AM report and mint stamps (used). Station address: P.O. Box 500, Stn. A, Toronto, Ontario M5W 1E6, Canada (Bill Wilkins, Springfield, MO).

KTNO, 880 kHz AM. ***Radio Esperanza***. Full data prepared card and four ad cards, signed by Erika Rodriguez, General Manager. Received in eight days for an AM report and $1.00 US. Station address: 5787 S Hampton Rd., Suite 340, Dallas, TX 75232 USA (Wilkins). Streaming audio: **www.ktno.com/**

WCBS, 880 kHz AM. Partial data letter and antenna card, signed by Barry Siegfried, Technical Supervisor. Received for an AM report and $1.00 US (returned). Station address: 524 W. 37th St., New York, NY 10019 USA. (Wilkins).

WJNO, 1290 kHz AM. ***News Radio 1290***. No-data e-QSL from Scott Paxson, Engineering. Received in 90 minutes after second follow-up e-report to: ***scottpaxson@clearchannel.com***. Station address: Newsradio 1290 WJNO, 3071 Continental Dr., West Palm beach, FL 33407 USA (Tom Banks, Dallas, TX). Streaming/on-demand audio **www.wjno.com**

WPLA, 1670 kHz AM. ***Fox Sports***. Full data prepared card with illegible signature, CE. Received in 11 days for an AM report and $ 1.00 US. Station address: 7080 Industrial Way, Macon, GA 31216 (Wilkins). Streaming audio **www.foxsports1670.com**

ZNS-1, Radio Bahamas, 1540 kHz AM. Full data verification from Jason R.A. Saunders, IT Dept. Received after six email attempts in 15 minutes for email to: ***j.saunders@znsbahamas.com*** (Molano).

NIGERIA

Voice of Nigeria, 7255 kHz. Full data E-QSL, unsigned. Received in seven days for English service e-report to: ***info@voiceofnigeria.org*** Station address: Broadcasting House, Ikoyi, P.M.B. 40003, Falomo, lagos, Nigeria (Sam Wright, Biloxi, MS). Streaming audio **www.voiceofnigeria.org**

PAPUA NEW GUINEA

Radio Fly, 5960 kHz. Email from Michael Miise in four hours, promising a QSL, followed with partial-data e-letter from James So-on in five hours. E-reports to: ***michael@oktedi.com*** and ***so-on@oktedi.com*** (Craighead).

PHILIPPINES

PBS/Radyo Pilipinas, 15190 kHz. Full data verification letter and stickers from Ricardo G. Lorenzo, Audience Relations. Received in 126 days. Station address: 4/F Media Centre Bldg., Visayas Avenue, Quezon City, 1100 Philippines (Mauro Giroletti, Italy/BCL News). Streaming audio **www.pbs.gov.ph/**

SÃO TOMÈ

IBB/Voice of America relay station, 6080 kHz. Date-only E-QSL, part of a two page PDF letter signed by Victor Cunha dos Santos Guadalupe, Supervisor. Received in 20 days for report sent to transmitter facility at: IBB Relay Station São Tomé, CP 522, São Tomé, São Tomé e Principe (Bruce Portzer/HCDX). Streaming audio **www.voanews.com/**

SRI LANKA

Deutsche Welle relay, 5965 kHz. Full data QSL card, unsigned. Received in 32 days for e-report to ***info@dw-world.de*** (Banks).

UTILITY

JFX, Kagoshima Fishing Radio, 8658 kHz USB. Full data E-QSL and station info. Received in 24 hours for e-report to: ***jfx@chime.ocn.ne.jp*** (Giroletti).

Non-Directional Beacon, SN, St. Catherine's, Ontario, Canada, 408 kHz, 10 watts. Full data prepared QSL card, signed by Joe Maganja, Nav Canada Technical Operations. Received in 50 days for e-report. QSL address: c/o Hamilton Airport Control Tower, P.O. Box 190, Mt. Hope, Ontario L0R 1W0 (Jim Pogue, Memphis, TN).

Non-Directional Beacon, UX, Hall Beach, Nunavat, Canada, 378 kHz, 500 watts. Full data prepared QSL card, signed by Michaël Duval-Mace, Technologue CNS. Received in 29 days for e-report to: Nav Canada, CP 280, Aéroport d'Iqaluit, Nunavut XOA 0H0 Canada (Pogue).

Tashkent Meteo, 10090 kHz. Full data E-QSL from Renat Grenaderov. Received in 22 days for an e-report to:***grenad@rambler.ru*** Postal address: 13 Lokomotivnaya St., Tashkent 100167, Uzbekistan (Fabricio Andrade Silva/playdx).

WCY, Marine Weather Center, 4045 kHz USB/ Full data verification on station letterhead, signed by Chris Parker, President. Received in 17 days for a utility report and $1.00 US (used). Station address: 5130 Medulla Rd., Lakeland, FL 33811 USA (Wilkins).

Additional QSLs excluded for space constraints are posted at the *Shortwave Central* blog **http:mt-shortwave.blogspot.com/**

How to Use the Shortwave Guide

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

① ② ⑤ ③ ④ ⑥ ⑦

CONVERT YOUR TIME TO UTC

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Daylight Time) 4, 5, 6 or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all *dates*, as well as times, are in UTC; for example, a show which might air at 0030 UTC *Sunday* will be heard on *Saturday* evening in America (in other words, 8:30 pm Eastern, 7:30 pm Central, etc.).

FIND THE STATION YOU WANT TO HEAR

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

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

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

CHOOSE PROMISING FREQUENCIES

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

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

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

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

Target Areas

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

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

MT MONITORING TEAM

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Additional Contributors to This Month's Shortwave Guide:

Thank You to …

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

Alokesh Gupta, India; Bob Fraser, Belfast, ME; Babcock; Carmen Jung / PAB; Elena Osipova / VO Russia; Evelyn Marcy, FL / WYFR; Nigel Holmes / R Australia; Ivo Ivanov, Bulgaria; Rachel Baughn / MT; Sean Gilbert, UK / WRTH; Wolfgang Büeschel, Germany.

SHORTWAVE BROADCAST BANDS

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

Notes

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

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

0000	0030		Egypt, Radio Cairo	6270na		
0000	0030		USA, BBG/Voice of America	7555as		
0000	0045		India, All India Radio/External Service	6055as		
			7305as	11645as	13605as	
0000	0057		Canada, Radio Canada International	11700as		
0000	0057		Romania, Radio Romania International	7385na		
			9580na			
0000	0058		Germany, Deutsche Welle	9885as	13780as	
0000	0100		Anguilla, Worldwide Univ Network	6090am		
0000	0100		Australia, ABC NT Alice Springs	4835do		
0000	0100		Australia, ABC NT Katherine	5025do		
0000	0100		Australia, ABC NT Tennant Creek	4910do		
0000	0100		Australia, Radio Australia	9660pa	12080pa	
			13690pa	15240pa	17715pa	17795pa
0000	0100		Bahrain, Radio Bahrain	6010me		
0000	0100		Canada, CFRX Toronto ON	6070na		
0000	0100		Canada, CFVP Calgary AB	6030na		
0000	0100		Canada, CKZN St Johns NF	6160na		
0000	0100		Canada, CKZU Vancouver BC	6160na		
0000	0100		China, China Radio International	6020eu		
			6075as	6180as	7350eu	7415as
			9570na	11790as	11885as	13750as
			15125as			
0000	0100		Malaysia, RTM/Traxx FM	7295do		
0000	0100		Micronesia, The Cross Radio/Pohnpei	4755 as		
0000	0100		New Zealand, Radio NZ International	15720pa		
0000	0100	DRM	New Zealand, Radio NZ International	17675pa		
0000	0100		Palau, T8WH/ WHRI	15700as		
0000	0100		Russia, Voice of Russia	9665na	9800na	
0000	0100		Spain, Radio Exterior de Espana	6055na		
0000	0100		Thailand, Radio Thailand World Service	15275na		
0000	0100		UK, BBC World Service	5970as	6195as	
			9740as	12095as	15335as	15360as
			17685as			
0000	0100		USA, American Forces Network/AFRTS	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0000	0100		USA, EWTN/WEWN Irondale, AL	11520af		
0000	0100		USA, FBN/WTJC Newport NC	9370na		
0000	0100		USA, Overcomer Ministries	9980na		
0000	0100	sm	USA, WBCQ Monticello ME	5110na		
0000	0100		USA, WBCQ Monticello ME	7415am	9330am	
0000	0100		USA, WHRI Cypress Creek SC	5920na		
			7315na	9860na		
0000	0100		USA, WRMI Miami FL	9955ca		
0000	0100		USA, WTWW Lebanon TN	5755va		
0000	0100		USA, WWCR Nashville TN	4840na	5935na	
			7465na	9980na		
0000	0100		USA, WWRB Manchester TN	3185na	3215va	
0000	0100		USA, WYFR/Family Radio Worldwide	5950na		
			6985na	7520sa	9505na	15440ca
0000	0100		Zambia, CVC Radio Christian Voice	4965af		
0030	0045	twhfas	Albania, Radio Tirana	9860na		
0030	0100		Australia, Radio Australia	15415as	17750as	
0030	0100	sfa	Canada, Bible Voice Broadcasting	7405as		
0030	0100	mtwhfa	Serbia, International Radio Serbia	9685na		
0030	0100		Thailand, Radio Thailand World Service	15275na		
0030	0100		USA, BBG/Voice of America	7430as	7555as	
0030	0100		USA, BBG/Voice of America/Special English			
			7430va	9715va	9780va	11725va
			12005va	15205va	15290va	17820va
0035	0040		India, All India Radio, Delhi-Kingsway	7370do		

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

0100	0130		Vietnam, Voice of Vietnam/Overseas Service			
			6175na			
0100	0157		North Korea, Voice of Korea	7220as	9345as	
			9730as	11735ca	15180sa	
0100	0200		Anguilla, Worldwide Univ Network	6090am		
0100	0200		Australia, ABC NT Alice Springs	4835do		
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek	4910do		
0100	0200		Australia, Radio Australia	9660pa	12080pa	
			13690pa	15240pa	15415as	17715pa
			17750as	17795pa		
0100	0200		Bahrain, Radio Bahrain	6010me		
0100	0200		Canada, CFRX Toronto ON	6070na		
0100	0200		Canada, CFVP Calgary AB	6030na		
0100	0200		Canada, CKZN St Johns NF	6160na		
0100	0200		Canada, CKZU Vancouver BC	6160na		
0100	0200		China, China Radio International	6020eu		
			6175eu	6180as	9410eu	9470eu
			9535as	9570na	9580na	9675eu
			9790na	11870as	15215as	15785as
0100	0200		Cuba, Radio Havana Cuba	6000na	6050na	
0100	0200		Malaysia, RTM/Traxx FM	7295do		
0100	0200		Micronesia, The Cross Radio/Pohnpei	4755 as		
0100	0200		New Zealand, Radio NZ International	15720pa		
0100	0200	DRM	New Zealand, Radio NZ International	17675pa		
0100	0200		Palau, T8WH/ WHRI	15700as		
0100	0200		Russia, Voice of Russia	9665na	9800na	
0100	0200		Taiwan, Radio Taiwan International	11875as		
0100	0200		UK, BBC World Service	7395as	9410as	
			9740as	11750as	11955as	12095as
			15310as	15335as	15360as	17685as
0100	0200		USA, American Forces Network/AFRTS	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0100	0200		USA, BBG/Voice of America	7430va	9780va	
			11705va			
0100	0200		USA, EWTN/WEWN Irondale, AL	11520af		
0100	0200		USA, FBN/WTJC Newport NC	9370na		
0100	0200		USA, Overcomer Ministries	9980na		
0100	0200	sm	USA, WBCQ Monticello ME	5110na		
0100	0200		USA, WBCQ Monticello ME	7415am	9330am	
0100	0200		USA, WHRI Cypress Creek SC	5920na		
			7315na	9840na	9860na	
0100	0200		USA, WRMI Miami FL	9955ca		
0100	0200		USA, WTWW Lebanon TN	5755va		
0100	0200		USA, WWCR Nashville TN	3215na	4840af	
			5935na	9980na		
0100	0200		USA, WWRB Manchester TN	3185va	5050va	
			5745va			
0100	0200		USA, WYFR/Family Radio Worldwide	6985na		
			9505na	15440ca		
0100	0200		Zambia, CVC Radio Christian Voice	4965af		
0120	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0130	0200		Iran, IRIB/ VOIRI	9605na	11920na	
0130	0200	twhfa	USA, BBG/Voice of America/Special English			
			7465va	9820va		
0130	0200	twhfa	USA, WRMI/Radio Slovakia Intl	9955ca		
0145	0200	twhfas	Albania, Radio Tirana	7425na		

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

0200	0215		Croatia, Croatian Radio	3985eu	7375am	
0200	0227		Iran, IRIB/ VOIRI	9605na	11920na	
0200	0230		Thailand, Radio Thailand World Service	15275na		
0200	0245		USA, WYFR/Family Radio Worldwide	5985ca		
			11835ca			
0200	0257		North Korea, Voice of Korea	13650as	15100as	
0200	0300		Anguilla, Worldwide Univ Network	6090am		
0200	0300	twhfa	Argentina, RAE	11710am		
0200	0300		Australia, ABC NT Alice Springs	4835do		
0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek	4910do		
0200	0300		Australia, Radio Australia	9660pa	12080pa	
			13690pa	15240as	15415as	15515pa
			17750as	21725pa		
0200	0300		Bahrain, Radio Bahrain	6010me		
0200	0300		Bulgaria, Radio Bulgaria	9700na	11700na	
0200	0300		Canada, CFRX Toronto ON	6070na		
0200	0300		Canada, CFVP Calgary AB	6030na		
0200	0300		Canada, CKZN St Johns NF	6160na		
0200	0300		Canada, CKZU Vancouver BC	6160na		
0200	0300		China, China Radio International	11770as		
			13640as			
0200	0300		Cuba, Radio Havana Cuba	6000na	6050na	
0200	0300		Egypt, Radio Cairo	9315na		
0200	0300		Indonesia, Voice of Indonesia/Jawa Barat			
			9525va	15150va		
0200	0300		Malaysia, RTM/Traxx FM	7295do		
0200	0300		Micronesia, The Cross Radio/Pohnpei	4755 as		
0200	0300		New Zealand, Radio NZ International	15720pa		
0200	0300	DRM	New Zealand, Radio NZ International	17675pa		
0200	0300		Philippines, PBS/ Radyo Pilipinas	11880me		
			15285me	17700me		
0200	0300		Russia, Voice of Russia	7440na	9665sa	
			15425na			
0200	0300		South Korea, KBS World Radio	9580sa		
0200	0300		Sri Lanka, SLBC	6005as	9770as	15745as
0200	0300		Taiwan, Radio Taiwan International	5950na		
			9680ca			
0200	0300		UK, BBC World Service	6005af	6195as	
			12095as	15310as	17790as	
0200	0300		USA, American Forces Network/AFRTS	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0200	0300		USA, EWTN/WEWN Irondale, AL	11520af		

0200 0300 USA, FBN/WTJC Newport NC 9370na
0200 0300 USA, KJES Vado NM 7555na
0200 0300 USA, Overcomer Ministries 5890na
0200 0300 sm USA, WBCQ Monticello ME 5110na
0200 0300 USA, WBCQ Monticello ME 7415am 9330am
0200 0300 USA, WHRI Cypress Creek SC 5920na 9840na 9860na
0200 0300 USA, WRMI Miami FL 9955ca
0200 0300 USA, WRNO New Orleans LA 7505am
0200 0300 USA, WTWW Lebanon TN 5755va
0200 0300 USA, WWCR Nashville TN 3215na 4840af 5890na 5935na
0200 0300 USA, WWRB Manchester TN 3185va 5050va 5745va
0200 0300 USA, WYFR/Family Radio Worldwide 6985na 9385ca 9505na
0200 0300 Zambia, CVC Radio Christian Voice 4965af
0215 0227 Nepal, Radio Nepal 5005as
0230 0255 China, Voice of the Strait (News Channel) Fuzhou 9505do
0230 0300 twhfas Albania, Radio Tirana 7425na
0230 0300 Vietnam, Voice of Vietnam/Overseas Service 6175na
0245 0300 Australia, HCJB Global Australia 15400as
0245 0300 India, All India Radio, Delhi-Kingsway 6030do 7235do 11830do 15135do
0245 0300 India, All India Radio/Gorakhpur 3945do
0250 0300 Vatican City State, Vatican Radio 6040am 7305am 9610am
0250 0300 Zambia, Zambia Broadcasting Corp 6165do
0255 0300 Sat Swaziland, TWR Africa 3200af

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

0300 0310 Pakistan, Azad Kashmir Radio/Islamabad 7265do
0300 0310 Pakistan, Azad Kashmir Radio/Rawalpindi 4790do
0300 0325 Sun Swaziland, TWR Africa 3200af
0300 0327 Iran, IRIB/ VOIRI 11920na
0300 0330 Egypt, Radio Cairo 9315na
0300 0330 Philippines, PBS/ Radyo Pilipinas 11880me 15285me 17700me
0300 0330 USA, KJES Vado NM 7555na
0300 0330 Vatican City State, Vatican Radio 7305af 7360af 9660af
0300 0355 mtwhf South Africa, Channel Africa 5980af
0300 0355 Turkey, Voice of Turkey 6165as 9515va
0300 0357 North Korea, Voice of Korea 7220as 9345as 9730as
0300 0357 Romania, Radio Romania International 7335na 9645na 11895as 15340as
0300 0358 Germany, Deutsche Welle 12005as 15595as
0300 0400 Anguilla, Worldwide Univ Network 6090am
0300 0400 Australia, ABC NT Alice Springs 4835do
0300 0400 Australia, ABC NT Katherine 5025do
0300 0400 Australia, ABC NT Tennant Creek 4910do
0300 0400 Australia, Radio Australia 9660pa 12080pa 13690pa 15240as 15415as 15515pa 17750as 21725pa
0300 0400 Bahrain, Radio Bahrain 6010me
0300 0400 twhfas Canada, CBC Northern Quebec Service 9625na
0300 0400 Canada, CFRX Toronto ON 6070na
0300 0400 Canada, CFVP Calgary AB 6030na
0300 0400 Canada, CKZN St Johns NF 6160na
0300 0400 Canada, CKZU Vancouver BC 6160na
0300 0400 China, China Radio International 9690am 9790na 11770as 13750as 15110as 15120as 15785as
0300 0400 Cuba, Radio Havana Cuba 6000na 6050na
0300 0400 Germany, Deutsche Welle 15595as
0300 0400 Malaysia, RTM/Traxx FM 7295do
0300 0400 Micronesia, The Cross Radio/Pohnpei 4755 as
0300 0400 New Zealand, Radio NZ International 15720pa
0300 0400 DRM New Zealand, Radio NZ International 17675pa
0300 0400 Oman, Radio Sultanate of Oman 15355af
0300 0400 Palau, T8WH/ WHRI 17800as
0300 0400 DRM Russia, Voice of Russia 15735as
0300 0400 Russia, Voice of Russia 9665sa 15425na 15585as
0300 0400 mtwhf South Africa, Channel Africa 3345af
0300 0400 Sat Sri Lanka, SLBC 6005as 9770as 15745as
0300 0400 Taiwan, Radio Taiwan International 5950na 15320as
0300 0400 UK, BBC World Service 3255af 6005af 6145af 6190af 6195as 7255af 9410eu 9750af 12035af 12095as 15310as 15365as 17790as
0300 0400 USA, American Forces Network/AFRTS 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0300 0400 USA, BBG/Voice of America 4930af 6080af 9885af 15580af
0300 0400 USA, EWTN/WEWN Irondale, AL 11520af
0300 0400 USA, FBN/WTJC Newport NC 9370na
0300 0400 USA, Overcomer Ministries 5890na
0300 0400 USA, WBCQ Monticello ME 7415am 9330am
0300 0400 USA, WHRI Cypress Creek SC 5920na 7385na 9840na
0300 0400 USA, WRMI Miami FL 9955ca
0300 0400 USA, WRNO New Orleans LA 7505am
0300 0400 USA, WTWW Lebanon TN 5755va
0300 0400 USA, WWCR Nashville TN 3215na 4840af 5890na 5935na
0300 0400 USA, WWRB Manchester TN 3185va 5050va 5745va
0300 0400 USA, WYFR/Family Radio Worldwide 11740ca 15255sa
0300 0400 Zambia, CVC Radio Christian Voice 4965af
0300 0400 Zambia, Zambia Broadcasting Corp 6165do
0315 0400 Australia, Radio Australia 15240pa
0330 0400 twhfas Albania, Radio Tirana 7425na
0330 0400 Vietnam, Voice of Vietnam/Overseas Service 6175na
0335 0340 India, All India Radio, Delhi-Kingsway 7235do 11830do 15135do

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

0400 0430 mtwhf France, Radio France Internationale 9805af 11995af
0400 0430 USA, BBG/Voice of America 4930af 4960af 6080af 9855af 11670af 15580af
0400 0445 USA, WYFR/Family Radio Worldwide 6985na 9505na
0400 0457 Germany, Deutsche Welle 7240af
0400 0458 New Zealand, Radio NZ International 15720pa
0400 0458 DRM New Zealand, Radio NZ International 17675pa
0400 0459 Germany, Deutsche Welle 13840af
0400 0500 Anguilla, Worldwide Univ Network 6090am
0400 0500 Australia, ABC NT Alice Springs 4835do
0400 0500 Australia, ABC NT Katherine 5025do
0400 0500 Australia, ABC NT Tennant Creek 4910do
0400 0500 Australia, Radio Australia 9660pa 12080pa 13690pa 15240as 15515pa 17750pa 21725pa
0400 0500 Bahrain, Radio Bahrain 6010me
0400 0500 twhfas Canada, CBC Northern Quebec Service 9625na
0400 0500 Canada, CFRX Toronto ON 6070na
0400 0500 Canada, CKZN St Johns NF 6160na
0400 0500 Canada, CKZU Vancouver BC 6160na
0400 0500 China, China Radio International 6020na 6080na 13750as 15120as 15785as 17730va 17855va
0400 0500 Germany, Deutsche Welle 6180af 15400af
0400 0500 Malaysia, RTM/Traxx FM 7295do
0400 0500 Micronesia, The Cross Radio/Pohnpei 4755 as
0400 0500 DRM Russia, Voice of Russia 15735as
0400 0500 Russia, Voice of Russia 13775na 15735as
0400 0500 mtwhf South Africa, Channel Africa 3345af
0400 0500 South Africa, CVC 1 Africa 9430af
0400 0500 Sat Sri Lanka, SLBC 6005as 9770as 15745as
0400 0500 UK, BBC World Service 3255af 3955eu 6005af 6190af 7255af 7310af 11945af 12035af 12095as 13840af 15310as 15365as 17790as
0400 0500 USA, American Forces Network/AFRTS 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0400 0500 USA, EWTN/WEWN Irondale, AL 11520af
0400 0500 USA, FBN/WTJC Newport NC 9370na
0400 0500 USA, Overcomer Ministries 5890na
0400 0500 USA, WHRI Cypress Creek SC 5920na 7385na 9825na
0400 0500 USA, WRMI Miami FL 9955ca
0400 0500 USA, WRNO New Orleans LA 7505am
0400 0500 USA, WTWW Lebanon TN 5755va
0400 0500 USA, WWCR Nashville TN 3215na 4840af 5890na 5935na

0400 0500 USA, WWRB Manchester TN 3185va 5050va 5745va
0400 0500 USA, WYFR/Family Radio Worldwide 5985na 9680na 9715ca
0400 0500 Zambia, CVC Radio Christian Voice 4965af
0400 0500 Zambia, Zambia Broadcasting Corp 6165do
0430 0500 Palau, T8WH/ WHRI 17800as
0430 0500 mtwhf Swaziland, TWR Africa 3200af 4775af
0430 0500 USA, BBG/Voice of America 4930af 4960af 6080af 11670af 15580af
0455 0500 Nigeria, Voice of Nigeria/Ikorodu 15120af
0459 0500 New Zealand, Radio NZ International 11725pa
0459 0500 DRM New Zealand, Radio NZ International 11675pa

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

0500 0507 twhfas Canada, CBC Northern Quebec Service 9625na
0500 0530 Eritrea, Radio Bana 5060do
0500 0530 mtwhf France, Radio France Internationale 13680af 15160af
0500 0530 Germany, Deutsche Welle 6180af 7430af 9480af
0500 0530 Japan, Radio Japan NHK World 5975va 6110na 11970va
0500 0530 UK, BBC World Service 5975eu
0500 0530 Vatican City State, Vatican Radio 5965va 7250eu 9660af 11625af 13765af
0500 0557 China, China Radio International 6020na 6190na 11710af 11895as 15350as 15465as 17505va 17540as 17730va 17855va
0500 0600 Anguilla, Worldwide Univ Network 6090am
0500 0600 Australia, ABC NT Alice Springs 4835do
0500 0600 Australia, ABC NT Katherine 5025do
0500 0600 Australia, ABC NT Tennant Creek 4910do
0500 0600 Australia, Radio Australia 9660pa 12080pa 13630pa 13690pa 15160pa 15240pa 17750as
0500 0600 Bahrain, Radio Bahrain 6010me
0500 0600 Bhutan, Bhutan Broadcasting Service 6035do
0500 0600 Canada, CFRX Toronto ON 6070na
0500 0600 Canada, CKZN St Johns NF 6160na
0500 0600 Canada, CKZU Vancouver BC 6160na
0500 0600 Cuba, Radio Havana Cuba 6000na 6010na 6050na 6060na 6150sa
0500 0600 mtwhf Equatorial Guinea, Radio Africa 2 15190af
0500 0600 Sat/Sun Equatorial Guinea, Radio East Africa 15190af
0500 0600 Liberia, Star Radio 3960do
0500 0600 Malaysia, RTM/Traxx FM 7295do
0500 0600 Micronesia, The Cross Radio/Pohnpei 4755 as
0500 0600 New Zealand, Radio NZ International 11725pa
0500 0600 DRM New Zealand, Radio NZ International 11675pa
0500 0600 Nigeria, Voice of Nigeria/Ikorodu 15120af
0500 0600 Russia, Voice of Russia 13775na
0500 0600 mtwhf South Africa, Channel Africa 7230af
0500 0600 South Africa, CVC 1 Africa 9430af
0500 0600 mtwhf Swaziland, TWR Africa 3200af 4775af
0500 0600 Swaziland, TWR Africa 9500af
0500 0600 Sat/Sun Swaziland, TWR Africa 4775af
0500 0600 Taiwan, Radio Taiwan International 6875na
0500 0600 UK, BBC World Service 3255af 3955eu 6005af 6190af 7255af 9410af 11945af 12095as 15310as 15365as 15420af 17640as 17790as
0500 0600 USA, American Forces Network/AFRTS 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0500 0600 USA, BBG/Voice of America 4930af 6080af 15580af
0500 0600 USA, EWTN/WEWN Irondale, AL 11520af
0500 0600 USA, FBN/WTJC Newport NC 9370na
0500 0600 USA, Overcomer Ministries 5890na
0500 0600 USA, WHRI Cypress Creek SC 7385va 9825va 11565va
0500 0600 USA, WRMI Miami FL 9955ca
0500 0600 USA, WTWW Lebanon TN 5755va
0500 0600 USA, WWCR Nashville TN 3215na 4840af 5890na 5935na
0500 0600 USA, WWRB Manchester TN 3185va 5050va 5745va
0500 0600 USA, WYFR/Family Radio Worldwide 5985na 9680na
0500 0600 Zambia, CVC Radio Christian Voice 6065af
0500 0600 Zambia, Zambia Broadcasting Corp 6165do
0515 0530 Sat Greece, Voice of Greece 11645eu
0530 0550 Sun Greece, Voice of Greece 11645eu
0530 0557 DRM Romania, Radio Romania International 7305eu
0530 0557 Romania, Radio Romania International 9655eu 17760eu 21500eu
0530 0600 Sat/Sun Clandestine, Sudan Radio Service/SRS 13720af
0530 0600 Palau, T8WH/ WHRI 17800as
0530 0600 Thailand, Radio Thailand World Service 17655va

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

0600 0615 Sat/Sun South Africa, TWR Africa 11640af
0600 0630 mtwhf France, Radio France Internationale 11615va 15160af 17605af 17800af
0600 0630 Germany, Deutsche Welle 9545af 15275af
0600 0630 Laos, Lao National Radio 7145as
0600 0645 smtwhf South Africa, TWR Africa 11640af
0600 0650 New Zealand, Radio NZ International 11725pa
0600 0650 DRM New Zealand, Radio NZ International 11675pa
0600 0655 mtwhf South Africa, Channel Africa 15255af
0600 0700 Anguilla, Worldwide Univ Network 6090am
0600 0700 Australia, ABC NT Alice Springs 4835do
0600 0700 Australia, ABC NT Katherine 5025do
0600 0700 Australia, ABC NT Tennant Creek 4910do
0600 0700 Australia, Radio Australia 9660pa 12080pa 13630pa 13690pa 15160pa 15240pa 15415as 17750as
0600 0700 Bahrain, Radio Bahrain 6010me
0600 0700 Canada, CFRX Toronto ON 6070na
0600 0700 Canada, CFVP Calgary AB 6030na
0600 0700 Canada, CKZN St Johns NF 6160na
0600 0700 Canada, CKZU Vancouver BC 6160na
0600 0700 China, China Radio International 11710af 11870me 11895as 13660as 15140me 15350as 15465as 17505va 17540as 17710as
0600 0700 Cuba, Radio Havana Cuba 6000na 6010na 6050na 6060na 6150sa
0600 0700 mtwhf Equatorial Guinea, Radio Africa 2 15190af
0600 0700 Sat/Sun Equatorial Guinea, Radio East Africa 15190af
0600 0700 Liberia, Star Radio 3960do
0600 0700 Malaysia, RTM/Traxx FM 7295do
0600 0700 Malaysia, RTM/Voice of Malaysia 6175as 9750as 15295as
0600 0700 Micronesia, The Cross Radio/Pohnpei 4755 as
0600 0700 Nigeria, Voice of Nigeria/Ikorodu 15120af
0600 0700 Palau, T8WH/ WHRI 17800as
0600 0700 Papua New Guinea, Radio Fly 5960do
0600 0700 Russia, Voice of Russia 15405pa
0600 0700 mtwhf South Africa, Channel Africa 7230af
0600 0700 South Africa, CVC 1 Africa 13590af
0600 0700 South Africa, CVC 1 Africa Radio 13590af
0600 0700 Swaziland, TWR Africa 9500af
0600 0700 UK, BBC World Service 5875eu 6005af 6190af 7430eu 9410af 9860af 12015af 12095as 15105af 15310as 15420af 17640af 17790as
0600 0700 USA, American Forces Network/AFRTS 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0600 0700 USA, BBG/Voice of America 6080af 11670af 15580af
0600 0700 USA, EWTN/WEWN Irondale, AL 11520af
0600 0700 USA, FBN/WTJC Newport NC 9370na
0600 0700 USA, Overcomer Ministries 5890na
0600 0700 USA, WHRI Cypress Creek SC 7385va 9825va 11565va
0600 0700 USA, WRMI Miami FL 9955ca
0600 0700 USA, WTWW Lebanon TN 5755va
0600 0700 USA, WWCR Nashville TN 3215na 4840af 5890na 5935na
0600 0700 USA, WWRB Manchester TN 3185va
0600 0700 USA, WYFR/Family Radio Worldwide 5850ca 7520eu 9680na 11530af 11580eu
0600 0700 Zambia, CVC Radio Christian Voice 6065af
0600 0700 Zambia, Zambia Broadcasting Corp 6165do
0602 0700 Swaziland, TWR Africa 6120af
0630 0700 Bulgaria, Radio Bulgaria 9600na 11600na
0630 0700 Congo Dem. Republic, Radio Kahuzi 6209do
0630 0700 Vatican City State, Vatican Radio 11625af 13765af 15570af
0645 0700 Sun Germany, TWR Europe 6105eu
0645 0700 Sun Monaco, TWR Europe 9800eu
0651 0658 New Zealand, Radio NZ International 11725pa
0651 0658 DRM New Zealand, Radio NZ International 13730pa
0659 0700 New Zealand, Radio NZ International 6170pa

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

0700	0730	Sun	Canada, Bible Voice Broadcasting			5945eu
0700	0730		China, Xizang PBS/Lhasa	4905do		4920do
			5240do	6110do	6130do	9490do
			9580do			
0700	0730	mtwhf	France, Radio France Internationale			15605af
			15615af	17605af		
0700	0730		USA, WRMI/Radio Prague			9955na
0700	0745	Sat	Canada, Bible Voice Broadcasting			5945eu
0700	0745		USA, WYFR/Family Radio Worldwide			7570eu
0700	0750	mtwhf	Germany, TWR Europe	6105eu		
0700	0750	Sun	Monaco, TWR Europe	9800eu		
0700	0750	Sun	Monaco, TWR Europe	9800eu		
0700	0750	mtwhf	Monaco, TWR Europe	9800eu		
0700	0758		New Zealand, Radio NZ International			6170pa
0700	0800		Anguilla, Worldwide Univ Network			6090am
0700	0800		Australia, ABC NT Alice Springs			4835do
0700	0800		Australia, ABC NT Katherine	5025do		
0700	0800		Australia, ABC NT Tennant Creek			4910do
0700	0800		Australia, Radio Australia	9475as		9660pa
			9710pa	11945as	12080pa	13630pa
			15160pa			
0700	0800		Bahrain, Radio Bahrain	6010me		
0700	0800	m/DRM	Belgium, TDP Radio	6015eu		
0700	0800		Canada, CFRX Toronto ON	6070na		
0700	0800		Canada, CFVP Calgary AB	6030na		
0700	0800		Canada, CKZN St Johns NF	6160na		
0700	0800		Canada, CKZU Vancouver BC			6160na
0700	0800		China, China Radio International			11895as
			13660as	15125va	13710eu	15350as
			15465as	17490eu	17540as	17710as
0700	0800	mtwhf	Equatorial Guinea, Radio Africa 2			15190af
0700	0800	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0700	0800		Liberia, Star Radio	3960do		
0700	0800		Malaysia, RTM/Traxx FM	7295do		
0700	0800		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0700	0800		Micronesia, The Cross Radio/Pohnpei			4755 as
0700	0800		Palau, T8WH/ WHRI	9930as		17800as
0700	0800		Papua New Guinea, Radio Fly			5960do
0700	0800		Russia, Voice of Russia	15405pa		
0700	0800	mtwhf	South Africa, Channel Africa	7230af		
0700	0800		South Africa, CVC 1 Africa	13590af		
0700	0800		South Africa, CVC 1 Africa Radio			13590af
0700	0800		Swaziland, TWR Africa	6120af		9500af
0700	0800		UK, BBC World Service	5875eu		6190af
			11760me	11765af	11830af	12095af
			15310as	15400af	15575as	17640af
			17790as	17830af		
0700	0800		USA, American Forces Network/AFRTS			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0700	0800		USA, EWTN/WEWN Irondale, AL			11520af
0700	0800		USA, FBN/WTJC Newport NC			9370na
0700	0800		USA, Overcomer Ministries	5890na		
0700	0800		USA, WHRI Cypress Creek SC			7385va
			9825va	11565va		
0700	0800		USA, WRMI Miami FL	9955ca		
0700	0800		USA, WTWW Lebanon TN	5755va		
0700	0800		USA, WWCR Nashville TN	3215na		4840af
			5890na	5935na		
0700	0800		USA, WWRB Manchester TN	3185va		
0700	0800		USA, WYFR/Family Radio Worldwide			5950ca
			5985na	6875na	9385af	9505ca
0700	0800		Zambia, CVC Radio Christian Voice			6065af
0700	0800		Zambia, Zambia Broadcasting Corp			6165do
0715	0750	Sun	Germany, TWR Europe	6105eu		
0715	0750	Sat	Monaco, TWR Europe	9800eu		
0730	0735		India, All India Radio, Delhi-Kingsway			15185do
			15260do			
0730	0800		Australia, HCJB Global Australia			11750pa
0759	0800	DRM	New Zealand, Radio NZ International			7440pa
0759	0800		New Zealand, Radio NZ International			6170pa

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

0800	0820		Indonesia, RRI Cimanggis/Jawa Barat			9680do
0800	0830		Australia, ABC NT Alice Springs			4835do
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek			4910do
0800	0830		Australia, HCJB Global Australia			11750pa
0800	0845		USA, WYFR/Family Radio Worldwide			5950ca
			9385af			
0800	0900		Anguilla, Worldwide Univ Network			6090am
0800	0900		Australia, Radio Australia	5995pa		9475as
			9590pa	9710pa	9580pa	11945as
			12080pa	13630pa		
0800	0900		Bahrain, Radio Bahrain	6010me		
0800	0900	t/DRM	Belgium, TDP Radio	6015eu		
0800	0900		Canada, CFRX Toronto ON	6070na		
0800	0900		Canada, CFVP Calgary AB	6030na		
0800	0900		Canada, CKZN St Johns NF	6160na		
0800	0900		Canada, CKZU Vancouver BC			6160na
0800	0900		China, China Radio International			11620as
			11895as	13710eu	15350as	15465as
			15625va	17490eu	17540as	
0800	0900	mtwhf	Equatorial Guinea, Radio Africa 2			15190af
0800	0900	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0800	0900	Sat	Italy, IRRS-Shortwave/NEXUS	9510va		
0800	0900		Liberia, Star Radio	3960do		
0800	0900		Malaysia, RTM/Traxx FM	7295do		
0800	0900		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0800	0900		Micronesia, The Cross Radio/Pohnpei			4755 as
0800	0900	DRM	New Zealand, Radio NZ International			7440pa
0800	0900		New Zealand, Radio NZ International			6170pa
0800	0900	mtwhfs	Palau, T8WH/ WHRI	9930as		17800as
0800	0900		Papua New Guinea, Radio Fly			5960do
0800	0900		Russia, Voice of Russia	15405pa		
0800	0900	mtwhf	South Africa, Channel Africa	9625af		
0800	0900		South Africa, CVC 1 Africa	13590af		
0800	0900		South Africa, CVC 1 Africa Radio			13590af
0800	0900	Sun	South Africa, SA Radio League			7205af
			17570af			
0800	0900		South Korea, KBS World Radio			9570as
0800	0900		UK, BBC World Service	6190af		11760me
			12095af	15310as	15400af	15575as
			17640af	17790as	17830af	21470af
0800	0900		USA, American Forces Network/AFRTS			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0800	0900		USA, EWTN/WEWN Irondale, AL			11520af
0800	0900		USA, FBN/WTJC Newport NC			9370na
0800	0900		USA, Overcomer Ministries	5890na		
0800	0900		USA, WHRI Cypress Creek SC			7385va
			11565va			
0800	0900		USA, WRMI Miami FL	9955ca		
0800	0900		USA, WTWW Lebanon TN	5755va		
0800	0900		USA, WWCR Nashville TN	3215na		4840af
			5890na	5935na		
0800	0900		USA, WWRB Manchester TN	3185va		
0800	0900		USA, WYFR/Family Radio Worldwide			5985na
			6875na			
0800	0900		Zambia, CVC Radio Christian Voice			6065af
0800	0900		Zambia, Zambia Broadcasting Corp			6165do
0815	0827		Nepal, Radio Nepal	5005as		
0820	0900	mtwhfa	Guam, TWR Asia/KTWR	15170as		
0830	0840		India, All India Radio, Delhi-Kingsway			15185do
			15260do			
0830	0900		Australia, ABC NT Alice Springs			2310do
0830	0900		Australia, ABC NT Katherine	2485do		
0830	0900		Australia, ABC NT Tennant Creek			2325do
0830	0900		Guam, TWR Asia/KTWR	11840as		
0840	0855		Mongolia, Mongolian Radio 2/Murun			4895do
0840	0855		Mongolia, Mongolian Radio 2/Ulaanbaatar			
			7260do			

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

0900	0910		Guam, TWR Asia/KTWR	11840as		
0900	0910		Papua New Guinea, Wantok Radio Light			
			7325do			
0900	0959		Germany, Deutsche Welle	15640as		17820as
0900	1000		Anguilla, Worldwide Univ Network			6090am
0900	1000		Australia, ABC NT Alice Springs			2310do
0900	1000		Australia, ABC NT Katherine	2485do		
0900	1000		Australia, ABC NT Tennant Creek			2325do
0900	1000		Australia, Radio Australia	9475as		9580pa
			9590pa	11945as		
0900	1000		Bahrain, Radio Bahrain	6010me		
0900	1000	w/DRM	Belgium, TDP Radio	6015eu		
0900	1000		Canada, CFRX Toronto ON	6070na		
0900	1000		Canada, CFVP Calgary AB	6030na		
0900	1000		Canada, CKZN St Johns NF	6160na		
0900	1000		Canada, CKZU Vancouver BC			6160na
0900	1000		China, China Radio International			11620as
			13790pa	15210as	15270eu	15350as
			17490eu	17570eu	17750as	
0900	1000	Sun	Greece, Voice of Greece	9420va		15630va
0900	1000		Malaysia, RTM/Traxx FM	7295do		

SHORTWAVE GUIDE

0900	1000		Malaysia, RTM/Voice of Malaysia	6175as
			9750as	15295as
0900	1000		Micronesia, The Cross Radio/Pohnpei	4755 as
0900	1000	DRM	New Zealand, Radio NZ International	7440pa
0900	1000		New Zealand, Radio NZ International	6170pa
0900	1000		Nigeria, Voice of Nigeria/Ikorodu	9690af
0900	1000		Palau, T8WH/ WHRI	9930as 15700as
0900	1000		Papua New Guinea, Radio Fly	5960do
0900	1000		Russia, Voice of Russia	15170as
0900	1000	mtwhf	South Africa, Channel Africa	9625af
0900	1000		South Africa, CVC 1 Africa	13590af
0900	1000		South Africa, CVC 1 Africa Radio	13590af
0900	1000		UK, BBC World Service	6190af 6195as
			9740as	11760me 12095af 15310as
			15400af	15575as 17640af 17760as
			17790as	17830af 21470af 21630as
0900	1000		USA, American Forces Network/AFRTS	4319usb
			5446usb	5765usb 7812usb 12133usb
			12759usb	13362usb
0900	1000		USA, EWTN/WEWN Irondale, AL	11520af
0900	1000		USA, FBN/WTJC Newport NC	9370na
0900	1000		USA, Overcomer Ministries	5890na
0900	1000		USA, WHRI Cypress Creek SC	7385va
			9825va	11565va
0900	1000		USA, WRMI Miami FL	9955ca
0900	1000		USA, WTWW Lebanon TN	5755va
0900	1000		USA, WWCR Nashville TN	4840af 5890na
			5935na	9985na
0900	1000		USA, WWRB Manchester TN	3185va
0900	1000		USA, WYFR/Family Radio Worldwide	9465as
			9755ca	
0900	1000		Zambia, CVC Radio Christian Voice	6065af
0900	1000		Zambia, Zambia Broadcasting Corp	6165do
0930	1000		China, Voice of the Strait/Fuzhou	6115do
0930	1000	Sun	Italy, IRRS-Shortwave/NEXUS	9510va
0930	1000		Saudi Arabia, BSKSA/External Service	15250af
0959	1000		Netherlands, R Netherlands Worldwide	12065as
			15110as	

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

1000	1025		China, Voice of the Strait (News Channel) Fuzhou	
			9505do	
1000	1030		Japan, Radio Japan NHK World	9605as
			9625pa	9840pa
1000	1030	mtwhf	USA, WRMI/Radio Prague	9955na
1000	1030		Vietnam, Voice of Vietnam/Overseas Service	
			9840as	12020as
1000	1040		Micronesia, The Cross Radio/Pohnpei	4755as
1000	1057		Netherlands, R Netherlands Worldwide	12065as
			15110as	
1000	1057		North Korea, Voice of Korea	11710ca 11735as
			13650as	15180sa
1000	1058	DRM	New Zealand, Radio NZ International	7440pa
1000	1058		New Zealand, Radio NZ International	6170pa
1000	1100		Anguilla, Worldwide Univ Network	11775am
1000	1100		Australia, ABC NT Alice Springs	2310do
1000	1100		Australia, ABC NT Katherine	2485do
1000	1100		Australia, ABC NT Tennant Creek	2325do
1000	1100		Australia, Radio Australia	9475as 9580pa
			9590pa	11945as
1000	1100		Bahrain, Radio Bahrain	6010me
1000	1100	h/DRM	Belgium, TDP Radio	6015eu
1000	1100		Canada, CFRX Toronto ON	6070na
1000	1100		Canada, CFVP Calgary AB	6030na
1000	1100		Canada, CKZN St Johns NF	6160na
1000	1100		Canada, CKZU Vancouver BC	6160na
1000	1100		China, China Radio International	6040na
			11610as	11635as 13590as 13620as
			13790na	15190as 15210as 15350as
			17490as	
1000	1100		India, All India Radio/External Service	7270as
			13695pa	15260as 15410as 17510pa
			17800as	17895pa
1000	1100		Indonesia, Voice of Indonesia/Jawa Barat	
			9525va	11785va
1000	1100	Sun	Italy, IRRS-Shortwave/NEXUS	9510va
1000	1100		Malaysia, RTM/Traxx FM	7295do
1000	1100		Nigeria, Voice of Nigeria/Ikorodu	9690af
1000	1100		Palau, T8WH/ WHRI	9930as
1000	1100		Russia, Voice of Russia	15170as
1000	1100		Saudi Arabia, BSKSA/External Service	15250af
1000	1100	mtwhf	South Africa, Channel Africa	9625af
1000	1100		South Africa, CVC 1 Africa	13590af
1000	1100		South Africa, CVC 1 Africa Radio	13590af
1000	1100		UK, BBC World Service	6190af 6195as
			9740as	11760me 12095af 15310as
			15400af	15575as 17640af 17760as
			17790as	21470af 21660as
1000	1100	Sat/Sun	UK, BBC World Service	17830af
1000	1100		USA, American Forces Network/AFRTS	4319usb
			5446usb	5765usb 7812usb 12133usb
			12759usb	13362usb
1000	1100		USA, EWTN/WEWN Irondale, AL	9390as
1000	1100		USA, FBN/WTJC Newport NC	9370na
1000	1100		USA, KNLS Anchor Point AK	11870as
1000	1100		USA, Overcomer Ministries	5890na
1000	1100		USA, WHRI Cypress Creek SC	7385va
			7400va	11565va
1000	1100		USA, WRMI Miami FL	9955ca
1000	1100		USA, WTWW Lebanon TN	5755va
1000	1100		USA, WWCR Nashville TN	4840af 5890na
			5935na	9985na
1000	1100		USA, WWRB Manchester TN	3185va
1000	1100		USA, WYFR/Family Radio Worldwide	5950na
			5985na	6875na 9465as
1000	1100		Zambia, CVC Radio Christian Voice	6065af
1000	1100		Zambia, Zambia Broadcasting Corp	6165do
1030	1100		Iran, IRIB/ VOIRI	17710as 21630as
1030	1100		Mongolia, Voice of Mongolia	12085as
1059	1100		New Zealand, Radio NZ International	9655pa
1059	1100	DRM	New Zealand, Radio NZ International	7440pa

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

1100	1105		Pakistan, Azad Kashmir Radio/Islamabad	
			7265do	
1100	1105		Pakistan, PBC/Radio Pakistan	15725eu 17720eu
1100	1120	f/DRM	Japan, Radio Japan NHK World	9760eu
1100	1127		Iran, IRIB/ VOIRI	17710as 21630as
1100	1130	Sat/DRM	South Korea, KBS World Radio	9760eu
1100	1130	fa	UK, BBC World Service	9760eu
1100	1130		Vietnam, Voice of Vietnam/Overseas Service	
			7285as	
1100	1145		USA, WYFR/Family Radio Worldwide	6875na
			9550sa	9755ca
1100	1157		Romania, Radio Romania International	15210eu
			15430eu	17510af 17670af
1100	1158		New Zealand, Radio NZ International	9655pa
1100	1158	DRM	New Zealand, Radio NZ International	7440pa
1100	1200		Anguilla, Worldwide Univ Network	11775am
1100	1200		Australia, ABC NT Alice Springs	2310do
1100	1200		Australia, ABC NT Katherine	2485do
1100	1200		Australia, ABC NT Tennant Creek	2325do
1100	1200		Australia, Radio Australia	5995pa 6020pa
			9475as	9560pa 9580pa 9590pa
			11945as	12080pa
1100	1200		Bahrain, Radio Bahrain	6010me
1100	1200	f/DRM	Belgium, TDP Radio	6015eu
1100	1200	Sat/Sun	Canada, CBC Northern Quebec Service	
			9625na	
1100	1200		Canada, CFRX Toronto ON	6070na
1100	1200		Canada, CFVP Calgary AB	6030na
1100	1200		Canada, CKZN St Johns NF	6160na
1100	1200		Canada, CKZU Vancouver BC	6160na
1100	1200		China, China Radio International	5955as
			6040as	11650as 11660as 11750na
			11795as	13590as 13645as 13650eu
			13720as	17490eu
1100	1200	Sun	Italy, IRRS-Shortwave/NEXUS	9510va
1100	1200		Malaysia, RTM/Traxx FM	7295do
1100	1200		Nigeria, Voice of Nigeria/Ikorodu	9690af
1100	1200		Palau, T8WH/ WHRI	9930as
1100	1200		Russia, Voice of Russia	12065as
1100	1200		Saudi Arabia, BSKSA/External Service	15250af
1100	1200	mtwhf	South Africa, Channel Africa	9625af
1100	1200		South Africa, CVC 1 Africa	13590af
1100	1200		South Africa, CVC 1 Africa Radio	13590af
1100	1200		Taiwan, Radio Taiwan International	7445as
			11715as	
1100	1200		UK, BBC World Service	6140as 6195as
			9740as	11760me 12095af 15285as
			15310as	15400af 15575as 17640as
			17760as	17790as 17830af 21470af
1100	1200		USA, American Forces Network/AFRTS	4319usb
			5446usb	5765usb 7812usb 12133usb
			12759usb	13362usb
1100	1200		USA, EWTN/WEWN Irondale, AL	9390as
1100	1200		USA, FBN/WTJC Newport NC	9370na
1100	1200		USA, Overcomer Ministries	5890na

1100	1200		USA, WHRI Cypress Creek SC	7385va
			9410va	11565va
1100	1200		USA, WRMI Miami FL	9955ca
1100	1200		USA, WTWW Lebanon TN	5755va
1100	1200		USA, WWCR Nashville TN	4840af 5890na
			5935na	15825na
1100	1200		USA, WWRB Manchester TN	3185va
1100	1200		USA, WYFR/Family Radio Worldwide	5950na
			7730sa	9625sa
1100	1200		Zambia, CVC Radio Christian Voice	6065af
1100	1200		Zambia, Zambia Broadcasting Corp	6165do
1130	1140	f	Vatican City State, Vatican Radio	15595as
			17765as	
1130	1200		Vietnam, Voice of Vietnam/Overseas Service	
			9840as	12020as
1135	1140		India, All India Radio, Delhi-Kingsway	9595do
			11710do	15185do
1135	1140		India, All India Radio/Dehli-Khampur	11620do
1135	1140		India, All India Radio/Gorakhpur	7250do
1159	1200		New Zealand, Radio NZ International	9655pa

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

1200	1215		Vatican City State, Vatican Radio	13730am
1200	1230		France, Radio France Internationale	21620af
1200	1230		Germany, AWR Europe	17535as
1200	1230		Saudi Arabia, BSKSA/External Service	15250af
1200	1245		USA, WYFR/Family Radio Worldwide	5950na
			5985na	
1200	1258		New Zealand, Radio NZ International	9655pa
1200	1259		Poland, Polskie Radio Warsaw	11675eu
			11980eu	
1200	1300		Anguilla, Worldwide Univ Network	11775am
1200	1300		Australia, ABC NT Alice Springs	2310do
1200	1300		Australia, ABC NT Katherine	2485do
1200	1300		Australia, ABC NT Tennant Creek	2325do
1200	1300		Australia, Radio Australia	5995pa 6020pa
			9475as	9560pa 9580pa 9590pa
			11945as	
1200	1300		Bahrain, Radio Bahrain	6010me
1200	1300	Sat/ SRM	Belgium, TDP Radio	6015eu
1200	1300	Sat/Sun	Canada, CBC Northern Quebec Service	
			9625na	
1200	1300		Canada, CFRX Toronto ON	6070na
1200	1300		Canada, CFVP Calgary AB	6030na
1200	1300		Canada, CKZN St Johns NF	6160na
1200	1300		Canada, CKZU Vancouver BC	6160na
1200	1300		China, China Radio International	5955as
			9460as	9600as 9645as 9730as
			9760pa	11650as 11660as 11690va
			11760pa	11980as 13645as 13650as
			13790eu	17490eu
1200	1300		Germany, Overcomer Ministries	15320as
1200	1300		Japan, Radio Japan NHK World	6120na
			9695as	
1200	1300		Malaysia, RTM/Traxx FM	7295do
1200	1300		Nigeria, Voice of Nigeria/Ikorodu	9690af
1200	1300		Palau, T8WH/ WHRI	9960as
1200	1300	mwhfs	Palau, T8WH/ WHRI	9930as 9960as
1200	1300	DRM	Russia, Voice of Russia	9445as
1200	1300		Russia, Voice of Russia	11500as
1200	1300		South Africa, CVC 1 Africa	13590af
1200	1300		South Africa, CVC 1 Africa Radio	13590af
1200	1300		South Korea, KBS World Radio	9650na
1200	1300		UK, BBC World Service	5875as 6140as
			6190af	6195as 9740as 11750as
			11760me	12095af 15310as 15575as
			17640af	17790af 17830af 21470af
1200	1300		USA, American Forces Network/AFRTS	4319usb
			5446usb	5765usb 7812usb 12133usb
			12759usb	13362usb
1200	1300		USA, BBG/Voice of America	7575va 9510va
			12075va	12150va
1200	1300		USA, EWTN/WEWN Irondale, AL	13580as
1200	1300		USA, FBN/WTJC Newport NC	9370na
1200	1300		USA, KNLS Anchor Point AK	11870as
1200	1300		USA, Overcomer Ministries	9980na 15320af
1200	1300		USA, WHRI Cypress Creek SC	7385va
			9410va	11565va
1200	1300		USA, WRMI Miami FL	9955ca
1200	1300		USA, WTWW Lebanon TN	9480va
1200	1300		USA, WWCR Nashville TN	7490na 9980na
			13845na	15825na
1200	1300		USA, WWRB Manchester TN	3185va
1200	1300		USA, WYFR/Family Radio Worldwide	17555sa
			17795ca	
1200	1300		Zambia, CVC Radio Christian Voice	6065af
1200	1300		Zambia, Zambia Broadcasting Corp	6165do
1215	1300		Egypt, Radio Cairo	17870as
1230	1235		India, All India Radio, Delhi-Kingsway	4860do
			6085do	17860do
1230	1300		Australia, HCJB Global Australia	15400as
1230	1300	Sat	Palau, T8WH/ WHRI	9930as
1230	1300		Thailand, Radio Thailand World Service	9890va
1230	1300		Turkey, Voice of Turkey	15450va
1230	1300		Vietnam, Voice of Vietnam/Overseas Service	
			9840as	12020as

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

1300	1325		Turkey, Voice of Turkey	15450va
1300	1330		Egypt, Radio Cairo	17870as
1300	1330		Japan, Radio Japan NHK World	15735as
			15660al	
1300	1357		North Korea, Voice of Korea	9335na 11710na
			13760eu	15245eu
1300	1400		Anguilla, Worldwide Univ Network	11775am
1300	1400		Australia, ABC NT Alice Springs	2310do
1300	1400		Australia, ABC NT Katherine	2485do
1300	1400		Australia, Radio Australia	5995pa 6020pa
			9560pa	9580pa 9590pa
1300	1400		Bahrain, Radio Bahrain	6010me
1300	1400	Sun/DRM	Belgium, TDP Radio	6015na
1300	1400	Sat/Sun	Canada, CBC Northern Quebec Service	
			9625na	
1300	1400		Canada, CFRX Toronto ON	6070na
1300	1400		Canada, CFVP Calgary AB	6030na
1300	1400		Canada, CKZN St Johns NF	6160na
1300	1400		Canada, CKZU Vancouver BC	6160na
1300	1400		China, China Radio International	5995as
			9570na	9650na 9730as 9760pa
			9765va	9870as 11660as 11760pa
			11980as	13610eu 13755as 13760eu
			13790eu	15260na
1300	1400		Germany, Overcomer Ministries	11860as
			17765as	
1300	1400	Sat	Greece, Voice of Greece	15630va
1300	1400	Sun	Greece, Voice of Greece	9420va
1300	1400		Indonesia, Voice of Indonesia/Jawa Barat	
			9525as	11785as
1300	1400		Malaysia, RTM/Traxx FM	7295do
1300	1400		New Zealand, Radio NZ International	6170pa
1300	1400		Nigeria, Voice of Nigeria/Ikorodu	9690af
1300	1400	mwfas	Palau, T8WH/ WHRI	9930as
1300	1400		Russia, Voice of Russia	12065as
1300	1400		South Africa, CVC 1 Africa	13590af
1300	1400		South Africa, CVC 1 Africa Radio	13590af
1300	1400		South Korea, KBS World Radio	9570as
1300	1400		Tajikistan, Voice of Tajik	7245va
1300	1400		UK, BBC World Service	5875as 6190af
			6195as	9740as 11760me 12095af
			15310as	15420af 15575as 17790as
			17830af	21470af
1300	1400		USA, American Forces Network/AFRTS	4319usb
			5446usb	5765usb 7812usb 12133usb
			12759usb	13362usb
1300	1400	Sat/Sun	USA, BBG/Voice of America	9510va 9760va
			12150va	
1300	1400		USA, EWTN/WEWN Irondale, AL	13580as
1300	1400		USA, FBN/WTJC Newport NC	9370na
1300	1400		USA, Overcomer Ministries	9980na 11860as
			15320as	17765as
1300	1400		USA, WBCQ Monticello ME	9330am
1300	1400		USA, WHRI Cypress Creek SC	7385va
			9840va	11565va
1300	1400		USA, WRMI Miami FL	9955ca
1300	1400		USA, WTWW Lebanon TN	9480va
1300	1400		USA, WWCR Nashville TN	7490na 9980na
			13845na	15825na
1300	1400		USA, WWRB Manchester TN	9385na
1300	1400		USA, WYFR/Family Radio Worldwide	11830na
			11865na	11910na 17795ca 11520as
			11560as	
1300	1400		Zambia, CVC Radio Christian Voice	6065af
1300	1400		Zambia, Zambia Broadcasting Corp	6165do
1330	1400	stw	Guam, AWR/KSDA	11860as
1330	1400		India, All India Radio/External Service	9690as
			11620as	13710as
1330	1400		Laos, Lao National Radio	7145as
1330	1400		Palau, T8WH/ WHRI	9930as
1330	1400		Vietnam, Voice of Vietnam/Overseas Service	
			9840as	12020as

1345	1400	Sun	Canada, Bible Voice Broadcasting	17945as
1359	1400		Netherlands, R Netherlands Worldwide	11835as

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

1400	1430	Sun	Germany, Pan American Broadcasting	15205as
1400	1430		Japan, Radio Japan NHK World	11705as
			15735as 21560va 15660al	
1400	1430		Thailand, Radio Thailand World Service	9575va
1400	1430	Sun	UK, FEBA Radio 12025as	
1400	1457		Netherlands, R Netherlands Worldwide	9800as
			11835as	
1400	1500		Anguilla, Worldwide Univ Network	11775am
1400	1500		Australia, ABC NT Alice Springs	2310do
1400	1500		Australia, ABC NT Katherine 2485do	
1400	1500		Australia, ABC NT Tennant Creek	2325do
1400	1500		Australia, Radio Australia 5995pa	6080as
			7240pa 9590pa 11660as	
1400	1500		Bahrain, Radio Bahrain 6010me	
1400	1500	DRM	Belgium, TDP Radio/Disco Palace	6015eu
1400	1500	Sat	Canada, Bible Voice Broadcasting	17945as
1400	1500	Sat/Sun	Canada, CBC Northern Quebec Service	
			9625na	
1400	1500		Canada, CFRX Toronto ON 6070na	
1400	1500		Canada, CFVP Calgary AB 6030na	
1400	1500		Canada, CKZN St Johns NF 6160na	
1400	1500		Canada, CKZU Vancouver BC	6160na
1400	1500		China, China Radio International	5955as
			9765va 9870as 11665me	11765as
			13710eu 13760eu 11740na	13790eu
			17630af	
1400	1500	Sat/Sun	Equatorial Guinea, Radio East Africa/Malabo	
			15190af	
1400	1500		Ethiopia, Radio Ethiopia/Home Service	5989do
			7110do 9705do	
1400	1500		Germany, Overcomer Ministries	9460eu
			13810va 17580af	
1400	1500		India, All India Radio/External Service	9690as
			11620as 13710as	
1400	1500		Libya, LJBC Voice of Africa 17725af	
1400	1500		Malaysia, RTM/Traxx FM 7295do	
1400	1500		New Zealand, Radio NZ International	6170pa
1400	1500		Nigeria, Voice of Nigeria/Ikorodu	9690af
1400	1500		Oman, Radio Sultanate of Oman	15140va
1400	1500		Palau, T8WH/ WHRI 9930as	
1400	1500	DRM	Russia, Voice of Russia 7225eu	9750eu
1400	1500		Russia, Voice of Russia 4975va	11500as
1400	1500		South Africa, CVC 1 Africa 13590af	
1400	1500		South Africa, CVC 1 Africa Radio	13590af
1400	1500		UK, BBC World Service 5845as	5875as
			6190af 6195as 7435af	9740as
			12095as 13820as 15310as	17640af
			17830af 21470af	
1400	1500		USA, American Forces Network/AFRTS	4319usb
			5446usb 5765usb 7812usb	12133usb
			12759usb 13362usb	
1400	1500		USA, BBG/Voice of America 6080af	12080af
			15580af 17545af	
1400	1500	mtwhf	USA, BBG/Voice of America 7540va	7575va
			12150va	
1400	1500		USA, EWTN/WEWN Irondale, AL	15610me
1400	1500		USA, FBN/WTJC Newport NC	9370na
1400	1500		USA, KJES Vado NM 11715na	
1400	1500		USA, Overcomer Ministries 9460eu	9980na
			13810va 17580af	
1400	1500		USA, WBCQ Monticello ME 9330am	
1400	1500	Sat	USA, WBCQ Monticello ME 15420am	
1400	1500		USA, WHRI Cypress Creek SC	7385va
			9840va 11565va 17510as	
1400	1500		USA, WJHR International Milton FL	15550na
1400	1500		USA, WRMI Miami FL 9955ca	
1400	1500		USA, WTWW Lebanon TN 9480va	
1400	1500		USA, WWCR Nashville TN 7490na	9980na
			13845na 15825na	
1400	1500		USA, WWRB Manchester TN 9385na	
1400	1500		USA, WYFR/Family Radio Worldwide	11910na
			13695na 17795ca 11560na	
1400	1500		Zambia, CVC Radio Christian Voice	6065af
1400	1500		Zambia, Zambia Broadcasting Corp	6165do
1405	1435	Sat/Sun	Canada, Bible Voice Broadcasting	9345as
1415	1427		Nepal, Radio Nepal 5005as	
1415	1430	mtwhfa	Germany, Pan American Broadcasting	15205as
1415	1500	Sun	Canada, Bible Voice Broadcasting	17945af
1425	1455		Swaziland, TWR Africa 4760af	
1430	1435		India, All India Radio, Delhi-Kingsway	9835do
1430	1440		India, All India Radio, Delhi-Kingsway	6085do
			9575do	
1430	1445	Sun	Germany, Pan American Broadcasting	15205as
1430	1500	mtwhfa	Albania, Radio Tirana 13625na	
1430	1500		Guam, AWR/KSDA 9560as	
1445	1500	smtwhf	Australia, HCJB Global Australia	15340as

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

1500	1510	mtwhfa	Turkmenistan, Turkmen Radio Service 1	5015do
1500	1515	Sun	Canada, Bible Voice Broadcasting	12035as
1500	1525	tf	Guam, TWR Asia/KTWR 12140as	
1500	1530	Sun	Canada, Bible Voice Broadcasting	17945as
1500	1530		Clandestine, Sudan Radio Service/SRS	17745af
1500	1530		Guam, AWR/KSDA 11720as	
1500	1530		Vietnam, Voice of Vietnam/Overseas Service	
			7285as 9840as 12020as	
1500	1535	mwhfa	Guam, TWR Asia/KTWR 12140as	
1500	1545		USA, WYFR/Family Radio Worldwide	15770sa
1500	1550		New Zealand, Radio NZ International	6170pa
1500	1557		Canada, Radio Canada International	11675as
			15125as	
1500	1557		North Korea, Voice of Korea 9335na	11710na
			13760eu 15245eu	
1500	1558		Libya, LJBC Voice of Africa 17725af	
1500	1600		Anguilla, Worldwide Univ Network	11775am
1500	1600		Australia, ABC NT Alice Springs	2310do
1500	1600		Australia, ABC NT Katherine 2485do	
1500	1600		Australia, Radio Australia 5995pa	6080as
			7240pa 9475as 9590pa	11660as
1500	1600		Bahrain, Radio Bahrain 6010me	
1500	1600		Bhutan, Bhutan Broadcasting Service	6035do
1500	1600	Sat/Sun	Canada, CBC Northern Quebec Service	
			9625na	
1500	1600		Canada, CFRX Toronto ON 6070na	
1500	1600		Canada, CFVP Calgary AB 6030na	
1500	1600		Canada, CKZN St Johns NF 6160na	
1500	1600		Canada, CKZU Vancouver BC	6160na
1500	1600		China, China Radio International	5955as
			6095me 7325as 7395as	9720me
			9765va 9800as 9870as	11965eu
			13640eu 13730na 13760eu	17630af
1500	1600	Sat/Sun	Equatorial Guinea, Radio East Africa/Malabo	
			15190af	
1500	1600		Germany, Overcomer Ministries	9460eu
			13810va 17580af	
1500	1600		Malaysia, RTM/Traxx FM 7295do	
1500	1600		Nigeria, Voice of Nigeria/Ikorodu	15120af
1500	1600	DRM	Russia, Voice of Russia 7225eu	
1500	1600		Russia, Voice of Russia 4975va	9660as
			11985va 12040eu	
1500	1600	mtwhf	South Africa, Channel Africa 9625af	
1500	1600		South Africa, CVC 1 Africa 13590af	
1500	1600		South Africa, CVC 1 Africa Radio	13590af
1500	1600		Uganda, Dunamis Shortwave 4750af	
1500	1600		UK, BBC World Service 5845as	5875as
			6190af 6195as 7435af	9540as
			9740as 12095as 13820as	15310as
			15400af 15420af 17640af	17830af
			21470af	
1500	1600		USA, American Forces Network/AFRTS	4319usb
			5446usb 5765usb 7812usb	12133usb
			12759usb 13362usb	
1500	1600		USA, BBG/Voice of America 4930af	6080af
			7540as 12080af 12150va	13750va
			15530va 15580af 17895af	
1500	1600		USA, BBG/Voice of America/Special English	
			6140af 7465va 9485va	9760va
1500	1600		USA, EWTN/WEWN Irondale, AL	15610me
1500	1600		USA, FBN/WTJC Newport NC	9370na
1500	1600		USA, KJES Vado NM 11715ca	
1500	1600		USA, KNLS Anchor Point AK 9920as	
1500	1600		USA, Overcomer Ministries 9460eu	9980na
			13810va 17580af	
1500	1600		USA, WBCQ Monticello ME 9330am	
1500	1600	Sat	USA, WBCQ Monticello ME 15420am	
1500	1600		USA, WBCQ Monticello ME 9330am	
1500	1600		USA, WHRI Cypress Creek SC	7385af
			9840af 15195va 17510as	
1500	1600		USA, WJHR International Milton FL	15550na
1500	1600		USA, WRMI Miami FL 9955na	
1500	1600		USA, WTWW Lebanon TN 9480va	
1500	1600		USA, WWCR Nashville TN 9980na	12160af
			13845na 15825na	
1500	1600		USA, WWRB Manchester TN 9385na	

1500	1600		USA, WYFR/Family Radio Worldwide	6280as
			11830na 11910na 17795ca	
1500	1600		Zambia, CVC Radio Christian Voice	6065af
1500	1600		Zambia, Zambia Broadcasting Corp	6165do
1515	1530		Australia, HCJB Global Australia	15340as
1515	1545	Sat	Canada, Bible Voice Broadcasting	13670as
1525	1555	Sat/Sun	Swaziland, TWR Africa 4760af	
1530	1540	Sat	Vatican City State, Vatican Radio	11850as
			13765as 15235as	
1530	1545		India, All India Radio, Delhi-Kingsway	6085do
			9575do 9835do	
1530	1545		India, All India Radio/Aligarh 7255do	9910do
1530	1545		India, All India Radio/External Service	9910as
1530	1545		India, All India Radio/Panaji, Goa	9820do
1530	1600	Sun	Canada, Bible Voice Broadcasting	13590me
1530	1600	h	Canada, Bible Voice Broadcasting	13670as
1530	1600		Germany, AWR Europe 15255as	
1530	1600		Iran, IRIB/ VOIRI 9600as 11945as	
1530	1600		Mongolia, Voice of Mongolia 12015as	
1545	1600	mtwhfa	Canada, Bible Voice Broadcasting	13590me
1551	1600		New Zealand, Radio NZ International	7440pa
1551	1600	DRM	New Zealand, Radio NZ International	6170pa

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

1600	1605	Sun	Croatia, Croatian Radio 6165eu	
1600	1615	tf	Canada, Bible Voice Broadcasting	13590me
1600	1615	mtwhfa	Croatia, Croatian Radio 6165eu	
1600	1627		Iran, IRIB/ VOIRI 9600as 11945as	
1600	1630		Eritrea, Radio Bana 5060 d0	
1600	1630		Guam, AWR/KSDA 11805as 12035as	
1600	1630		Vietnam, Voice of Vietnam/Overseas Service	
			7220me 7280eu 9550me 9730eu	
1600	1645	h	Canada, Bible Voice Broadcasting	13590me
1600	1645		USA, WYFR/Family Radio Worldwide	11830na
			11865na	
1600	1657		North Korea, Voice of Korea 9990va	11545va
1600	1658		Germany, Deutsche Welle 6170as	
1600	1659		Germany, Deutsche Welle 15410as	
1600	1700		Anguilla, Worldwide Univ Network	11775am
1600	1700		Australia, ABC NT Alice Springs	2310do
1600	1700		Australia, ABC NT Katherine 2485do	
1600	1700		Australia, Radio Australia 5995pa	6080as
			7240pa 9475as 9710pa	11660as
1600	1700		Bahrain, Radio Bahrain 6010me	
1600	1700	Sat/Sun	Canada, Bible Voice Broadcasting	13590me
1600	1700	Sat	Canada, CBC Northern Quebec Service	
			9625na	
1600	1700		Canada, CFRX Toronto ON 6070na	
1600	1700		Canada, CFVP Calgary AB 6030na	
1600	1700		Canada, CKZN St Johns NF 6160na	
1600	1700		Canada, CKZU Vancouver BC	6160na
1600	1700		China, China Radio International	6060as
			7420af 7235as 9570af	11900af
			11940eu 11965eu 13760eu	
1600	1700		Egypt, Radio Cairo 15345af	
1600	1700	Sat/Sun	Equatorial Guinea, Radio East Africa/Malabo	
			15190af	
1600	1700		Ethiopia, Radio Ethiopia 7235va	9560va
1600	1700		France, Radio France Internationale	15605af
			17605af	
1600	1700		Malaysia, RTM/Traxx FM 7295do	
1600	1700	DRM	New Zealand, Radio NZ International	6170pa
1600	1700		New Zealand, Radio NZ International	7440pa
1600	1700		Russia, Voice of Russia 4975va	11985va
			12040eu	
1600	1700		South Africa, CVC 1 Africa 13590af	
1600	1700		South Africa, CVC 1 Africa Radio	13590af
1600	1700		South Korea, KBS World Radio	9515eu
			9640as	
1600	1700		Taiwan, Radio Taiwan International	9435as
			15485as	
1600	1700		Uganda, Dunamis Shortwave 4750af	
1600	1700		UK, BBC World Service 3255af	5845as
			5975as 6190af 9495as	12095as
			13820as 15400af 15420af	17640af
			17795af 17830af 21470af	
1600	1700		USA, American Forces Network/AFRTS	4319usb
			5446usb 5765usb 7812usb	12133usb
			12759usb 13362usb	
1600	1700		USA, BBG/Voice of America 4930af	6080af
			15580af	
1600	1700		USA, BBG/Voice of America/Special English	
			11890va 12080va 13750va	
1600	1700		USA, EWTN/WEWN Irondale, AL	15610me
1600	1700		USA, FBN/WTJC Newport NC	9370na
1600	1700		USA, Overcomer Ministries 9980na	
1600	1700	Sat	USA, WBCQ Monticello ME 15420am	
1600	1700		USA, WBCQ Monticello ME 9330am	
1600	1700		USA, WHRI Cypress Creek SC	7385af
			9840af 17520af	
1600	1700		USA, WJHR International Milton FL	15550na
1600	1700		USA, WRMI Miami FL 9955na	
1600	1700		USA, WTWW Lebanon TN 9480va	
1600	1700		USA, WWCR Nashville TN 9980na	12160af
			13845na 15825na	
1600	1700		USA, WWRB Manchester TN 9385na	
1600	1700		USA, WYFR/Family Radio Worldwide	6085ca
			13695na 17555eu 17795ca	18980eu
			21525af	
1600	1700		Zambia, CVC Radio Christian Voice	6065af
1600	1700		Zambia, Zambia Broadcasting Corp	6165do
1630	1700		China, Xizang PBS/Lhasa 4905do	4920do
			5240do 6110do 6130do	7255do
			7385do	
1630	1700		Guam, AWR/KSDA 11740as	
1630	1700		Palau, T8WH/ WHRI 9930as	
1630	1700	m	South Africa, SA Radio League	3230af
1630	1700		Turkey, Voice of Turkey 15520as	
1640	1650		Turkmenistan, Turkmen Radio Service 2	4930do

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

1700	1720	t	Canada, Bible Voice Broadcasting	13590me
1700	1725		Turkey, Voice of Turkey 15520as	
1700	1729	DRM	Romania, Radio Romania International	7350eu
1700	1730	Sat	Canada, Bible Voice Broadcasting	13590me
1700	1730	m	South Africa, SA Radio League	3230af
1700	1730		Vietnam, Voice of Vietnam/Overseas Service	
			9625eu	
1700	1755	mtwhf	South Africa, Channel Africa 9675af	
1700	1757	DRM	Romania, Radio Romania International	9535eu
1700	1757		Romania, Radio Romania International	11735eu
1700	1759	DRM	Poland, Polskie Radio Warsaw	7265eu
1700	1759		Poland, Polskie Radio Warsaw	9770eu
1700	1800		Anguilla, Worldwide Univ Network	11775am
1700	1800		Australia, ABC NT Alice Springs	2310do
1700	1800		Australia, ABC NT Katherine 2485do	
1700	1800		Australia, Radio Australia 5995pa	6080as
			9475as 9580pa 9710pa	11880pa
1700	1800		Bahrain, Radio Bahrain 6010me	
1700	1800	Sat/Sun	Canada, Bible Voice Broadcasting	11960me
1700	1800	Sat	Canada, CBC Northern Quebec Service	
			9625na	
1700	1800		Canada, CFRX Toronto ON 6070na	
1700	1800		Canada, CFVP Calgary AB 6030na	
1700	1800		Canada, CKZN St Johns NF 6160na	
1700	1800		Canada, CKZU Vancouver BC	6160na
1700	1800		China, China Radio International	6090as
			6140as 6145eu 6165me	7235as
			7265as 7410as 7420as	11900af
			13760af	
1700	1800		Egypt, Radio Cairo 15345af	
1700	1800	Sat/Sun	Equatorial Guinea, Radio Africa	7190af
1700	1800		Malaysia, RTM/Traxx FM 7295do	
1700	1800		New Zealand, Radio NZ International	7440pa
1700	1800	DRM	New Zealand, Radio NZ International	6170pa
1700	1800		Palau, T8WH/ WHRI 9930as	
1700	1800		Russia, Voice of Russia 4975as	11985af
			12040eu	
1700	1800		South Africa, CVC 1 Africa 4965af	13590af
1700	1800		South Africa, CVC 1 Africa Radio	4965af
			13590af	
1700	1800		Swaziland, TWR Africa 3200af	
1700	1800	Sat	Swaziland, TWR Africa 3200af	
1700	1800		Taiwan, Radio Taiwan International	15690af
1700	1800		UK, BBC World Service 3255af	5845as
			5975as 6190af 7405af	7565as
			9410af 9495as 12095af	15400af
			17795af 17830af	
1700	1800		USA, American Forces Network/AFRTS	4319usb
			5446usb 5765usb 7812usb	12133usb
			12759usb 13362usb	
1700	1800		USA, BBG/Voice of America 6080af	12015af
			15580af 17895af	
1700	1800		USA, EWTN/WEWN Irondale, AL	15610me
1700	1800		USA, FBN/WTJC Newport NC	9370na
1700	1800		USA, Overcomer Ministries 9980na	
1700	1800		USA, WBCQ Monticello ME 9330am	15420am
1700	1800		USA, WHRI Cypress Creek SC	7385af
			9840af 17520af	

1700	1800		USA, WJHR International Milton FL			15550na
1700	1800		USA, WRMI Miami FL	9955ca		
1700	1800		USA, WTWW Lebanon TN	9480va		
1700	1800		USA, WWCR Nashville TN	9980na		12160af
			13845na	15825na		
1700	1800		USA, WWRB Manchester TN	9385na		
1700	1800		USA, WYFR/Family Radio Worldwide			13690na
			17555eu	17795eu		
1700	1800		Zambia, Zambia Broadcasting Corp			6165do
1714	1800		Congo Dem. Republic, Radio Kahuzi			6209do
1720	1740	Sat/Sun	USA, BBG/Voice of America/Studio 7			4930af
			12130af	15730af		
1730	1735		India, All India Radio, Delhi-Kingsway			6085do
			7370do	9575do	9835do	
1730	1800		Bulgaria, Radio Bulgaria	5900eu		7400eu
1730	1800	mtwhf	Clandestine, Sudan Radio Service/SRS			9590af
1730	1800		Clandestine, Zimbabwe Comm Radio/Radio Dialogue 4895af			
1730	1800	mtwh	USA, BBG/Voice of America/Studio 7			4930af
			12130af	15730af		
1730	1800		Vatican City State, Vatican Radio			11625af
			13765af	15570af		
1745	1800	DRM	India, All India Radio/External Service			9950eu
1745	1800		India, All India Radio/External Service			7400af
			7410af	7550eu	9415af	9445af
			11670eu	11935af		
1759	1800		Netherlands, R Netherlands Worldwide			6020af
			15495af			

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

1800	1810		Tanzania, Radio Tanzania/Zanzibar			11735af
1800	1815	Sun	Canada, Bible Voice Broadcasting			13590me
1800	1815	Sat	Canada, Bible Voice Broadcasting			11855as
1800	1830		Congo Dem. Republic, Radio Kahuzi			6209do
1800	1830		South Africa, AWR Africa	3215af		3345af
1800	1830	w	South Africa, AWR Africa	9755af		
1800	1830		USA, BBG/Voice of America	6080af		9850af
			12015af	15580af		
1800	1830	Sat/Sun	USA, BBG/Voice of America	4930af		
1800	1835		New Zealand, Radio NZ International			7440pa
1800	1835	DRM	New Zealand, Radio NZ International			6170pa
1800	1845	Sun	Canada, Bible Voice Broadcasting			9430me
1800	1855		Clandestine, Zimbabwe Comm Radio/Radio Dialogue 4895af			
1800	1857		Netherlands, R Netherlands Worldwide			6020af
			15495af			
1800	1857		North Korea, Voice of Korea	13760eu		15425eu
1800	1859		Canada, Radio Canada International			9530af
			11765af	17810af		
1800	1859		Canada, Radio Canada International			9740va
			11845af	15365af	17790af	
1800	1900		Anguilla, Worldwide Univ Network			11775am
1800	1900	mtwhf	Argentina, RAE	15345eu		
1800	1900		Australia, ABC NT Alice Springs			2310do
1800	1900		Australia, ABC NT Katherine	2485do		
1800	1900		Australia, Radio Australia	6080pa		7240pa
			9475as	9580pa	9710pa	11880pa
1800	1900		Bahrain, Radio Bahrain	6010me		
1800	1900	Sat	Canada, Bible Voice Broadcasting			9430me
1800	1900	Sun	Canada, Bible Voice Broadcasting			6030eu
1800	1900		Canada, CFRX Toronto ON	6070na		
1800	1900		Canada, CFVP Calgary AB	6030na		
1800	1900		Canada, CKZN St Johns NF	6160na		
1800	1900		Canada, CKZU Vancouver BC			6160na
1800	1900		China, China Radio International			6175eu
			9600eu	13760eu		
1800	1900	Sat/Sun	Equatorial Guinea, Radio Africa			7190af
1800	1900	DRM	India, All India Radio/External Service			9950eu
1800	1900		India, All India Radio/External Service			7400af
			710af	7550eu	9415af	9445af 11670eu
			11935af			
1800	1900		Kuwait, Radio Kuwait	15540eu		
1800	1900		Liberia, Star Radio	3960do		
1800	1900		Malaysia, RTM/Traxx FM	7295do		
1800	1900		Nigeria, Voice of Nigeria/Ikorodu			15120af
1800	1900		Palau, T8WH/ WHRI	9930as		9955pa
1800	1900		Russia, Voice of Russia	4975me		12040va
1800	1900		South Africa, CVC 1 Africa	4965af		13590af
1800	1900		South Africa, CVC 1 Africa Radio			4965af
			13590af			
1800	1900		South Korea, KBS World Radio			7275eu
1800	1900		Swaziland, TWR Africa	9500af		
1800	1900		Taiwan, Radio Taiwan International			6155eu
1800	1900		UK, BBC World Service	3255af		7405af
			11765va	11810af	12095af	15400af
1800	1900		USA, American Forces Network/AFRTS			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1800	1900		USA, EWTN/WEWN Irondale, AL			15610me
1800	1900		USA, FBN/WTJC Newport NC			9370na
1800	1900		USA, Overcomer Ministries	9980na		
1800	1900		USA, WBCQ Monticello ME	9330am		15420am
1800	1900	Sat	USA, WBCQ Monticello ME	7415am		
1800	1900		USA, WHRI Cypress Creek SC			7385af
			9840af	17520af		
1800	1900		USA, WJHR International Milton FL			15550na
1800	1900		USA, WRMI Miami FL	9955ca		
1800	1900		USA, WTWW Lebanon TN	9480va		
1800	1900		USA, WWCR Nashville TN	9980na		12160af
			13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9385na		
1800	1900		USA, WYFR/Family Radio Worldwide			5905af
			13615na	13690na	17795ca	17845af
			18980eu			
1800	1900		Zambia, Zambia Broadcasting Corp			6165do
1805	1810	Sat	Croatia, Croatian Radio	6165eu		
1805	1815	mtwhf	Croatia, Croatian Radio	6165eu		
1815	1845	Sat	Canada, Bible Voice Broadcasting			6030eu
1830	1845		Croatia, Croatian Radio	15540na		
1830	1900	mtwhf	Moldova, (Transnistria) Radio PMR			6240na
1830	1900		South Africa, AWR Africa	9610af		
1830	1900		Turkey, Voice of Turkey	9785eu		
1830	1900		UK, BBC World Service	9850as	5875as	
			5905af	5950as	5950as	5975as
			6190af			
1830	1900		UK, BBC World Service	9410af		
1830	1900		USA, BBG/Voice of America	4930af		6080af
			9850af	12015af	15580af	
1836	1850		New Zealand, Radio NZ International			9615pa
1836	1850	DRM	New Zealand, Radio NZ International			9890pa
1845	1850		Guinea, RTV Guineenne	7125do		
1845	1900	mtwhfa	Albania, Radio Tirana	7520na		13735na
1851	1900		New Zealand, Radio NZ International			9615pa
1851	1900	DRM	New Zealand, Radio NZ International			15720pa
1859	1900		Netherlands, R Netherlands Worldwide			7425af
			11610af			

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

1900	1925		Turkey, Voice of Turkey	9785eu		
1900	1930		Germany, Deutsche Welle	6150af		9735af
			11795af	17610af		
1900	1930		USA, BBG/Voice of America	4930af		4940af
			6080af	9850af	15580af	17895af
1900	1930		Vietnam, Voice of Vietnam/Overseas Service			
			7280eu	9730eu		
1900	1945	DRM	India, All India Radio/External Service			9950eu
1900	1945		India, All India Radio/External Service			7400af
			7410af	7550eu	9415af	9445af
			11670eu	11935af		
1900	1945		USA, WYFR/Family Radio Worldwide			6085ca
1900	1950		New Zealand, Radio NZ International			9615pa
1900	1950	DRM	New Zealand, Radio NZ International			15720pa
1900	1957		Netherlands, R Netherlands Worldwide			7425af
			15495af			
1900	1957		North Korea, Voice of Korea	7210af		9975va
			11535va	11910af		
1900	2000		Anguilla, Worldwide Univ Network			11775am
1900	2000		Australia, ABC NT Alice Springs			2310do
1900	2000		Australia, ABC NT Katherine	2485do		
1900	2000		Australia, Radio Australia	6080pa		7240pa
			9500as	9580pa	9710pa	11880pa
1900	2000		Bahrain, Radio Bahrain	6010me		
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St Johns NF	6160na		
1900	2000		Canada, CKZU Vancouver BC			6160na
1900	2000		China, China Radio International			7295va
			9435af	9440af		
1900	2000		Cuba, Radio Havana Cuba	11760sa		
1900	2000		Egypt, Radio Cairo	11510af		
1900	2000	Sat/Sun	Equatorial Guinea, Radio Africa			7190af
1900	2000		Indonesia, Voice of Indonesia/Jawa Barat			
			9525eu	11785eu		
1900	2000		Kuwait, Radio Kuwait	15540eu		
1900	2000		Liberia, Star Radio	3960do		
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		Nigeria, Voice of Nigeria/Ikorodu			7255af
1900	2000		Palau, T8WH/ WHRI	9930as		
1900	2000		Russia, Voice of Russia	12040va		
1900	2000		South Africa, CVC 1 Africa	4965af		13590af

1900	2000		South Africa, CVC 1 Africa Radio			4965af
			13590af			
1900	2000	mtwhf	Spain, Radio Exterior de Espana			9665eu
			11610af			
1900	2000		Swaziland, TWR Africa	3200af		
1900	2000	Sat	Swaziland, TWR Africa	3200af		
1900	2000		Thailand, Radio Thailand World Service			7205eu
1900	2000		UK, BBC World Service	3255af		5875as
			5950as	6005af	6190af	9410af
			11810af	12095af	15400af	
1900	2000		USA, American Forces Network/AFRTS			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1900	2000		USA, BBG/Voice of America/Special English			
			7485va	9630va		
1900	2000		USA, EWTN/WEWN Irondale, AL			15610me
1900	2000		USA, FBN/WTJC Newport NC			9370na
1900	2000		USA, KJES Vado NM	15385ca		
1900	2000		USA, Overcomer Ministries	9980na		
1900	2000		USA, WBCQ Monticello ME	7415am		9330am
			15420am			
1900	2000		USA, WHRI Cypress Creek SC			7385af
			9840af	17520na		
1900	2000		USA, WJHR International Milton FL			15550na
1900	2000		USA, WRMI Miami FL	9955ca		
1900	2000		USA, WTWW Lebanon TN	9480va		
1900	2000		USA, WWCR Nashville TN	9980na		12160af
			13845na	15825na		
1900	2000		USA, WWRB Manchester TN	9385na		
1900	2000		USA, WYFR/Family Radio Worldwide			3230af
			7270af	13615na	13690na	17795ca
			17845af	18930eu	18980eu	
1900	2000		Zambia, Zambia Broadcasting Corp			6165do
1905	1920	Sat	Mali, RTV Malienne	5995do		
1930	2000		Iran, IRIB/ VOIRI	5940eu	6205eu	9780eu
			9800af			
1930	2000		South Africa, RTE Radio Worldwide			5840af
1930	2000		USA, BBG/Voice of America	4930af		4940af
			6080af	15580af		
1930	2000	Sat/Sun	USA, WRMI/Radio Prague	9955na		
1945	2000	DRM	Vatican City State, Vatican Radio			9800am
1950	2000		Vatican City State, Vatican Radio			4005va
			5885va	7250va	9645va	
1951	2000		New Zealand, Radio NZ International			11725pa
1951	2000	DRM	New Zealand, Radio NZ International			15720pa

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

2000	2027		Iran, IRIB/ VOIRI	5940eu	6205eu	9780eu
			9800af			
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu		13735na
2000	2030		Egypt, Radio Cairo	11510af		
2000	2030		Niger, ORTN/La Voix du Sahel			9705do
2000	2030		South Africa, RTE Radio Worldwide			5840af
2000	2030	Sat	Swaziland, TWR Africa	3200af		
2000	2030		USA, BBG/Voice of America	4930af		4940af
			6080af	15580af		
2000	2030		Vatican City State, Vatican Radio			7365af
			9755af	11625af		
2000	2045		Rwanda, Radiodiffusion Rwandaise			6055do
2000	2045		USA, WYFR/Family Radio Worldwide			17750eu
2000	2050		New Zealand, Radio NZ International			11725pa
2000	2050	DRM	New Zealand, Radio NZ International			15720pa
2000	2057		Germany, Deutsche Welle	6150af		
2000	2057		Netherlands, R Netherlands Worldwide			7425af
			11610af			
2000	2100		Anguilla, Worldwide Univ Network			11775am
2000	2100		Australia, ABC NT Alice Springs			2310do
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek			2325do
2000	2100		Australia, Radio Australia	6080pa		7240pa
			9500as	11650pa	11660pa	11880pa
2000	2100		Bahrain, Radio Bahrain	6010me		
2000	2100		Belarus, Radio Station Belarus			7255eu
			7360eu	7390eu		
2000	2100	DRM	Belgium, TDP Radio/Disco Palace			17755am
2000	2100		Canada, CFRX Toronto ON	6070na		
2000	2100		Canada, CFVP Calgary AB	6030na		
2000	2100		Canada, CKZN St Johns NF	6160na		
2000	2100		Canada, CKZU Vancouver BC			6160na
2000	2100		Canada, Radio Canada International			15235af
			15330af	17735af		
2000	2100		China, China Radio International			5960eu
			5985af	7285eu	7415eu	9440af
			9600eu			
2000	2100	Sat/Sun	Equatorial Guinea, Radio Africa			7190af
2000	2100		Kuwait, Radio Kuwait	15540eu		
2000	2100		Liberia, Star Radio	3960do		
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100		Nigeria, Voice of Nigeria/Ikorodu			7255af
2000	2100		Palau, T8WH/ WHRI	9930as		
2000	2100		Russia, Voice of Russia	12040va		
2000	2100		South Africa, CVC 1 Africa	4965af		9505af
2000	2100		South Africa, CVC 1 Africa Radio			4965af
			9505af			
2000	2100		UK, BBC World Service	3255af		6005af
			6190af	9410af	11810af	12095af
			13710af			
2000	2100		USA, American Forces Network/AFRTS			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2000	2100	mtwhf	USA, BBG/Voice of America	5930va		9480va
2000	2100		USA, EWTN/WEWN Irondale, AL			15610as
2000	2100		USA, FBN/WTJC Newport NC			9370na
2000	2100		USA, Overcomer Ministries	9980na		
2000	2100		USA, WBCQ Monticello ME	7415am		9330am
			15420am			
2000	2100		USA, WHRI Cypress Creek SC			7385na
			15665na			
2000	2100		USA, WJHR International Milton FL			15550na
2000	2100		USA, WRMI Miami FL	9955ca		
2000	2100		USA, WTWW Lebanon TN	9480va		
2000	2100		USA, WWCR Nashville TN	9980na		12160af
			13845na	15825na		
2000	2100		USA, WWRB Manchester TN	9385na		
2000	2100		USA, WYFR/Family Radio Worldwide			17725sa
			17795ca	17845af	18980eu	
2000	2100		Zambia, Zambia Broadcasting Corp			6165do
2030	2045		Thailand, Radio Thailand World Service			9680eu
2030	2057	DRM	Romania, Radio Romania International			9765eu
2030	2057		Romania, Radio Romania International			11880na
			11940na	13800na		
2030	2100	mtwhf	Moldova, (Transnistria) Radio PMR			6240eu
2030	2100		Turkey, Voice of Turkey	7205va		
2030	2100		USA, BBG/Voice of America	4930af		6080af
			7555as	15580af		
2030	2100	Sat/Sun	USA, BBG/Voice of America	4940af		
2030	2100		Vietnam, Voice of Vietnam/Overseas Service			
			7220me	7280eu	9550me	9730eu
2045	2100		India, All India Radio/External Service			7550eu
			9445eu	9910pa	11620pa	11670eu
			11715pa			
2045	2100	DRM	India, All India Radio/External Service			9950eu
2051	2100	DRM	New Zealand, Radio NZ International			11675pa

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

2100	2110		Papua New Guinea, Wantok Radio Light			
			7325do			
2100	2115	twh	USA, WBCQ Monticello ME	7415am		
2100	2125		Turkey, Voice of Turkey	7205va		
2100	2130		Australia, ABC NT Alice Springs			2310do
2100	2130		Australia, ABC NT Katherine	2485do		
2100	2130		Australia, ABC NT Tennant Creek			2325do
2100	2130		Austria, AWR Europe	11955af		
2100	2130	Sat	Canada, CBC Northern Quebec Service			
			9625na			
2100	2130		South Korea, KBS World Radio			3955eu
2100	2145		USA, WYFR/Family Radio Worldwide			13615na
			13690na	17795ca	18980eu	
2100	2150		New Zealand, Radio NZ International			11725pa
2100	2150	DRM	New Zealand, Radio NZ International			11675pa
2100	2157		North Korea, Voice of Korea	13760eu		15245eu
2100	2200		Anguilla, Worldwide Univ Network			11775am
2100	2200		Australia, Radio Australia	9500as		9660pa
			11660pa	11650pa	11695as	13630pa
			15515pa			
2100	2200		Bahrain, Radio Bahrain	6010me		
2100	2200		Belarus, Radio Station Belarus			7255eu
			7360eu	7390eu		
2100	2200	DRM	Belgium, TDP Radio	17555eu		
2100	2200		Bulgaria, Radio Bulgaria	5900eu		7400eu
2100	2200		Canada, CFRX Toronto ON	6070na		
2100	2200		Canada, CFVP Calgary AB	6030na		
2100	2200		Canada, CKZN St Johns NF	6160na		
2100	2200		Canada, CKZU Vancouver BC			6160na
2100	2200	DRM	Canada, Radio Canada International			9800na
2100	2200		China, China Radio International			5960eu
			7205af	7285eu	7325af	7415eu
			9500eu			

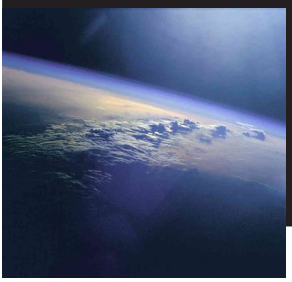
2100	2200	Sat/Sun	Equatorial Guinea, Radio Africa	7190af
2100	2200		India, All India Radio/External Service	7550eu
			9445eu 9910pa 11620pa	11715pa
2100	2200	DRM	India, All India Radio/External Service	9950eu
2100	2200		Malaysia, RTM/Traxx FM 7295do	
2100	2200		Micronesia, The Cross Radio/Pohnpei	4755 as
2100	2200		Palau, T8WH/ WHRI 9930as	
2100	2200		South Africa, CVC 1 Africa 4965af	9505af
2100	2200		South Africa, CVC 1 Africa Radio	4965af
			9505af	
2100	2200	Sat/Sun	Spain, Radio Exterior de Espana	9650eu
2100	2200		Syria, Radio Damascus 9330va	12085va
2100	2200		UK, BBC World Service 3255af	3915as
			5875as 5905as 6005af	6190af
			6195as 9410af 9915af	12095af
2100	2200		USA, American Forces Network/AFRTS	4319usb
			5446usb 5765usb 7812usb	12133usb
			12759usb 13362usb	
2100	2200		USA, BBG/Voice of America 6080af	7555as
			15580af	
2100	2200		USA, EWTN/WEWN Irondale, AL	15610as
2100	2200		USA, FBN/WTJC Newport NC	9370na
2100	2200		USA, Overcomer Ministries 9980na	
2100	2200	fasm	USA, WBCQ Monticello ME 7415am	
2100	2200		USA, WBCQ Monticello ME 9330am	
2100	2200		USA, WHRI Cypress Creek SC	7385na
			13660na	
2100	2200		USA, WJHR International Milton FL	15550na
2100	2200		USA, WRMI Miami FL 9955ca	
2100	2200		USA, WTWW Lebanon TN 9480va	
2100	2200		USA, WWCR Nashville TN 7465na	9350na
			9980na 13845na	
2100	2200		USA, WWRB Manchester TN 9385na	
2100	2200		USA, WYFR/Family Radio Worldwide	17845af
2100	2200		Zambia, Zambia Broadcasting Corp	6165do
2115	2145	w	USA, WBCQ Monticello ME 7415am	
2115	2200		Egypt, Radio Cairo 6270eu	
2130	2200		Australia, ABC NT Alice Springs	4835do
2130	2200		Australia, ABC NT Katherine 5025do	
2130	2200	mtwhfa	Canada, CBC Northern Quebec Service	
			9625na	
2151	2200		New Zealand, Radio NZ International	15720pa
2151	2200	DRM	New Zealand, Radio NZ International	17675pa

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

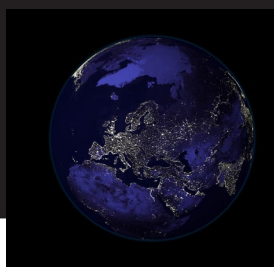
2200	2205		Zambia, Zambia Broadcasting Corp	6165do
2200	2210		Guinea, Radio Familia FM 4900do	
2200	2230		India, All India Radio/External Service	7550eu
			9445eu 9445eu 9910pa	11620pa
			11670eu 11715pa	
2200	2230	DRM	India, All India Radio/External Service	9950eu
2200	2245		Egypt, Radio Cairo 6270eu	
2200	2245		USA, WYFR/Family Radio Worldwide	15770af
2200	2255		Turkey, Voice of Turkey 9830va	
2200	2257		Romania, Radio Romania International	5960eu
			7435eu 9790eu 11940eu	
2200	2300		Anguilla, Worldwide Univ Network	6090am
2200	2300		Australia, ABC NT Alice Springs	4835do
2200	2300		Australia, ABC NT Katherine 5025do	
2200	2300		Australia, Radio Australia 9660pa	13630pa
			15230pa 15515pa 15560pa	
2200	2300		Bahrain, Radio Bahrain 6010me	
2200	2300	smtwhf	Canada, CBC Northern Quebec Service	
			9625na	
2200	2300		Canada, CFRX Toronto ON 6070na	
2200	2300		Canada, CFVP Calgary AB 6030na	
2200	2300		Canada, CKZN St Johns NF 6160na	
2200	2300		Canada, CKZU Vancouver BC	6160na
2200	2300		China, China Radio International	9590as
2200	2300	Sat/Sun	Equatorial Guinea, Radio Africa	7190af
2200	2300		Malaysia, RTM/Traxx FM 7295do	
2200	2300		Micronesia, The Cross Radio/Pohnpei	4755 as
2200	2300		New Zealand, Radio NZ International	15720pa
2200	2300	DRM	New Zealand, Radio NZ International	17675pa
2200	2300		Palau, T8WH/ WHRI 9930as	
2200	2300		Russia, Voice of Russia 9800va	
2200	2300		UK, BBC World Service 3915as	5875as
			5905as 5935af 6195as	7490as
			9580as 9915af 12095af	
2200	2300		USA, American Forces Network/AFRTS	4319usb
			5446usb 5765usb 7812usb	12133usb
			12759usb 13362usb	
2200	2300	smtwh	USA, BBG/Voice of America 5915va	7480va
			7575va 11955va	
2200	2300		USA, BBG/Voice of America 7555as	
2200	2300		USA, EWTN/WEWN Irondale, AL	15610me
2200	2300		USA, FBN/WTJC Newport NC	9370na
2200	2300		USA, Overcomer Ministries 9980na	
2200	2300		USA, WBCQ Monticello ME 7415am	9330am
2200	2300	Sat/Sun	USA, WBCQ Monticello ME 5110am	
2200	2300		USA, WHRI Cypress Creek SC	9850na
			13620na 17820na	
2200	2300		USA, WRMI Miami FL 9955ca	
2200	2300		USA, WTWW Lebanon TN 5755va	
2200	2300		USA, WWCR Nashville TN 7465na	9350na
			9980na 13845na	
2200	2300		USA, WWRB Manchester TN 3185na	3215na
			5050na 5745na	
2200	2300		USA, WYFR/Family Radio Worldwide	5950na
			15255sa 15440ca	
2200	2300		Zambia, CVC Radio Christian Voice	4965af
2215	2230		Croatia, Croatian Radio 3985eu	7375sa
2230	2300	mtwhf	Moldova, (Transnistria) Radio PMR	6240eu
2230	2300	fa	Palau, T8WH/ WHRI 9930as	
2230	2300		South Africa, AWR Africa 15320as	
2230	2300		USA, BBG/Voice of America/Special English	
			7460af 9570va 11840va	15340va
2245	2300		India, All India Radio/External Service	6055as
			7305as 11645as 13605as	

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

2300	0000		Anguilla, Worldwide Univ Network	6090am
2300	0000		Australia, ABC NT Alice Springs	4835do
2300	0000		Australia, ABC NT Katherine 5025do	
2300	0000		Australia, Radio Australia 9660pa	13690pa
			15230pa 15415as 17795pa	
2300	0000		Bahrain, Radio Bahrain 6010me	
2300	0000		Bulgaria, Radio Bulgaria 9700na	11700na
2300	0000	smtwhf	Canada, CBC Northern Quebec Service	
			9625na	
2300	0000		Canada, CFRX Toronto ON 6070na	
2300	0000		Canada, CFVP Calgary AB 6030na	
2300	0000		Canada, CKZN St Johns NF 6160na	
2300	0000		Canada, CKZU Vancouver BC	6160na
2300	0000		China, China Radio International	5915as
			5990ca 6145na 7350eu	7410as
			9610as 11690as 11790as	11840na
2300	0000		Cuba, Radio Havana Cuba 5040ca	
2300	0000		Egypt, Radio Cairo 6270na	
2300	0000		India, All India Radio/External Service	6055as
			7305as 11645as 13605as	
2300	0000		Malaysia, RTM/Traxx FM 7295do	
2300	0000		Micronesia, The Cross Radio/Pohnpei	4755 as
2300	0000		New Zealand, Radio NZ International	15720pa
2300	0000	DRM	New Zealand, Radio NZ International	17675pa
2300	0000		Russia, Voice of Russia 9665va	9800va
2300	0000		UK, BBC World Service 7490as	9580as
			9740as 9890as 11850as	12010as
2300	0000		USA, American Forces Network/AFRTS	4319usb
			5446usb 5765usb 7812usb	12133usb
			12759usb 13362usb	
2300	0000		USA, BBG/Voice of America 5895va	7555as
			7575va 11955va	
2300	0000		USA, BBG/Voice of America/Special English	
			7460af 9570va 11840va	15340va
2300	0000		USA, EWTN/WEWN Irondale, AL	15610me
2300	0000		USA, FBN/WTJC Newport NC	9370na
2300	0000		USA, Overcomer Ministries 9980na	
2300	0000		USA, WBCQ Monticello ME 9330am	
2300	0000	fasmtw	USA, WBCQ Monticello ME 7415am	
2300	0000		USA, WHRI Cypress Creek SC	7315na
			9850na 9860na 17820na	
2300	0000		USA, WRMI Miami FL 9955ca	
2300	0000		USA, WTWW Lebanon TN 5755va	
2300	0000		USA, WWCR Nashville TN 7465na	9350na
			9980na 13845na	
2300	0000		USA, WWRB Manchester TN 3185na	3215na
			5050na 5745na	
2300	0000		USA, WYFR/Family Radio Worldwide	5950na
			11580sa 15440ca	
2300	0000		Zambia, CVC Radio Christian Voice	4965af
2300	2330	DRM	Vatican City State, Vatican Radio	9755am
2300	2345		USA, WYFR/Family Radio Worldwide	11740na
2330	0000		Australia, Radio Australia 17750as	
2330	0000	h	USA, WBCQ Monticello ME 7415am	
2330	0000		Vietnam, Voice of Vietnam/Overseas Service	
			9840as 12020as	



MTXtra
Shortwave Broadcast Guide



SPANISH

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

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

1700	1725		Turkey, Voice of Turkey	11930va	
1700	1800		Bolivia, Radio Cultural Juan XXIII	6055do	
1700	1800		Bolivia, Radio Fides	6155do	9624do
1700	1800		Bolivia, Radio Illimani/Radio Patria Nueva	6025do	
1700	1800		Bolivia, Radio Logos	4865do	6165do
1700	1800		Bolivia, Radio San Miguel	4700do	
1700	1800		Bolivia, Radio Tacana	4781do	
1700	1800		Chile, CVC La Voz	9635sa	17680sa
1700	1800		Colombia, La Voz de tu Conciencia	6010do	
1700	1800		Colombia, La Voz del Guaviare	6035do	
1700	1800		Colombia, Marfil Estereo	5910do	
1700	1800		Cuba, Radio Havana Cuba	11690ca	13680ca
			13750na	15370sa	17750sa
1700	1800		Cuba, Radio Rebelde	5025na	6140na
			12040ca		
1700	1800		Dominican Republic, Radio Amanecer Int'l	6025do	
1700	1800		Ecuador, Radio Quito	4919do	
1700	1800		Equatorial Guinea, Radio Nacional/Bata	5005do	
1700	1800		Equatorial Guinea, Radio Nacional/Malabo	6250do	
1700	1800		Honduras, HRMI/ Radio Misiones Intl	3340do	
1700	1800		Indonesia, Voice of Indonesia/Jawa Barat	9525eu	11785eu
1700	1800		Mexico, XEOI/Radio Mil	6010do	
1700	1800		Mexico, XEQM/RASA/Radio Candela	6104do	
1700	1800		Mexico, XERTA/Radio Transcontinental	4800do	
1700	1800		Mexico, XEXQ/Radio Universidad	6045do	
1700	1800		Peru, La Voz de Anta	5323do	
1700	1800		Peru, La Voz de la Selva	4824do	
1700	1800		Peru, La Voz de las Huarinjas	5059do	
1700	1800		Peru, Radio Altura	5014do	
1700	1800		Peru, Radio Bethel	5921do	
1700	1800		Peru, Radio Chota	4888do	
1700	1800		Peru, Radio Cusco	6195do	
1700	1800		Peru, Radio del Pacifico	9675do	
1700	1800		Peru, Radio del Pacifico	4974do	
1700	1800		Peru, Radio Frecuencia Popular	5485do	
1700	1800		Peru, Radio La Hora	4857do	
1700	1800		Peru, Radio La Reina de la Selva	5486do	
1700	1800		Peru, Radio Libertad de Junin	5039do	
1700	1800		Peru, Radio Madre de Dios	4950do	
1700	1800		Peru, Radio Manantial	4986do	
1700	1800		Peru, Radio Maranon	4835do	
1700	1800		Peru, Radio Melodia	5939do	
1700	1800		Peru, Radio Ondas del Suroiente	5120do	
1700	1800		Peru, Radio Quillabamba	5025do	
1700	1800		Peru, Radio San Miguel	4930do	
1700	1800		Peru, Radio Santa Monica	4965do	
1700	1800		Peru, Radio Santa Rosa	6047do	
1700	1800		Peru, Radio Sicuani	4826do	
1700	1800		Peru, Radio Tawantinsuyo	6173do	
1700	1800		Peru, Radio Union	6114do	
1700	1800		Peru, Radio Victoria	6019do	9720do
1700	1800		Peru, Radio Vision	4790do	
1700	1800		Spain, Radio Exterior de Espana	7275eu	
1700	1800	mtwhfa	Spain, Radio Exterior de Espana	17715sa	
			17755af		
1700	1800	Sat	Spain, Radio Exterior de Espana	9765ca	
			11815sa	17850na	
1700	1800	Sun	Spain, Radio Exterior de Espana	11815sa	
			17715sa		
1700	1800	Sat/Sun	Spain, Radio Exterior de Espana	9665eu	
			17755af		
1700	1800		USA, BBG/Radio Marti	11930ca	13820ca
			15330ca		
1700	1800		USA, EWTN/WEWN Irondale, AL	11550ca	
			13830sa		
1700	1800		USA, KVOH Rancho Simi CA	17775ca	
1700	1800		USA, WYFR/Family Radio Worldwide	6085ca	
			13615na	15130ca	
1700	1800		Venezuela, Radio Amazonas	4940do	

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

1800	1830	Sun	Canada, Bible Voice Broadcasting	9435eu	
1800	1830		Vietnam, Voice of Vietnam/Overseas Service	7280eu	9730eu
1800	1845		USA, WYFR/Family Radio Worldwide	21670eu	
1800	1900	Sun	Argentina, RAE	6060am	15345am
1800	1900		Bolivia, Radio Cultural Juan XXIII	6055do	
1800	1900		Bolivia, Radio Illimani/Radio Patria Nueva	6025do	
1800	1900		Bolivia, Radio Logos	4865do	6165do
1800	1900		Bolivia, Radio San Miguel	4700do	
1800	1900		Bolivia, Radio Tacana	4781do	
1800	1900		Chile, CVC La Voz	9635sa	17680sa
1800	1900	DRM	Chile, CVC La Voz	17640sa	
1800	1900		Colombia, La Voz de tu Conciencia	6010do	
1800	1900		Colombia, La Voz del Guaviare	6035do	
1800	1900		Colombia, Marfil Estereo	5910do	
1800	1900		Cuba, Radio Havana Cuba	13750na	
1800	1900		Cuba, Radio Rebelde	5025na	6140na
			12040ca		
1800	1900		Dominican Republic, Radio Amanecer Int'l	6025do	
1800	1900		Ecuador, Radio Quito	4919do	
1800	1900		Equatorial Guinea, Radio Nacional/Bata	5005do	
1800	1900		Equatorial Guinea, Radio Nacional/Malabo	6250do	
1800	1900		Honduras, HRMI/ Radio Misiones Intl	3340do	
1800	1900		Mexico, XEOI/Radio Mil	6010do	
1800	1900		Mexico, XEQM/RASA/Radio Candela	6104do	
1800	1900		Mexico, XERTA/Radio Transcontinental	4800do	
1800	1900		Mexico, XEXQ/Radio Universidad	6045do	
1800	1900		Peru, La Voz de Anta	5323do	
1800	1900		Peru, La Voz de la Selva	4824do	
1800	1900		Peru, La Voz de las Huarinjas	5059do	
1800	1900		Peru, Radio Altura	5014do	
1800	1900		Peru, Radio Bethel	5921do	
1800	1900		Peru, Radio Chota	4888do	
1800	1900		Peru, Radio Cusco	6195do	
1800	1900		Peru, Radio del Pacifico	9675do	
1800	1900		Peru, Radio del Pacifico	4974do	
1800	1900		Peru, Radio Frecuencia Popular	5485do	
1800	1900		Peru, Radio La Hora	4857do	
1800	1900		Peru, Radio La Reina de la Selva	5486do	
1800	1900		Peru, Radio Libertad de Junin	5039do	
1800	1900		Peru, Radio Madre de Dios	4950do	
1800	1900		Peru, Radio Manantial	4986do	
1800	1900		Peru, Radio Melodia	5939do	
1800	1900		Peru, Radio Ondas del Suroiente	5120do	
1800	1900		Peru, Radio Quillabamba	5025do	
1800	1900		Peru, Radio San Miguel	4930do	
1800	1900		Peru, Radio Santa Monica	4965do	
1800	1900		Peru, Radio Santa Rosa	6047do	
1800	1900		Peru, Radio Sicuani	4826do	
1800	1900		Peru, Radio Tawantinsuyo	6173do	
1800	1900		Peru, Radio Union	6114do	
1800	1900		Peru, Radio Victoria	6019do	9720do
1800	1900		Peru, Radio Vision	4790do	
1800	1900		Spain, Radio Exterior de Espana	7275eu	
1800	1900	mtwhfa	Spain, Radio Exterior de Espana	9665eu	
			9765ca	17755af	17850na
1800	1900		Spain, Radio Exterior de Espana	11815sa	
			17715sa		
1800	1900		USA, BBG/Radio Marti	11930ca	13820ca
			15330ca		

1800	1900		USA, EWTN/WEWN Irondale, AL		12050ca
			13830sa		
1800	1900		USA, KVOH Rancho Simi CA		17775ca
1800	1900		USA, WYFR/Family Radio Worldwide		6085ca
			15130ca		
1800	1900		Venezuela, Radio Amazonas	4940do	

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

1900	1930	Sat	Vatican City State, Vatican Radio		9755af
			11625af		
1900	1957		North Korea, Voice of Korea	13760eu	15245eu
1900	1957		Romania, Radio Romania International		9700ca
			11715sa		
1900	2000	Sun	Argentina, RAE 6060am	15345am	
1900	2000		Bolivia, Radio Cultural Juan XXIII		6055do
1900	2000		Bolivia, Radio Illimani/Radio Patria Nueva		
			6025do		
1900	2000		Bolivia, Radio Logos	4865do	6165do
1900	2000		Bolivia, Radio San Miguel	4700do	
1900	2000		Bolivia, Radio Tacana	4781do	
1900	2000		Chile, CVC La Voz	9635sa	17680sa
1900	2000	DRM	Chile, CVC La Voz	17640sa	
1900	2000		Colombia, La Voz de tu Conciencia		6010do
1900	2000		Colombia, La Voz del Guaviare		6035do
1900	2000		Colombia, Marfil Estereo	5910do	
1900	2000		Cuba, Radio Havana Cuba	13750na	
1900	2000		Cuba, Radio Rebelde	5025na	6140na
			12040ca		
1900	2000		Dominican Republic, Radio Amanecer Int'l		
			6025do		
1900	2000		Ecuador, HCJB/La Voz de los Andes		6050sa
1900	2000		Ecuador, Radio Quito	4919do	
1900	2000		Equatorial Guinea, Radio Nacional/Bata		
			5005do		
1900	2000		Equatorial Guinea, Radio Nacional/Malabo		
			6250do		
1900	2000		Honduras, HRMI/ Radio Misiones Intl		3340do
1900	2000		Mexico, XEOI/Radio Mil	6010do	
1900	2000		Mexico, XEQM/RASA/Radio Candela		6104do
1900	2000		Mexico, XERTA/Radio Transcontinental		4800do
1900	2000		Mexico, XEXQ/Radio Universidad		6045do
1900	2000		Peru, La Voz de Anta	5323do	
1900	2000		Peru, La Voz de la Selva	4824do	
1900	2000		Peru, La Voz de las Huarinjas	5059do	
1900	2000		Peru, Radio Altura	5014do	
1900	2000		Peru, Radio Bethel	5921do	
1900	2000		Peru, Radio Chota	4888do	
1900	2000		Peru, Radio Cusco	6195do	
1900	2000		Peru, Radio del Pacifico	9675do	
1900	2000		Peru, Radio del Pacifico	4974do	
1900	2000		Peru, Radio La Hora	4857do	
1900	2000		Peru, Radio La Reina de la Selva		5486do
1900	2000		Peru, Radio Libertad de Junin	5039do	
1900	2000		Peru, Radio Madre de Dios	4950do	
1900	2000		Peru, Radio Manantial	4986do	
1900	2000		Peru, Radio Melodia	5939do	
1900	2000		Peru, Radio Ondas del Suroiente		5120do
1900	2000		Peru, Radio Quillabamba	5025do	
1900	2000		Peru, Radio San Miguel	4930do	
1900	2000		Peru, Radio Santa Monica	4965do	
1900	2000		Peru, Radio Santa Rosa	6047do	
1900	2000		Peru, Radio Sicuani	4826do	
1900	2000		Peru, Radio Tawantinsuyo	6173do	
1900	2000		Peru, Radio Union	6114do	
1900	2000		Peru, Radio Victoria	6019do	9720do
1900	2000		Peru, Radio Vision	4790do	
1900	2000		Spain, Radio Exterior de Espana		7275eu
			11815sa 15110na	17715sa	
1900	2000	mtwhfa	Spain, Radio Exterior de Espana		9765ca
			17850na		
1900	2000	Sat/Sun	Spain, Radio Exterior de Espana		9665eu
			17755af 17850na		
1900	2000		USA, BBG/Radio Marti	11930ca	13820ca
			15330ca		
1900	2000		USA, EWTN/WEWN Irondale, AL		12050ca
			13830sa		
1900	2000		USA, KVOH Rancho Simi CA		17775ca
1900	2000		Venezuela, Radio Amazonas	4940do	
1900	2000		Venezuela, Radio Nacional de Venezuela		
			15290am		
1930	2000		Bolivia, Radio Santa Ana	4451do	

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

2000	2020	Sun	Belarus, Radio Station Belarus		7255eu
			7360eu 7390eu		
2000	2100	Sat/Sun	Argentina, RAE 6060am	15345am	
2000	2100		Bolivia, Radio Cultural Juan XXIII		6055do
2000	2100		Bolivia, Radio Illimani/Radio Patria Nueva		
			6025do		
2000	2100		Bolivia, Radio Logos	4865do	6165do
2000	2100		Bolivia, Radio Nacional de Huanuni		5965do
2000	2100		Bolivia, Radio San Miguel	4700do	
2000	2100		Bolivia, Radio Santa Ana	4451do	
2000	2100		Bolivia, Radio Tacana	4781do	
2000	2100		Bulgaria, Radio Bulgaria	6000eu	9400eu
2000	2100		Chile, CVC La Voz	9635sa	17680sa
2000	2100		Colombia, La Voz de tu Conciencia		6010do
2000	2100		Colombia, La Voz del Guaviare		6035do
2000	2100		Colombia, Marfil Estereo	5910do	
2000	2100		Cuba, Radio Havana Cuba	13750na	
2000	2100		Cuba, Radio Rebelde	5025na	6140na
			12040ca		
2000	2100		Dominican Republic, Radio Amanecer Int'l		
			6025do		
2000	2100		Ecuador, HCJB/La Voz de los Andes		6050sa
2000	2100		Ecuador, Radio Quito	4919do	
2000	2100		Equatorial Guinea, Radio Nacional/Bata		
			5005do		
2000	2100		Equatorial Guinea, Radio Nacional/Malabo		
			6250do		
2000	2100		Honduras, HRMI/ Radio Misiones Intl		3340do
2000	2100		Mexico, XEOI/Radio Mil	6010do	
2000	2100		Mexico, XEQM/RASA/Radio Candela		6104do
2000	2100		Mexico, XERTA/Radio Transcontinental		4800do
2000	2100		Mexico, XEXQ/Radio Universidad		6045do
2000	2100		Peru, La Voz de Anta	5323do	
2000	2100		Peru, La Voz de la Selva	4824do	
2000	2100		Peru, La Voz de las Huarinjas	5059do	
2000	2100		Peru, Radio Altura	5014do	
2000	2100		Peru, Radio Bethel	5921do	
2000	2100		Peru, Radio Chota	4888do	
2000	2100		Peru, Radio Cusco	6195do	
2000	2100		Peru, Radio del Pacifico	9675do	
2000	2100		Peru, Radio del Pacifico	4974do	
2000	2100		Peru, Radio Frecuencia Popular		5485do
2000	2100		Peru, Radio La Hora	4857do	
2000	2100		Peru, Radio La Reina de la Selva		5486do
2000	2100		Peru, Radio Libertad de Junin	5039do	
2000	2100		Peru, Radio Madre de Dios	4950do	
2000	2100		Peru, Radio Manantial	4986do	
2000	2100		Peru, Radio Melodia	5939do	
2000	2100		Peru, Radio Ondas del Suroiente		5120do
2000	2100		Peru, Radio Quillabamba	5025do	
2000	2100		Peru, Radio San Miguel	4930do	
2000	2100		Peru, Radio Santa Monica	4965do	
2000	2100		Peru, Radio Santa Rosa	6047do	
2000	2100		Peru, Radio Sicuani	4826do	
2000	2100		Peru, Radio Tarma	4775do	
2000	2100		Peru, Radio Tawantinsuyo	6173do	
2000	2100		Peru, Radio Union	6114do	
2000	2100		Peru, Radio Victoria	6019do	9720do
2000	2100		Peru, Radio Vision	4790do	
2000	2100		Spain, Radio Exterior de Espana		7275eu
			15110na		
2000	2100	Sat	Spain, Radio Exterior de Espana		9765ca
			11815sa 17715sa	17850na	
2000	2100	Sun	Spain, Radio Exterior de Espana		11815sa
			17715sa		
2000	2100	Sat/Sun	Spain, Radio Exterior de Espana		9665eu
			17755af		
2000	2100		Taiwan, Radio Taiwan International		3965eu
2000	2100		USA, BBG/Radio Marti	9565ca	11930ca
			13820ca		
2000	2100		USA, EWTN/WEWN Irondale, AL		12050ca
			13830sa		
2000	2100		USA, KVOH Rancho Simi CA		17775ca
2000	2100		USA, WYFR/Family Radio Worldwide		5985ca
			11855ca 13690na	15130ca	
2000	2100		Venezuela, Radio Amazonas	4940do	
2000	2100		Venezuela, Radio Nacional de Venezuela		
			17705am		
2020	2040		Vatican City State, Vatican Radio		4005ca
			5885ca 7250sa	9645sa	
2030	2100		Iran, IRIB/ VOIRI 6055sa	7300sa	9780sa

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

2100	2127		Iran, IRIB/ VOIRI 6055sa	7300sa	9780sa
2100	2130		Ecuador, HCJB/La Voz de los Andes		6050sa
2100	2130		France, Radio France Internationale		17630as

2100 2157 Romania, Radio Romania International 9755eu 11965eu
2100 2200 Sat/Sun Argentina, RAE 6060am 15345am
2100 2200 Bolivia, Radio Cultural Juan XXIII 6055do
2100 2200 Bolivia, Radio Fides 6155do 9624do
2100 2200 Bolivia, Radio Illimani/Radio Patria Nueva 6025do
2100 2200 Bolivia, Radio Logos 4865do 6165do
2100 2200 Bolivia, Radio Loyola 5996do
2100 2200 Bolivia, Radio Nacional de Huanuni 5965do
2100 2200 Bolivia, Radio Pio XII 5952do
2100 2200 Bolivia, Radio San Gabriel 6080do
2100 2200 Bolivia, Radio San Jose 5580do
2100 2200 Bolivia, Radio San Miguel 4700do
2100 2200 Bolivia, Radio Santa Ana 4451do
2100 2200 Bolivia, Radio Santa Cruz 6134do
2100 2200 Bolivia, Radio Tacana 4781do
2100 2200 Bolivia, Radio Virgen de Remedios 4834do
2100 2200 Chile, CVC La Voz 9635sa 17680sa
2100 2200 China, China Radio International 7335eu 9640eu
2100 2200 Clandestine, Radio Republica/WRMI 5954am
2100 2200 Colombia, La Voz de tu Conciencia 6010do
2100 2200 Colombia, La Voz del Guaviare 6035do
2100 2200 Colombia, Marfil Estereo 5910do
2100 2200 Cuba, Radio Havana Cuba 5040ca 9840ca 11770eu 12010sa 12040ca
2100 2200 Cuba, Radio Rebelde 5025na 6140na 12040ca
2100 2200 Dominican Republic, Radio Amanecer Int'l 6025do
2100 2200 Dominican Republic, Radio Cristal Int'l 5009do
2100 2200 Ecuador, Radio Oriental 4781do
2100 2200 Ecuador, Radio Quito 4919do
2100 2200 Equatorial Guinea, Radio Nacional/Bata 5005do
2100 2200 Equatorial Guinea, Radio Nacional/Malabo 6250do
2100 2200 Honduras, HRMI/ Radio Misiones Intl 3340do
2100 2200 Honduras, Radio Luz y Vida 3250do
2100 2200 Mexico, XEOI/Radio Mil 6010do
2100 2200 Mexico, XEQM/RASA/Radio Candela 6104do
2100 2200 Mexico, XERTA/Radio Transcontinental 4800do
2100 2200 Mexico, XEXQ/Radio Universidad 6045do
2100 2200 Peru, La Voz de Anta 5323do
2100 2200 Peru, La Voz de la Selva 4824do
2100 2200 Peru, La Voz de las Huarinjas 5059do
2100 2200 Peru, Radio Altura 5014do
2100 2200 Peru, Radio Bethel 5921do
2100 2200 Peru, Radio Chota 4888do
2100 2200 Peru, Radio Cultural Amauta 4955do
2100 2200 Peru, Radio Cusco 6195do
2100 2200 Peru, Radio del Pacifico 9675do
2100 2200 Peru, Radio Frecuencia Popular 5485do
2100 2200 Peru, Radio La Hora 4857do
2100 2200 Peru, Radio La Reina de la Selva 5486do
2100 2200 Peru, Radio Libertad de Junin 5039do
2100 2200 Peru, Radio Madre de Dios 4950do
2100 2200 Peru, Radio Manantial 4986do
2100 2200 Peru, Radio Melodia 5939do
2100 2200 Peru, Radio Ondas del Suroiente 5120do
2100 2200 Peru, Radio Quillabamba 5025do
2100 2200 Peru, Radio San Miguel 4930do
2100 2200 Peru, Radio Santa Monica 4965do
2100 2200 Peru, Radio Santa Rosa 6047do
2100 2200 Peru, Radio Sicuani 4826do
2100 2200 Peru, Radio Tarma 4775do
2100 2200 Peru, Radio Tawantinsuyo 6173do
2100 2200 Peru, Radio Union 6114do
2100 2200 Peru, Radio Victoria 6019do 9720do
2100 2200 Spain, Radio Exterior de Espana 7275eu 15110na
2100 2200 Sat Spain, Radio Exterior de Espana 9765ca 11815sa 17715sa 17850na
2100 2200 Sun Spain, Radio Exterior de Espana 11815sa 17715sa
2100 2200 Sat/Sun Spain, Radio Exterior de Espana 17755af
2100 2200 USA, BBG/Radio Marti 9565ca 11930ca 13820ca
2100 2200 USA, EWTN/WEWN Irondale, AL 12050ca 13830sa
2100 2200 USA, KVOH Rancho Simi CA 17775ca
2100 2200 USA, WYFR/Family Radio Worldwide 5985ca 6915sa 11855ca 15130ca 15600eu
2100 2200 Venezuela, Radio Amazonas 4940do
2130 2200 Sat/Sun Ecuador, HCJB/La Voz de los Andes 6050sa

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

2200 2255 Ecuador, La Voz del Napo 3279do
2200 2257 North Korea, Voice of Korea 13760eu 15245eu
2200 2259 Canada, Radio Canada International 11990sa 15455sa
2200 2300 Sat/Sun Argentina, RAE 6060am 15345am
2200 2300 mtwhf Argentina, RAE 6060am 11710am
2200 2300 Bolivia, Radio Cultural Juan XXIII 6055do
2200 2300 Bolivia, Radio Fides 6155do 9624do
2200 2300 Bolivia, Radio Illimani/Radio Patria Nueva 6025do
2200 2300 Bolivia, Radio Lipez 4796do
2200 2300 Bolivia, Radio Logos 4865do 6165do
2200 2300 Bolivia, Radio Loyola 5996do
2200 2300 Bolivia, Radio Mosoj Chaski 3310do
2200 2300 Bolivia, Radio Nacional de Huanuni 5965do
2200 2300 Bolivia, Radio Pio XII 5952do
2200 2300 Bolivia, Radio San Gabriel 6080do
2200 2300 Bolivia, Radio San Jose 5580do
2200 2300 Bolivia, Radio San Miguel 4700do
2200 2300 Bolivia, Radio Santa Ana 4451do
2200 2300 Bolivia, Radio Santa Cruz 6134do
2200 2300 Bolivia, Radio Tacana 4781do
2200 2300 Bolivia, Radio Virgen de Remedios 4834do
2200 2300 Bolivia, Yatun Ayllu Yura/Radio Yura 4716do
2200 2300 Chile, CVC La Voz 9780sa
2200 2300 China, China Radio International 7210eu 7250eu 7335eu 9490eu 9640eu 13700ca
2200 2300 Clandestine, Radio Republica/WRMI 5954am
2200 2300 Colombia, La Voz de tu Conciencia 6010do
2200 2300 Colombia, La Voz del Guaviare 6035do
2200 2300 Colombia, Marfil Estereo 5910do
2200 2300 Cuba, Radio Havana Cuba 5040ca 9840ca 11770eu 12010sa 12040ca
2200 2300 Cuba, Radio Rebelde 5025na 6140na 12040ca
2200 2300 Dominican Republic, Radio Amanecer Int'l 6025do
2200 2300 Dominican Republic, Radio Cristal Int'l 5009do
2200 2300 Ecuador, HCJB/La Voz de los Andes 6050sa
2200 2300 Ecuador, Radio Oriental 4781do
2200 2300 Ecuador, Radio Quito 4919do
2200 2300 Equatorial Guinea, Radio Nacional/Bata 5005do
2200 2300 Equatorial Guinea, Radio Nacional/Malabo 6250do
2200 2300 Honduras, HRMI/ Radio Misiones Intl 3340do
2200 2300 Honduras, Radio Luz y Vida 3250do
2200 2300 Mexico, XEOI/Radio Mil 6010do
2200 2300 Mexico, XEQM/RASA/Radio Candela 6104do
2200 2300 Mexico, XERTA/Radio Transcontinental 4800do
2200 2300 Mexico, XEXQ/Radio Universidad 6045do
2200 2300 Peru, La Voz de Anta 5323do
2200 2300 Peru, La Voz de la Selva 4824do
2200 2300 Peru, La Voz de las Huarinjas 5059do
2200 2300 Peru, Radio Altura 5014do
2200 2300 Peru, Radio Bethel 5921do
2200 2300 Peru, Radio Bolivar 5460do
2200 2300 Peru, Radio Chota 4888do
2200 2300 Peru, Radio Cultural Amauta 4955do
2200 2300 Peru, Radio Cusco 6195do
2200 2300 Peru, Radio del Pacifico 9675do
2200 2300 Peru, Radio del Pacifico 4974do
2200 2300 Peru, Radio Frecuencia Popular 5485do
2200 2300 Peru, Radio Huanta 2000/Radio Dos Mill 4746do 4755do
2200 2300 Peru, Radio La Hora 4857do
2200 2300 Peru, Radio La Reina de la Selva 5486do
2200 2300 Peru, Radio Libertad de Junin 5039do
2200 2300 Peru, Radio Madre de Dios 4950do
2200 2300 Peru, Radio Manantial 4986do
2200 2300 Peru, Radio Melodia 5939do
2200 2300 Peru, Radio Ondas del Suroiente 5120do
2200 2300 Peru, Radio Quillabamba 5025do
2200 2300 Peru, Radio San Miguel 4930do
2200 2300 Peru, Radio Santa Monica 4965do
2200 2300 Peru, Radio Santa Rosa 6047do
2200 2300 Peru, Radio Sicuani 4826do
2200 2300 Peru, Radio Tarma 4775do
2200 2300 Peru, Radio Tawantinsuyo 6173do
2200 2300 Peru, Radio Union 6114do
2200 2300 Peru, Radio Victoria 6019do 9720do
2200 2300 Peru, Radio Vision 4790do
2200 2300 Spain, Radio Exterior de Espana 7275eu 15110na

2200	2300	Sat	Spain, Radio Exterior de Espana 17850na		9765ca
2200	2300		Syria, Radio Damascus 13610va	9330eu	12085va
2200	2300		USA, BBG/Radio Marti 9565ca	6030ca	7405ca
2200	2300		USA, EWTN/WEWN Irondale, AL 13830sa		12050ca
2200	2300		USA, KVOH Rancho Simi CA		17775ca
2200	2300		USA, WYFR/Family Radio Worldwide 6915sa 7520sa 15255sa		5985ca 11855ca 15130ca
2200	2300		Venezuela, Radio Amazonas		4940do
2200	2300		Venezuela, Radio Nacional de Venezuela 11670am		
2200	2330		France, Radio France Internationale		17630as
2230	0000		Cuba, Radio Havana Cuba	6000na	9640na
2230	2300		Peru, Radio Genesis	4850do	
2230	2300		Peru, Radio Nueva Super Sensacion		6536do
2230	2300		Peru, Radio Rasuwilca	4805do	

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

2300	0000	Sat/Sun	Argentina, RAE	6060am	15345am
2300	0000		Bolivia, Radio Cultural Juan XXIII		6055do
2300	0000		Bolivia, Radio Fides	6155do	9624do
2300	0000		Bolivia, Radio Illimani/Radio Patria Nueva 6025do		
2300	0000		Bolivia, Radio Lipez	4796do	
2300	0000		Bolivia, Radio Logos	4865do	6165do
2300	0000		Bolivia, Radio Loyola	5996do	
2300	0000		Bolivia, Radio Mosoj Chaski	3310do	
2300	0000		Bolivia, Radio Nacional de Huanuni		5965do
2300	0000		Bolivia, Radio Pio XII	5952do	
2300	0000		Bolivia, Radio San Gabriel	6080do	
2300	0000		Bolivia, Radio San Jose	5580do	
2300	0000		Bolivia, Radio San Miguel	4700do	
2300	0000		Bolivia, Radio Santa Ana	4451do	
2300	0000		Bolivia, Radio Santa Cruz	6134do	
2300	0000		Bolivia, Radio Virgen de Remedios		4834do
2300	0000		Bolivia, Yatun Ayllu Yura/Radio Yura		4716do
2300	0000		Bulgaria, Radio Bulgaria	7400eu	9400eu
2300	0000		Chile, CVC La Voz	9780sa	
2300	0000		China, China Radio International 7210eu 7250eu	9590eu	6175eu 9800eu
2300	0000		Clandestine, Radio Republica/WRMI		5954am
2300	0000		Colombia, La Voz del Guaviare		6035do
2300	0000		Cuba, Radio Havana Cuba 9770sa 12010sa	6060na	6120ca 12040ca

MT SHORTWAVE STATION RESOURCE GUIDE

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

Uniden HomePatrol-1 Digital Radio Scanner

Simple Programming - Simply enter your zip code or city, and HomePatrol-1 selects the channels in use in your area.

TrunkTracker IV (Motorola APCO 25 Digital, Motorola, EDACS, LTR) - Lets you monitor all of the major types of communications systems used by public safety, local government, amateur radio operators, and more.

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3.5" Daylight Viewable Display

Free Radio System Updates - Radio System database is updated weekly.

No Subscription Needed.

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HomePatrol Sentinel PC Software Included - Lets you update the HomePatrol-1's database, update firmware, and more easily manage favorites lists and other settings in your HomePatrol-1.

HomePatrol-1 lets you quickly hear the communications systems used by Public Safety, Aircraft, Military, Weather Spotters and more. Simply enter your US Zip code or Canadian Postal Code and HomePatrol-1 does the rest. Whether it is across town or across the street, HomePatrol-1 keeps you informed.

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MILCOM
MONITORING MILITARY COMMUNICATIONS

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Australian Military HF Network Complete

A year ago this month, Boeing Defense Australia announced the completion of the Australian Joint Project 2043's High Frequency Modernization (HFMod) Project. This Joint Project was a multi-year, multi-million dollar, HF equipment and software upgrade that established the new Australian Modernized High Frequency Communications System (MHFCS) Network.

This is the Australian military equivalent to the U.S. Department of Defense High Frequency Global Communications System (HF-GCS) and U.K. Defense High Frequency Communication Service (DHFCS) Terrestrial Air Sea Communications (TASCOMM) radio systems.

MHFCS is a managed HF long-range communications system that offers the Australian military a network to exchange information between fixed and mobile stations using one integrated system. The MHFCS provides survivable, reliable, long-range, secure and insecure tactical HF communications coverage on and over continental Australia as well as offshore to at least 2,000 nautical miles.

The HFMod Project replaced naval high-frequency radio stations at Canberra, Darwin, Exmouth, Sydney, Cairns and Perth, and the Air Force high-frequency radio stations at Sydney, Townsville, Darwin and Perth. The new network provides enhanced high-frequency radio communications capabilities and compatible high-frequency equipment in selected ADF mobile platforms.

In the final phases of the project, the contractor introduced Automatic Link Establishment (ALE), Automatic Link Maintenance (ALM), and Automatic Call Maintenance modes into the system. The final phase of this MHFCS upgrade also delivered enhanced services over HF that includes e-mail, interactive services, facsimile and file transfer.

Recently, monitors worldwide have seen an increase in ALE activity on this network. Some of this could be due to an increase in the number of mobile units being brought online. A major improvement provided by MHFCS is the delivery of enhanced HF capabilities to mobile platforms, including automation and relay capability for mobile-to-mobile users via the MHFCS fixed network.

Some of the mobile units that will use the network include:

- Defense Force School of Signals (3 mobile units)
- Deployable Minewarfare and Clearance Diving Headquarters (3 mobile units)
- CH-47D Chinook Helicopters (6 aircraft)
- Australian Army 1CCS (4 mobile units)
- Army Strategic HF (14 mobile units)
- S70-9-A Black Hawk Helicopters (34 aircraft)
- 6 Mine Hunter Coastal Ships (plus a shore-based reference set)
- 12 Armidale Class Patrol Boats
- Two Hydrographic Ships
- Six Aussie Air Force 737-7ES "Wedgetail" Mini AWACS aircraft (see list below)

Australian Modernized High Frequency Communications System (MHFCS) Network

Voice Contact Net Frequencies (USB):
3700.0/22868.0 kHz (VCN-1)
5878.0/20632.0 kHz (VCN-2)
9340 kHz (VCN-3)
10212.0 kHz (VCN-4)
12172.0 kHz (VCN-5)

ALE Frequencies (ALE/USB):
8122.0 10177.0 11206.0 12672.0 13480.0 kHz

Monitored ALE Addresses:

AAC001	A30-001	Aussie Air Force 737-7ES "Wedgetail" Mini AWACS aircraft
AAC002	A30-002	Aussie Air Force 737-7ES "Wedgetail" Mini AWACS aircraft
AAC003	A30-003	Aussie Air Force 737-7ES "Wedgetail" Mini AWACS aircraft
AAC004	A30-004	Aussie Air Force 737-7ES "Wedgetail" Mini AWACS aircraft
AAC005	A30-005	Aussie Air Force 737-7ES "Wedgetail" Mini AWACS aircraft
AAC006	A30-006	Aussie Air Force 737-7ES "Wedgetail" Mini AWACS aircraft
SANDAR	Darwin, Australia	
SANNWC	Exmouth, Australia	
SANRIV	Riverina, Australia	
SANTVL	Townsville, Australia	

Additional Australian Military Frequency Assignments
Emission Designator: 3K00F1B
Telegraphy using frequency modulation = Narrow-Band Direct-Printing
Frequencies:
3205.5 5375.5 5843.5 5897.5 7350.5 7548.0 9057.5 9070.5 11157.5 12140.5 12143.5 13883.5 17420.0 25012.5 kHz

Emission Designator: 3K00H9W
Composite emission: single-sideband, full carrier; composite system with one or more channels containing quantized or digital information together with one or more channels containing analog information (eg: combination of telegraphy and telephony)
Frequencies:
2843.5 3701.5 5879.5 7527.5 9341.5 10213.5 10216.5 11402.5 12173.5 12176.5 15963.5 20633.5 22869.5 26398.0 kHz

Emission Designator: 3K00J9W
Single-sideband, suppressed carrier; composite system with one or more channels containing quantized or digital information together with one or more channels containing analog information (eg: combination of telegraphy and telephony)
Frequencies:
18408.5 18435.0 23143.5 23146.5 24300.0 24651.5 24701.5 24801.5 25301.5 25401.5 26201.5 26301.5 26501.5 26786.5 27435.5 27447.5 27453.5 27459.5 27474.5 27477.5 kHz

Emission Designator: 6K00B9W
Multi-channel independent sideband (ISB) 2 sidebands combined voice/RTTY
Frequencies:
2145.0 2296.0 2776.0 3328.0 3348.0 4304.0 4310.0 5175.0 5195.0 5791.0 5820.0 6378.0 6442.0 6769.0 6898.5 6936.0 6994.0 7320.0 7462.0 7560.0 7681.0 7693.0 7750.0 8056.0 8460.0 8557.0 9050.0 9159.0 9412.0 10105.0 10368.0 10407.0 10512.0 10518.0 10595.0 10825.0 10847.2 10921.0 11165.0 11481.0 12060.0 12812.0 12876.0 13440.0 13480.0 13965.0 14687.0 14693.0 14790.0 14874.0 15696.0 15858.0 16270.0 17002.0 17117.0 17475.0 18365.0 18522.0 18528.0 18551.0 18585.0 18735.0 19060.0 19150.0 20110.0 20420.0 20550.0 20550.0 20931.0 20937.0 20968.0 22449.0 22639.5 23185.0 23589.0 24210.0 24420.0 25360.0 25457.0 25515.0 kHz

❖ New HF Military/ Government Nets

Over the last few months, some new and old military/government networks have been active in the High Frequency (HF) spectrum. Some of these networks are easily heard here in the United States, while others are best heard in Europe. Here is a listing of some of the stuff that has been monitored, both old and new.

Lithuanian Military
Frequencies (ALE/USB): 7650.0 7825.0 7988.5 8750.0 8765.0 8995.0 9150.0 9315.0 11080.0 12177.0 13950.0 14447.0 14822.5 19128.0 kHz
ALE Addresses: P1G S1B

Maritime Service of the Armed Forces of Malta
Frequencies (ALE/USB): 6205.0 6838.0 8207.0 12315.0 13118.0 16402.0 18204.0 22372.0 kHz
ALE Addresses: 2700 3201 3203 A1A A2A
AB1 Armidale class patrol vessel P21
AB2 Armidale class patrol vessel P22
AB3 Armidale class patrol vessel P23
AB4 Armidale class patrol vessel P24
ABA Armed Forces Headquarters

U.S. Army National Guard,
875th Engineering Battalion, Jonesboro, Arkansas
Frequencies (ALE/USB): 4927.5 6985.5 7720.0 8058.5 9065.0 9145.0 10151.5 10703.0 11998.5 12087.0 12163.5 16120.0 kHz
ALE Address: EN875TOC

U.S. Army National Guard,
43rd WMD-CST, Eastover, South Carolina
Frequencies (ALE/USB):
7720.0 8047.0 8058.5 9065.0 9145.0 kHz.
ALE Address: SCC43NG

U.S. Coast Guard Auxiliary
Frequencies (USB):
2124.2 2234.0 2447.5 2479.0 2810.3 3154.5 3203.0 3390.5 4819.5 4847.0 4965.3 5253.5 5322.5 5845.2 5855.3 6821.8 6972.8 7351.5 7542.0 7736.5 7743.5 8002.3 8035.3 9183.5 9195.5 9338.5 10509.3 10986.0 11030.5 11061.0 11115.0 11130.3 11130.5 14459.5 15740.5 15979.5 16128.5 16210.0 19221.5 22924.5 22955.5 22979.5 kHz.

U.S. Government Network
(Agency Unknown)
Frequencies (ALE/USB):
2552.4 4947.9 5241.7 7971.9 9352.2 10874.3 12188.6 kHz

ALE Addresses: KLE439 KLE439B KLE444 KLE445 KLE446 KLE449 KOP629 Mineral Wells, WV (Also seen on SHARES frequencies)

U.S. Government or Military Network (Agency Unknown)
Frequencies (ALE/USB):
6767.0 6773.0 6780.5 9056.6 9064.0 kHz
ALE Addresses: NSFHQ1 OPMHQ1 OPMHQ2

❖ CAP Regional Nets Sprouting Up Everywhere

As mentioned in my April 2011 *Milcom* column, the Civil Air Patrol (CAP) recently announced that they were creating new regional HF ALE networks to supplement their national ALE net. From an official CAP source:

"Each of the eight regions is being assigned a suite of HF frequencies to be used as the region ALE net. Conventional voice nets remain valuable for confidence checks and training and may also be scheduled on these frequencies. Conventional operations, however, must share the channel with ALE operations – to include automatic ALE soundings. With training and experience, operators will become accustomed to pausing voice operations during a sounding and then continuing when the channel is clear."

Since that initial announcement, we have uncovered several of the new regional nets, their frequencies, and stations seen sounding on them. Our list of this information below is far from complete, but will give you a starting point to launch your monitoring effort if you want to follow the HF happenings of the CAP. (The mode is ALE/USB).

Great Lakes Region:
2508.0 4604.0 7630.0 10504.0 12200.0 14438.0 kHz
Station List:
0003WICAP 0004WICAP 0034ILCAP 0070ILCAP 0079ILCAP 0148KYCAP 0545MICAP 4750WICAP

Middle East Region:
3385.0 4585.0 4633.0 5447.0 6773.0 7665.0 9082.0 10518.0 kHz
Station List:
0001NCCAP 0002NCCAP 0002SCCAP 0003NCCAP 0004SCCAP 0004WVCAP 0011DCCAP 034MERCAP 0040WVCAP 043MERCAP 0044SCCAP 0065DECAP 0204SCCAP 0900NCCAP 0901NCCAP 0902NCCAP 0903NCCAP 0906NCCAP

North Central Region:
4482.0 4505.0 4576.0 10510.0 12098.0 14450.0 16353.0 kHz
Station List:
0004IACAP 0010MOCAP 0100NDCAP 101NCRCAP 0135MOCAP 0309MOCAP 0740MOCAP 0748MOCAP 2300MNCAP 4800MNCAP

Northeast Region:
4576.0 4630.0 4636.0 6773.0 7656.0 10557.0 12218.0 14914.0 kHz
Station List:
0010PACAP 0011NHCAP 0016MECAP 0020CTCAP 0021CTCAP 0025CTCAP

Rocky Mountain Region:
4509.0 4601.0 7618.0 7665.0 10542.0 14430.0 18516.0 22875.0 kHz
Station List:
004RMRCAP 0093COCAP

Southeast Region:
2511.0 4502.0 4512.0 4576.0 4630.0 4636.0 6773.0 7704.0 10545.0 18205.0 kHz
Station List:
0004GACAP 0004MSCAP 0008MSCAP 0016MSCAP 0181ALCAP 201SERCAP 202SERCAP 0250GACAP 0595ALCAP 0903ALCAP

Southwest Region:
4512.0 4627.0 6773.0 7416.0 10550.0 10557.0 12183.0 12218.0 16333.0 kHz
Station List:
0004AZCAP 0004TXCAP 0011ARCAP 0048ARCAP 0049ARCAP 0058ARCAP 100SWRCAP 0989OKCAP 4074OKCAP 4400TXCAP 9072AZCAP

National Command ALE Network:
2011.0 3204.0 4477.0 5006.0 6806.0 7602.0 8012.0 9047.0 10162.0 11402.0 12081.0 13415.0 14357.0 15602.0 17412.0 19814.0 25354.0 29894.0 kHz
Station List:
0001OKCAP 004MERCAP 004RMRCAP 004SWRCAP 0004ARCAP 0004IACAP 0004MICAP 0004MSCAP 0004NVCAP 0004NYCAP 0004TXCAP 0004WICAP 0004WVCAP 0010NVCAP 0010PACAP 0011ARCAP 0011CACAP 0011DCCAP 0011NVCAP 0011OKCAP 0011RICAP 0014NVCAP 0016MECAP 0016RICAP 0020CTCAP 0020NHCAP 0021CTCAP 022NHQCAP 0025CTCAP 0032WICAP 032WVCAP 033NHQCAP 034MERCAP 037RMRCAP 040NHQCAP 0040IACAP 0040WVCAP 0041CTCAP 0042NHCAP 042RMRCAP 043MERCAP 043SECCAP 0043ILCAP 044NCRCAP 046NHQCAP 047SERCAP 0048FLCAP 054NHQCAP 058NHQCAP 060PCRCAP 0065DECAP 0078NVCAP 0094ALCAP 100NCRCAP 100NERCAP 100PRCAP 100SERCAP 100SWRCAP 0100NDCAP 101NCRCAP 101NERCAP 0112GACAP 0140BRCAP 0140NCCAP 0140NVCAP 0148KYCAP 163CACAP 0164CACAP 0181ALCAP 201SERCAP 202SERCAP 0204TXCAP 0220INCAP 0230NECAP 0303WACAP 0314MICAP 0323AZCAP 0355OKCAP 0360FLCAP 0431ILCAP 0602IACAP 0748MOCAP 0775NVCAP 0902ALCAP 952NHQCAP 1000SWRCAP 4800MNCAP 6700ARCAP 9101ORCAP 9999INCAP AED AVS JNR MCC NATLCAP OFF RIC

❖ Military Frequency Changes

Below is a list of some of the latest changes in military frequencies reported from U.S. government public domain sources. (Frequencies are in MHz unless otherwise indicated).

Cannon AFB, New Mexico (KCVS)
118.425 Cannon Approach Control

Chicago ARTCC (ZAU)
273.525 Low/High Altitude, Pullman, Michigan RCAG

Fayetteville Regional, Arkansas (Grannis Field) (KFAY)
285.575 Com RTR (ex-397.850)

Fort Campbell/Campbell AAF, Kentucky (KHOP)
237.600 Shoc Pad

Fort Hood/Hood AAF, Texas (KHLR)
38.900 Longhorn Tower
143.000 Longhorn Tower
237.500 Longhorn Tower

Fort Indiantown Gap/Muir AAF (KMUI)
118.250 Harrisburg Approach (ex-116.250)

Fort Rucker/Cairns AAF, Alabama (KOZR)
41.200 Air-to-Air
139.125 Shell ATCT – Local VHF
139.200 Hooper Tower – East Primary
139.425 Brown Stagefield – Tower North (ex-149.800)
139.550 Lucas Tower – New Tower East (ex-148.925)
140.225 Hanchey Tower – Local Control (ex-141.800)
140.250 Hub Radio - Hub FOC AO Hawk (ex-149.700)
142.125 Lowe AHP – Lowe Base Operations (ex-140.675)
142.425 Shell ATCT – Ground VHF (ex-148.800)
142.500 Hanchey Tower – Ground Control (ex-149.600)
142.900 Runkle Tower – Tower South (ex-139.425)
143.500 Goldberg Stagefield – Tower East
225.625 Hooper Tower – East Alternate
342.225 Hooper Tower – West

Jacksonville ARTCC (ZJX)
127.575 Alma Georgia RCAG (ex-132.300)
269.025 Alma Georgia RCAG (ex-290.400)

Key West NAS, Florida (Boca Chica Field) (KNQX)
313.700 Key West Approach Control

Melbourne International (KMLB)
134.350 COM RCAG (ex-135.075)

Montgomery Regional Field (Dannelly Field) (KMGM)
360.975 Air National Guard Operations

Mountain Home AFB, Idaho (KMUO)
324.100 PMSV Metro (ex-342.500)
371.850 Departure Control (ex-371.200)
341.800 Pilot-to-Dispatcher (PTD) (ex-372.200)

Nellis AFB, Nevada (KLSV)
119.350 Nellis Control: Tonopah
126.650 Nellis Control: Wilson Creek/Caliente
254.400 Nellis Control: Tonopah
317.525 Nellis Control: Wilson Creek/Caliente

Niagara Falls International, New York (KIAG)
261.900 Command Post Decommissioned (Fuzzy callsign)
340.025 Command Post, users of Fuzzy and Horseshow now contact this command post. (Carbonate callsign)
371.250 Command Post Decommissioned (Horseshow callsign)

Pope AFB, North Carolina (KPOB)
134.100 Command Post – Available on request only
285.575 Fayetteville Approach Control (ex-397.850)
257.100 Command Post – Secondary
381.300 Command Post – Primary

Robins AFB, Georgia (KWRB)
320.100 Tower (Air-to-ground facility frequency, ex-316.125 now on tower frequency)

Yakima/Vagabond AHP, Washington (KFCT)
30.025 Operations (Callsign Rattlesnake)
118.150 ASOS
138.625 Operations (Callsign Rattlesnake)
363.400 Operations (Callsign Rattlesnake)

❖ Milcom Air Show Military Base Profile

The DoD military air show teams will only visit one military base this month: the U.S. Air Force Thunderbirds will perform at Travis AFB, California, at the end of July. So, for those who will attend this show, here is our exclusive frequency for this West Coast AMC base.

Travis AFB, California (KSUU)
(Mode is AM and frequencies are in MHz unless otherwise indicated)

Aeronautical

Aero Club UNICOM	123.300
AMC Air-to-Air	138.875 139.925
Approach Control	119.900/322.325 South, 126.600/291.000 North
ATIS	135.550/292.125 (Digital-ATIS, data link enabled)
Clearance Delivery	127.550/335.800
Command Post	141.900 252.100 311.000 321.000 349.400
Departure Control	119.900 126.600 306.900 322.325 (322.325 South and 306.900 North)
Ground	121.800/289.400
Ground Controlled Approach (GCA)	294.700 318.100
Pilot-to-Dispatcher (PTD)	342.500 (ex-285.575 NOTAM change)
PMSV Metro	271.100 271.200
Squadron/Wing Common	361.500
Supervisor of Flying (SOF)	349.700
Tower	120.750 239.050 254.400
Training	226.525 239.175
VQ-3/SCW-1 West Coast Alert TACAMO Air-to-Ground	279.800

Land Mobile Radio Trunk Radio System
Disaster Net Repeaters 408.0875/417.0875 and 409.125/418.125
P16 UHF Trunk Radio System, Motorola System ID 5F32
406.575/413.100 407.325/416.425 408.000/412.925
408.175/416.275 408.250/419.950 409.225/413.625
409.475/416.875 409.650/415.875 409.925/419.650
410.000/413.475 410.225/416.250 410.300/419.500
410.525/419.025 410.850/417.150

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Final Four Federal Activities

The NCAA Final Four basketball games recently held in Houston, Texas brought out a previously unheard of federal response and local monitors took note. As seen at the Super Bowl in Arlington, Texas just a few months prior, the FBI seemed to take a majority of the responsibility for the distributed radio communications. Although most activity was encrypted, no doubt that multiple agencies were working this event and most likely using radio networks set up for the Final Four.

Media reports prior to the events reported that security levels at the Final Four games and related events would be at "Super Bowl proportions." News reports also stated that federal agencies from the Secret Service, FEMA, FAA, TSA, EPA, US Postal Service and the Nuclear Regulatory Agency would be involved in federal security and intelligence operations, in addition to local, regional and state law enforcement agencies.

Reliant Stadium was the site of the actual games, but there were additional events at the George R Brown Convention Center and team hotels in the Galleria area. Some clear traffic made references to the "JHAT" or Joint Hazard Assessments Team, a term that has been used at other large secured events in the past.

Here is what Houston area listeners heard during the Final Four events:

161.2050, 146.2 PL	AMTRAK Police, most likely supporting with K-9 units
165.2375, 100.0 PL	DHS CBP NET 1
165.2875, N650	BATFE NET 1
165.8375	
165.8250, N060	DHS ICE
167.2375, N167	FBI
167.7875, N167	FBI A7
168.7625, N167	FBI
168.8875, N167	FBI A6
170.3750, N167	FBI
170.7250, Patched to Houston Police Department "Citywide" channel (460.5250)	
170.8625, N167	FBI
171.2000, both analog and P-25 digital reported on this frequency.	
171.4375, N167	FBI George R Brown Convention Center and Command Center
171.6125, N167	FBI
171.6875, N167	FBI
172.2125, N167	FBI
172.2875, N167	FBI
282.4250, CSQ AM	Customs Air Marine Division
411.7875, NAC 293	US Coast Guard allocation, heard but not confirmed

One unusual frequency noted was 171.2000 MHz. This channel was reported to be a "mixed mode" channel; that is, traffic was possibly in both analog and P-25 digital. The frequency is a nationwide US Department of Energy allocation and was noted after some clear traffic on one of the FBI channels indicated that the DoE was on location. It's again unknown if they were on scene as standard procedure or protocol, or if there was a specific threat to this event that warranted a visit from the Department of Energy.

❖ Department of Energy Radio Channels

As I was reading the listener reports from the Houston Final Four and the subject of the Department of Energy came up, I thought I would add some information about possible frequencies they might use.

Back in the September 2006 issue of *Monitoring Times*, I covered the subject of the DoE and some of the radio systems they used. I listed radio frequencies that are used at various DoE facilities across the country, but this time, let's take a look at what they might use anywhere and at any time.

Nuclear Emergency Support Teams (part of the Department of Energy's National Nuclear Security Administration) are scientists and technicians who respond to a suspected or confirmed nuclear emergency. While NEST is not a law-enforcement agency, they work in conjunction with the FBI, who is tasked with investigating illegal uses of nuclear materials. Some background on NEST and what they do can be found here: **www.nv.doe.gov/nationalsecurity/homelandsecurity/nest.aspx**

As part of the NEST equipment that is deployed in a nuclear emergency, transportable communications gear is undoubtedly a big portion of the "go kit." There are a number of frequencies that have been rumored to be part of a cache of radio channels available for use anywhere by NEST. The Department of Energy has numerous allocations throughout the federal VHF and UHF bands, so be sure and search for possible DoE activity. But also keep an ear on the following frequencies at the next large event and see if anything is active:

163.1000 164.2750 164.8625 167.9750 168.4500 171.2000 171.9500 173.0000

These channels were confirmed as being in some of the DoE transportable radio systems at one time. I suspect they are still current and may be analog or P25 digital, with encryption available in either mode. And be sure to let me know what you find active!

❖ EPA Radio Channels

Another agency that can show up at some of these large-scale public events is the Environmental Protection Agency, or EPA. Formed by an executive order by President Nixon in 1970, the EPA is an independent government agency tasked with setting and enforcing national standards for environmental quality. The EPA responds to some natural disasters where environmental quality is a concern and to man-made disasters, such as oil or chemical spills. Since the formation of the Department of Homeland Security, the EPA has been supporting DHS with air quality and monitoring the air for hazardous substances at large public events, such as Super Bowls.

The EPA does have radio channels available for their use at these events, but they are not often heard. I recently received some information regarding the new standard EPA radio channel plan for disaster response. The radios are set up with different zones of channels, depending on the situation and needs of the responding EPA crews. Here is a rundown of the radio layouts as used by the EPA; all frequencies are in megahertz:

ENVIRONMENTAL PROTECTION AGENCY

ZONE 1 – EPA Simplex

Channel Name	Receive Frequency	Transmit Frequency
1 EPA CSQ	164.4500, CSQ	164.4500, CSQ
2 EPA DPL	164.4500, CSQ	164.4500, D114
3 FED ER 1	162.7000, CSQ	162.7000, D143
4 FED ER 2	162.7750, CSQ	162.7750, D165
5 FED ER 3	166.4500, CSQ	166.4500, D205
6 FED ER 4	166.4750, CSQ	166.4750, D315
7 FED ER 5	173.8750, CSQ	173.8750, D371
8 EMERGENCY	173.9125, CSQ	173.9125, D423
9 MARINE 81A	157.0750, CSQ	157.0750, CSQ
10 MARINE 82A	157.1250, CSQ	157.1250, CSQ
11 FED CSQ OPEN	168.3500, CSQ	168.3500, CSQ
12 FED DPL OPEN	168.3500, CSQ	168.3500, D532
16 EPA CSQ	164.4500, CSQ	164.4500, CSQ

ZONE 2 – EPA Repeaters

1 EPA RPT	173.8750, D731	166.4750, D731
2 NI/CG RPT 1	168.7000, CSQ	170.9750, CSQ
3 NI/CG RPT 2	168.1000, CSQ	170.4500, CSQ
4 NI/CG RPT 3	168.0750, CSQ	170.4250, CSQ
5 NI/CG RPT 4	166.6125, CSQ	168.4000, CSQ
6 NI/CG RPT 5	167.1000, CSQ	169.7500, CSQ
7 NI/CG RPT 6	168.4750, CSQ	173.8125, CSQ
8 NI/CG SIM 1	170.9750, CSQ	170.9750, CSQ
9 NI/CG SIM 2	170.4500, CSQ	170.4500, CSQ
10 NI/CG SIM 3	170.4250, CSQ	170.4250, CSQ
11 NI/CG SIM 4	168.4000, CSQ	168.4000, CSQ
12 NI/CG SIM 5	169.7500, CSQ	169.7500, CSQ
13 NI/CG SIM 6 29	173.8125, CSQ	173.8125, CSQ

ZONE 3 – Mutual Aid

1 V-CALL	155.7525, CSQ	155.7525, CSQ
2 V-TAC 1	151.1375, CSQ	151.1375, CSQ
3 V-TAC 2	154.4525, CSQ	154.4525, CSQ
4 V-TAC 3	158.7375, CSQ	158.7375, CSQ
5 V-TAC 4	159.4725, CSQ	159.4725, CSQ
6 IR RPT-CALL	169.5375, CSQ	164.7125, 167.9 PL
7 IR RPT-1	170.0125, CSQ	165.2500, 167.9 PL
8 IR RPT-2	170.4125, CSQ	165.9625, 167.9 PL
9 IR RPT-3	170.6875, CSQ	166.5750, 167.9 PL
10 IR RPT-4	173.0375, CSQ	167.3250, 167.9 PL
11 IR VHF-5	169.5375, CSQ	169.5375, CSQ
12 IR VHF-6	170.0125, CSQ	170.0125, CSQ
13 IR VHF-7	170.4125, CSQ	170.4125, CSQ
14 IR VHF-8	170.6875, CSQ	170.6875, CSQ
15 IR VHF-9	173.0375, CSQ	173.0375, CSQ
16 FED OPEN	168.3500, CSQ	168.3500, CSQ

In the above list, CSQ stands for open or carrier squelch, PL is CTCSS tone squelch, and D is DCS or Digital Coded Squelch. You will notice that the EPA appears to prefer DCS as opposed to CTCSS sub-audible tone squelch. Not too many other federal agencies utilize DCS squelch on their radio systems. Also note the presence of marine channels in the EPA radios. These channels are specifically set aside for marine environmental spills and other disaster response with the Coast Guard.

The EPA response teams have transportable repeaters available for use, as can be seen in Zone 2 of the radio template. Zone 3

contains nationwide local and federal interoperability frequencies that are showing up in almost every federal agency channel plan.

In some of their radios, the EPA has set aside two additional zones of digital channels. The frequencies are laid out in the same order as Zones 1 and 2, but in P-25 digital. So far I have not found any information as to P25 NAC's used by the EPA, but when that information becomes available, you will find it here in the *Fed Files*!

❖ Olympic National Forest

Each month I have been highlighting a National Park or US Forest in the Pacific Northwest. This month we will look at the Olympic National Forest in Northwestern Washington State.

The area once known as the Olympic Forest Reserve became the Olympic National Forest in 1907. The forest covers nearly 640,000 acres and surrounds the areas near the Olympic National Park and the Olympic Mountain range.

As with other large national forests, they rely on a number of radio repeaters scattered across the acreage, all with a common output frequency. In the case of the Olympic National Park, the inputs to all these repeaters also utilize a common input frequency with a unique CTCSS squelch tone for each location.

OLYMPIC NATIONAL FOREST

	Repeater OUT	Repeater IN
EAST NET		
Blyn	171.4750, 123.0 PL	164.8000, 136.5 PL123.0
Maynard	171.4750, 123.0 PL	164.8000, 162.2 PL
Buck (Crows Nest)	171.4750, 123.0 PL	164.8000, 179.9 PL
Jefferson	171.4750, 123.0 PL	164.8000, 97.4 PL
Gold	171.4750, 123.0 PL	164.8000, 123.0 PL
South Mountain	171.4750, 123.0 PL	164.8000, 110.9 PL
Spoon	171.4750, 123.0 PL	164.8000, 91.5 PL
WEST NET		
Neilton	171.5500, 123.0 PL	164.8250, 114.8 PL
Higley	171.5500, 123.0 PL	164.8250, 131.8 PL
Mt Octopus	171.5500, 123.0 PL	164.8250, 141.3 PL
Humptulips	171.5500, 123.0 PL	164.8250, 203.5 PL
Mt Ellis	171.5500, 123.0 PL	164.8250, 151.4 PL
North Mtn	171.5500, 123.0 PL	164.8250, 94.8 PL
Hunger	171.5500, 123.0 PL	164.8250, 100.0 PL
TAC		
All Forest Personnel	164.9625, CSQ	164.9625, 123.0 PL
AVIATION NET		
National Flight Following	168.6500, 110.9 Hz	168.6500, 110.9 Hz
Air Guard	168.6250, 110.9 Hz	168.6250, 110.9 Hz
Olympia NF Air-to Ground	167.6250, CSQ	167.6250, CSQ

❖ Mt. Rainier Update

In the May *Fed Files* I spotlighted Mt. Rainier National Park, also in Washington State. After that column was published, I received some updated information about some of the frequencies I provided. The "fire mobilization" frequency of 171.7750 MHz is no longer utilized by Mt. Rainier since they went narrowband. The UHF frequency of 419.9500 MHz is an old link channel, also no longer in use. And the 406.2500 MHz channel may be a satellite telemetry uplink frequency.

It was pointed out that the list I published had the Air Guard and National Flight Following frequencies reversed. Color me embarrassed, but consider that they were reversed on some USFS documents as well! But they are correct in the Olympic National Forest list above.

That's all for this installment of the *Fed Files*. I'll be back in September with more federal monitoring information!

BOATS, PLANES, AND TRAINS

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Becoming an RF Sleuth

With this summertime column, I paused to think how the rising price of gasoline and other items might be affecting the traveling public. Like so many other people, I have decided to put off a planned driving trip to eastern Canada because of the rising cost. The word "staycation" seems to be becoming ever more prevalent these days. I guess it will be added to the dictionary soon!

When I first got into the shortwave monitoring hobby, we were called "Armchair Adventurers." It seems to me that with people staying home more, the armchair adventure might become more common again. Where else can a person become lost for a few hours far away from home or hear some interesting events taking place, without burning a single gallon of gas?

❖ South Carolina DX

My March vacation in Myrtle Beach, SC saw me with an array of listening gear placed near the window. My Grundig Satellit 750 proved to be an invaluable receiver and did surprisingly well with just the attached whip antenna. An Icom T90A amateur handheld, my marine handheld, and a dual band rig in the car completed the equipment.

We did not know if we would have an internet connection on a regular basis, so I also wanted to keep in touch with things back in Canada. I was able to monitor Radio Canada International, along with Radio Australia and Radio New Zealand, for interesting news. I even picked up the shortwave service of CFRB Toronto, CFRZ on 6070 kHz. CHU Ottawa on 7850 and 14670 kHz were strong signals.

On the marine side, I was able to monitor some VHF traffic. Several Coast Guard stations came in on channel 16 and also on channel 22A. Channels 9 and 13 were useful for monitoring the Intracoastal Waterway. Of course, most ship-to-ship channels were busy. I was particularly interested in the Canadian yachts traveling back north from a winter in Florida.

As for HF radio, I had no trouble hearing Bermuda ZBR on 2182 and 2582 kHz, as we were practically on the same latitude. I also noted how times have changed. At a Myrtle Beach coffee shop, I had a great chat with two Coast Guard crewmen. I asked if they used HF radio at all. They said, very little, and that if they wanted to test HF they had to phone Coast Guard Oak Island to turn on the HF set so they could test their equipment.

Being right on the coast, the Canadian East Coast stations on 2182, 2598 and 2749 kHz came in well at night. The USCG on 5696 and 8983 were very strong. I hope to put up a wire antenna next year and get even better results.

My marine handheld also has a built-in weather alert and I was made aware of a severe thunderstorm warning and a tornado watch while I was there.

Freighter Umiak 1 below Montreal

❖ Finding the Frequencies

If you are to become an armchair adventurer, you must have frequencies to monitor. This is where you get to be an RF sleuth and have the fun of discovering what is going on in your area.

One way to do this is to just cruise over the shortwave spectrum and see what you find. This is quite inefficient, but it was once the only real option hobbyists had.

Another is to look in radio publications like *Monitoring Times*. A subscription is invaluable. I am particularly fond of the online magazine format. Like many long time radio enthusiasts I did not think I would like it, but I get the magazine early and have no problem storing it. I can also print out just the pages I want. Again, I bring up Hugh Stegman's *Utility World* column as a great place for frequency information and time of day for reception. If you see that people in your area are receiving 6 MHz aircraft transmissions, then it is likely that 6 MHz marine traffic may also be heard.

Of course, you can also search the Internet. Google is also a good source of marine frequency listing sites.

❖ Canadian Marine Frequency Sites

I have two particular sites for Canadian marine frequencies that I use. The first is the Radio Frequency Search provided by Industry Canada. This office has absorbed others including the Department of Communications. You can access this search at the address **http://sd.ic.gc.ca/Radio_Frequency_Search**. You can also put Spectrum Direct Radio Frequency Search in Google.

Here you can search for frequencies by frequency, frequency range, geographic area, license owner or call sign. If you put in a range of marine frequencies, you get all the users. If you put in a range of frequencies and a geographic area, you can narrow the search. I found all the Canadian Marine Coast station frequencies plus a few I did not know of. The listing seems to be quite up to date, as there are some listings for local businesses which have just started.

This technique is useful for any kind of service search. I found a listing for 2080.4 kHz for a fishery on Lake Erie. I also found a listing for 2186.6 kHz. I did find some Coast Guard

vessel HF listings for a Great Lakes ship. I have been told they are not used in summer but are used in winter during ice breaking operations.

I also found some interesting listings for VHF. Channel 7A is used by several boat lines on the Great Lakes. 156.275 MHz is used by the Department of Fisheries. Channel 18 is also used by a local boat line. Be sure to scan all the marine channels as there may be specific assignments in your area.

I also found some listings for marine companies outside the marine frequency range. Parks Canada uses 157.47 MHz, and 157.455 MHz is used by Owen Sound Transportation, Pelee Island Division. Suffice it to say, the frequency search is worth a look.

The second site is for Radio Aids to Marine Navigation. This is the official document for Canadian Coast Stations, and the 2011 edition is available. There is an edition for the East Coast, Great Lakes and Lake Winnipeg, and eastern Arctic, as well as a Pacific Coast edition. You can see the location, frequencies, and broadcast schedules for all Canadian Coast Guard Radio Stations, including those for ship traffic control on the various waterways. The Canadian arctic stations, mentioned before in my columns, will be on in July and are a good catch.

Some stations use a variety of operating modes, including USB, FAX and NAVTEX. All the information you need can be found here. The website is **www.ccg-gcc.gc.ca/eng/ccg/mcts_radio_aids**. You can also Google search the publication.

In the Industry Canada site you can also find a table of frequency allocations for Canada. It tells what frequency ranges are allotted to what service.

While searching the internet, I came across a listing for HF frequencies for Marine Atlantic Ferries in Eastern Canada. 2324.5, 2367.5, 4466.5, 4993.5, 5761.5, 7409.5, 7836.5 and 11418.5 MHz USB were listed. I am curious how much they are used. Can any of our readers tell us?

❖ USCG Weather Broadcasts

As of January 2005, according to their website, the US Coast Guard monitors the following voice frequencies for initial contacts and distress: 4125, 6125, 8291 and 12290 kHz USB.

The US Coast Guard HF voice weather broadcasts are aired at various times and on several frequencies. They use USB and a computer synthesized voice. Schedules for NMN Chesapeake, VA; NMG New Orleans, LA; NMC Point Reyes, CA; NOJ Kodiak Alaska; NMO Honolulu, Hawaii; and NRV Guam are all listed there. They use 4, 6, 8, 12, 13 and 17 MHz frequencies.

6501 kHz is common to most of them. I have heard NOJ here on that frequency. Besides giving interesting weather data they can serve as propagation guides for your area. Since they broadcast on a regular schedule, you can check signal strength easily.

NOJ gives the Bering Seas forecasts, and if you watch *Deadliest Catch* you can get an idea of what the fishermen are encountering. Watch the radios shown on the program: I have seen 4125 kHz, 6501 kHz and 2088.4 kHz being used on HF. Channels 16, 21A and 22A have been shown on the VHF radios. Once a radio sleuth, always one, I guess!

❖ HF Marine Channels

The web site **www.naval.com/HF-freq.htm** will give you all the HF marine SSB channels. The channels are numbered and usually have two frequencies. The higher frequency will be the shore station and the lower will be the ship frequency. Be sure to look in both areas of the band. If you hear a shore station, check the corresponding ship frequency for that channel. Of course, ship enthusiasts like me will look up any ship we hear to see what type it is, etc.

The website **www.ac6v.com** will give you all the frequency information you can handle. Look for his list of frequencies from dc to daylight. You will also notice that some marine CW frequencies still exist. Don't be afraid to give them a try. CW identifiers are also used on marine digital stations. Just by looking around, I found SVO, a station in Greece, giving a CW identifier at 0120Z, on 8423.3 kHz. Shortly thereafter I heard the CW identifier for HEB on 4251.1 kHz. They have a great website describing this Swiss station. Who knows what you will hear?

❖ VHF Marine Channels

If you have a marine VHF radio, scan in the I (International), C (Canadian) and U (United States) settings, so you will not miss some of the simplex channels used. If you have a scanner, remember to scan from 156.0 to 157.4 MHz and from 160.0 to 162.025 MHz to catch all the channels used. The higher frequencies are referred to as B frequencies and are used by shore stations. The lower, A, frequencies are used by ships. All simplex channels are on A frequencies.

Also look for your local police fire and rescue services. There are many of these which have marine units. Our local fire and Ontario Provincial Police units all have vessels and often use their own frequencies to contact their offices.

For those of you who monitor the AIS system for ships, the St. Lawrence Seaway is now including water depth information in the broadcasts. If you do not have an AIS receiver you can see this type of information at **www.marinetraffic.com/ais/**. They have AIS data from worldwide locations.

❖ Amateur Radio

With the summer coming, I often hear amateurs on vessels using the local VHF repeaters. Many Skywarn (US) and Canwarn (Canada) weather groups activate on amateur VHF repeaters during weather alerts. Frequencies can be found by scanning 145 to 148 MHz and 430 to 450 MHz, by checking the internet, or by asking local amateur operators.

On HF, the Maritime Mobile Service Net and Pacific Seafarers Net on 14,300 USB handles traffic from many maritime mobiles and broadcast weather info on the half hour. I always listen and have contacted some interesting ships by hearing them there first. The Great Lakes Marine Net is still on 3932 and 726 kHz at 0830 and 1930 Eastern Time. They usually go to 7261 after about 15 minutes. You can also try the Caribbean Weather Net on 3815 kHz at 1030 and 2330 UTC. Don't forget the Hurricane Watch Net on 14,325 when a storm threatens land.

❖ Final Thoughts

My sympathy goes out to all who have been so badly distressed by the large number of storms and flooding in the United States and Canada. Record rainfall and tornados have caused so much damage and injury to many. Like many radio amateurs, I am on standby here to provide communications in an emergency.

I can't stress enough the usefulness of a weather radio with a built-in alert function. It just might be a lifesaver. We had sustained winds here of over 50 mph and a tornado watch in April. Listening to weather radio and the amateur bands was a great help, particularly when we lost power.

Again, please send in your monitoring reports, frequencies, useful websites, etc. to my address in *Monitoring Times*. I have set up a new mailbox here and should get your emails without problem.

There are many interesting vessels which are coming up the Seaway and I use the radio to get accurate times when they will be at the best photography locations. This longtime armchair adventurer will be listening and I hope you are as well. Who knows? You may even become the *Hercule Poirot* of the radio spectrum!

Tug Commodore Straits, a surprise visitor to Kingston

GLOBALNET

Exploring the World of Internet Radio and Television

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Tracking the Tropics Goes Digital

When I was younger, hurricane season was one of the more eventful times of the year in the Van Horn household. And it would have been even if we had not lived in cities like Jacksonville, Florida and New Orleans, Louisiana many of those years – cities with a vested interest in the eventual landing spots of tropical disturbances.

I have written frequently about fond memories of my parents turning the dials to tune in transmissions from the affected areas directly. This set up my lifelong fascination with obtaining information directly from the scene of the action, with as little filtering from a third party as possible.

However, our fascination went beyond just simply tuning in radio transmissions from hams relaying messages to Caribbean islands. Every year we picked up the latest hurricane tracking map, and each new update from the hurricane center resulted in three people with pencils in hand marking the storm's latest location.

Later, I remember my father and I interfacing a radio with our computer to print out weather maps and the latest satellite images. This was all in the days before you could simply type in a Web address and have instant access. Back then, getting this type of information was reserved for a privileged few with the knowledge and equipment to access it.

Thankfully, that is no longer the case. Today, there is a wealth of information at our disposal for tracking and monitoring hurricanes that we could only dream of back then. Comparably, we have our own personal weather stations at our fingertips, thanks to the abundance of Web sites available with this information on the Internet.

With the peak of hurricane season nearly upon us, let's take a look at the resources available for those wanting to stay on top of the latest hurricane information. In addition to streaming audio and video, we will take a look at some places you can find up-to-date storm information, weather maps and tracking data.

I do want to make a quick note about the information I am going to include here. While resources like the Weather Channel are fine for basic information, the target of this column is those who want a little more detailed and in-depth information, often straight from the government agencies involved, like the National Hurricane Center or FEMA. I by no means claim this to be a complete resource, merely a collection of some of the resources that I find myself frequently using during hurricane season.

Of course, I welcome your additions of Web sites that you utilize. You can email me at *loyd@globalnetmt.com* if you have something you would like to share with our readers.

❖ Getting storm data – Where is the action?

The first thing you usually want to do is to find out where storms are located and where they are heading. This will help direct you to the radio stations or weather stations to tune in online. From there, you can plan appropriate listening strategies as the storm progresses.

The National Hurricane Center is the straight-from-the-horse's-mouth source of information on all tropical storms in the Atlantic or Pacific. Not only do they post forecasts and bulletins on each storm, but they also have visible satellite, IR, and water vapor images for weather buffs, to help get a clearer picture of what is happening in the storm.

Another fantastic Web site is StormPulse. This Web site offers its service to companies for forecasting and storm alerts, but also has a pretty significant and sophisticated interface for tracking tropical storms.

Here you can find the latest satellite imagery, radar for when the storms approach land, projected path cones, NHC forecasts and more.

❖ The sounds of the storm

So, now that you know where the storm is and what it is doing, it's time to take a listen to what is happening.

The first thing you might want to check out is the NOAA Weather Radio station for the affected area if the hurricane is targeting a region in the U.S. (Don't forget about Hawaii; they get Pacific storms out there, too).

The easiest thing to do might be to search a streaming database like TuneIn for the specific city in question, or do a Google search to see if there is a stream for the NOAA station you want to listen to. There are a few Web sites that contain links to a good number of the NOAA streams. However, I haven't found any of them to be all-inclusive or entirely reliable.

The most reliable list I have found comes from WeatherUnderground. All of the NOAA streams I checked out worked, but the trouble is that not all streams are linked here. There is a pretty large list from the NOAA Web site that links to third-party Web sites that stream their All-Hazards stations. This list, too, does not appear complete, and a good number of the streams I tried weren't working, but you may have better success than I did, so it is at least worth a shot.

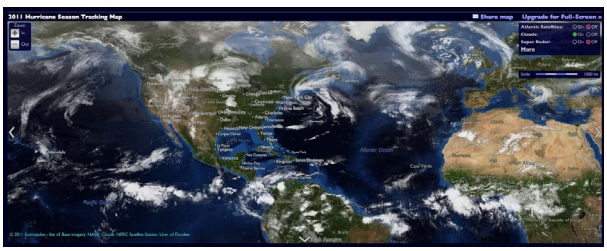
As I mentioned last month in my "breaking news tips" column, another good place to look for information is on local television station web sites or on-line streaming in the affected area.

During the late April tornado outbreak in Alabama, Georgia, and Tennessee, I was watching non-stop live coverage from nearly every television station in the affected area. They were doing live video shots, continuous radar updates, call-ins from government officials and local residents reporting damage, etc. These are fantastic resources for finding out directly from the local media what is happening.

Likewise, you might want to use a streaming database like TuneIn or Reciva to find the local radio stations. Often they will do non-stop storm coverage as well. I have previously mentioned the fantastic job that WWL-870 AM in New Orleans did at providing information during Hurricane Katrina, so a Gulf Coast hurricane usually has me stopping here early and often.

❖ Nonbroadcast Sources

In our never-ending search for information directly from the scene, there are still ways you can hear the live action, even before storms hit the mainland.



The Hurricane Watch Net on 14.325 MHz is an invaluable resource for on-the-ground observations from amateur radio operators within 100-miles of a hurricane. Run by the amateur station at the National Hurricane Center, WX4NHC. Hams have for years monitored this frequency for emergency communications from within the affected areas.

There is also a Voice-over-Internet-Protocol (VoIP) Web site devoted to weather and hurricane communications. There is a weekly Skywarn/Hurricane preparation net that meets at 0000 UTC Sundays. This can also be a good source of information during hurricanes.

During times of activity, there are numerous streams on the Web of the Hurricane Watch Net, but the most reliable comes direct from the Hurricane Watch Net Web site.

Likewise, there are online receivers capable of tuning in VHF Marine emergency communications and Coast Guard communications. It is impossible to post the links to all of these sources in the scope of this column. The best way to find what you want is to become familiar with likely online receivers ahead of the storm and then use them to search for the area that you want to tune in.

I have provided information on these online receivers in previous columns, but I will include here what I consider to be one of the better sites to find streaming receivers: GlobalTuners (link the table at the end of the column). Likewise, you might want to do a Google search or join an online forum like Yahoo's LiveScannerAudio or RadioReference; there are often posts during major storms for streams from the affected area.

There are a few good general purpose places to look for marine communications and Coast Guard communications in general.

The Coast Guard Amateur Radio station runs a daily net on 14.300 MHz, and there is a link from their Web site to listen to this live. There is also a link available to listen to previous Nets at SSB Net Podcasts. You can also access this Net stream from the 14300 Net Website: see the link in the GlobalNet links below.

I also found a good source for streaming VHF marine traffic. The Budget Boat Towing Web site has live and archived audio from marine channels 05A, 16 (international distress calling channel) and 22A. It is worth a check regularly, not just during hurricane season.

As with chasing any major breaking news or natural disaster through traditional radio, finding communications online is about preparing ahead of the event to know where to look, so that you can immediately pull up your Web sites and not miss any of the action!

❖ Internet Radio Changes

The two largest stream providers have made fairly significant changes recently, but it shouldn't be anything to scare off users.

First, industry leader RadioTime has officially changed its name to TuneIn. This comes after the Dallas, Texas-based company acquired its smartphone application last September. As of press time, not much has changed in the interface through the newly-named Tunein.com Web site. Likewise, there is no word on what, if any, effect this will have on other formerly-RadioTime based apps, such as the popular WunderRadio.

The other big name in stream sourcing, Reciva, also made a significant announcement recently. The company says its focus in the future will steer away from hardware development and more towards "server side" products, which will allow them to expand their already large streaming database and add additional features, including still pictures and video.

Basically what this means is that, while Reciva has been pursuing features such as Rotel and Grace Digital for development, it will shift its focus from hardware development to software ventures. This is more in line with what TuneIn has been doing, allowing third-party developers to use the streaming database for their products, but placing the company focus on expanding what its database service offers.

It sounds like both TuneIn and Reciva – long the two dominant source streams for mobile apps, WiFi radios, and countless home computer users – are positioning themselves for a head-to-head contest. I have discussed in previous columns that I thought that TuneIn (then RadioTime) seemed to be doing at establishing itself as the industry-leader among streaming databases. Now Reciva seems to have realized this and is focusing efforts on closing the gap.

My logic behind proclaiming TuneIn as an early frontrunner is based on the businesses with whom they chose to partner. TuneIn has partnerships with Cisco, Kodak, Microsoft and Logitech. Those are some pretty big names with which to link the future success of one's company. We haven't seen the same efforts from Reciva, at least not yet. This latest announcement, I predict, will change that.

All-in-all, it will be interesting to see how these two companies push each other for market share of the rapidly growing WiFi radio and mobile app market. This will be especially true as Internet radio and other Web-apps are more widely used in automobiles. TuneIn has already started making a push in this effort. If Reciva is serious about being the leader in the industry, they will have to do the same.

That should just about wrap up this month's edition of *GlobalNet*. Look for a review in next month's *MT* that should appeal to streaming enthusiasts and audio/video junkies in general. Here's a hint: I am calling this amazing little black box "the ultimate bundle" for how well it ties everything together.

Until next month, 73!

GLOBALNET LINKS

14300 Net Web site - **http://14300.net/avlinks.html**
GlobalTuners - **www.globaltuners.com/**
HearWeatherRadio - **http://hearweatherradio.com/**
Hurricane Watch Net - **www.hwn.org/**
National Hurricane Center – Satellite Imagery - **www.nhc.noaa.gov/satellite.shtml**
StormPulse - **www.stormpulse.com/atlantic**
VoIPWx - **www.voipwx.net/**
W4CGC.ORG - **www.w5cgc.org/**
WX4NHC Web site - **http://www2.fiu.edu/orgs/w4ehw/**
Reciva - **www.reciva.com/**
TuneIn - **http://tunein.com/**

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
kevincarey@monitoringtimes.com

Longwave in Retrospect

It is well established that the higher one goes in frequency the trickier it is to get a radio circuit working in a stable and predictable way. Interestingly, our perspectives on what constitutes a "high frequency" have changed over the decades. For example, 30 MHz was once considered to be Ultra High Frequency (UHF), whereas we now consider it to be the start of the Low-Band VHF spectrum. This helps explain why a "UHF connector" (the common PL-259 type) is *not* recommended for use at what we consider UHF today (300 MHz to 3 GHz).

Taking the above into account, it is not difficult to see why much of radio's early history was played out on the longwave frequencies. Things worked better there, in terms of stability and construction tolerance. Lead lengths of components were of practically no concern, and drifting was not a big problem on longwave. Everything became more critical as things went up in frequency, so most early gains in radio naturally took place on longwave.

Ironically, Heinrich Hertz's 1887 lab experiments with a resonant loop and small spark gap are believed to have been conducted on what we now consider to be VHF frequencies (perhaps near a 4-meter wavelength). Despite this landmark experiment proving the existence of electromagnetic energy that could be conveyed over a distance, the overwhelming amount of early work in radio occurred on longwave. At one time, in fact, it was widely believed that the longer the wavelength, the longer the communication range.

With the discovery of long-range HF communication in the 1920s and 30s, things began to change. There was a steady migration upward in frequency for many radio services. Hams, in particular, demonstrated early on the potential for DX using medium and high frequencies (MF and HF) on wavelengths of less than 200-meters. Relegated to these frequencies by law, hams made the best of the situation, soon discovering the huge value that these "short waves" offered.

Despite the meteoric growth of HF and VHF, longwave remains – even to this day – an important spectrum for some applications. Broadcast, military and navigation services are primary users of the band, but even hams are exploring its usefulness for ground wave coverage in emergency situations. The steady and predictable propagation of longwave makes it a natural choice for all of these services. It comes at a cost, due to the large antennas and high power that are often used, but the benefits are there, just the same.

❖ Web Resources

Do you recall about 10-12 years ago when many thought the Internet was going to spell the doom of our radio hobby? It simply didn't happen. It turns out that the Internet has become a fantastic tool for information exchange and recruiting of others into our hobby. Today, you can get online and find help with troubleshooting, learning about utility signals, you can download decoding software, and even purchase all of the pieces you need to put a station together. Just about everything is there – if you know where to look.

This month, we'll explore some websites related to historical uses of the longwave spectrum. Below, in no particular order, are websites dealing with the topic along with brief descriptions of each site's content. Do you have other links to add to the list? Send them along so we can present them in a future column.

www.alexander.n.se/

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

www.hermanboel.eu/radiohistory/index.htm

This website covers European LW/MW Broadcast History. Want to see what the LF broadcasting scene looked like in Europe from 1925 on? This is the place to find out.

www.angelfire.com/space/proto57/rdf.html

From time to time we've covered the intrigue of Radio Direction Finding (RDF) receivers, which were once commonly used on boats of all sizes. The web URL above is an excellent place to learn more about these units and see photos of many classic models. My favorite is the Sperry three-band RDF, which has a real *Jetson's* look!

http://jproc.ca/radiostor/aalt.html

This site covers the history of the interesting high power transmitter that operates on 17.2 kHz in Sweden (see www.alexander.n.se/ above). It uses no tubes or transistors to generate its signals. This transmitter is fired up from time to time as a demonstration, and has been heard in the US.

www.loran-history.info/

Finally shut down in early 2010, the LORAN navigation system enjoyed a long and useful tenure on the longwave frequency of 100 kHz. It provided 1/4 mile positioning accuracy, which was not bad for ground-based system. Take a moment to review this site to learn about how things were done prior to GPS!

www.save500khz.org/

This site covers the grassroots efforts to preserve the 500 kHz Marine Distress & Calling Frequency as a historically significant place on the radio dial.

http://tinyurl.com/4xu2pav

This site covers the history of aerobeacons and the famous A/N Radio Range that operated through the 1960s in many areas.

http://tinyurl.com/LW-Propag

While not truly historical in nature, a good understanding of LF propagation can only help you to fully enjoy the LW band. A free e-book is now available for download titled *Understanding LF and HF Propagation*. It was written by Steve Nichols, G0KYA and Alan Melia, G3NYK of the Radio Society of Great Britain's (RSGB) Propagation Studies Committee. The book is based on a series of articles that Steve and Alan wrote on LF and HF propagation for the RSGB's *RadCom* magazine in 2008-09. It includes three features specifically focused on LF. You can download your free copy of the book at the URL above.

www.scribd.com

If you've been around long enough to remember Ken Cornell's *Low and Medium Frequency Radio Scrapbooks*, you know how chock full of information they are. Each issue is a non-pretentious look into what could be done to get on longwave and derive maximum performance from your gear and antennas. It had a homebrew theme to it. Ken would be the first to tell you, he was not a trained expert in radio, but rather a believer in picking up the soldering iron and trying something out.

On scribd.com, I was able to locate a copy

This spark transmitter, known as "Old Betsy," is displayed at ARRL Headquarters in Newington, CT. It was used by League founder Hiram P. Maxim.

of Ken's famous 1977 *Scrapbook* as well as his 1977/78 *Addendum* which added circuits on transistors. You can locate them both by going to the URL **www.scribd.com** and entering "Ken Cornell" in the search window. The two books should appear within the first few returns of your search. Next, click Download to save the PDF file to your computer. After downloading, you'll be able to open the file(s) and scroll through every page.

❖ Loggings & the Future of NDBs

We've grown accustomed to hearing about the imminent demise of non-directional beacons (NDBs) over the past 15 or so years. Thus far, it has not happened on a large scale, in large part because the stations offer a simple and reliable way of performing navigation and positioning. Recent budget challenges are forcing many services to be examined for their continued effectiveness, cost and criticality. The previously mentioned LORAN shutdown was one example.

NDBs are clearly an area in which there is opportunity for cost savings. These factors, along with recent innovations in high accuracy differential GPS (DGPS), might mean that we will begin to see more NDB shut-downs in the not too distant future. This is *not* to say that they will go away overnight. Private beacons and those serving remote areas appear to be more secure and will likely be with us for some time to come.

Nevertheless, I wanted to go on record as saying that no matter what happens to traditional beacon service, *Below 500 kHz* will continue to provide full coverage of the many other activities happening on longwave. These include Experimental/Ham activity, Natural Radio signals, time stations, and other utilities. Ham operation, in particular has a very promising future on longwave, and we will be there to cover it!

This month we have NDB loggings that are provided courtesy of Richard Palmer (MO) and Russ Hill (MI). Have some loggings of your own to send? Just use the address at the top of this column to get in touch.

See you next month!

NONDIRECTIONAL BEACON LOGGINGS

kHz	ID	ST/PR/ITU*	CITY	Date/Time	BY
201	CZE	AR	Clarksville	03/02 0729	R.P. (MO)
203	AB	SD	Aberdeen	03/02 0733	R.P. (MO)
204	B6	??	Unknown	03/02 0738	R.P. (MO)
204	YFY	NU	Iqaluit	03/18 0853	R.P. (MO)
208	YSK	NU	Sanikiluaq	03/06 0926	R.P. (MO)
209	MT	QC	Chibougamau	03/18 0858	R.P. (MO)
210	CLO	CLM	Cali	03/02 0752	R.P. (MO)
212	YGX	MB	Gillam	03/07 1101	R.H. (MI)
219	ZRS	SK	Regina	03/24 1115	R.P. (MO)
227	CG	BC	Castlegar	03/18 0906	R.P. (MO)
241	YLL	AB	Lloydminster	03/24 1123	R.P. (MO)
242	MMI	TN	Athens	03/02 0851	R.P. (MO)
248	FRT	SC	Spartanburg	03/17 1104	R.H. (MI)
248	QL	AB	Lethbridge	03/24 1126	R.P. (MO)
248	UL	QC	Montreal	03/17 1104	R.H. (MI)
248	WG	MB	Winnipeg	03/16 1105	R.H. (MI)
260	YSQ	BC	Atlin	03/24 1129	R.P. (MO)
263	QY	NS	Sydney	03/18 0936	R.P. (MO)
273	DOM	DMA	Melville Hall	03/19 0820	R.P. (MO)
277	V2	SK	Humboldt	03/24 1136	R.P. (MO)
278	UBA	CUB	Baracoa	03/19 0834	R.P. (MO)
280	QX	NL	Gander	03/03 0340	R.P. (MO)
282	OXD	OH	Oxford	03/01 1437	R.P. (MO)
283	UZG	CUB	Zaragoza	03/13 0222	R.P. (MO)
284	MXR	NM	Raton	03/19 0850	R.P. (MO)
287	GS	SC	Greer	03/03 0353	R.P. (MO)
326	ZEF	NC	Elkin	03/03 0834	R.P. (MO)
332	BVN	NE	Albion	03/03 0854	R.P. (MO)
332	SBU	MN	Blue Earth	03/03 0850	R.P. (MO)
335	ZKF	ON	Kitchener	03/03 0902	R.P. (MO)
341	ZLP	ON	Toronto	03/03 0915	R.P. (MO)
344	BKU	MT	Baker	03/07 1107	R.H. (MI)
344	YC	AB	Calgary	03/07 1209	R.P. (MO)
344	ZIY	CYM	George Town	03/03 0922	R.P. (MO)
349	AAF	FL	Apalachicola	03/21 0852	R.P. (MO)
350	DF	NL	Deer Lake	03/04 0740	R.P. (MO)
351	MSQ	VA	Culpeper	03/04 0747	R.P. (MO)
351	YKQ	QC	Waskaganish	03/29 0300	R.H. (MI)
353	IN	MN	Int'l Falls	03/07 1057	R.H. (MI)
356	IUL	IN	La Porte	03/20 0810	R.P. (MO)
376	ZIN	BAH	Great Inaugua	03/08 0657	R.P. (MO)
391	SWZ	TN	Smyrna	03/13 0240	R.P. (MO)
400	MDS	SD	Madison	03/16 1143	R.P. (MO)
414	IEB	MO	Lebanon	03/29 1609	R.P. (MO)
419	TX	GA	Lawrenceville	03/06 0901	R.P. (MO)
450	PPA	DOM	Puerto Plata	03/01 0316	R.P. (MO)
526	ZLS	BAH	Stella Maris	03/01 0331	R.P. (MO)

** A complete list of ITU codes is available at:* ***www.wordiq.com/definition/ITU_letter_codes***

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

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The BC-1206-C Beacon Receiver

❖ Our New Project

When I first saw the little (4' x 4" x 6-5/8") BC-1206-C receiver, I was intrigued but puzzled. It was obviously a World War II military set. And with its 200-400 kHz frequency range and its light, compact construction, it certainly looked like an aircraft receiver. Yet military aircraft receivers were usually set up to plug into rack mountings, while this little radio seemed to have no mounting fittings whatever.

Furthermore, with its nicely finished black crackle cabinet, it seemed to be intended to be situated independently of any installed instruments, perhaps as an add-on. Instead of a plug, it sprouted three individual wires for power and antenna connections.

I did find out later that, if desired, the radio could be installed in a standard instrument panel mounting hole. As supplied, the four fasteners on the front panel are screwed into threaded bushings. They would be removed and reinstalled to hold the radio in place behind the panel.

I decided to turn to the milsurplus mailing list for help and received some almost instantaneous answers. The guys on this reflector are very knowledgeable indeed and generous about sharing their expertise. Whenever I've referred a question about military equipment to this reflector, I've received in-depth answers almost as soon as I've finished posting the query. If you have an interest in military equipment, it would be worth your while to join up. To do that, e-mail *milsurplus-request@mailman.qth.net* and put "help" in the subject line.

❖ Designed for Ferrying

Combining information I received from no less than five helpful individuals with some independent research I conducted on the Internet, here's what I came up with: As its appearance suggests, the BC-1206 was intended mainly as a temporary receiver for use in planes being ferried from the factories where they were manufactured. The destinations might be to the embarkation points from which they were to be shipped overseas or to special depots where the regular radio equipment was to be installed. The 1206 gave pilots access to weather and other information being broadcast from airports along the route and facilitated their following homing beacons when landing under conditions of poor visibility.

Ferry pilot Florene Watson warms up a P-51 Mustang prior to takeoff (AAF Photo).

You may wonder how the ferry pilot could communicate with a control tower without a transmitter. Simple – the pilot would rock his (or her – we'll get into that in a minute) wings in view of the tower. That would be the signal that a weather report and any other current information was being requested. The tower would respond on a standard, prearranged frequency.

Some planes, such as fighters, needed a BC-1206 during ferrying even if their regular radio complement had already been installed. As used in combat, these planes wouldn't normally have need for a radio in the 1206's frequency range. But, once in the field, if circumstances should arise where such communications capability was needed, a BC-1206 could be easily retrofitted.

❖ The WASP Pilots

No discussion of World War II airplane ferrying activities would be complete without mentioning the WASPs (Woman Airforce Service Pilots). These women handled ferrying and other non-combat assignments to free up male pilots for battle. There were eventually about 1,000 of them.

Already holding commercial pilot's licenses on entering the program, the women then went through almost the same flight training as their male counterparts. Exceptions were weapons training and various combat maneuvers.

By war's end, the WASPs had delivered 12,650 aircraft of 78 different types – including fighters and heavy bombers.

❖ BC-1206 Circuitry and Mounting

The BC-1206 was built by several different manufacturers, and the various models sometimes differed slightly in mechanical and electrical specifications. Our example is a BC-1206-C (Model 524), built by the Setchell

The compact BC-1206-C measures only 4" X 4" X 6 5/8".

Carlson Co. Its appearance is typical, and like most 1206s, it operated from 24-28 vdc obtained from the plane's electrical system. An unusual feature is that the 24-28 volts powered not only the heaters, but also the plate and bias circuits. No dynamotor or other source of high voltage was required.

I was able to download a good copy of the manual for the 1206 from the Boat Anchor Manual Archive (BAMA) mirror site at **http://bama.edebris.com/manuals/**. Although the manual is for a BC-1206-CM, the schematic and parts list is identified as "Model 524," which is the designation that appears on my 1206-C. So I'm assuming that the difference is small and probably mechanical rather than electrical.

A glance at the schematic showed that (except for the unusual power requirements) the circuit is a conventional superheterodyne design. Four of the tubes are 12-volt Loktal types with their heaters wired in series-parallel to be lit from 24-28 volts. The fifth is a 28-volt Loktal.

A Loktal tube has a keyed locating "boss" similar to that found on the more common Octal tubes except that it also has a groove that is engaged by a retaining spring mounted in the socket. The spring snaps into place when the tube is inserted, minimizing the chances of the tube becoming loose due to vibrations in flight.

The circuit includes a 14H7 r.f. amplifier, 14J7 oscillator-mixer, 14H7 i.f. amplifier, 14R7 detector-first audio and 28D7 output. The radio is designed for headphone output and, as supplied, the output transformer is strapped for 300-ohms. The output impedance

can be changed to 4,000 ohms by changing an internal connection.

Note that the 14-prefix tubes actually have 12-volt heaters. They bear the prefix "14" to differentiate them from 12-volt Octal tubes, which bear the "12" prefix.

The installation instructions, as found in the manual, confirmed my thought that this radio was intended to be suitable for an *ad hoc* temporary installation. While mentioning that the radio could be installed in a standard 3-1/8" mounting hole, it was also suggested that, alternatively, "A metal strap of sufficient length should be drawn tightly around the receiver base and fastened securely in the location desired." Because of the Loktal tubes, the manual went on, shock mounting would not ordinarily be required.

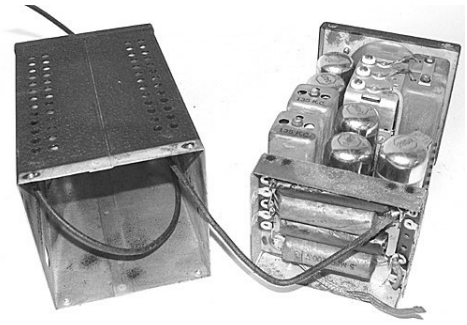
❖ Inside the 1206

Getting inside this little gem was quite daunting at first. It seemed clear that the cabinet should be slid off backwards, out from under the lip formed from the edges of the front panel. But after removing all obvious screws, even the four intended to secure the set to an instrument panel, no amount of pulling or tugging would budge the cabinet. It didn't help that there was no way of holding back the front panel against the pull, other than to dig one's fingernails into the edge of the front panel lip where it met the cabinet. This was a precarious grip at best.

I tried, very gingerly, to pry the cabinet out from under the lip at various spots. Nothing doing. Just in case, I also removed the front panel knobs and the mounting nuts for the phone jack and volume control. But still, there was no sign of movement. Then I went on line to find photos of the 1206 removed from its cabinet to see if there might be some trick that I had overlooked. I was fortunate enough to find a couple of good pictures, and they verified that there were no special fasteners involved. It should be possible to slide the cabinet back and off.

Having exhausted all other possibilities, I tried the method of last resort: brute force (gently applied of course). Somehow I managed to hold one end of a length of 1" X 1/2" scrap wood against the edge of the front panel lip with one hand – at the same time holding the cabinet down against the bench top. Then I hammered against the other end with my other hand. Applying impulses in this manner did the trick and, little by little, the receiver grudgingly slid out of the cabinet.

But, there was one more obstacle keeping me from sliding the cabinet all the way off. A ground braid fastened to the set's chassis passed through a small hole in the cabinet along with a power lead. The free end of the braid terminated in a terminal lug to be fastened to the outside of the cabinet under a mounting screw. The braid was too short to allow the cabinet to slide off all the way and the crimped-on lug wouldn't pass through the hole. So, I had to cut it off. Luckily the power lead, also terminated in a lug, was more than long enough, so it could be left intact. The braid and ground lug will be replaced later.



The radio gave up its cabinet, but only after a struggle (see text).

Take a look at the picture I'm including of the 1206 stripped of its cabinet, and you'll see what was really causing the drag that made cabinet removal so difficult. At the back of the radio (the end facing you) you'll see a shielded compartment holding the components of a filter circuit for removing generator hash. It was the walls of this filter shield, rather than the front panel lip, that had been binding the cabinet.

❖ From the Readers

Harold "Ward" Cornelius W4OOY, sent along a more sophisticated explanation than mine (in the May and June issues) of the ingenious method used by Philco to add a high police band (2.3 - 2.5 MHz) to the Model 37-62 broadcast radio that was the subject of our last restoration. I'm quoting his very clear discussion verbatim:

"The police band reception on the Philco was accomplished by tuning the input RF coil to this superheterodyne radio's image frequency. The photo of the Philco dial shows that the broadcast band frequency and the police band frequency are about 940 kHz apart. Here's what is going on: When operating on the broadcast band, the set's local oscillator operates 470 kHz above the tuned signal. The incoming signal and the oscillator mix to produce the IF of 470 kHz. However, a signal that is 470 kHz above the oscillator will also mix and produce the IF. The RF coil can tune to the signal on the oscillator's low side (broadcast band) or the high side (2.5 MHz police band). The two will always be twice the IF frequency apart. This was a neat way for Philco to produce an extra tuning band at virtually no cost.

"I did the same thing in the 1940s by taking some turns off the loop antenna of a small broadcast-band radio in order to monitor the Grand Rapids, Michigan police radio station WPEB on 2442 kHz. How times have changed!"

Reader *A. Joseph Ross* also commented on the "High Police Band" issue as follows:

"Your 'High Police Band Mystery' reminds me of a phenomenon that I wrote to 'Ask Bob' about a couple of years ago. When I was a teen, someone showed me a trick whereby you can connect a length of wire about two to three yards long across the terminals of the loop antenna in a 5-tube AM radio, and the radio will receive shortwave signals. Strong local stations still appear at their normal dial positions (though a little weaker), while at various spots on the dial, the strongest of the international broadcasters (BBC, Radio Moscow, etc.) could be heard.

"This was my first introduction to short wave radio. I found that the trick tended to work well on any radio that was a later model having miniature tubes and printed circuits, even an AM-FM radio on the AM setting. I never could get it to work on the older radios with Bakelite-based tubes and hand-wired circuits. As I recall, Bob's explanation involved something similar to the way the police band setting worked on your Philco."

Joe went on to echo those readers who are in favor of my running more consumer projects in the column – possibly even later ones than I have tended to do in the past. He suggests a 1960s tube set – possibly even an a.m.-f.m. radio – pointing out that "A radio made in 1960, after all, is now over 50 years old."

OK, point taken. One of the next consumer radio projects we handle in the column will be 1960s vintage or thereabouts. If I don't have something appropriate in my backlog of restoration candidates, I'll pick something up at one of the radio meets this summer.

See you next month when, hopefully, we will try powering up the BC-1206-c receiver.

I don't think this is any big news, but I wanted to pass this info along so I'd have a chance to say how much I really enjoy MT & all the GREAT info ya'll put out for us every month! Keep up the excellent work! I love this radio stuff! My radio hobby enjoyment has increased tremendously since I found MT as a resource.

Kenneth K.

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Vintage Antenna Systems

When it was all "roll your own"

Nowadays, it's easy to buy any sort of antenna, feedline, tuner, or lightning arrestor that might suit your fancy. Numerous companies build these items in modern factories and compete for the disposable income of eager radio enthusiasts, who are the beneficiaries of modern technology. Computer modeling, space-age materials, and modern manufacturing methods combine to create a veritable cornucopia of antenna-related items. A credit card and a few mouse clicks will get you just about anything you want for your antenna system, delivered to your doorstep.

So, it might sometimes be hard to remember that for early radio enthusiasts none of this was true – that, once upon a time, hams and listeners hand-made all of these components, just like they built radios and other gear from scratch. And they weren't blessed with modern marvels like the computer, or the Internet, or aircraft aluminum. One thing they did have in abundance, though, was good old ingenuity.

❖ Early Feedlines

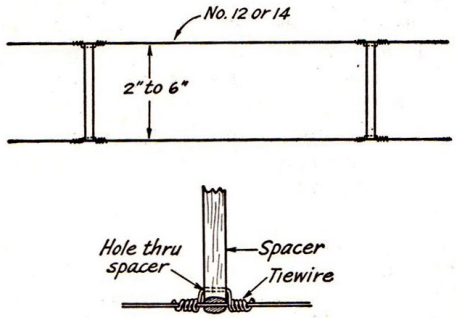
Did you know that coaxial cable was actually patented way back in 1880? Its popularity in our civilian radio hobby only dates from the end of the Second World War, when massive amounts of military surplus coax were suddenly available on the market. Because television also grew rapidly after War Two, coax became very popular due to its shielded – and therefore interference-reducing – aspect.

Before all that came about, though, radio hobbyists didn't mess too much with coaxial cable. It was expensive, for one thing. Remember that for most of the twelve years prior to Pearl Harbor, America had been a limp rag in the fist of the Depression, and hobbyists didn't have a lot of spare change. So, early feedlines tended to take one of two basic forms: a single wire, or a balanced pair of wires.

A single wire, the earliest solution, tended to spray RF all over the shack, even when worked against a good ground. Of course, for the hobbyist who only listened and didn't transmit, this wasn't much of an issue.

Enterprising hams finally hit on the solution of the "balanced" feedline, with two "hot" leads link-fed from the transmitter to the two halves of a dipole or other balanced antenna. This arrangement tamed the stray RF in the shack, to an extent.

But of course, you couldn't go down to your local store and buy twin-lead, or ladder line, or window line. They didn't yet exist as manufactured products, so hams "rolled their own." There wasn't much in the way of standardization, but eventually most homebrewers settled on two #12 or #14 wires, separated two to six inches by wooden insulators. The first illustration is a classic shot of suggested assembly for just such a homemade "open wire feeder," which I found in the 1967 edition of ARRL's *Radio Amateur's Handbook.*



Ironically, this type of feedline has made quite a comeback in recent times, as more and more operators realize how essentially lossless it is, even with high SWR on the line. This greatly enables the use of shortened or otherwise "random" dipoles and so forth, getting a lot more stealth operators on HF. Also, the advent of efficient tuners and good quality baluns has made balanced feedline much easier to use. And we owe it all to the pioneering souls who first figured out how to homebrew ladder line.

By the way, you can Google "open wire feedline" and find a number of how-to articles on various ways to construct this type of line. There's even video footage from YouTube to walk you through the homebrewing process.

Or, you can take the easy way out like I did and buy the beautifully manufactured 450 ohm window line that is so easy to procure nowadays, thanks to those early experimenters who came up with the basic idea so many years ago.

❖ Multiband Antennas

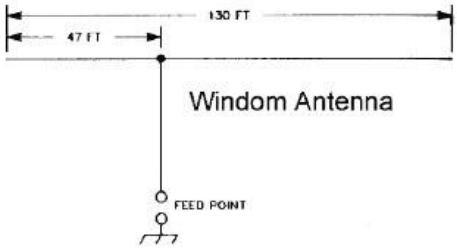
Another problem that those early hams set their minds to was how to get multiband performance out of a single antenna. Oddly enough, if they had had the kind of wide range tuners we're blessed with nowadays, their homemade ladder line would have been the key to solving this very neatly. (As I've harped on many times, ladder line and a good tuner will enable any dipole to operate on every HF band where the dipole is at least a quarter wave long.)

Since they didn't have the tuner thing resolved yet, they tackled the problem another way – exploring how to feed a wire "resonant" at the lowest frequency desired, in such a way that the antenna would also take power well on higher frequencies. One concept these folks focused on was the fact that all the bands that existed then were harmonically related. In other words, they had 80, 40, 20, and 10 meter bands – and for that matter 5, 2-1/2 and 1-1/4 meter bands as well, and each band was the second harmonic of the previous band – 3.5, 7, 14, 28, 56, 112, 224 MHz (or "megacycles" as they would have said). So, these experimenters thought very much in terms of this handy "times two" relationship from band to band.

(Our modern band assignments lack much of this coherence. Consider the WARC bands and the 15 meter band, and the moving of 5 and 2-1/2 meters to 6 and 2 meters.)

The big problem here is the mathematics. Ever try to feed power to a coax-fed 80 meter dipole on 40 meters, for example? It turns out that the 70 ohm impedance at the center of the 135 foot dipole, when fed at 3.5 MHz, transforms to something like 5000 ohms when fed at 7 MHz! Do you smell coax burning? Even with the open wire feedline of the period, higher power levels could generate some pretty spectacular fireworks at these impedances, lighting things up at the transmitter end.

At this point, one of the legendary heroes of radio came onstage. Loren Windom, W8GZ, discovered through experimentation that, if the 80 meter dipole was reconfigured as a single 130 foot wire and fed about 14% off-center with a single wire feedline, an acceptable compromise was attained where the antenna would take power efficiently on 80 meters and all of its harmonics. Loren was running high power for the 1920s – 250 watts! – and so other hams sat up and took notice. Soon, the new "Windom" antenna was all the rage in the amateur community. I've included a modern drawing of this concept, taken from ARRL's *Antenna Book.*



Nowadays, several direct descendants of Loren Windom's antenna are very popular. The

Carolina Windoms keep W8GZ's off-center feed idea, reconfiguring the antenna as a dipole fed with coaxial cable. Most versions have a choke balun in the feedline, and often there is a 4:1 balun at the connection between feedline and antenna. I've heard many of these on the air, and they are excellent performers.

Another version is called "OCF," or off-center-fed dipole. Ladder line or other open-wire line is often used to feed this one. In fact, some of the very earliest experimenting with the original Windom involved this arrangement. Thanks, Loren Windom, for one of the great original antenna ideas.

❖ Dealing with Lightning

Another important area where good old ingenuity stood in for technology was the concept of the lightning arrestor. All those wire antennas up in the air must have made many operators apprehensive about potential lightning strikes; after all, Ben Franklin and his kite-in-a-storm has been a well-known tale for a couple of centuries. Coincidentally, perhaps, Ben also came up with the concept of the lightning rod, to protect tall wooden buildings from direct strikes.

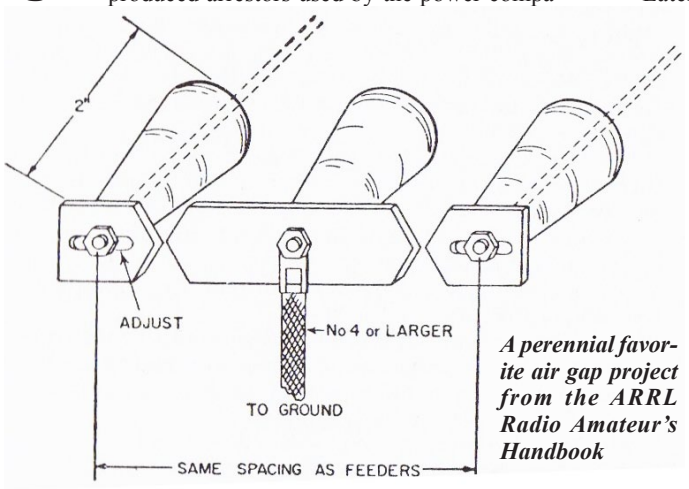
Actually, the need for lightning protection of wires in mid-air had already arisen, before radio ever became a hobby. When the utility companies started hanging all those miles of wire on poles, they quickly learned the necessity of diverting the huge energy of a lightning strike to ground. Unprotected power lines were a huge potential death trap for all those utility customers.

It didn't take long to refine the concept of the *air gap*. As with a spark plug, a large enough voltage will jump across an air gap of a given size, while lower voltages will not. Ground one side of the gap, tie the other to the line to be protected, and *voila!* Lightning-sized potential is diverted to ground, while normal line voltages are unaffected.

Unfortunately, most of those early hams couldn't get their hands on the commercially produced arrestors used by the power companies. A little ingenuity, though, enabled these fearless hobbyists to "roll their own" air gap lightning arrestors. The illustration, a perennial favorite from the ARRL's *Radio Amateur's Handbook,* shows a typical solution, for installation where the two-wire feeder enters the shack.

Sections of brass or copper strap, typically 1/8 inch thick and 1/2 inch wide, were cut to size, with points on the "air gap" ends. The middle bar was solidly grounded to grounding rods with heavy braid; the two outer bars were attached to the two-wire feedline. The gaps were adjusted until just large enough not to arc across when transmitting. Higher power levels, of course, required larger gaps.

Later hams simplified the construction somewhat, using two spark plugs installed in threaded holes in a grounding bar. You can still find this version sold online, at **www.thewireman.com**.



A perennial favorite air gap project from the ARRL Radio Amateur's Handbook

Well, friends, that's our look at vintage antenna systems. Take a moment to reflect on, and appreciate, the work of these hardy experimenters, who made by hand so much of the equipment and materials that we today tend to take for granted.

Join me here in the August issue, and we'll turn yet another page in the tales of antennas. Until then, happy operating!

Brian Wood, W0DZ
www.dzkit.com

DXLab Suite Software

Guest reviewer Rick Kile, WA7BNG*

DX Lab Suite is an excellent set of ham radio applications for rig control, logging and award tracking, spot collection, and propagation analysis and prediction. The eight interactive applications offer great flexibility to configure displays to your needs, and they are easy to install, use, and update. Best of all, this extraordinary suite of software is *freeware.*

❖ The Applications

Launcher

This application is the foundational building block of the DXLab Suite of applications. Install this one first and let the installer save a shortcut to your desktop. Use this application to install any or all of the remaining DXLab applications, receive notifications of software and database updates and manage their installation, and to provide overall status of DXLab.

Once the Launcher app is installed and running, you will be presented with a small display as shown below that reflects the status of the seven DXLab applications: Red for not started, Yellow for running but minimized, and Green for running and displayed. On this and all other DXLab displays, running the mouse pointer over a button or display field brings up a brief explanation of the highlighted button or function.

Note: this and all other screen shots shown in this article can be found on the DXLab website at: www.dxlabsuite.com

The "Start" and "Terminate" buttons are used to selectively start or terminate any or all of the DXLab apps. The "Minimize" and "Restore" buttons are pretty self-explanatory: displays for running apps are hidden or brought back to the display at the touch of a single button. Clicking the "Help" button takes you to a detailed set of Help files that explain Launcher functionality and how to use it. If you are a new user of the DXLab Suite, this is a great place to start.

After you have read through the Help files, pick the "Config" button to customize Launcher features. In my case, I have found that having the Launcher "always on top" is useful, as is checking daily for new app and database upgrades. If you plan on using two monitors, checking the box on this and the Config screens for the other apps allows you to lay out where you want each app to reside on your monitors and have DXLab software remember your preference each time you start them up.

As I mentioned earlier, the Launcher app is the building block app for DXLab. Using the Launcher Config screen you can install the remaining apps one at a time. The display shows you what version of an app is installed, and what, if any, version upgrades are available. Picking the "Install" button associated with an app on this screen or the control button on the launcher begins the installation process. Once a baseline version of the application is installed, the installer then checks for available updates and automatically upgrades the app to the most current version.

Commander

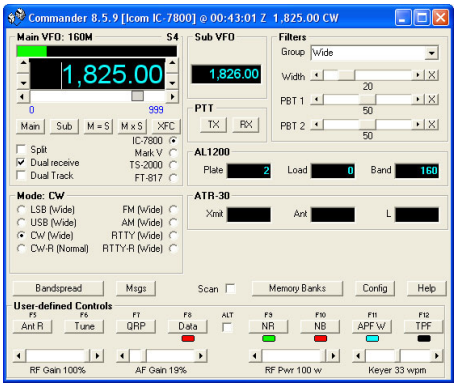
The next application I chose to install is the DXLab rig control application. To minimize clutter on your desktop, I suggest you do not place shortcuts on your desktop for Commander or any of the other remaining apps. Use the Launcher app to control the entire suite of apps.

As a summary, Commander tracks frequency and mode information for up to four radios, provides 100 memories to store and recall frequency and mode information, and interacts with other DXLab applications (when installed and running), including DXKeeper, PropView, SpotCollector and WinWarbler, to share frequency and mode information.

At my station I use DXLab on a laptop computer connected to my ICOM IC-756 Pro III via the CI-V interface, and with a DZKit Sienna for digital modes with DXLab running on the integrated PC that is an option on this HF Transceiver kit. DXLab software is compatible with a wide variety of popular radios from Alinco, Elecraft, ICOM, Kenwood, TEN-TEC Yaesu and others. Check their website for a complete list.

If you don't see your rig on the list, try joining the DXLab forum and ask for help in making your rig work. I worked with Dave AA6YQ, to get the DZKit Sienna added. While DXLab is freeware, I found the factory support to be very responsive and timely.

The Commander display is shown below. Again, the best place to start once you have installed Commander is the Help page, then pick the "Config" button to set up Commander functions. To get started, on the "General" tab I had to select my IC-756 Pro III from the pull down screen, enter the CI-V interface parameters, and select the "Continuous Interrogation" box. On the "Ports" tab I had to configure serial port information. The Config display has tabs to configure filters, memories, transverters, and multiple radios. I strongly urge you to review the Help files to explore and exploit these capabilities.



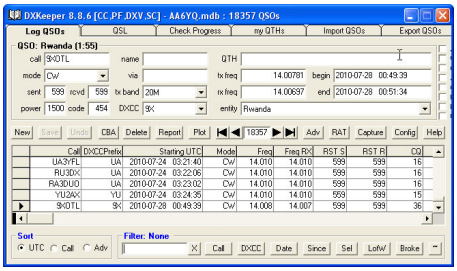
Using the Launcher app you can install and run any or all of the remaining apps in the DXLab Suite. Use the Help to learn about how to configure and use each app.

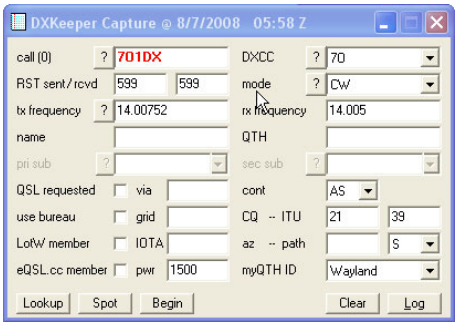
DX Keeper

DXKeeper is the application to use for logging QSOs, uploading QSO information to the ARRL *Logbook of the World*, and tracking progress towards achieving awards. In addition, DXKeeper interacts with other DXLab applications like Commander for rig control and logging frequency and mode information, WinWarbler for digital QSOs, Pathfinder for access to QSL path information, and services such as QRZ.com for information about stations you work or are trying to work. DXKeeper can access information from a number of ham callbooks and online services.

I have DXKeeper configured to log into and access information online from QRZ.Com via the Pathfinder application and I use that info to fill in QSO data. It also includes features to print QSLs, address labels and envelopes, upload QSO info to eQSL.cc, and import/export QSO information in a variety of formats for use in other applications.

On screen buttons provide a wide variety of ways to sort and display information. Picking the "Capture" button brings up a simple display that is optimized for rapidly entering QSO data. Us-



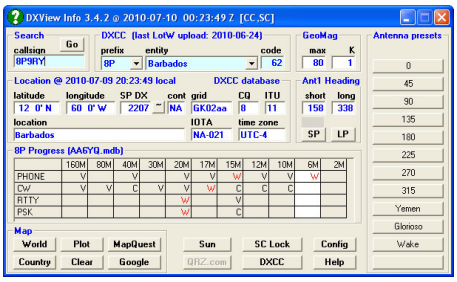


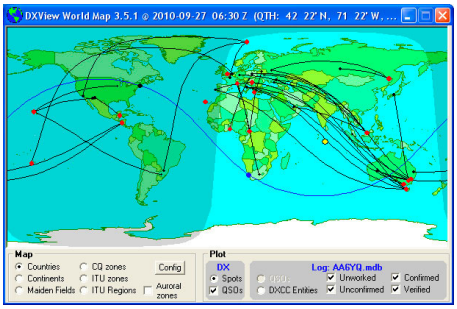
ing the "Config" button gives you tabbed access to set up DXKeeper and customize the look and feel of your electronic logbook by selecting what information to display and the order in which it is displayed from left to right.

DX View

DXView consists of two primary displays. The first is a well organized display of station information including callsign, prefix, entity, lat/long info and both short and long path beam headings. DXView works with DXKeeper to display your current status by band and mode with the prefix.

Picking the "World" button brings up a world map display that shows your QTH and the DX station in question, day/night terminator, and sun location. There are many options for customizing the world map to display grid squares, continents, ITU and CQ zones and regions, as well as data plots representing from your log, verified, confirmed, unconfirmed and/or unworked QSOs or entities.





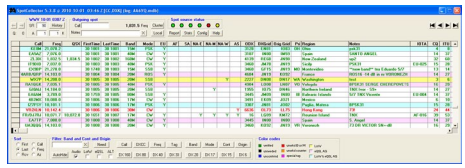
SpotCollector

Working with the SpotCollector application, the DXView World Map displays Spots collected via that application. When I roll the mouse pointer over a given Spot, a pop-up displays callsign, entity name, frequency (plus any split info), mode, time the Spot was posted, and Short Path beam heading.

Clicking on the Spot enables the Commander rig control application to pass frequency and mode information to your radio from the collected Spot for quick QSY to the selected station. DXView interfaces with a number of popular rotors and rotor control applications to position your antenna to the short or long path beam heading for the DX station in question.

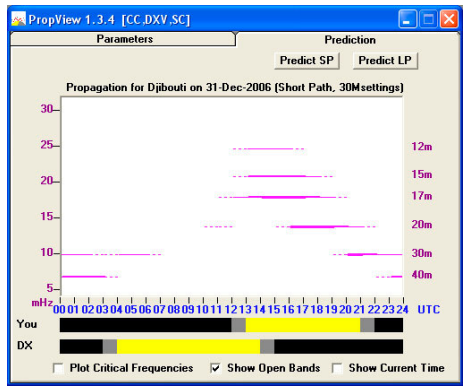
Spot Collector allows you to collect, filter and display Spot information from six sources. Using information from your DXKeeper log, SpotCollector provides color coded feedback to you, the operator, for stations or entities you need to work by band or mode, and lets you know if a station participates in *Logbook of the World*.

During a recent DX event, I filtered the SpotCollector display to show only stations using *LOTW* on specific bands and modes to limit the amount of information I had to sort through to chase stations in countries I needed as I pursue endorsements on my DXCC. As with other DXLab displays, SpotCollector is user configurable to add Spot sources, choose what data is presented in the SpotCollector display, and in what order from left to right, enable or disable audio alarms to let you know a needed entity has been posted, and add overrides for specific callsigns and entities.



PropView

PropView uses one of three user selectable propagation forecasting tools (VOACAP, ICEPAC, and IONCAP) and Solar Flux Index and K Index readings to calculate minimum and maximum usable frequencies from your QTH to a selected DX station. Propagation predictions are displayed graphically by band over time to give you insight into the best time and frequencies available to work a particular entity.



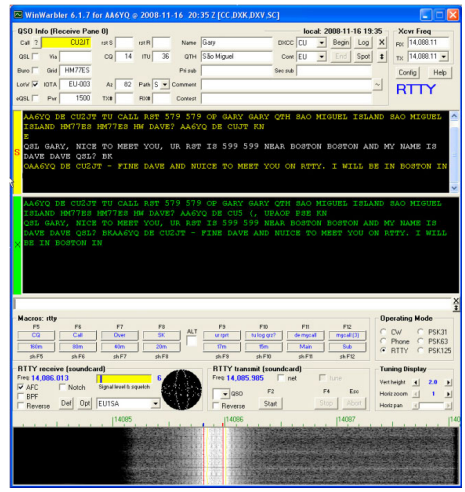
PathFinder

Pathfinder is a tool to find QSL path information using a variety of popular sources such as Buckmaster, QRZ, and the IK3QAR database.

WinWarbler

WinWarbler is the last of eight integrated applications in the DXLab Suite of ham radio software. It provides PSK31, PSK63 and PSK125 capabilities while displaying three channels of decoded text. On the companion Stations Heard display, all stations heard over a 3.5 kHz swath of the spectrum are monitored and displayed.

WinWarbler also includes RTTY capabilities using the MMTTY engine and can send but not receive CW. I am still learning more about how to use WinWarbler and have it installed on the DZKit Sienna PC to explore digital modes of operation.



Like the other DXLab apps, Winwarbler is integrated with the other DXLab applications to plot QSOs on the DXView world map, utilize frequency, mode and other rig control features with Commander to conduct PSK and RTTY QSOs, and with DXKeeper to update log files, as well as working with Pathfinder and SpotCollector for getting access to QSL info and for posting RTTY and PSK Spots.

❖ Get the Free Download!

As you can see from this brief review, DXLab software provides a tremendous amount of capability in a single integrated suite of applications. The best way to really understand what this package can do is to go to **www.dxlabsuite.com/**, download the apps, and learn them one by one as you install and customize them for your use. Check out the very active DXLab forum at: **http://groups.yahoo.com/group/dxlab/**

In summary, you will be hard pressed to find a better set of applications to cover your needs. The ease of installation and maintenance built into the Launcher application, the wide range of capabilities provided by the other seven applications, and the flexibility to customize to meet your needs and preferences make DXLab a winner. And, you can't beat the price!

** This column was written by a colleague, Rick Kile, WA7BNG, who uses DX Lab Suite extensively. I asked him if he could write something up on his experience with the program. He did such a nice job on it that I am submitting what he wrote. - BW*

Those Weird Noises on 1090 MHz

By Larry Van Horn, N5FPW
Monitoring Times Technical Editor

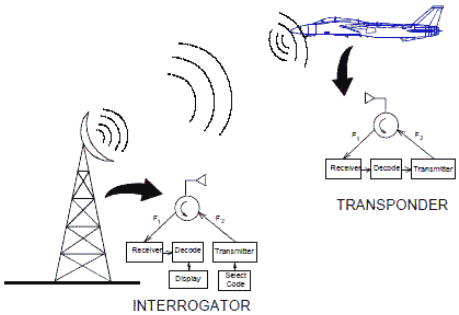
Travel with me back to a topic that was first discussed in *Monitoring Times* many years ago: On page 9 of the October 1985 issue of *MT*, Bob Grove asked, "What's That Weird Noise on 1090 MHz?"

Bob later answered his own question in the December issue (page 7): "1090 MHz is the transponder frequency used by an aircraft as it automatically identifies itself for ground radar after being triggered from the ground station on 1030 MHz." The system that Bob referred to back in 1985 is an acronym that most aviation enthusiasts are familiar with – IFF (Identification Friend or Foe).

Little did Bob or anyone else back then know that monitoring IFF signals would eventually transition to a new aspect of the monitoring hobby that has revolutionized plane spotting – real-time virtual radar.

In my June 2011 *Milcom* column, I introduced some basic information on technology that is now available to radio hobbyists and aviation enthusiasts to allow the monitoring of Mode-S/ ADS-B IFF signals. In this and future *On The Bench* columns, we will dig deeper into these signals, the equipment to hear and decode them, and the other aspects of real time virtual radar monitoring.

But, before I delve into what we have available today, let's look back again to December 1985. Bob received a great explanation of the IFF system from instrument rated pilot Gordon Bousman of Lake Villa, Illinois:



IFF Operations Illustration (courtesy DoD)

"Radar-transponder replies are one-half micro second pulse pairs with 21 microseconds spacing. These pulse trains contain data (altitude information and squawk code) and the usual output power is 250 watts. The ground interrogation signals comes from an antenna which is mounted on top of the air traffic control radar and sweeps with it.

"The replies received from the aircraft in the area are decoded by a computer and displayed on the radar scope as enhanced blips (more visible than just the primary radar return) and have a data block that is displayed next to the blip.

"The data block contains such information as altitude, flight number, and ground speed. Normally only one squawk code (4096 are possible) is assigned for the entire flight. The air traffic controller can 'blot out' unwanted targets by asking the computer to display only those transponder replies that he is interested in.

"Radar transponders are not limited to commercial aircraft, but are carried by most all aircraft and are, in fact, required by law if you operate any aircraft in a TCA (Terminal Control Area) which are radar controlled areas setup around larger cities in the U.S."

❖ More History

The need to identify friends from foes in a battle situation is obvious. Historically, visual clues were available for such identification, such as uniform, coat of arms, flags, aircraft configuration, etc. However, with the advent of radar and the ability to see a target electronically long before it can be identified visually, the need arose to be able to determine whether a given radar contact was a friendly or a foe.

The world's first IFF, developed by Germany in 1940, was the FuG-25a "Erstling" (English: "Debut"). It received the radar frequencies on 125 MHz (Freya radar) and 550-580 MHz (Würzburg radar). To start the identification procedure, the ground operator switched the pulse frequency of his radar from 3750 Hz to 5000 Hz. The airborne receiver decoded that and started to transmit its code. Before departure, two mechanical keys of 10 bits each were inserted into the reader. The IFF transmitter worked on 168 MHz with a power of 400 watts (PEP).

Unfortunately for the Germans, British intelligence were able to build their own IFF transmitter, called "Perfectos." When mounted into an RAF Mosquito, it could trigger the FuG-25, and therefore betrayed the position of the night fighters. To avoid that, the FuG-25 had to be switched off very often.

The first active IFF was developed by the United States and Great Britain during World War II. The first systems used a receiver that would only oscillate in response to the received radar signal. This oscillation caused the receiver to transmit and be received by the ground forces. Since only "friendly" forces would have the requisite equipment, this became the first fully electronic IFF system

In some respects the term IFF is somewhat of a misnomer, as IFF can only positively identify friendly targets, but not hostile ones. If an IFF interrogation receives no reply or an invalid reply, the object cannot be identified as friendly, but is not positively identified as a foe.

There are many reasons for friendly aircraft not to reply to IFF, such as battle damage or equipment failure, loss of encryption keys, and wrong encryption keys. Terrain-hugging aircraft are very often poor candidates for line-of-sight systems such as the IFF system. The 1090/1030 MHz digital signals cannot penetrate terrain, and very often atmospheric effects (referred to as anomalous or tropospheric propagation) cause timing, range, and azimuth issues.

❖ IFF Method of Operation

The IFF system is considered a secondary radar system, since it operates completely differently and independently of the primary radar system that tracks aircraft skin returns only, although the same CRT display is frequently used for both. Position with IFF is determined by comparing antenna dish angle and the delay from the interrogator (1030 MHz) pulse to the received IFF pulses on (1090 MHz).

The IFF of World War II and Soviet military systems (1946 to 1991) used coded radar signals (called Cross-Band Interrogation, or CBI) to automatically trigger the aircraft's transponder in an aircraft illuminated by the radar. Modern IFF systems use a separate specialized transponder beacon which can operate without radar. They are referred to as cross-band beacons or transponders.

Cessna ARC-RT-395A Transponder 04

A transponder (short for transmitter-responder and sometimes abbreviated to XPDR, XPNDR, TPDR or TP) is an electronic device that produces a response when it receives a radio-frequency interrogation. In aviation, air-

craft have transponders to assist in identifying them on radar and on other aircraft's collision avoidance systems.

Air traffic control units use the term "squawk" when they are assigning an aircraft a transponder code, e.g., "Squawk 7421." Squawk or squawking thus can be said to mean "select transponder code" or "I have selected transponder code xxxx"

IFF is used by both military and civilian aircraft. Modes 1, 2, 4 and 5 are for military use only. Modes 1, 2 and 3 are collectively known as Selective Identification Feature (SIF) modes. Civilian aircraft use modes A, C and S. Mode C, which includes barometric pressure altitude information, is often used in conjunction with mode A. Mode A is often referred to as mode 3/A due to the similarity to the military mode 3. Mode S is a new civilian mode developed to replace both mode A and C. I will have more in-depth information on Mode-S and its sub-broadcast modes in a future *On The Bench* column.

❖ Military Modes

There are four major military-only modes of operation currently in use by military aircraft, plus one sub-mode. The non-secure codes are manually set by the pilot in the cockpit, and are assigned by the air traffic controller. A new secure mode for the military is in development and is included in our list of IFF modes listed below.

- Mode 1 is a non-secure low-cost method used by ships to track aircraft and other ships. This mode uses a 2-digit 5-bit mission code. This is a military only mode and is cockpit selectable.
- Mode 2 is used by aircraft making carrier-controlled approaches during inclement weather. It uses a 4-digit octal unit code. Again, this is a military-only IFF mode and is set on the ground for fighters.
- Mode 3 is shared with civilian secondary surveillance radar (SSR) Mode A. Mode 3 is the standard system also used by commercial aircraft to relay their position to ground controllers throughout the world for air traffic control (ATC). Mode 3/A uses a 4-digit octal identification code for the aircraft, assigned by the air traffic controller (military and civilian).
- Mode 4 is secure, encrypted IFF (the only true method of determining friend or foe). Mode 4 IFF systems operate by sending an encrypted data stream from the interrogator. The transponder, if it is able to decrypt the data stream, responds with a simple 3 bit response; the temporal spacing of the 3 bits corresponds to the encrypted data transmitted. Because this response carries no information other than "yes I understand," a Mode 4 transponder must always operate with a Mode 1 or Mode 2 transponder in order to provide further identification of the responding aircraft.

  It is possible to "spoof" a mode 4 system by responding to any mode 4 interrogation with a randomly timed 3-bit sequence. However, due to the number of possible encrypted challenge codes, it is statistically unlikely to properly "spoof" the response, and even less likely to be able to do so more than once. For this reason, IFF systems rely on receiving a set number of proper responses from a given target before declaring them a "friend."

  While the likelihood of "guessing" the right sequence is very low, it is possible to monitor challenges and responses and, with some sophisticated computing power that is becoming more and more readily available, break the encryption algorithm. For this reason, Mode 4 technology is being phased out in favor of Mode 5 technology
- Mode 5 provides a crypto-secure version of Mode S and ADS-B GPS position. It is the secured version of Mode-S/ADS-B for use by the U.S. military. Mode 5 IFF systems allow for much more sophisticated data exchanges between the interrogator and transponder, with encryption of both interrogation and response. With longer interrogation sequences and reply sequences, and improved encryption techniques, the possibility of breaking the encryption by monitoring the communications is greatly reduced.

  Mode 5 is divided into two levels. Both are crypto-secure with enhanced encryption, spread spectrum modulation, and time of day authentication. Level 1 is similar to Mode 4 information, but enhanced with an aircraft unique PIN. Level 2 is the same as Mode 5 level one, but includes additional information such as aircraft position and other attributes.

IFF MODES

MODE	PURPOSE	INTERROGATION
1	MILITARY-AIRCRAFT MISSION	PULSE 1, PULSE 3, 3 MICROSECONDS
2	MILITARY-PERSONAL IDENTIFICATION	PULSE 1, PULSE 3, 5 MICROSECONDS
3/A	MILITARY/CIVILIAN ATC	PULSE 1, PULSE 3, 8 MICROSECONDS
C	ALTITUDE REPORTING	PULSE 1, PULSE 3, 21 MICROSECONDS
4	SECURE MILITARY IFF	SYNC, ENCIPHERED

❖ Civilian Aircraft

Civilian IFF transponders can have several different modes: A, B, C, D and S. Modes A and C are commonplace in the United States. Modes B and D are most commonly used in other countries.

- Mode 3, mentioned above, is shared with civilian secondary surveillance radar (SSR) Mode A. Mode 3 is the standard system also used by commercial aircraft to relay their position to ground controllers throughout the world for air traffic control (ATC).

  When Mode A is used, it transmits a group of coded pulses. These codes consist of four digit identification numbers that have been assigned by ATC. ATC announces the code they want the aircraft to use and the pilot enters that code into the transponder equipment. Once it is entered in, it is sent back to ATC as a Mode A reply. ATC can then identify each aircraft that has an operational transponder by its distinct, coded number.
- Mode C takes Mode A one step further. If the aircraft is equipped with an encoder and altimeter, ATC will actually see the flight level altitude. Mode C uses a 4-digit octal code for aircraft's pressure altitude and used by both the military and civilian aircraft.

  Mode C is known as the altitude encoder. So, if an aircraft is equipped with a Mode A/C transponder (which most have), ATC will be able to see a coded number and altitude information for each of those equipped aircraft.
- Mode S is the newest mode for civilian use (the military has been using it for some time now). Mode S provides multiple information formats to a selective interrogation. Each aircraft is assigned a fixed 24-bit address which is used by both military and civilian aircraft. With Mode S, ATC gets even more information. Aircraft equipped with Mode-S avionics will allow the ground station to identify an aircraft by its ICAO 24-bit address.

Once considered a luxury by many pilots a few years ago, IFF transponders and encoders are now a requirement in most aircraft flown in the U.S. today. It is that requirement that aviation monitoring enthusiasts are exploiting to enable us to listen to those weird noises on 1090 MHz and turn them into real virtual radar displays in our radio shacks.

In our next article in this *On the Bench* series, we will talk more specifically about the technology used to display our virtual radar displays – Mode-S/ADS-B.

ACRONYMS

ADS-B	Automatic Dependent Surveillance - Broadcast
CBI	Cross-Band Interrogation
CRT	Cathode Ray Tube
FAA	Federal Aviation Administration
FIS-B	Flight Information Services - Broadcast
IFF	Identification Friend or Foe
IFR	Instrument Flight Rules
NOTAMS	Notices to Airmen
TCA	Terminal Control Area
TIS-B	Traffic Information Services - Broadcast
VFR	Visual Flight Rules

DPD Productions ADS-B Vertical Antenna

One of the basic principles under which I operate as a radio monitor is "the higher the radio frequency, the better the antenna needed for good reception." While I might be able to get away with a simple wire antenna for my HF amateur station, that won't be the case with my VHF/UHF amateur and scanner stations.

So, when I recently set up my Mode-S/ADS-B radio system in the mountains of western North Carolina, I knew I would need a good, top-end omnidirectional antenna to receive the 1090 MHz data transmissions from aircraft. My goal was simple: the better and higher the antenna, the more range and, consequently, the more aircraft I would be able to plot.

What I settled on was the DPD Productions ADS-B vertical antenna. This omnidirectional antenna is tuned for Mode-S/ADS-B reception, using receivers such as the SBS-1/2 or RadarBox, and is specifically tuned to the frequency of 1090 MHz, which is the center of the Mode-S/ADS-B band.

Antenna Construction and Installation

The actual brass antenna elements and feed point for this antenna are sealed inside a UV resistant plastic radome which allows the antenna to be very resistant to weather and other environmental damage. The antenna is strong enough to withstand an ice storm and will also do well in a coastal environment: You won't have to worry about corrosion on the elements with this design. The design also helps control friction-induced static from wind and dust.

Instead of the usual UHF connector included with most antennas, the ADS-B antenna includes a 50 Ohm female N connector on the end of a small cable pigtail. N connectors are more water resistant and handle high frequencies better.

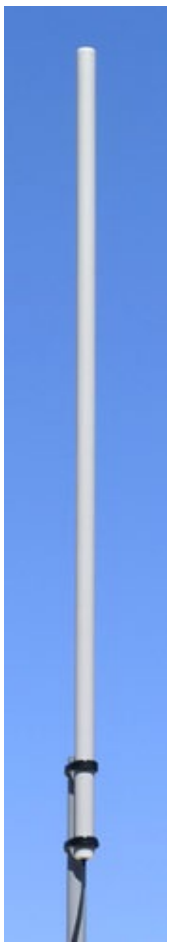
As you purchase this antenna, one additional decision you will need to make is your choice of coax. Due to the high frequency at which these systems operate and the potential losses that can occur through cable, I highly recommended that you choose at least an RG8 size coax cable with N connectors. Using anything smaller or adding adapters will introduce losses at this frequency most monitors will find unacceptable. Spending the extra funds will definitely increase the performance of this antenna.

The instructions that came with the antenna were well written, and installation was a snap. A metal ground plane is not needed with this design and no assembly was necessary, nor were extra mounting parts needed. You just use the mounting clamps that come with the antenna to attach the antenna to any standard 1-1/4 inch mounting mast (mast not included).

I found the construction of this antenna superb. It is extremely well made and should last a long time on the pole with little or no maintenance.

Bottom Line

My ADS-B receiver came with a small magnetic mount antenna provided. Reception on that antenna up here in the mountains wasn't great. When I connected my receiver to the DPD antenna, the difference was noticeable right away.



Not only did I receive more aircraft – both Mode-S and ADS-B – but my polar plot diagram started increasing in size right away. In other words, my range was extended dramatically with this antenna!

I also noticed that the amount of ADS-B equipped aircraft increased within the same range as I had before. That seems to indicate that I had been missing some ADS-B aircraft that were right under my nose.

The bandwidth of this antenna is fairly narrow. It may be that some intermod issues may have caused me to miss some ADS-B traffic when I used the 1090 MHz mag mount. The narrow bandwidth of this antenna may have eliminated intermod problems created by adjacent strong signals.

I also find that the movement of aircraft on my screen now seems more "fluid" since the signals being received are much stronger. This allows for fewer drop outs and a smoother track on screen.

If you have a Mode-S receiver and you don't have a DPD ADS-B antenna, you really don't know what you are missing.

This antenna is available from DPD Productions. You can get more information on ordering it and their other antenna products at **www.dpdproductions.com/**.

– Review by Larry Van Horn, N5FPW

Table One: DPD ADS-B Vertical Manufacturer Specifications

Gain	9 dBi
SWR	1.5:1 or less on center frequency
Pattern	Omni-directional
Wavelength	Multiple 1/2
Tuned Freq	1090 MHz (Mode-S / ADS-B band)
Connector	N Female
Cable	RG8X
Cable Length	12-inches
Height	57-inches
Width	1 1/4-inch
Weight	1-lb 11-oz
Wind Area	0.50 square feet

REVIEW 2

❖ MFJ-260C 300 Watt Wideband Dummy Load

So, why would anyone want to hook a big resistor to a ham rig when there's an antenna available?

Dummy loads – for those of our readers unfamiliar with them – represent ideal antennas … with one exception. On the plus side, they are pure resistances: no "reactances" (deleterious inductance and capacitance effects) which can result in wasted power.

If your rig is supposed to be attached to a 50 ohm load (the antenna), then that's what a 50 ohm dummy load provides. And it has an enormously-wide bandwidth with no adjustments being necessary.

So what is that one exception? Why don't we use them as antennas? Because all of the power that they acquire is used up as heat!

The dummy load is exclusively a transmitter tuning apparatus. It allows a transmitter's power output circuitry to be maximized under ideal conditions as if it were feeding its signal to a perfect antenna. This way we can concentrate on optimizing the antenna to radiate as much of the RF power it is receiving from the transmitter as it can.

The MFJ-260C is such a wideband dummy load. It is a non-reactive, high-wattage resistor on a heat sink, contained in a husky metal case. Air slots allow convective cooling. Rubber bumper feet reduce the likelihood of it slipping on or scratching a desktop surface.

This 300 watt model is designed to operate from DC to 650 MHz, and is fitted with a UHF-style N connector. A derating curve is silk-screened to one end to show safe "on" periods vs. power levels, so as not to destructively overheat the resistor.

The MFJ-260C will allow 300 watts to be loaded into it for about half a minute, but a more typical 100 watt transmitter can operate at full power for up to one and one-half minutes before the heating becomes excessive. After a brief cool-down period, you can go again.

Many VHF/UHF rigs operate at significantly lower levels, like 25 watts or even less. Handhelds are often only five watts. As you might expect, at these low power levels, continuous transmissions are acceptable for five to 10 minutes at a clip.

So, does it do its job?

We confirmed that the MFJ-260C 50-ohm resistance, heat derating recommendations, and SWR (under 1.5:1) are accurate. The unit is well constructed and painted, and is housed in an all-metal (aluminum), cosmetically-professional enclosure.

If you transmit, you're eventually going to question whether your rig is putting out the power it's supposed to. A quality dummy load like the MFJ-260C will absorb that transmitter's energy like a perfectly-matched antenna, while you check the output with a wattmeter or simply read the transmitter's meters.

In a pinch, feel the cabinet of the dummy load for heat and compare the time interval with the chart on the back of the unit! And, did I mention that the price is right? MFJ-260C dummy load, $39.95 from MFJ Enterprises (P.O. Box 494, Mississippi State, MS 39762; www.mfjenterprises.com; 1-800-647-1800); also available from selected *MT* advertisers.

– Review by Bob Grove, W8JHD.

REVIEW 3

❖ Midnight Science Ultrasonic Dish

In April 2009, we reviewed the RX-1 ultrasonic receiver for listening to the sounds of nature, such as bat calls. It's a fine receiver for listening to these chirps in the 40 kHz range, down-converted into the human hearing range. That receiver has been replaced by the Ultra RX-2 with automatic gain control.

Now, an optional parabolic dish reflector is available as well for both models. We ordered the dish and followed the directions to attach it to our original RX1 as shown in the attached photo.

Some assembly required

The dish kit modification does require some tools and shop experience. Holes have to be drilled in the receiver case to accommodate the bracket which holds the dish; a hand grip must also be mounted on the bottom of the receiver case; and a two-conductor cable needs to be soldered to the receiver (after removing the original microphone) and to the new mike in the parabolic dish unit.

The parabolic dish is sturdily held against the receiver mounting plate by three metal struts. The microphone is aimed back at the dish from the focal point of the reflected sound. The entire assembly is comfortably balanced, lightweight, and held by a pistol grip.

Let's listen

After assembly, it was time to test the unit. Switching on the receiver, the directivity and gain of the new combination was immediately apparent.

Grasping the hand grip and aiming the dish at various targets, I was able to select the ultrasonic components of keys rattling, my collies' dog collars, water running from a faucet (yes, that's ultrasonically noisy!), and even footfalls on our gravel driveway – a crunching piezoelectric effect.

Walking through the house with the dish-amplified detector was an ear-opening experience. Computers emanate a strange whine, while electrical wiring and switches often radiate clicks.

A longer walk through the neighborhood revealed quite an array of ultrasounds – insects' and hummingbirds' wings beating, stream water trickling, my wife's digital camera autofunctions, and a solar-powered, solid-state fence charger that sounded like an alien invasion in a science fiction movie! And right now I'm waiting for nightfall to eavesdrop on bats!

Practical applications

Electrically-infuriating power lines often develop leakage paths in insulator cracks and loose connections. The resulting "hisses" and "zaps" are rich in acoustic harmonics which can be audibly bulls-eyed by aiming the ultrasonic dish.

Locating high-pressure gas leaks is another useful application of the dish. Again, the outgassing is rich in acoustic harmonics.

The bottom line

While the Midnight Science RX1 and RX2 ultrasonic receivers are sufficiently sensitive to detect a wide array of ultrasound sources, the addition of a parabolic reflector adds directivity as well as additional gain, making the system very satisfactory for both hobby and practical applications.

The original swath of directivity for the mike alone is a wide 50 degrees, but the addition of the parabolic dish narrows this to a razor-sharp 3 degrees! Not only that, it adds some 20 dB of gain as well.

For more information and ordering information for these ultrasonic instruments, visit the Midnight Science website, home of the Xtal Set Society, at **www.midnightscience.com/ultra-kits.html (**The Xtal Set Society, PO BOX 3636, Lawrence, KS 66046 Ph: 405-517-7347)

– Review by Bob Grove, W8JHD

REVIEW 4

❖ MFJ Lapel-Style Speaker/Microphone

For most of us, using a hand-held two-way radio means drawing it off a belt and holding it to our faces to send and receive. So how about our favorite TV and movie action thrillers where the good guys all talk up their sleeves or press a button and talk through their collars? They may not even have a cord dangling from an ear bud.

Lapel-style speakers and speaker/microphones provide excellent comfort, immediate response and reliable quality near the ear, all without removing the handy-talkie from your belt. Such is the 294 series from MFJ Enterprises.

The 294 series must be ordered to fit particular models of radios, since not all use the same mike/earphone jack configuration. The MFJ294Y is a single, 1/8-inch (3.5 mm) plug style. It has four contacts for earphone (speaker), mike, transmit/receive, and common ground. Compare this with common mono and stereo plugs with two or three contacts respectively.

The speaker/mike plug on the 294Y is made to mate with the ICOM IC-Q7A and the Yaesu FT50R and VX1 transceivers. A small button on the side of the casing is pressed to engage the transmit function. A rigid spring clip can swivel 360 degrees for the most convenient access on a shirt lapel or collar. The speaker/mike is connected to the radio by a 3-½ foot coil cord.

So how about scanners?

Those of us who choose to use the unit for our belt-worn scanners don't need the microphone or transmit/receive provision; an efficient speaker near our ear is all we want. And the 294 provides this with lightweight, compact convenience; however, it will be necessary for some scanner models to accessorize the plug with an adapter.

The tip of the plug is for speaker activation, the most common configuration for external monaural earphone and speaker jacks. I found that the 294Y worked right out of the package with my Uniden scanner and with my ATTEN spectrum analyzer as well.

The plug requires a 1/8-inch (3.5 mm) monaural jack. The speaker's 8 ohm impedance will match any low-impedance audio output jack. The electrets condenser microphone is rated for a 20-20,000 Hz frequency response.

The speaker audio quality is voice tapered, and its crisp output provides clarity with minimum distortion even at high outputs in noisy locations.

Whether you're looking for a high performance, low cost lapel speaker for a scanner, or a convenient speaker/mike for your HT, or just want to impress the crowd, the MFJ294 speaker/mike is for you!

MFJ294 $16.95 from MFJ Enterprises, Starkville, MS (P.O. Box 494, Mississippi State, MS 39762; **www.mfjenterprises.com**; 1-800-647-1800); also available from selected *MT* advertisers.

– Review by Bob Grove, W8JHD.

What's NEW

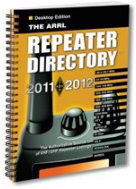
Tell them you saw it in Monitoring Times

Larry Van Horn, New Products Editor

ARRL Repeater Directory

The American Radio Relay League has recently released the 2011/2012 edition of their annual *ARRL Repeater Directory*® in three different formats.

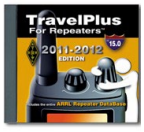
In print there are two different editions, including a pocket-sized edition, perfect for mobile operations (size 3.75 x 5.25 inches), and a desktop edition (size 6 x 9 inches and now spiral bound). Both editions have thousands of listings for VHF/UHF repeaters across the US and Canada and have the following features:



- Handy indexing tabs on the cover to aid finding the listings you're looking for.
- Easier-to-read listings.
- Key to repeater notes located right up front.
- Icons make it easy to identify "Open" or limited access repeater systems.
- Repeater operating practices, repeater lingo and hints for newly licensed hams.
- Frequency coordinator contact information.
- D-Star and APCO 25 repeaters
- Using CTCSS tones and Digital Coded Squelch (DCS)
- VHF/UHF Band Plans and 2-meter channel-spacing map
- Tips for handling interference
- IRLP, WIRES-II, and EchoLink® (Internet linked) nodes
- Emergency message handling procedures
- Transceiver memory log

The third format is a CD-ROM called the *TravelPlus CD-ROM* and comes with a bonus *Repeater Directory*, Version 15.0, a power packed CD for hams who use electronic publications.

With *TravelPlus for Repeaters*™, you have the power of *The ARRL Repeater Directory* on your computer as your traveling companion, and you'll never be alone on the road. You can locate ham radio repeaters along US and Canadian travel routes using this map-based software package.



This feature-packed CD-ROM includes the following features:

- Map your travel route and tune in. Supports GPS with separate external hardware (cable and adapter purchased separately and not supplied with TravelPlus).
- View and print maps and repeater lists.
- Access the ARRL Repeater DataBase, global Internet linked nodes, AM/FM radio, broadcast television, and NOAA weather stations, USA and Canadian licenses, and ham radio points of interest.
- Export data. Transfer to Palm™ or Pocket PC, radio programming software, and more.

This CD requires Microsoft Windows™ XP or Vista, and a Pentium or comparable processor and a CD-ROM. 16 MB of RAM (32 MB or more recommended). Hard disk with at least 50 MB free (run from CD-ROM) or 260 MB free (run from hard drive). 640 x 480, High Color (16 bit) graphics supported.

The pocket-sized book ARRL #1769 cost $10.95, and the Desktop edition ARRL #1936 sells for $15.95 plus shipping. The TravelPlus for Repeaters CD-ROM. ARRL #7921 retails for $39.95 plus shipping. If you have previously purchased a TravelPlus CD, there is a discount available. Just cut out the Proof of Purchase from the booklet included with your previous edition CD, and return it with your order for this new 2011-2012 edition by mail to the ARRL only. Please specify ARRL Order #7921U, and include $19.95 plus $2.75 shipping with your order.

These fine amateur publications are available from the ARRL website (**www.arrl.org**), via their toll free order line at 1-888-277-5289 9 (8 a.m. to 5 p.m. Monday through Friday, except holidays), or snail mail to ARRL, 225 Main Street, Newington, CT 06111-1494. You should also check your local amateur radio dealer or selected *Monitoring Times* advertisers for these and other ARRL publications.

Domestic Broadcasting Survey 13

Edited by DSWCI Chairman, Anker Petersen

The 54 year-old Danish Shortwave Club International (DSWCI), which contains experienced DXers in 33 countries all over the world as members, has just issued the 13th edition of its annual *Domestic Broadcasting Survey*. This shortwave broadcast reference is divided into three parts:

- Part 1: A survey of the tropical broadcast bands covering all active broadcasting stations on 2300 to 5700 kHz, including clandestines.
- Part 2: Domestic stations on international shortwave bands above 5700 kHz broadcasting to a domestic only audience (non-international broadcaster).
- Part 3: Deleted frequencies between 2 and 30 MHz which have not been reported heard during the past five years, but may reappear. (This Part 3 is only published in the e-mail version, but buyers of the printed version can get a copy from the editor upon request.)

This new *Survey* is based upon many official sources and DX-bulletins. A-11 schedules have been included when they were available. In order to make the *DBS* more reliable, DSWCI monitors from around the world have checked throughout the period May 2010 - March 2011, to see if each of the 775 station frequencies is on the air. Active stations are marked with an A ("Regular"), B ("Irregular") or C ("Sporadic") in the list. D means "Likely inactive."

A unique feature of this publication is in the right column called "Last log." It shows the last month and year before DBS deadline on March 31, 2011, when a particular station was last logged by a DXer somewhere in the world. This is another way of indicating the current audibility of the station. To avoid inactive stations in this DBS, most frequencies which have not been heard during the past year, have been deleted and are moved to Part 3.

Other useful features for easy identification (ID) are the parallel frequencies and reference to Station ID slogans.

All buyers of *DBS-13* will get a username and password, giving them access to the monthly updates on the tropical bands published under the name *Tropical Bands Monitor* on the DSWCI website. There is similar data from 2005, 2006, 2007, 2008, 2009 and 2010 available at **www.dswci.org/tbm** to the general public.

The electronic publications is 26 pages in the A-4 size and DBS-13 is available by e-mail as pdf-format (about 750 kB in size). A limited number of copies of this publication are available printed on paper. It is 23 pages without Part 3 in the printed version.

Both the electronic and printed editions are sold by the club treasurer: DSWCI, c/o Bent Nielsen, Egekrogen 14, DK-3500 Vaerloese, DENMARK. The cost for each edition is:

- E-Mail edition: DKK 35,00 or USD 7.00 or EUR 5,00 or GBP 4,00 or SEK 45,00 or IRC 3.
- Printed edition: DKK 70,00 or USD 14.00 or EUR 10,00 or GBP 9,00 or SEK 90,00 or IRC 6.

Payment by cash notes is accepted: no checks or postal money orders. If you want to pay via PAYPAL or if you have Euro as national currency, contact Andreas Schmid, *schmidandy@aol.com*. Payment via PayPal is only available for persons living outside the European Union (EU) and in US$ currency.

For additional mailing instructions, consult the website at **www.dswci.org/**

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, *larryvanhorn@monitoringtimes.com*.

When ordering or inquiring about the products mentioned in this column, be sure to tell them that you saw it in the pages of *Monitoring Times* magazine.

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Dayton Hamvention: A Rite of Passage

Bob Grove W8JHD

Every mid-May the Dayton Amateur Radio Association presents the largest hamfest in the nation. Tens of thousands of radio enthusiasts challenge the eternal road construction delays to descend upon the grounds of Hara Arena, just North of Dayton, Ohio. I'm one of those zealots.

We addicts just love to see the bright, shiny, new products in the arena complex. We renew friendships upon discovering familiar names and call signs on each other's badges. And we walk the 12 acres of flea market, reminiscing as we see the holy relics of our early years in ham radio.

It's a fun time, with smiles everywhere. And it's a learning experience as well for those who attend the many informative forums covering a wide array of topics, especially useful during our transition from analog to digital communications.

I start out in the indoor complex where all the manufacturers exhibit their latest entries, but it's not long before my thoughts begin to wander, and I wander as well – outside to the flea market!

This is where the bargains are; acres of discontinued equipment and parts waiting for someone to discover them. This is where patient wives attend their husbands who try to explain just what each of these contraptions is, expecting their wives to share their boyish enthusiasm.

I watched one wife who had trudged through every row of flea market merchandise with her husband and was now standing patiently at the last open tailgate where he was fondly examining the final batch of items that meant nothing to her. She smiled and asked him, "Well, now are you ready to go back to the mother ship?"

The Dayton Hamvention. It's one of a kind.

This collection of German WWII Enigma crypto machines under glass drew flea market attention.

Looking for bargain test equipment? Several clean EICO units ready for customers.

If you don't have enough room to display it sideways, stack it!

Antique radios peppered the 12-acre flea market.

Need tubes?

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The indoor Hara Arena is a busy place during Hamvention.

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Discover exceptional performance, state of the art specifications and a receiver with a menu of optional extras that can be configured to your own needs and specifications.

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- Two selectable Type N antenna input ports
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- Optional AR-I/Q Windows software facilitates the easy storage and playback of transmissions captured within up to 1 MHz bandwidth or, signals can be subjected to further analysis.
- An optional GPS board can be used for an accurate time base and for time stamping digital I/Q data.
- The triple-conversion receiver exhibits excellent sensitivity across its tuning range.
- Powered by 12 volts DC (AC Adapter included), it may be operated as a base or mobile unit.
- Software-driven operating selections include IF bandwidth, frequency, mode, filters, a screen-displayed graphical "S-meter," memory inputs, volume and squelch settings and more
- Professional (government) version is equipped with a standard voice-inversion monitoring feature

**Cellular blocked for US consumer version. Unblocked version available to qualified purchasers with documentation. Specifications subject to change without notice or obligation.*

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