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

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June 2011

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Holiday on Shortwave

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In this issue:

AR2300 "Black Box" Professional Grade Communications Receiver

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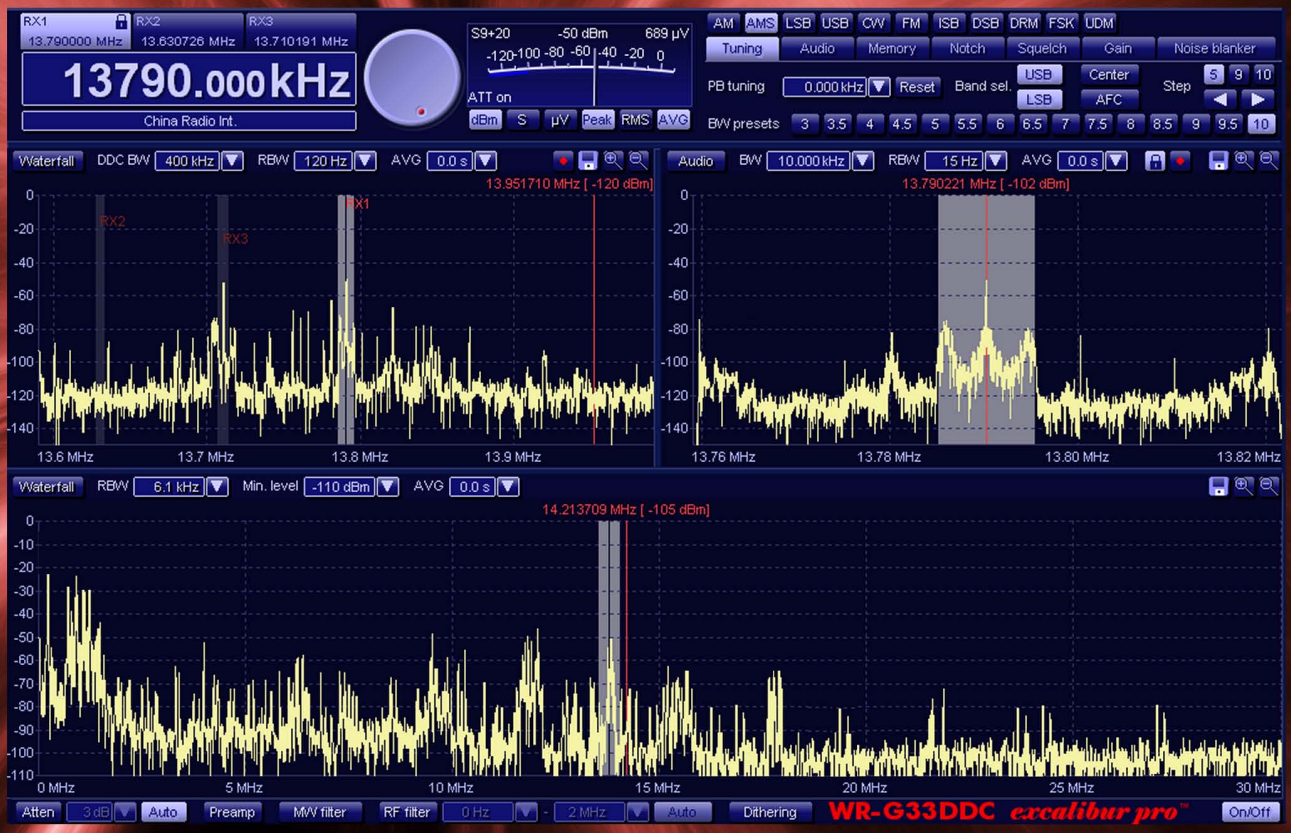

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Monitoring Times

Vol. 30 No. 6 June 2011

Holiday on Shortwave..8

By Eric Bryan

With the U.S. dollar taking a beating abroad, gas prices nudging the $4 mark, and the jobless rate hovering in the 8 to 10 per cent range, there's not a lot of incentive to go abroad.

Luckily, this summer *MT* readers can turn on their shortwave radios and cruise the less explored countries of Europe. In this month's cover story Eric gives an inviting thumbnail sketch of these countries, all of which make for interesting listening. Many are former Soviet bloc countries and maintain a very listenable presence on the shortwave bands.

Using the English language shortwave guide in the center of this magazine, the websites and QSL addresses in this article, you'll be able to visit each of these countries for a most enjoyable and very inexpensive trip. And, with the money you save, you could just upgrade your shortwave radio!

On Our Cover

Clockwise from left top corner: The English section at Voice of Turkey (courtesy: VOT); QSL from Radio Ukraine International (courtesy RUI); announcers in studio at Radio Belarus (courtesy Radio Belarus); antenna farm at Radio Serbia (courtesy: Radio Serbia).

C O N T E N T S

R E V I E W S

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COMMUNICATIONS

by Ken Reitz

AMATEUR/SHORTWAVE

Hams React to Japan Quake

Amateur radio activity in the aftermath of the March 11 9.0 earthquake in Japan involved hams from many parts of the world. Locally, according to a report from ARRL, Japanese hams under the auspices of the Japan Amateur Radio League (JARL) set up emergency operations on frequencies throughout the HF bands as well as 2 meters and 70 cm.

IARU Region 3 secretary Ken Yamamoto was quoted as saying, "Those who can operate in the affected areas are providing a lifeline for rescue teams and those at local shelters. Some stations are operating with car batteries and others with engine generators."

There were many stories in the media about concerned relatives from abroad sending health and welfare inquiries to Japanese hams who were able to answer those requests through their HF and repeater networks. Meanwhile, U.S. hams stationed observers throughout the U.S. west coast to report on the effects of the tsunami as it made its way across the Pacific Ocean from the quake's epicenter. An estimated $15 million in damage was reported at Santa Cruz harbor alone as 100 boats were damaged or sunk by the wave.

JJY Time Station Forced to Close Down

According to an article in *PC World*, Japanese national time signal station JJY, operating at 40 kHz, survived the March 11 earthquake but was forced to shut down March 12. Since the station is located just 16 kilometers from the malfunctioning Fukushima nuclear power station, the site fell within the 20 kilometer evacuation zone established by the government. A second transmitter site located in western Japan operates at a different frequency (60 kHz), is not received well in the area served by JJY and wouldn't work on devices designed to use its 40 kHz signal.

NIST Fumbles ARRA Bucks

Anyone using an "atomic clock" in the eastern part of the U.S. knows that it's sometimes difficult to get a decent signal to run the clock. That problem was to be corrected with the addition of an east coast transmission site for a new National Institute of Standards and Technology (NIST) 60 kHz radio station. Funding for the project was to be provided by the American Recovery and Reinvestment Act (ARRA).

According to John Lowe, manager of NIST stations WWV, WWVH and WWVB,

(courtesy: NIST)

writing in *Radio World* online, a number of sites, including the VoA site in Greenville, North Carolina, were seen as possibilities as a home for such a station. The final choice fell to the Redstone Arsenal in Huntsville, Alabama, but negotiations with NASA, which was worried about the effects of such a high-powered, low frequency installation at their site, fell through.

By that time the ARRA funding window closed and no new station will be built. Lowe explains, in the article, NIST is looking at other ways to bring a better signal to the east coast.

AM/FM/TV/CABLE

Motley Fool: Radio is Dead

The private investor advice company *The Motley Fool* published an article on their web site (**www.fool.com**) March 10 titled, "Radio is Dead." The report looked at the buyout of Citadel Broadcasting by Cumulus Media and noted gloomily, "The radio industry has changed dramatically on this side of the recession."

It listed radio's chief competitors – Sirius/XM with more than 20 million paying subscribers, the wildly popular smart phones with their endless online listening apps, and popular streaming audio services such as Pandora with nearly 80 million U.S. subscribers – as evidence of such change. In a final salvo the article said, "…investors are better off avoiding this industry altogether. Terrestrial radio will never be the same."

Thieves hit KSL Xmtr Site

KSL NewsRadio had its own news story March 29 when thieves hit the transmitter building and carted away $30,000 worth of copper and tools. Unfortunately for the thieves, the entire episode was caught on a series of surveillance cameras which should be enough to allow Salt Lake City police to make arrests. The station aired much of the surveillance footage on their web site.

Former FCC Chair Heads Big Cable

Michael Powell, former chairman of the Federal Communications Commission and the latest high-ranking FCC official to breeze through the FCC's well-oiled revolving door, has a new job. He's now president and CEO of the National Cable & Telecommunications Association, the largest and most influential cable lobby in the U.S.

Powell's market-oriented tenure oversaw unprecedented media ownership consolidation that brought smiles to Wall Street investors. Among other bright ideas Powell pursued during his FCC reign was broadband-over-powerlines (BPL), now deemed a total flop even by supporters. Since he left the FCC in 2005, Powell worked out of the D.C. office of a major law firm specializing, in part, in legal affairs brought before the FCC.

SATELLITE

Stern Unhappy, Sues Sirius/XM

No one likes a cut in pay and who can't empathize with satellite radio talk show host Howard Stern, who has to show up for work for a few hours, three days a week to earn his reported $80 million a year salary (which is down from $100 million a year for the previous five years).

SiriusXM™ SATELLITE RADIO

Well, Howard's not looking for your empathy. Instead, according to the *New York Times*, he's suing the satellite radio monopoly, Sirius/XM, who his lawyer claims, "has reneged on its commitment to Stern, unilaterally deciding that it has paid him enough." According to the article, the aging shock-jock wants a cut in the company's profits in the form of stock.

That's not the end of Sirius/XM's legal troubles. According to *Bloomberg Businessweek*, a suit alleging that the satellite radio service jacked up prices by 40%, despite promising the FCC it wouldn't, should be in trial as you are reading this.

In addition, Sirius/XM acknowledges in their latest stock filing that, "A Multistate Working Group of 28 State Attorneys General, led by the Attorney General of the State of Ohio, is investigating certain of our consumer practices." Separate investigations by the Florida and Missouri Attorneys General are also underway, according to Securities and Exchange Commission documents filed by the company.

Sat-TV Customers Gripe to BBB

An article in the *Hartford Business Journal* online noted that cable and satellite-TV customers lodged the largest number of complaints with the Better Business Bureau in 2010. According to the report, the cell phone industry came in second and new car dealers earned third place in the number of complaints filed nationwide.

PUBLIC SERVICE

JFK Dead Zone for NYPA Police

The *New York Post* reported in March that a new terminal for JetBlue at JFK Airport had been found to be a radio "dead zone" half a year before the terminal opened in October 2008. The airport, part of New York's Port Authority (NYPA), noted that 37 NYPA police died in the 9-11 attacks and nearly ten years later NYPA officers are issued preprogrammed cell phones to use in an emergency if they are unable to use their radios. The article noted that a permanent radio fix will cost $3 million.

Oregon Rethinks Radio System

An article in the Portland *Oregonian* March 22 detailed efforts of a state legislative committee investigating Oregon's extravagantly priced and overly ambitious state-wide radio system known as OWIN (Oregon Wireless Interoperability Network). Wrote Brent Walth in the article, "With the project years behind schedule, legislators must figure out how to meet the deadline and keep costs down as they face a $3.5 billion general fund budget gap for 2011-13."

The article perfectly describes the situation faced by many states and municipalities today that had previously signed up for lavish interoperable radio systems at a time of overflowing tax coffers and hundreds of millions of dollars in federal grants. The reality of today's deep recession, made worse by declining property values and shrinking tax revenues, has forced these same entities to rethink such systems.

FCC ENFORCEMENT

Station Fined for Airing Ads as News

Video News Releases, known in the TV trade as VNRs, are basically company news releases dolled up to look like actual news stories and distributed to local network stations nationwide that are always starved for filler to stick between the weather and sports scores.

A March article in *Television Broadcast* reported that, back in June 2006, a Minneapolis Fox-owned TV station ran a VNR distributed through Fox News Edge that the FCC has decided should have been tagged with what it calls "sponsorship identification." That means that the VNR contained material for which money, service, or consideration of any type is supplied directly or indirectly.

The FCC noted that, among other things, the VNR featured only GM products in a "news" story that was supposed to be about how popular convertibles were that summer. Fox argued the fine was a violation of its First Amendment rights, but the FCC wrote that "… listeners and viewers are entitled to know who seeks to persuade them." The station was fined $4,000.

FCC Throws Book at Cal. Pirate

The routine fine for operating an unlicensed radio station is $10,000, but the FCC was particularly fed up with one San Jose, California, pirate whose FM signal was also an unwanted presence on the local aviation band. That's a big FCC no-no.

The fun started back on March 12, 2010 when FCC field agents, responding to a complaint of interference from the Federal Aviation Administration (FAA), located the pirate at his residence operating as KNRG 92.9 in San Jose. The agents left a Notice of Unlicensed Operation (NOUO).

Less than two months later the agents were tracking down another complaint and found the offending station operating on 93.7 FM at a different address but recognized the operator as the same guy they'd tagged earlier. The agents left a second NOUO. Then, on June 15, 2010, again responding to complaints by the FAA of interference, the agents tracked a signal on 92.9 right back to the pirate's new address and issued a third NOUO.

Finally, on July 23, 2010 agents, tracking a signal on 104.3 FM, found themselves at the doorstep of yet a third address for the same operator. Agents handed him a fourth NOUO. And, just one day short of a year from their initial investigation, the FCC issued the pirate a Notice of Apparent Liability for Forfeiture for $25,000.

More FM Pirates Rounded Up

According to documents in the FCC's Enforcement Bureau, additional FM pirate operators were issued NOUOs in the 30 day reporting period since the last issue of *MT Communications,* including ones in Riverdale, Maryland on 93.5 FM; Miami, Florida at 103.9 FM; Ft. Lauderdale, Florida on 96.1 FM, and Mattapan, Massachusetts on 96.5 FM.

Office of Inspector General

The Mattapan operator gets this month's QRO FM pirate award. His station was putting out a whopping 422,417 microvolts per meter at 35 meters. The maximum allowed under Part 15 Device rules is 250 microvolts per meter at three meters.

The Miami operator ran a French language station aimed at the area's Haitian community and was a repeat offender from 2007 when he was caught operating from Port St. Lucie, Florida. For his persistence the pirate was fined $20,000.

Science Teacher's Revenge Backfires

Agents, working out of the Chicago FCC field office were responding to complaints of cell phone interference when their investigation took them to a high school north of Chicago where a cell phone jamming device was discovered. A science teacher admitted to FCC agents the unit had been in operation at the time of inspection. An NOUO and Interference to Licensed Radio Stations were issued to the teacher with copies sent to the school's principal and Superintendent of Public Schools.

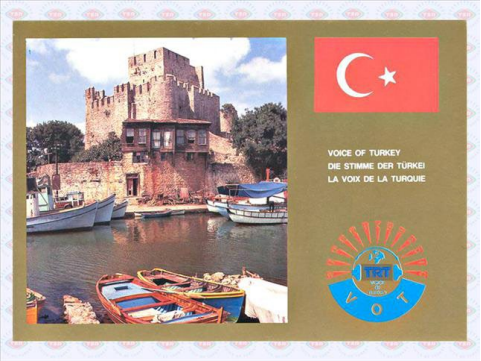
Finally, Relief from Interference

The FCC Enforcement Bureau March 7 issued three notices to unnamed individuals for interference from various devices including a wireless Ethernet adaptor, a heating system, and a pellet stove, all of which were said to be causing harmful interference to unnamed operators in the Amateur Radio Service.

And, finally, remember those complaints you sent to the FCC about interference on the ham bands from equipment operated by your local power company one or two years ago? Well, nine notices were finally sent out in early March to named electric companies from seven states stemming from complaints that their equipment might be causing interference to amateur radio operators who were not named in FCC documents.

Got a complaint? File and wait.

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, David Alpert, Rachel Baughn, Harry Baughn, Bob Grove, Norman Hill, Steve Karnes, and Larry Van Horn.



Courtesy: Voice of Turkey

Holiday on Shortwave

By Eric Bryan

Vintage Radio Vatican QSL courtesy: Ken Reitz KS4ZR

Though we are entering what is usually not the optimal seasonal DX period, an upswing in solar activity might offer some European catches you've been missing for awhile or have never heard before. In fact, as I'm writing this, the Voice of Greece is coming through with a fair signal, broadcasting Greek folk music on 9420 kHz.

Leaving aside the larger, more regularly heard broadcasters, why not take advantage of the improving ionospheric conditions and, using your shortwave radio, travel deep into Europe and explore its lesser-known countries and their broadcasters? For the latest frequencies and broadcast times, please refer to *MT's Shortwave Guide* found at the center of this magazine. QSL information is just below the description of each country. Some broadcasters offer online QSL report forms, and are so noted; others require written reports posted through the mail.

Albania

Meaning "Country of the Eagle" in Albanian, this southeastern European nation is situated in the northwestern section of the Balkan Peninsula. With Italy 47 miles away to the west across the Adriatic Sea, Albania borders Montenegro to the northwest, Serbia to the northeast, Macedonia to the east, and Greece to the south and southeast.

Variously occupied by Italian and Balkan powers through the centuries, Albania became part of the Ottoman Empire in the 16th century. The country didn't achieve independence until 1912, and entered its communist era in 1944. As with many former Communist bloc countries, Albania began its shift to democracy and an open economy in 1991.

At about 11,100 square miles, Albania is mostly mountainous, with ranges running from the northwest to the southeast, and coastal lowlands. Agriculture forms over half of Albania's economy, with the country growing olives, sunflower seeds, figs, sugar beets, potatoes, grains, fruit, and tobacco. The primary meal in Albania is lunch. This often has a main course of vegetables, including olives, cucumbers, peppers, and tomatoes, seasoned with olive oil, salt and vinegar.

Vintage Radio Tirana QSL courtesy: Ken Reitz KS4ZR

Radio Tirana technically began shortwave broadcasts in 1937 with a three kilowatt transmitter in Tirana. One of the regular socialist Cold War voices through the 1960s and 1970s, by 1987 the station was transmitting 66 hours of programs in 20 languages daily. They currently carry many English programs to North America and Europe.

Web site: **http://rtsh.sil.at/index.html**
QSL Info:
External Service
Rruga Ismail
Qemali Nr 11
Tirana, Albania

Belarus

The Republic of Belarus is in eastern central Europe. Mostly flat and full of lakes, marshes, and forests, Belarus is bordered by Poland to the west, Latvia and Lithuania to the northwest, Russia on the east, and Ukraine on the south. Belarus is a study in perseverance and preservation of culture and identity in the face of centuries of occupation. Pulled this way and that over the centuries by Lithuania, Poland, and Russia, Belarus declared its independence in 1991, helping to topple the USSR in the process.

With an area of about 80,150 square miles, Belarus grows sugar beets, grains, and potatoes. In this country, dinner is the primary meal. Rye bread is popular, as rye grows well in the Belarusian climate. Guests and travelers are often treated by hosts to the traditional offering of bread and salt. Meals have an emphasis on pork and vegetables.

Radio Station Belarus began shortwave broadcasts in 1962 with programs in Belarusian. The station added German programs in 1985, Russian and English in 1998, and Polish in 2006, with currently 16 hours of airtime daily.

Web site: **www.radiobelarus.tvr.by/eng/**
QSL Info:
Radio Belarus
4 Krasnaya St.
Minsk, Belarus
Postal code 220807

Belgium

Along with Luxembourg and The Netherlands, Belgium forms The Low Countries. Having an area of 11,787 square miles, the country is made up of the coastal plain, the central plateau, and the Ardennes highlands. Belgium is bordered on the south and southwest by France, on the east by Luxembourg and Germany, and on the north by The Netherlands and the North Sea.

The name Belgium comes from the ancient Celtic tribe of the Belgae which once populated the region. Formerly under French and Dutch rule, Belgium gained its independence in 1830.

Besides grains and potatoes and sugar beets, Belgium produces tomatoes and fruits and flax. Dairy and livestock farming are also major industries in the country. Famous, of course, for its chocolate, Belgium is also known for its beer and waffles and French fries, which originated in this country, not France. Traditional dishes are mussels with French fries and steak with French fries and salad.

TDP Radio is a Belgium-based DRM broadcaster specializing in dance, trance, and disco music. Relayed via French Guiana.

Web Site: **www.tdpradio.com/**
QSL Info:
TDP Radio
P.O. Box 1 2310
Rijkevorsel
Belgium

Bulgaria

Vintage Radio Sofia QSL Courtesy: Ken Reitz KS4ZR

In southeastern Europe on the Balkan Peninsula, Bulgaria is bordered on the south by Greece and Turkey, on the west by Serbia and Montenegro, at the north by Romania, and to the east by the Black Sea. Bulgaria released itself from Communist domination in 1990 when it adopted a multiparty system.

Having an area of 42,855 square miles, Bulgaria grows tobacco, fruits – raspberries in particular – vegetables, grains, and oilseeds. Known for its wine production, Bulgarian cuisine is diverse. Grilled meats, baklava, stews, steamed and baked dishes are common. Yogurt, salami, pastry, and a salad made of onion, cucumbers, tomatoes, roasted peppers, parsley, and brine cheese is a specialty.

Broadcasting since 1930, Radio Bulgaria carries almost 60 total hours of daily air time on shortwave and mediumwave in ten languages.

Web site: **http://bnr.bg/sites/en/Pages/default.aspx**
QSL info:
http://bnr.bg/sites/en/Pages/ReceptionReport.aspx
(QSL report form and email address)

Croatia

Also in southeast Europe on the Balkan Peninsula, Croatia has an area of 21,820 square

miles and a diverse landscape of mountains, plains, coastline, as well as thousands of Mediterranean islands. Croatia is bordered by Bosnia and Herzegovina on the southeast, Serbia and Hungary on the east, Slovenia on the north, and the Mediterranean on the west. The necktie, Dalmatian dogs, and some of the earliest fountain pens had their origins in Croatia.

Cuisine in Croatia carries Hungarian and Austrian influences with specialties including chicken prepared with tomatoes, onions and paprika; fried cheese; veal cutlets; and cheese pastries. Stews, soups, salty pies, and cheese are also typical.

The Voice of Croatia began broadcasting in 1991 on shortwave to Croatians living abroad. The station added English and Spanish news in 2000. They began around the clock transmissions in 2003. Voice of Croatia is relayed via Germany.

Web site: **www.hrt.hr/**
QSL info:
Hrvatska Radio
Prisavlje 3
10000 Zagreb
Croatia

Czech Republic

With an area of 30,450 square miles, the Czech Republic is surrounded by Germany to the west and northwest, Poland on the north, Slovakia on the east, and Austria on the south.

The country holds the former lands of the historic Moravia and Bohemia, and a portion of Silesia. Bohemia and Moravia formed part of the Austro-Hungarian Empire. In 1918, the two regions were united with Slovakia and part of Silesia to create Czechoslovakia. Czechoslovakia became a democratic state after the fall of the Berlin Wall in 1989. In 1993, the territories separated into Slovakia and the Czech Republic.

The country's landscape varies from low plains to highlands and is bound by mountain ranges. The Czech Republic grows mainly potatoes, sugar beets, flax, corn, grains, and hops. Livestock is also important. The traditional Czech diet is similar to German cuisine. Pork and cabbage and dumplings are standard; frankfurters and open-faced sandwiches are common snack bar fare. The Czechs are famed for their beer, and the Moravians within the country are noted for their wine.

Radio Prague began shortwave broadcasts in 1936 with a brand new 34 kilowatt transmitter which could operate from 13 to 100 meters. The station was released from Communist control after 1989, and by 2001 Radio Prague was transmitting in English, Russian, Spanish, German, Czech, and French with 24 hours of air time daily.

Vintage Radio Prague QSL Courtesy Ken Reitz KS4ZR

Web site: **www.radio.cz/en**
QSL info:
www.radio.cz/en/report
(online reception form)

Greece

Including the Greek islands, which make up about 20% of Greece's land, the country's total area is about 50,950 square miles. Greece occupies the southern section of the Balkan Peninsula. It's bordered on the north by Albania, Macedonia, Bulgaria, and Turkey.

Ancient Greece is famed for its advances in the arts, government, and philosophy. The country fell under Ottoman rule in the 15th century. It began to break free and expand its territory in 1830. The monarchy was ended in 1974.

About 80% of Greece's mainland is mountainous, and the Greek islands are mostly mountainous or hilly, and arid. Greece produces cotton, grapes, vegetables, sugar beets, tobacco, and olives, with sheep and goat farming being a primary part of the country's agriculture. Coffee and pastry shops abound in Greece, and kebabs and honey-flavored sweetmeats such as baklava are primary in the Greek diet. Cuisine also includes the traditional Greek peasant diet of olives, cheese, vegetables, beans with olive oil served with rustic bread, and little or no meat. A famous Greek wine is retsina, preserved with resin such as pine pitch, giving it an interesting and acquired taste.

The Voice of Greece has its origins in Athens Radio, which was established in 1938. The first shortwave service of Athens Radio began in 1940, after the outbreak of the Greek-Italian War. The service broadcast programs to the front and the Balkans from Athens. In 1947, after the German-Italian occupation, the shortwave service was expanded to cover Egypt, Cyprus, Turkey, and the USSR, via a 7.5 kilowatt transmitter.

The project was expanded in 1971 with the installation of two 110 kilowatt transmitters and antenna arrays aimed toward the five continents. The international service was named The Voice of Greece in 1975. The Voice of Greece, or ERA 5, broadcasts 23 hours daily in 12 languages. Voice of Greece is relayed via WRMI and WRN.

Web site: **www.voiceofgreece.gr/news-in-english/blog**
QSL info:
Voice of Greece
432 Messoghion Av.
15432 Aghia Paraskevi
Athens, Greece

Moldova

This country covers an area of about 13,000 square miles and was the smallest former USSR republic next to Armenia. Moldova is bordered on the west by Romania and on the north, east, and south by Ukraine. Formerly under Ottoman influence, Moldova became independent with the collapse of the USSR in 1991.

Primarily hilly plains and deep river valleys, Moldova is an agriculturally rich country known for its vineyards and wine production. Radio Moldova International went on air in 1992, soon after the country's independence, broadcasting in English, Spanish, French, Russian, and Romanian.

Web site: **www.trm.md/index.php?location=4**
QSL info:
Radio Moldova International
Str. Miorita 1
Chisinau
Republic of Moldova

Poland

Bordered on the west by Germany; the north by the Baltic Sea and Russia; the east by Lithuania, Belarus, and Ukraine; and the south by Slovakia and the Czech Republic, Poland covers an area of 120,728 square miles. Formerly united with Lithuania, Poland has a history of being partitioned by Prussia, Austria, and Russia. During and after World War II Polish territory was again sliced and annexed by Germany and the USSR. The Communist regime, in power since 1945, collapsed and was replaced by a non-Communist coalition in 1989.

The Polish landscape ranges from coastal lowland and beaches with enormous dunes, to a wasteland-desert, to highlands, to plains, to the Carpathian, Tatry, and Sudety mountains. The main crops of Poland are grains, potatoes, rapeseed, tobacco, sugar beets, strawberries, apples, and currants. Dairy and livestock farming is also important, with the usual dairy products, meat, and wool produced.

Polish cuisine includes stuffed dumplings; jellied fish; sauerkraut with meat; and beat, cabbage, and potato soups. Chicken, pork, and pastas are also popular. Currant juice, beer and vodka are traditional Polish drinks. Gingerbread and babka are traditional desserts.

Polish Radio External Service, formerly Radio Polonia, launched its shortwave service in 1936 with broadcasts in Polish and English. Stifled during World War II, the service resumed in 1945. In 1990, the service expanded to include programs in Belarusian, Ukrainian, Latvian, Lithuanian, and Estonian. Joining the World Radio Network in 2000, PRES broadcasts 11 hours daily in seven languages, including Hebrew.

Web site: **www.thenews.pl/radio/**
QSL info:
www2.polskieradio.pl/zagranica/eqsl/eqsl.aspx?r=tn
(e-QSL report form)

Romania

With a size of 91,700 square miles, Romania is surrounded by Hungary on the west, Ukraine on the north, Moldova on the east, the Black Sea on the southeast, Bulgaria on the south, and Serbia and Montenegro on the southwest. With a history of being under Ottoman and Austro-Hungarian rule, modern Romania was founded in 1859. It was a kingdom from 1881 to 1947. Romania threw off the Communist yoke in 1989 and had free elections in 1990.

Courtesy Radio Romania

The Carpathian Mountains run through northern and central Romania, and the Eastern Carpathians range from the northern border to the center of the country. The Southern Carpathians, or Transylvanian Alps, reach west from the eastern range, while the Western Carpathians range over the western part of Romania. The rest of the country includes hills, tablelands, and lowlands.

Romania grows corn and grains, sugar beets, grapes, and potatoes. Livestock is also significant in Polish farming, as well as viniculture. Traditional Romanian cuisine includes cornmeal porridge, grilled meatballs, sour soups, plum brandy, wine, and turnovers for dessert. Beer is also important, with Romanians ranking among the top consumers of beer in the world.

Radio Romania International has its origins in the first experimental external broadcasts made in 1927 in Romanian, German, Italian, and French. The broadcasts were made official in 1932 and were heard as far away as New Zealand. Formerly Radio Bucharest, RRI was formed with the anticommunist revolution in 1989. Portuguese, Spanish, Arabic, Chinese Bulgarian, Hungarian, Ukrainian, Greek, Turkish, Russian, Serbian, and Aromanian were broadcast in the 1990s. Currently, RRI has 25.5 hours of airtime daily in ten languages.

Web site: **www.rri.ro/index2.shtml?lang=1**
QSL info:
www.rri.ro/art.shtml?lang=1&sec=334&art=15152
(online report)

Serbia

The area of Serbia is 34,116 square miles. Serbia borders Montenegro, Bosnia-Herzegovina, and Croatia on the west; Hungary on the north; Bulgaria and Romania on the east; Macedonia on the south, and Albania on the southwest.

Serbian land was conquered by the Romans and later was part of the Byzantine Empire. The first Kingdom of Serbia was founded in 1168. Serbian territory extended into parts of Montenegro, Greece, and Albania in the 14th century. Serbia fell under Ottoman rule in 1459. Serbia began to throw off Turkish control in 1815, and completed the job in 1867. Later, Serbia fell under the influence of the Austro-Hungarian Empire. Yugoslavia was formed in 1918 and reformed in 1946, encompassing Serbia; Serbia's capital Belgrade became capital of Yugoslavia. Serbia declared its independence in 1991.

Serbia is mountainous in the southeast, home to the Balkan Mountains, and the Dinaric Alps loom over Kosovo. The rest of the country ranges from fertile plains to hilly regions.

Serbia grows flax, hemp, fruit, grains, corn, and sugar beets. More than one-third of the world's raspberries are produced by Serbia. Lunch is the main meal of the day, in keeping with Mediterranean tradition. The cuisine includes sausages, jams, jellies, fruit brandy (with grape, plum, and pear most common), applejack, and sauerkraut, with various cakes, buns, and baklava for dessert. Serbian cooking is almost devoid of spices, with paprika and black pepper being two of the few used.

Foreign broadcasts from Serbia (then the Kingdom of Yugoslavia), began in 1936. After the occupation during World War II, shortwave transmissions resumed under Radio Belgrade, which later became Radio Yugoslavia and reverted back to Radio Belgrade in 1954. The international service became independent in 1978. The service became the International Radio of Serbia in 1991, and it broadcasts in 12 languages daily.

Web site: **www.glassrbije.org/E/**
QSL info: *radioju@sbb.rs*
International Radio Serbia
Hilandarska 2, 11000
Belgrade
Republic of Serbia

Turkey

With a total area of about 300,948 square miles, Anatolian or eastern Turkey makes up about 97% of the country, with European Turkey occupying the remainder of its area. Turkey abuts Greece and the Aegean Sea on the west; Bulgaria to the northwest: the Black Sea on the north; Naxcivan, Armenia, and Georgia to the northeast; Iran on the east; and the Mediterranean, Syria, and Iraq to the south. The Turkish landscape varies from fertile plains in the southeast and northwest, to western river valleys, to high arid plateaus and mountains in the east.

Agriculture is so successful in Turkey that they are one of the only countries in the world to produce a surplus of food. Turkey grows figs, tea, cereal grains, maize, cotton, grapes, sugar beets, fruits, and produces silk. Turkey is Europe's top wool producer, with sheep being the primary livestock. In the fertile coastal regions, tobacco, olives, hazelnuts and potatoes are also grown.

Spices and herbs are paramount in Turkish cuisine, with parsley, cinnamon, garlic, mint, and dill common. With strong regional differences, traditional Turkish dishes include Black Sea anchovies, rice, burghul, kebabs, yogurt, baklava, flatbread, green salads, pastas, Mediterranean fish, rice pudding, halvah, Turkish delight, and stuffed eggroll-like fare called Dolma.

Courtesy Voice of Turkey

Web site: **www.trtenglish.com/trtworld/en/news.aspx**
QSL info:
TRT External Services Dept.
P.K. 333
Yeni ehir
06443 Ankara, Turkey

Ukraine

Ukraine, the largest European country after Russia (not counting the total area of Turkey), has an area of 233,100 square miles and is bordered by Hungary, Slovakia, and Poland to the west; to the north by Belarus; to the northeast and east by Russia; to the south by the Sea of Azov and the Black Sea; and to the southwest by Moldova and Romania. Ukraine's area includes the autonomous Crimean Peninsula in the south. With a history of suffering under the Mongol invasion and Polish and Russian powers, Ukraine freed itself from Communism and declared its independence in 1991.

A great part of Ukraine is covered by fertile plains, with the Crimean Mountains at the south end of Crimea and the Carpathian Mountains in the far west making up about five percent of the total area. Ukraine grows the ever ubiquitous sugar beet, corn, grains, fruits and vegetables. Livestock including sheep, goats and cattle is also widespread.

Ukrainian cuisine focuses on rye bread, borsch (beet soup), potatoes, fresh and pickled vegetables, and has an emphasis on pork dishes. There is also the famous Chicken Kiev. Dessert includes Kiev Cake, made of meringue, hazelnuts, and butter cream. Wheat whiskey is a common drink.

Radio Ukraine International broadcasts on shortwave in Ukrainian, English, German, and Romanian. RUI is another broadcaster whose voice was liberated by the collapse of Communism in Eastern Europe in 1989.

Web site: **www.nrcu.gov.ua/index.php?id=2**
QSL info:
Radio Ukraine International
English Service
Kreshchatyk 26
Kiev 01001, Ukraine.

Vatican City

The smallest independent country in the world, Vatican City, also known as the Holy See, is a Roman enclave with an area of 110 acres. Vatican City was founded in 1929 and sits in northwestern Rome on Vatican Hill. Ruled by the Pope, the country had its own currency until it adopted the Euro.

Surrounded by medieval walls marked by six gates, Vatican City is home to the Sistine Chapel, St. Peter's Basilica, the Apostolic Palace, St. Peter's Square, the medieval Vatican Gardens, and the Vatican Museums and Library.

Established in 1931 by Marconi, with its first shortwave transmissions made via a 10 kilowatt transmitter, Vatican Radio gradually expanded to include broadcasts in 47 languages, with some in DRM mode.

Web site: **www.radiovaticana.org/inglese/en-index.asp**
QSL info:
Vatican Radio
English programmes
Palazzo Pio
Piazza Pia, 3
00120 Vatican City

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Taking the Fear out of Your Next Adventure

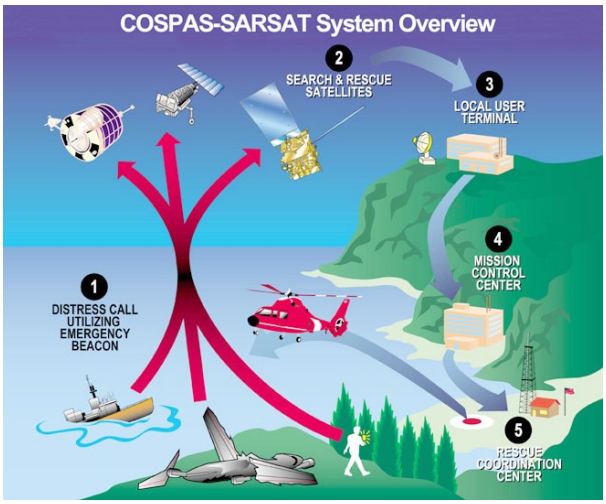
By Ken Reitz KS4ZR

The history of the exploration of our planet is accompanied by a long list of the missing: adventurers and explorers who set out on a mission of discovery, for knowledge or profit, and never returned. It's not that they didn't understand the risks; it's just that there was no fallback rescue plan. They were truly on their own.

Fast forward a few centuries and everyone – seasoned trekker or foolhardy neophyte – can set into motion millions of dollars' worth of communications hardware and hundreds of highly skilled professionals to pluck them out of harm's way, with the touch of a button on a tiny beacon transmitter.

Air Force Rescue Coordination Center

The use of beacons to let searchers locate someone in trouble is nothing new. For years beacons operating at 121.5 MHz were widely used on airplanes, boats and by hikers. But, they were pricey, typically over $1,000. Today, beacons costing from $250-800, operate on 406 MHz and are monitored via SARSAT (Search And Rescue Satellite), a geosynchronous orbiting satellite and part of the larger COSPAS-SARSAT system that uses a combination of high and Low Earth Orbit (LEO) satellites. The satellites monitor ELTs (Emergency Locator Beacons) typically used in aircraft, EPIRBs (Emergency Position-Indicating Radio Beacon) typically used on boats, and PLBs (Personal Locator Beacons) typically used by hikers, bicyclists, skiers and the like.



COSPAS-SARSAT System Overview: How your distress call finds its way to rescuers. (Courtesy: NOAA)

Information from a beacon alert is forwarded to the Air Force Rescue Coordination Center (AFRCC), Tyndall Air Force Base in Florida, which serves as the single agency responsible for coordinating on-land federal Search and Rescue (SAR) activities in the 48 contiguous United States, Mexico and Canada. The system operates twenty-four hours a day and ties directly into the Federal Aviation Administration's alerting system, as well as the U.S. Mission Control Center. AFRCC's computer system also contains resource files that list federal and state organizations, which can conduct or assist in SAR efforts throughout North America.

The change from 121.5 MHz beacons to 406 MHz has addressed many of the shortcomings of the older beacons. Significant among the problems was that of false alerts – a costly proposition that requires tens of thousands of dollars and a large number of man-hours in Search and Rescue to respond to each such alert. According to NOAA, which operates the COSPAS-SARSAT system, 98 per cent of alerts received on the older 121 MHz beacons were false. Today about one in 12 alerts are actual distress signals, still an amazing number of false alerts.

Another problem was that the older beacons transmitted an anonymous signal, making it unclear whether the alert had been triggered by accident. The newer 406 beacons send unique registration coding when triggered that detail ownership and associated contact numbers to let responders know within minutes, if not seconds, whether or not an SAR response is required. This makes response to false alerts on the 406 beacons considerably less expensive. Often the false alert will be discovered by the first phone call made by the SAR system. Older beacon alerts had to be responded to with the full weight of an SAR, only to discover the false alert much later in the search.

In addition, the older beacons had an accuracy range of 12-15 nautical miles (nm) as opposed to non-GPS 406 beacons, which have 1-3 nm accuracy, and under-100-yard accuracy with a GPS-equipped 406 beacon. The older beacons had an output of .1 watt, while the newer beacons' output is 5 watts.

Air Force Lt. Col. Charles Tomko, Commander AFRCC, in an interview with *MT,* spoke about the false alert issue. "We deal with each and every alert as if there is a person in distress at the other end and man our unit accordingly," he said, adding, "Our focus is on education. There is a balance to getting people to use beacons correctly and as early as possible so we have the best chance of saving them."

The number of EPIRBs and PLBs sold has skyrocketed over the last few years as the cost has come down dramatically and more people are aware of their use. While that also means more potential false alerts, Tomko is prepared. "That also means more people who have the distress beacon will be saved where they might not have been without one, and we are always supportive of that."

The key to lowering the false alert rate is education. Retailers, who benefit from surging beacon sales, could do more to help. Manufacturers include registration information with the beacons they make and it would be helpful if retailers took more active steps to see that their customers register their new beacons. AFRCC'S Tomko said, "This is one of our two big outreach programs, both to the general public as well as the manufacturers." He noted that, "Sometimes old instruction manuals are found or incorrect or dated information on testing may be out there that cause an innocent false alarm. The manufacturers are good about working with the SAR community, and NOAA directly interfaces with them to provide feedback."

Not Ready for the Wilderness

There was a spate of stories in the media

variously titled "Yuppie 911," stemming from an incident in the Grand Canyon in September of 2009 in which inexperienced hikers triggered their PLB no less than three times. The rescuers forced the party onto the helicopter and airlifted them to the top of the canyon on the last such rescue.

The story sparked debate in the hiking community and among the SAR groups, which were considering charging for their services if it was determined that the rescued hikers' experience wasn't up to what they were attempting, or if a party made too many rescue calls during a single hike. In the past two years, however, those stories seem to have drifted off the hot topic list.

AFRCC's Tomoko reiterates the need for consumer education. "There are anecdotal reports of people saying they would not have gone where they had if they didn't have a beacon. However, we always advocate having a distress beacon and being fully instructed in how it is used, as well as when to use it. But, in addition to having a correct beacon that is properly registered, they need to prepare for the environment and the activity as well. The beacon is for the unexpected that could happen to anyone, but it is still the responsibility of the individual to prepare."

Buying a PLB/EPIRB

You might think it's easy to buy a PRB/EPIRB, but you won't find them at Radio Shack, Walmart, LL Bean, Blue Ridge Mountain Sports (my local outdoor outfitter) or many other stores that should be obvious suppliers. I found the McMurdo FastFind® 210 PLB with GPS for $300 at Cabelas. It sold for $220 at REI. The ACR Electronics SARlink 406 PLB was $500 at REI and $430 at Cabelas "bargain cave," which might mean this product is on the way out at that store. Locally, your best bet will be at a marina or other boat-related store.

McMurdo Fast Find 210 PLB ($249) 5 watt 406 MHz operates for 24 hours and weighs just over 5 ounces. (Courtesy: REI.com)

I found lower prices for these and similar products at Amazon.com where, according to their statistics, 76 per cent of purchasers opted for the cheaper ACR Aquafix 406 PLB with onboard GPS ($200 plus shipping), despite the fact that there were no reviews on the product. Here's a reminder: pay attention to real world reviews of these products on all web sites that carry them, before making your purchase. This is no place to cheap out. If you make the decision to buy such a device, do your homework. Reviewers of these products are brutally honest and, to the credit of the retailers, the reviews appear to be unedited.

Beacon Operation

Once you've bought your beacon you must register it. You can go to NASA's web site or directly to COSPAS-SARSAT here: **www.beaconregistration.noaa.gov** (a secure site) or here: **www.406registration.com/** also a secure site.

You may have occasion to test your beacon, but it's not as simple as you might think. Here's a link to NASA's FAQ on beacon testing: **www.cospas-sarsat.org/images/stories/media/misc/NOAA_SARSAT_FAQ_on_Emergency_Beacon_Testing.pdf**

Live testing of the beacon is not allowed, because the "test" will be interpreted by the SAR system as a distress alert (and may account for many of the more than 90 per cent false alerts). However, each unit has a way, prescribed by the manufacturer, to test it before you head for the hills.

According to the NOAA FAQ: "Every beacon has a unique digital code, made up of bits (1's and 0's). In a self test, the beacon alters the code by swapping two designated bits. The ground stations know to ignore the test, and stop the chain of events that normally occur to notify a Rescue Coordination Center (RCC). If the signal is sent without this change, you will not get the proper display or audible notification (contact the manufacturer immediately if so). Also, since every beacon by law is to be registered to you (free of charge), you will probably be contacted by the RCC or other rescue agency that got the alert. That's how you know the test didn't perform correctly."

NOAA reports that 406 MHz beacons have a nearly instantaneous detection by geosynchronous satellites providing worldwide coverage. Over the 121.5 MHz beacons, NOAA also reports that 406 MHz beacons show an average of three hours time saved in maritime and six hours time saved in inland first alert launches. That amount of time is crucial in responding to a distress signal and, ironically, the false alerts make possible a continuous test of the entire SAR system, allowing tweaking of communications routes, command structure and rescue protocol when there are actually no lives at stake.

Another Kind of Beacon

But, should rescue from a bad situation be limited to hikers blundering in the wilderness? Why not a service for normal people just going through their everyday lives? Hams have enjoyed this sense of backup for decades. Long before the ubiquitous cell phone, hams used VHF, UHF and even HF frequencies to summon aid for themselves and others when on the road. There was a sense of pride in being able to do so.

With the knowledge that came from earning a license and, together with hams across the country who built sensitive and easily accessed repeaters, it's been possible to use auto patch services or request other hams to place calls on your behalf to send a tow truck, ambulance or request police notification. The service has always been free and available only to those who earn at least the entry level amateur radio license.

There is a similar service in OnStar®, the commercial auto rescue and navigation service, which requires onboard equipment and a $200 to $300 a year subscription fee depending on which services you want. But, once you stray from your vehicle, you're left to the capabilities of your cell phone service provider to get help. Unless, that is, you have SPOT, the commercial satellite-relayed personal locator device.

SPOT is a privately held company that has built a ground-up personal locator business based in Houston, Texas and is not part of any military, government agency or volunteer organization. It's a for-profit communications company that offers extensive services utilizing leased satellite space on Low Earth Orbit (1610-1620 MHz L-Band) satellites, proprietary transmitting devices and a significant number of employees engaged in product and service development and sales.

The products are innovative and fill a huge gap between a common cell phone, which is not very practical in real wilderness, and a PLB, which is basically a satellite-based panic button. On most PLBs you'll see the following admonition: "This Personal Locator Beacon should only be used in situations of grave and imminent danger, and only as a last resort when all means of self-rescue have been exhausted."

But, what if you aren't having an emer-

RESCUE ME!

FEBRUARY 26: The COSPAS-SARSAT system detected a 406 MHz PLB distress signal about 1200 NM east of Puerto Rico. The Sailing Vessel RECIDIVE, with four persons on board, was demasted and they set off their PLB. The Coast Guard LANTAREA Rescue Coordination Center diverted a volunteer vessel the KANARIS to the scene. In addition LANTAREA launched an aircraft from Air Station Elizabeth City. The four persons were taken aboard the KANARIS in good health.

MARCH 2: The COSPAS-SARSAT system detected a 406 MHz PLB distress signal about 100 miles southeast of Barrow, Alaska. Three persons were traveling in a land vehicle, over rough terrain when one of them sustained a head injury from the bumpy road. The other travelers activated there PLB. The Alaska Rescue Coordination Center received the SARSAT alert, and forwarded the SARSAT coordinates to North Slope Borough Search and Rescue (NSB). NSB dispatched a helicopter which picked up the injured man and took him back to Barrow for treatment. The other two travelers continued on their way.

MARCH 3: The COSPAS-SARSAT system detected a 406 MHz EPIRB distress signal about 3NM SE of Garden Bay, Louisiana. The Fishing Vessel NIXIE began sinking after hitting a submerged object. The EPIRB was activated and distress calls were made via VHF radio. Coast Guard District 8 (D-8) received the SARSAT and radio info simultaneously. D-8 dispatched a helicopter to the scene. In addition the Coast Guard Cutter STURGEON was diverted to the SARSAT coordinates. The crew of the helicopter located the F/V NIXIE. There were three people and a dog aboard. The three people and the dog were on an island near the sinking NIXIE. The crew of the helicopter transported the survivors to Bell Chase Naval Air Station. Three SARSAT (plus the dog) rescues. – From U.S. Coast Guard's 2011 blog On Scene

Staff Sgt. Christopher Uppling (left) and Lt. Col. Julie Eubanks, both controllers with the Air Force Rescue Coordination Center at Tyndall AFB, Florida, establish communications with their counterparts at Mexico's Rescue Coordination Center during a search for a missing airplane near the U.S.-Mexico border Oct. 15, 2010. The controllers assisted in the coordination of locating the fatal crash site. (U.S. Air Force photo by Capt. Jared Scott)

gency and want to spend another night at that beautiful scenic overlook? Your family expects you back tomorrow, but you have enough supplies for another day and it's just too much fun. Wouldn't it be great if you could just send a message that you're OK? Even better, wouldn't it be nice if your family or friends could see exactly where you are and know that you are, in fact, OK? That's where the SPOT product line comes in handy.

SPOT devices are still one-way messaging, but their five different products address the needs of a variety of outdoor enthusiasts, including boaters. The most popular is the SPOT Messenger that gives users the option to press an SOS button (notifies their emergency response center of your GPS location), a Help button (asks family or friends to assist), Check-in OK (lets your contacts know where you are and that you're OK), and Custom Message (sends a previously prepared custom message to family and friends).

The SPOT Connect hooks a SPOT Communicator via Bluetooth with your smartphone, and suddenly your Droid, Blackberry or iPhone is a satellite communicator. You can update your Facebook page, use your Twitter account, send short email messages, send a text message, or hit the SOS button that immediately sends your GPS position and an emergency message to GEOS, the commercial company that supports SPOT devices and operates their own International Emergency Response Coordination Center (IERCC) at their headquarters in Houston, Texas.

Most SPOT device subscriptions are $100, though there is an option to use the SPOT HUG which allows monitoring of various vehicles full time. If a monitored vehicle moves without your authorization, a signal is sent to GEOS so indicating.

Of course, you'd expect to pay for any communications services in places where there is no cell phone service and, in addition to the initial expense of the various SPOT devices and a yearly subscription fee, you can expect to pay extra for these services as well: Track Progress ($50/year), Type and Send ($50 for 500 messages; $30 for 100 messages or .50/message); Sensor alerts for four monitoring sensors ($50 for 50 messages or $1.50 each).

And that brings us to another shortcoming of PLBs. Suppose you're more than a college student hiking your way through Thailand. Suppose instead that you're an executive with a Fortune 500 company trying to secure a lucrative overseas business deal or perhaps you're working on behalf of a company that wants you to investigate a competitor's advantage overseas. You're out of the jurisdiction of AFRCC, and anyway, you may not want to answer tricky questions from your own government if you get into hot water and need extracting quickly. That's when SPOT and the other GEOS services really come in handy.

One of the benefits of SPOT is their GEOS Search and Rescue program that can make arrangements for any contingency. As it says on their web site, "The average response time from the receipt of your 911/SOS message, until referring an emergency responder, is only 11 minutes, wherever you are in the world."

How is this possible? Well, among the management team at SPOT is a consultant who is also part of a Miami-based, "full-spectrum risk mitigation consulting firm." This consultant has 22 years in the Central Intelligence Agency, specializing in the protection of overseas CIA personnel; if they can't come up with a plan to get you out of hot water, you're probably cooked.

The marketplace brings additional problems as every entrepreneur knows, and SPOT has had its share. At the end of March this year SPOT issued a recall on the SPOT Satellite Communicator that was bundled with DeLorme's Earthmate PN-60w hand-held GPS unit. According to the company's recall notice, "In certain incidents, intended messages may not be transmitted, including requests for help or emergency assistance, when the SPOT Satellite Communicator is used at temperatures below 40 degrees Fahrenheit." The affected units had a serial number range from 0-20000000 and 0-2019999. Consumers who bought those particular units were instructed to return the units for replacement and receive an additional six months of service at no charge. The DeLorme unit is not part of the recall.

Coast Guard at sea rescue (Courtesy: U.S.C.G.)

The company has also suffered from other corporate policy-related issues that range from unhappiness with customer service to dissatisfaction over required renewal billing practices similar to other subscription-based services such as satellite-TV or some cell phone plans. Consumers thinking about buying this line of products would also do well to read the online reviews of readers who have had firsthand experience with SPOT.

Happy Trails

Americans live in a country that has millions of acres of public land that are accessible to all, rich or poor, fit or unfit, prepared to be in the wilderness or not. But, the most amazing thing is that, on top of that, if we just put out a little upfront cash, our government is willing to come to our aid when we are injured at the base of a canyon, stranded in a boat, or dangling precariously from a cliff.

Of all the money that we spend to outfit ourselves for adventure, it's odd that more don't spring for the $250 for a basic PLB before the trip. Imagine how much you might be willing to pay for such a device in the wilderness when you really need one.

This summer, before you head out on that two week camping excursion, consider getting your own PLB. But, don't forget to register it and, please, learn how to use it. If you opt for SPOT, check the fine print of your subscription contract. And, if you're a ham, invest in an *ARRL Repeater Handbook* and look for repeaters that might cover the areas in which you'll be hiking, canoeing or climbing.

MT

RESOURCES

WHERE TO LISTEN:
U.S. VHF Channels (U.S. Dept. Homeland Security and U.S. Coast Guard)
www.navcen.uscg.gov/?pageName=mtVhf

U.S. C.G. Navigation Center HF Distress and Watch-keeping Schedule
www.navcen.uscg.gov/?pageName=cgcommsCall

RECENT RESCUES:
NOAA SARSAT Report updates rescues to date
www.sarsat.noaa.gov/

BEACON REGISTRATION:
Register your beacon: **www.beaconregistration.noaa.gov/**
or **www.406registration.com/** (both are secure pages)

FAQ ON EMERGENCY BEACON TESTING:
www.cospas-sarsat.org/images/stories/media/misc/NOAA_SARSAT_FAQ_on_Emergency_Beacon_Testing.pdf

SPOT SERVICES AND PRODUCTS:
www.findmespot.com

First Aid for Canada

By Dwight Robinson

It all started the day I decided to save Canada. Without bothering to call ahead and find out if they wanted saving, I launched my rescue. In 1997, the spring thaw of the Red River was threatening Winnipeg. I threw caution to the prairie wind, mounted my canoe on my trusty Honda and headed east. Along the way I hoped to view several small aircraft for sale and multiply my trip's usefulness.

Somewhere in eastern Montana I remembered a way of amplifying my car radio reception that I'd used with my old Volvo carrying our fiberglass Hudson Bay canoe. By clipping the aluminum canoe rim to my ancient car radio antenna, I'd markedly improved Seattle area FM reception. Why not with my all-aluminum Grumman canoe?

I cabled the car's antenna to the canoe and presto, an unbelievable increase in FM reception, even out on the prairies! Since that worked so well, my super-creativity leaped into action. At rest stops I clipped my FM antenna to flag poles, chain link fences, and metal garbage cans. However, I almost forgot my original mission until one evening in Canada a road sign clearly spelled out FORGET.

This roadside shrine, built in the 1930s by French Catholic settlers, brought me back to reality. The next day I headed for the Red River and I spent the afternoon looking over an Aeronca Champ aircraft that needed an owner like me. The price was right and I abandoned saving Canada. (Anyway, they were doing quite well without me, thank you very much!)

Retrieving my Purchase

Spring turned into fall and it was October before I could take possession of the airplane in Manitoba and wing my way west. After exchanging the seaplane floats for standard wheel landing gear, I lifted off and headed back west. Fueling stops included cooperative farmers as well as small airfields. Along the way there were a lot of helpful folks who made the trip safer and more enjoyable. My main trouble was the plane's only aviation radio.

With the Avcom King transceiver out of service, my VFR flight plans were opened and closed daily at available coin phones and at the mercy of farmers and businesses who took pity on this pilot from the past. One day on the flight I was quickly running out of daylight so I landed my single-engine plane in a farmer's field beside Portal, North Dakota. The next day a snowstorm prevented takeoff. That evening I walked out to check my plane's mooring lines. In the white-out conditions I couldn't even find my own plane. I needed direction. As I turned around, I saw the powerful lighting of the Portal freight yards and followed it back to safety. The next day my footprints showed I had missed the airplane by five feet!

Clearing sunny days saw me winging my way west and navigating with primitive instruments: magnetic compass, turn-and-bank, altimeter, and rate of climb. I improvised a "radio compass" using the ferro-antenna of my portable AM-FM pocket radio. By switching to AM I homed in on local AM stations and checked call signs. It worked! (Most of the time.)

Dwight on the air at KSEW, Sitka, Alaska 1964

After reaching the Rockies, discretion overtook me and I tucked Bluebird in for the winter. I was content to hand the trip over to Amtrak engineers and follow the iron rails back to Seattle and home.

I never did save Canada and they didn't know what they missed!

About the Author: Dwight Robinson is a retired professor from Western Washington University. Currently he is a contributor to radio KLAY 1180 in Tacoma, Washington.

Dwight's Taylorcraft with no battery in Sitka, Alaska 1964

Dwight Robinson writing and riding on a northbound train 2009

Portable Ham Station in a Briefcase

By Bob Patterson K5DZE
(Photos by author unless otherwise noted)

Ever watch one of those old war movies where a secret agent opens a briefcase to reveal a "shortwave set" complete with earphones and straight key? The agent quickly strings out a short wire antenna inside the room, turns on his equipment and proceeds to send a coded CW message to Headquarters. He hurries to finish sending before he is discovered, but the enemy is closing in. In one case that I remember, the agent was caught because his rig was using the AC power in his room which caused the lights to flicker, thus giving him away. Sound familiar?

Well, today it is easy and fun to create a similar radio set-up using modern low power (QRP) radios and equipment that can let you operate and make contacts for Field Day, from the lake, a hotel, or about anywhere else you can think to operate. All you have to do is to assemble the right equipment and accessories to fit into a briefcase and you have an HF station that can go where and when you go. Best of all, unlike in the movies, you don't have to worry about someone surrounding the house trying to catch you, and you don't even need AC power to operate. Oh yes…and it's a LOT of fun, too!

Choosing the Right Radio

The central item in this portable set-up is the transceiver, but, unlike the old secret agent days, modern QRP radios are solid state, relatively inexpensive, battery powered, and very flexible. They are also extremely effective. Portable radios range from the sophisticated, ready-made, all-mode, all-band Yaesu FT-817ND ($640) to tiny, single-band CW kits such as the MFJ-9200 ($250).

Homebrew rigs shine in this field and dozens of kit rigs are available for you to pick from. Likewise, there are a growing number of commercially prepared kits, as well as ready-to-go out-of-the-box QRP rigs, available at very affordable prices.

Of particular interest are the Trail Friendly Rigs (TFR) that are designed to operate on two or more bands in a size not much larger than a one inch thick stack of QSL cards. These are battery operated and easily carried into the field. TFR radios certainly worthy of your consideration are the Elecraft KX-1 ($300) from **www.elecraft.com**/; the Ten Tec R4020 and 4030 ($250) from **http://tentec.com/index.php?id=193**, and the Hendricks PFR-3A ($250), available at **www.qrpkits.com/pfr3.html**.

The Case for Briefcases

The case you select to carry your rig can be one of several types. I used one of my briefcases that had served me well until I retired. You can use an office style briefcase, a metal equipment case, or even a small piece of luggage if you wish. The more common and everyday it looks, the less it will appear like a radio in a box. Metal equipment cases are durable, often come with quality poly foam already in them, and prices can be reasonable at your area Harbor Freight, Northern Tools, or online store. Just make sure you think your plan through before you purchase a case that is too small, has too little foam, or one that can't be modified easily. My office briefcase was 18 x 13 x 6 inches, which seems to be a good size to carry the number of needed items.

The inside foam inserts consist of three pieces of inexpensive polyurethane foam obtained from Hobby Lobby or a sewing store. It is kind of foam normally used for pillow and furniture padding. The bottom piece is one inch thick and cut to fit the bottom of the case. The center insert piece of foam is two inches thick and cut to lie on top of the bottom piece. It will hold the equipment. The top piece is another one inch layer of foam that is placed on top of the center insert when closing the case for transport. I chose not to glue any of these foam pieces into the briefcase so I can remove the center insert easily. I have found this works quite well. Slots are cut in the top left and right corners to allow the briefcase hinges to recess into them. Your case may or may not need these slots depending on how your briefcase is made.

MFJ-9200 ($250) one band (your choice) CW QRP transceiver. (Courtesy: MFJ Enterprises)

The center insert holds the radio and accessories that you wish to carry. Once these items are placed where you want them they are traced onto the foam and these tracings are cut out to hold the equipment. The nice thing about not gluing the bottom and center foam together is that the center insert can be easily replaced with another insert that is cut for different equipment allowing you to configure gear for your travel and operating needs.

As an example, one insert might be cut to hold a Ten Tec R4020, key/keyer, Z817 auto tuner, headphones, AC wall wart and a couple of accessories. This configuration makes a great CW "weekender" for the lake. Another insert might be cut to hold an FT-817ND, Signalink USB, Z817 auto tuner, and AC wall wart to give you great PSK31 rig in a briefcase. This latter set-up features digital capabilities and SSB as well as CW, which might be better for a week or two vacation stay or an extended business trip. You can decide which rig you want to carry and just use the insert with the equipment that meets the need. I'll discuss how to cut the foam in a moment, but first let's look at what might go into the case.

The Other Stuff

As mentioned, what goes in your case depends on what equipment you have and what you want to carry around with you. Refer to the briefcase picture to see what I have included in my briefcase.

From left to right starting on the top row:

- Ten Tec 4020 transceiver
- Small CW key
- Over the ear Sony headphones
- (The empty slot is for the rig's AC wall wart power supply)

On the second row, from left to right:

- LDG Z817 auto tuner (sits on top of a home-

LDG Z817 auto-tuner ($130) shown with Yaesu FT817ND QRP rig. (Courtesy: LDG Electronics)

brew folding tilt stand for the 4020)
- iSpeaker mini speaker system for use with the 4020 (From eBay)
- Folding book light
- Grundig G6 portable AM/FM/CW/SSB receiver for HF/VHF
- Mini tape recorder

Options you might want consider:
- A mini speaker if your rig has only earphone output
- Mini digital recorder for logging or notes
- ARRL Mini Log with pen and paper
- Laminated check list for your radio
- Extra batteries
- A few portable operation QSL cards
- Small digital clock set to GMT
- Digital flashlight
- 1 foot length of mini coax to connect transceiver to tuner

Small speakers when you don't want to wear headphones. (Courtesy: Author)

The idea is really not to see how much "stuff" you can take, but rather to take only what you really need and will use. When possible, choose a mini-sized item over a full size item. Note the mini-speakers available from eBay for $11 or less. Both work well for this use, both are battery powered, and both charge from any USB port. One is three inches long, one is four inches long, and both are very small as you can see by comparing them to the ball point pen in the photo. They work well to let you have CW through a speaker if you tire of wearing earphones or want to share what you hear.

Compare the J.H. Bunnell full size J-37 key (see photo) with the smaller surplus Soviet "Spetsnaz" key (in the middle) and the even smaller gold Christmas Key available from Morse Express. All these are excellent keys and each is a favorite, but the "Spetsnaz" key is just right for travel and my brief case.

When cutting your equipment pockets, leave as much foam between your radio, tuner, and other items as you can when you cut the center insert holes. This will ensure good padding and protection for your equipment.

Small hand-keys for old-school CW ops. (Courtesy: Author)

Cutting the foam can be more difficult than it looks if you want it to be neat. I found that an electric kitchen knife makes the best cut. If you choose to use a regular knife, a long, very sharp, serrated blade will also do a clean cut. An X-Acto knife will cut the foam, but can be hard to keep straight. Remember not to put items too close to each other. One to two inches of foam padding around your equipment will help provide good padding and protection. If you "over cut" something and need to put a small piece back in place, Elmer's White Glue-All seems to work well to glue foam back in place.

A Choice of Antennas

The antenna you use with your portable rig is again a matter of personal choice. Every amateur has his/her favorites, but we are looking for something small that works well. I recommend the Par End Fedz 10-20-40 Tri-bander for QRP portable work. It features small diameter no-kink wire, rugged construction and light weight. No antenna tuner is needed with this antenna and, in fact, it is recommended that you *not* use one. The antenna can be rolled up into a very small coil for transport and best of all; this little antenna really works, as a check with eHam.com shows (**www.eham.net/reviews/detail/3717**). You might also get it into your briefcase on top of your top foam pad if you don't have too much gear already stuffed into your case.

Tripod modified to support Hamstick antenna. (Courtesy: Author)

If you can't get it in your case, you can carry it in a very small bag with your briefcase. A small spool of fishing line and a lead weight makes it easy to attach to one end of the antenna, toss into a tree and then pull it up to be ready to go. (I understand that this antenna is very popular with our troops overseas in the sand pile, so that says a lot about how well it works!)

Another antenna for portable work and one you can easily make to take along in the car/SUV is a tripod-mounted Hamstick. Using an old folding camera tripod or something similar, attach a mounting bracket to hold a Hamstick antenna on the band of your choice. Use at least three radials made up of 16 feet of flat braid or pick up several 16-foot tape measures for this (I found three on the internet for $9). Attach these radials to the antenna mount and lay them out on top of the ground to act as a counter poise for the antenna. An antenna tuner such as the LDG Z817 ($130) works well and is recommended with this antenna for best match.

To transport your Hamstick when it's not in use, carry it in a Hamstick Transport Tube which consists of a PVC tube with an inside pipe insulation core and screw-on caps on each end of the PVC tube. This tube set-up will really protect your Hamsticks as you travel. If you want more specific details and pictures on this antenna and the PVC Transport Tube construction, see my web site at **www.k5dze.net/Antennas.htm**.

15 meter Hamstik in PVC tube ready for transport. (Courtesy: Author)

As you can see, if you bring all the right items together you can create a nice portable rig that fits in a single carrying case making you all set for Field Day, a trip to the lake, or a summer vacation to almost anywhere.

If you're flying, you can imagine the TSA's interest in this item if you just send it through the luggage scanner in a busy airport! I'd suggest that before you just toss the closed briefcase on the scanner belt, you ask to personally show it to a TSA inspector so you can explain what it is. It would also be helpful if you can have the radio and tuner open (screws out or loose) so it can be pulled apart to show the insides to the inspector if needed.

Have a quality photocopy of your current Amateur License laminated and included in your briefcase to show you are indeed licensed by the FCC. You might also have one of your QSL cards just to help make your case. To make sure what you include in your briefcase will be acceptable, you can check the TSA web site for the current list of what is and is not acceptable. Of course, also be sure that if you are flying commercially, you don't have a knife, multi-purpose tool, diagonals, or other such items in your briefcase.

And, one last piece of advice… make sure the lights don't dim when you transmit or the bad guys might just find ya!

Bob Patterson's previous articles in MT were "Build Your Own 10 Meter Beacon," May 2010 and "An Easy-to-Build All-Band HF Loop Antenna," October 2010.

MT's 2011 Guide to North American Radio Museums

Compiled by Ken Reitz KS4ZR

Planning a road trip this summer? Work a radio museum into your route and enjoy another aspect of the radio hobby. Here is a brief list of radio museums to get you started.

If you're not planning a trip, you can visit many of these museums by taking their "virtual tour." All information presented here is the latest as gleaned from the homepages of each museum. If you know of any changes or additions please feel free to email me at *kenreitz@monitoring-times.com* and I will put the changes in the next available issue of *Monitoring Times*.

Alabama Historical Radio Society
Don Kresge Memorial Museum located in the Alabama Power Building
600 North 18th Street
Birmingham, Alabama
www.alabamahistoricalradiosociety.org
The museum is open during normal business days and hours. Society meetings are each Saturday at 9:00 am. Parking at the Alabama Power Building is free.

Alabama Historical Radio Society

American Museum of Radio and Electricity
1312 Bay Street
Bellingham, WA 98225
Phone: 360-738-3886
www.amre.us
Open Wednesday through Saturdays from 11 am to 4 pm, Sundays from noon to 4 pm and by appointment. Admission is $5 for adults and $2 for children 11 years and under.

American Radio Relay League
225 Main Street
Newington, CT
Phone: 860-594-0200
www.arrl.org/visit-us
Tours of ARRL HQ, including vintage W1AW station, are given several times daily. Licensed hams may operate W1AW from three studios.

Antique Wireless Association Museum
187 Lighthouse Road
Hilton, NY 14468
www.awamuseum.org/
Membership ($25) includes subscription to AWA Journal, a quarterly publication about radio history. The home page has the latest information on the AWA 2011 conference (August 16-20).
Visit the AWA on YouTube: www.youtube.com/user/AWAMuseum
For information about the AWA museum contact museum curator Bruce Roloson: *broloson@stny.rr.com* or deputy director Bob Hobday N2EVG: *N2EVG@arrl.net*.

Arizona's Radio and Television Museum (House of Broadcasting)
7150 East 5th Street
Scottsdale, AZ
Phone: 602-0944-1997
www.houseofbroadcasting.com/
Monday through Saturday 10:00 am- 6:00 pm. Open Sundays 10:00 am-5:00 pm. Admission is free.

California Historical Radio Society (CHRS)
Bay Area Radio Museum
KRE-AM 1400 Berkeley, California
Housed at historic radio station KRE San Francisco, offers restored classic radios for sale in support of CHRS here: http://radioshowroom.com. Also housed at KRE is W6CF the James Maxwell memorial amateur radio station and electronics reference library. See web site for contact information.

California Historical Radio Society (CHRS) is housed in radio station KRE San Francisco, itself a radio icon. (Courtesy: CHRS)

College of Charleston Communications Museum
58 George Street
Charleston, SC
Phone: 843-953-5810
http://spinner.cofc.edu/~jrmuseum/index.html
Open Monday through Friday 12:00 Noon - 4:00 pm except College of Charleston holidays.

Hammond Museum of Radio
295 Southgate Road
Guelph, Ontario Canada
Phone: 519-822-2441 ext. 590
www.hammondmuseumofradio.org
The Hammond Company began building radios in 1920 and is still in business, though not in manufacturing radios. Still, Fred Hammond VE3HC, one of the founder's sons now deceased, maintained a radio connection throughout the decades. Open normal business hours Monday through Friday and weekends by request. Houses one of the largest collections of Collins amateur radio equipment anywhere. Listen for VE3HC on the ham bands and collect their QSL card. Nori Irwin VE3AQZ, curator.

Marconi National Historic Site of Canada
Table Head on Timmerman Street
Glace Bay, Nova Scotia
www.pc.gc.ca/lhn-nhs/ns/marconi/natcul.aspx
Open daily, 10:00 a.m. to 6:00 p.m. from June 1 to September 15. No admission fee.

Military Communications and Electronics Museum
Canadian Forces Base
Kingston, Ontario Canada
Phone: 613-541-4675
www.c-and-e-museum.org/
8:00 am-4:00 pm Monday-Friday
11:00 am-4:00 pm Weekends and Holidays
Open first weekend in May until first weekend in September (Labor Day). Admission is voluntary donation.

Museum of Broadcasting
3517 Raleigh Avenue
St. Louis Park, MN 55416
Phone: 952-926-8198
www.museumofbroadcasting.org/index.html
Hours: Wednesday through Saturday 10:00 am-5:00 pm. Closed Tuesday and holidays. Admission: Adults: $6, Seniors and students: $5.
Begun in 1988 and encompassing 12,000 square feet of antique radios, televisions and broadcast equipment, the exhibits are based on the Joe Pavek W0OEP collections of hundreds of vintage radios. The museum also houses the Museum of Broadcasting Hall of Fame featuring Minnesota radio and television broadcasters.

Museum of Broadcast Communications
State and Kinzie
Chicago, Illinois
Phone: 312-245-8200
www.museum.tv/
Currently offering no exhibits while their new building is being finished.

Museum of Radio and Technology
1640 Florence Ave
Huntington, WV 25701
Phone: 304-525-8890
www.ohio.edu/people/postr/MRT
The museum is open from 10:00 am until 4:00 pm Saturdays and 1:00 pm-4:00 pm Sundays all-year around except certain holidays. The Museum is also open from 10:00 am until 4:00 pm on most Fridays from mid-April through October. There is no charge for admission, but a voluntary donation box is located in the hallway.

National Cryptologic Museum
Phone: 301-688-5849
You'll need a map: www.nsa.gov/about/cryptologic_heritage/museum/map/index.shtml
www.nsa.gov/about/cryptologic_heritage/museum/index.shtml
Part of National Security Agency (NSA). Open Monday through Friday 9:00 am-4:00 pm. Admission is free. Free parking.

National Electronics Museum (History of the Nation's Defense Electronics)
1745 West Nursery Road
Linthicum, MD
Phone: 410-765-0230
www.nationalelectronicsmuseum.org/
Open from 9:00 am-4:00 pm Monday through Friday, and 10:00 am-2:00 pm on Saturdays. Admission is $3 for adults, $1 for students and seniors. Children 5 and under are free. Free parking.

New England Wireless and Steam Museum
1300 Frenchtown Road
East Greenwich, RI
Phone: 401-885-0545
www.newsm.org
Extensive collection of early amateur radio and commercial wireless transmitting and receiving equipment. Open Thursdays 9:00 am - 4:30 pm.

Paley Center for Media (formerly Museum of Radio and Television)
25 West 52 Street
New York, NY 10019
Phone: 212-621-6600
Also:
465 N. Beverly Drive, Beverly Hills, CA
Phone: 310-786-1000 or 786-1025
www.paleycenter.org
Hours: Wednesday-Sunday from Noon-6:00 pm, Thursday from Noon-8:00 pm. Closed Mondays and Tuesdays. Admission: General $10, Student/Senior $8, children under 14 $5.

Pikes Peak Radio Museum
6735 Earl Drive
Colorado Springs, CO
Phone: 719-550-5810
www.pikespeakradiomuseum.com
Open 10:00 am - 5:00 pm Monday through Friday. Admission is free.
The museum is part of Norbern Electronics which offers a repair service on a wide variety of radio and electronic products from tubes to transistors. Details at: www.norbern.com/

Radio and Television Museum
2608 Mitchellville Rd
Bowie, Maryland
Phone: 301-390-1020
http://radiohistory.org/
Email: radiotvmuseum@verizon.net
Open Friday from 10:00 am-5:00 pm as well as Saturday and Sunday from 1:00 pm-5:00 pm.
Includes Harmel House Annex, not normally part of their tour (though hams are welcome), which houses W3R and features a 1940s Collins AM station.

Society for the Preservations of Antique Radio in Canada
Kerria Drive
Riverview Hospital
Coquitlam, B.C., Canada
Phone: 604-777-1885 (Sundays)
www3.telus.net/radiomuseum/
Open most Sundays, 10:00 am-4:00 pm
Location is around the Riverview Hospital grounds, check their web site for exact directions to the museum. Free parking.

A 1950s-era Zenith Transoceanic portable restored December 2010 by the Society for the Preservation of Antique Radio in Canada. (Courtesy: Gerry O'Hara VE7GUH and SPARC)

Southern Appalachian Radio Museum
Room 315 of the Elm Building
Ashville-Buncombe Technical Community College
Asheville, NC
www.saradiomuseum.org/index.html
Open February through November Fridays from 1 pm to 3 pm. Tour is $5 per person, children under 13 are free. Contact information is on the home page.

Sunshine Radio Museum
8 East Main Street
Sodus, NY 14551
Phone: 315-483-8451
http://sunshineradiomuseum.org/index.html
Open 9:00 to 5:00 Mon. through Fri. and 9:00 to 1:00 on Saturday. Museum tours are by appointment only.

U.S. Army Signal Corps and Ft. Gordon Museum
Building 29807
Fort Gordon, GA 30905-5293
Phone: 706-791-2818/3856
www.signal.army.mil/ocos/museum
Open Tuesday-Friday 8:00 am-4:00 pm. Closed on federal holidays.

Vintage Radio and Communications Museum of Connecticut
115 Pierson Lane
Windsor, CT 06095
Phone: 860-863-2903
www.vrcmct.org
Open Thursday and Friday 10:00 am-3:00 pm, Saturday: 10:00 am-5:00 pm, Sunday: 1:00 pm-4:00 pm. Admission to the museum is free to supporting members, otherwise: Adults: $7, Seniors over 60: $6, Students: $5.

Western Historic Radio Museum
Parish House
109 South F Street
Virginia City, NV
Open May through October 11:00 am to 5:00 pm on a "by chance" or "by appointment" schedule. E-mail (w7ybs@att.net) to confirm that they will be open on the day you plan to visit. Admission: $5 for adults and $2 for children under 15 years old.

MT

SCANNING REPORT

THE WORLD ABOVE 30MHZ

Dan Veeneman
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www.signalharbor.com

Steps in the Wrong Direction

Change is a fact of life in the radio business. Sometimes these changes are for the better, sometimes for the worse, and sometimes those changes have to be undone. This month we take a look at a rural county in Kansas and an Indiana system that might have been a step in the wrong direction.

❖ Scott County, Kansas

Howdy Dan,

I read your article on trunking. Thanks for all of the good information.

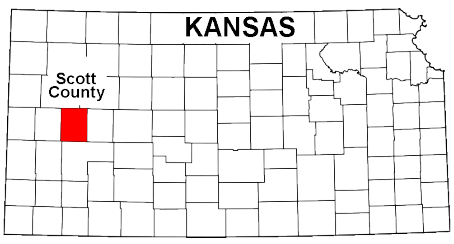
I also live in a rural area. A few years ago I was given a scanner with 800 MHz capability. However, our system out here in Scott County, Kansas has recently added a trunking system. Is it possible to find the (I believe) four "traffic" frequencies instead of buying a new trunking scanner? Being that we are rural, there simply is not that much traffic. So if an ambulance or fire truck goes out on a call, I shouldn't have much problem listening in. Yet I am having a difficult time finding the frequencies.

Also, I believe (if I remember correctly) that we use Motorola radios. So I assume, based on your article, that they would be on the Motorola system. They are a part of the statewide interoperability system.

We had a class recently and the guy from the State said my scanner might work if I knew which frequencies were being transmitted for the traffic. Yet, I just never hear anything on them.

Any suggestions would be great.

Howard in Kansas



Scott County is located in the western part of Kansas, about 300 miles east of Denver, and covers just over 700 square miles. It is home to nearly 5,000 residents, with 3,500 of them living in the county seat of Scott City. Interstate 70 runs through counties just to the north.

For many years the county radio operations took place on several conventional analog frequencies in the VHF (Very High Frequency) and UHF (Ultra High Frequency) bands.

Frequency	Description
152.375	Scott City Schools (Transportation)
154.0475	Scott County Emergency Operations
155.175	Scott City Schools (Security)
155.370	Scott County Sheriff (Dispatch)
155.475	Scott County Sheriff (Mutual Aid)
155.805	Scott City (Agencies)
453.100	Scott County Sheriff (Security)
453.425	Scott County Highway Maintenance
462.950	Scott County Emergency Medical Services (Dispatch)
462.975	Scott County Emergency Medical Services

❖ Kansas Statewide System

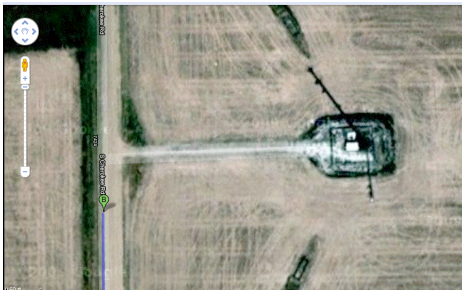
If the county decides to move their radio operations over to 800 MHz, they would likely join the Kansas Statewide Interoperable Communication System (KSICS), a trunked radio system operated by the Kansas Department of Transportation (KDOT).

KSICS uses Motorola radio equipment and follows APCO Project 25 (P25) digital standards for both voice and trunking. Each voice channel uses the P25 Common Air Interface (CAI) and each control channel follows the P25 trunking protocol. For the hobbyist, this means that the scanner must be one of the newer digital-capable units. First generation digital scanners like the Uniden BC250D and BC785D can monitor transmissions that use the P25 CAI but are not capable of trunk-tracking these "pure" P25 systems that do not use the venerable 3600-baud control channel.

❖ Viewing the Repeater Site

A search of the Federal Communications Commission (FCC) Universal Licensing System (ULS) for Scott County shows the following six repeater frequencies: 851.8375, 852.4625, 852.7250, 852.9750, 853.4000 and 853.8625 MHz assigned under the call sign WQKW593. ULS also reports that the repeater site is located at 38 degrees 22 minutes 20.1 seconds North latitude, 101 degrees 4 minutes 14.6 seconds West longitude.

Using a free Internet service called *Google Maps*, we can take a look at this location and see for ourselves where exactly it is and what might be there. Go to **http://maps.google.com** and put in "38 22 20.1 N, 101 4 14.6 W" into the search box, then click on the "Search Maps" button. Select the "Satellite" view from the upper right-hand box, then zoom in on the location to see the tower facility.



These latitude and longitude coordinates place the repeater site about eight miles south of Modoc, Kansas on the eastern side of South Cherokee Road. The satellite view from Google Maps shows a monopole tower (and its shadow) with several antennas, mounted next to a building a few hundred feet from South Cherokee Road, in a fenced-in area at the end of a service road.

The FCC database indicates the tower is 129 meters (423 feet) high, putting it quite high above the surrounding terrain and making it visible for some distance. Such height also allows it to provide good coverage for much of the local area.

❖ Talkgroups

As you might imagine, the statewide trunked system has a large number of active talkgroups. The following is a list of talkgroups that might be active in and around Scott County.

Decimal	Hex	Description
335	14F	Highway Patrol Troop E (Primary Dispatch)
336	150	Highway Patrol Troop E (Special Events 1)
337	151	Highway Patrol Troop E (Car-to-Car)
338	152	Highway Patrol Troop E (Secondary Dispatch)
339	153	Highway Patrol Troop E (Special Events 2)
340	154	Highway Patrol Troop E (Special Events 3)
341	155	Highway Patrol Troop E (Special Events 4)
342	156	Highway Patrol Troop E (Zone A Operations)
343	157	Highway Patrol Troop E (Zone A Car-to-Car)
344	158	Highway Patrol Troop E (Zone B Operations)
345	159	Highway Patrol Troop E (Zone B Car-to-Car)
346	15A	Highway Patrol Troop E (Zone C Operations)
347	15B	Highway Patrol Troop E (Zone C Car-to-Car)
348	15C	Highway Patrol Troop E (Zone D Operations)
349	15D	Highway Patrol Troop E (Zone D Car-to-Car)
351	15F	Highway Patrol Troop E (Emergency Operations)
352	160	Highway Patrol Troop E (Administration)
406	196	Army National Guard Region 2 (Channel 21)
407	197	Army National Guard Region 2 (Channel 22)
408	198	Army National Guard Region 2 (Special Operations Group)
409	199	Army National Guard Region 2 (Civil Support Team)
410	19A	Army National Guard Region 4 (Channel 41)
411	19B	Army National Guard Region 4 (Channel 42)

412	19C	Army National Guard Region 4 (Special Operations Group)
413	19D	Army National Guard Region 4 (Civil Support Team)
422	1A6	Turnpike Authority (Toll Booths)
423	1A7	Turnpike Authority (Event 3)
655	28F	LifeTeam (Medical Helicopter Dispatch)
656	290	LifeTeam (Medical Transport)
657	291	LifeTeam (Fixed Wing Aircraft Operations)
658	292	LifeTeam (Ground Operations)
784	310	Alcoholic Beverage Control 4
786	312	Alcoholic Beverage Control 5
788	314	Alcoholic Beverage Control 6
795	31B	Alcoholic Beverage Control (Operations)
796	31C	Alcoholic Beverage Control (Special Projects)
797	31D	Alcoholic Beverage Control 2
799	31F	Alcoholic Beverage Control
870	366	State Fire Marshal 1 (Southwest)
875	36B	State Fire Marshal 2 (Southwest)
1290	50A	Fish and Wildlife Management (Southwest)
1291	50B	Fish and Wildlife Management Car-to-Car (Southwest)
1292	50C	Wildlife Law Enforcement Dispatch (Southwest)
1293	50D	Wildlife Law Enforcement Car-to-Car (Southwest)
1294	50E	Army National Guard Region 1 (Channel 11)
1295	50F	Army National Guard Region 1 (Channel 12)
1296	510	Army National Guard Region 1 (Special Operations Group)
1297	511	Army National Guard Region 1 (Civil Support Team)
1298	512	Army National Guard Region 3 (Channel 31)
1299	513	Army National Guard Region 3 (Channel 32)
1300	514	Army National Guard Region 3 (Special Operations Group)
1301	515	Army National Guard Region 3 (Civil Support Team)
1306	51A	Turnpike Authority (Dispatch North)
1307	51B	Turnpike Authority (Car-to-Car North)
1308	51C	Turnpike Authority (Maintenance)
1309	51D	Turnpike Authority (Radio Technicians)
1310	51E	Turnpike Authority (Event 1)
1311	51F	Turnpike Authority (Event 2)
1605	645	Wildlife and Parks Events (Southwest)
2015	7DF	Public Safety Answering Point Interoperability (Southwest)
2016	7E0	Medical Interoperability (Southwest)
2017	7E1	Emergency Operations Center Interoperability (Southwest)
2019	7E3	Incident Command System 1 (Statewide)
2020	7E4	Incident Command System 2 (Statewide)
2021	7E5	Incident Command System 3 (Statewide)
2022	7E6	Incident Command System 4 (Statewide)
2023	7E7	Incident Command System 5 (Statewide)
2024	7E8	Incident Command System 6 (Statewide)
2025	7E9	Incident Command System 7 (Statewide)
2026	7EA	Incident Command System 8 (Statewide)
2027	7EB	Incident Command System 9 (Statewide)
2028	7EC	Incident Command System 10 (Statewide)
2029	7ED	Command 1 (Statewide)
2030	7EE	Command 2 (Statewide)
2057	809	Law Enforcement Interoperability (Southwest)
2058	80A	Emergency Management Interoperability (Southwest)
2059	80B	Fire Interoperability (Southwest)
2060	80C	Emergency Medical Services Interoperability (Southwest)
4024	FB8	Incident Command System 11 (Statewide)
4025	FB9	Incident Command System 12 (Statewide)
4026	FBA	Incident Command System 13 (Statewide)
4027	FBB	Incident Command System 14 (Statewide)
4028	FBC	Incident Command System 15 (Statewide)
4029	FBD	Incident Command System 16 (Statewide)
4030	FBE	Incident Command System 17 (Statewide)
4031	FBF	Incident Command System 18 (Statewide)
4032	FC0	Incident Command System 19 (Statewide)
4033	FC1	Incident Command System 20 (Statewide)
4034	FC2	Command 3 (Statewide)
4035	FC3	Command 4 (Statewide)

Scott County is in Kansas Department of Transportation (KDOT) District 6, but I don't have any talkgroups specifically for KDOT. I also don't have talkgroups that are dedicated to Scott County, although there must be some. Perhaps if Howard, or another local resident, runs his scanner in "Open" mode to collect all active talkgroups, we can identify exactly what is happening in western Kansas.

❖ Motobridge

In addition to KSICS, 76 repeater sites across Kansas are equipped with a capability called *Motobridge* that provides the ability to "patch" frequencies between different radio systems. Kansas Highway Patrol dispatchers monitor call-in frequencies, waiting for requests to patch together specific frequencies. These requests typically come during mutual aid and multi-jurisdictional events that require emergency personnel from different departments to communicate with each other.

The primary frequencies used for interoperability are listed below and are always good to have programmed in your scanner.

Channel Name	Frequency	Band	Type
LCALLKS	39.58	VHF Low	State
LTACKS	39.70	VHF Low	State
VCALL10	155.7525	VHF High	National
VTAC11	151.1375	VHF High	National
VTAC12	154.4525	VHF High	National
VTAC13	158.7375	VHF High	National
VTAC14	159.4725	VHF High	National
UCALL40	453.2125	UHF	National
UTAC41	453.4625	UHF	National
UTAC42	453.7125	UHF	National
UTAC43	453.8625	UHF	National
8CALL90	866.0125	800	National
8TAC91	866.5125	800	National
8TAC92	867.0125	800	National
8TAC93	867.5125	800	National
8TAC94	868.0125	800	National

❖ Steuben County, Indiana

In the March *Scanning Report* column we covered Steuben County, Indiana's transition from their old radio system to a new OpenSky installation in January of this year. Because no consumer scanner on the market can monitor OpenSky transmissions, the transition marked another jurisdiction where residents and visitors are prevented from knowing first-hand about public safety activity in the local area.

Just three months after the switchover, the Steuben County Sheriff, along with nearly a dozen other public safety officials, issued a letter of "No Confidence" in the new system. According to the Sheriff, the OpenSky system

has experienced a series of problems and issues of concern culminating in what was described as a complete radio system failure in early April, leaving officers and medical personnel unable to communicate during an incident involving a stabbing victim and a suspect on the run. Additional reports claim that as many as 200 separate failures of various types and severity have occurred, leading to the overall sense that the OpenSky system is unreliable.

The OpenSky vendor, Harris RF Communications Public Safety and Public Communications, blamed interference from a third party for the failure and promised to work closely with the County to correct any problems. They did not mention problems with some other OpenSky installations, or the failed effort to build a $2 billion statewide OpenSky network in New York – a contract that was ultimately terminated after initial tests showed unreliable service.

I maintain a web page of known and reported OpenSky systems at **www.signalharbor.com/opensky.html** and welcome your additions, corrections and updates to the list. Please let me know of any local news articles or press releases that mention these or any other OpenSky systems.

❖ Backtracking

Immediately after the April incident, the Steuben County Sheriff ordered that the old EDACS system be reactivated and urged the County Board of Commissioners to begin an investigation "into proper action of obtaining a radio communications system that will provide the level of safety and security to all Steuben County Emergency Services and its citizens."

The Steuben County Enhanced Digital Access Communications System (EDACS) network, despite the name, sends voice transmissions in analog format. Nearly all trunk-tracking scanners can follow EDACS activity as long as the frequencies are entered in Logical Channel Number (LCN) order.

LCN	Frequency
01	851.1625
02	853.1125
03	853.5250
04	857.1125
05	856.1125
06	868.5250
07	868.1125
08	866.1625
09	851.5375
10	851.3875
11	861.4125
12	862.4125
13	863.4125
14	864.4125
15	865.4125
16	860.2125
17	859.2125
18	858.2125
19	857.2125
20	856.2125

Decimal	AFS	Description
449	03-081	Countywide Operations (Training)
451	03-083	County Sheriff (Operations)
452	03-084	County Sheriff (Jail)
457	03-091	County Emergency Medical Services (Primary Dispatch)
458	03-092	County Emergency Medical Services (Secondary Dispatch)
460	03-094	Medical Channel 1
461	03-095	Medical Channel 2
465	03-101	County Sheriff (Probation
466	03-102	County Sheriff (Marine Division
469	03-105	County Sheriff (Courthouse)
470	03-106	County Sheriff (Jail)
473	03-111	County Sheriff (Dispatch)
474	03-112	County Sheriff (Records)
475	03-113	County Sheriff (Traffic)
476	03-114	County Parks Department
477	03-115	County Sheriff (Tactical)
478	03-116	County Sheriff (Administration)
481	03-121	County Fire (Dispatch)
482	03-122	County Fireground 1
483	03-123	County Fireground 2
484	03-124	County Fireground 3
486	03-126	County Water Department
487	03-127	County Fireground 4
488	03-130	County Fire (Administration)
496	03-140	Countywide Operations
500	03-144	County Highway Department
501	03-145	Countywide Emergency
503	03-147	County Emergency Management
504	03-150	County Building Inspector
505	03-151	County Soil District
506	03-152	County Codes Enforcement
507	03-153	County Planning Commission
508	03-154	County Surveying Commission
509	03-155	County Health Department
510	03-156	County Fairgrounds
695	05-067	Link to Hoosier SAFE-T Statewide system

❖ Encryption

Hey Dan,

Is there any radio scanner that will decode APCO-25 digital encrypted transmissions, and if so, where can I get one?

Jim via the Internet

While it is frustrating for scanner listeners to be shut out of local police and fire activity due to technological incompatibilities like those brought on by OpenSky, some jurisdictions and departments go even further and actually encrypt their transmissions. This means that even if a scanner existed with the capability of monitoring a particular system, without the proper decryption keys the conversations occurring on the system could not be overheard.

In larger metropolitan areas it is not surprising to find that police departments routinely encrypt radio traffic from specialized units like SWAT (Special Weapons and Tactics) and Narcotics, where the potential risk of having a criminal overhear tactical or undercover activity could place an officer's life at risk. What is surprising are agencies that indiscriminately encrypt everything, even if it is routine and there is no risk to life, limb or property.

In the United States, FCC regulations make it clear that encrypted transmissions are off-limits for monitoring. This includes encrypted APCO P25 transmissions. Scanners on the market today do not support decryption of any encrypted voice traffic, although there are some older analog voice inversion units that purport to undo some of the simpler (and quite old) analog scrambling techniques. P25 encryption in particular uses modern digital algorithms and, when implemented properly, effectively protects voice content.

Interestingly, there are times when you might be able to hear a conversation that should be encrypted but actually goes out in the clear. Such an event can occur when participating radios are not keyed properly. In order for a radio to properly encrypt (when transmitting) and decrypt (when receiving) an encrypted transmission, it must have the proper set of keys. If the radio doesn't have a key or it has the wrong key (for instance, it might have missed an update and still has an old key), it will not be able to participate in an encrypted conversation.

When that happens, either the dispatcher has to communicate with that radio in the clear (where everyone can hear it), or all of the other radios in the conversation are forced to transmit in the clear so that the improperly-keyed radio can participate.

However, the bottom line for Jim is that there is no scanner on the market that can decrypt APCO P25 transmissions, and unless the FCC drastically changes their regulations, there won't be one in the future.

That's all for this month. More scanner information, links and frequencies can be found on my web site at **www.signalharbor.com**. I also welcome your questions, comments and activity reports via electronic mail to *danveeneman@monitoringtimes.com*. Until next month, enjoy the start of summer and happy scanning!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
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SWR Variations

Reader Larry Wheeler, W9QR, supplied the following answer to a question in my May column (p. 23) as to why SWR readings in an antenna system may change when the power level increases or decreases from a transmitter even if there are no impedance changes from heating the coax:

"The radiated RF field is making its way back into the transmitter, causing an inaccurate reading in the SWR measuring circuit. If the problem disappears when a shielded dummy load is used, then we know that the above is correct because there are is no reflected energy to produce standing waves.

"Inadequate grounding can cause the generation of 'out of band' signals, sometimes from the synthesizer, that naturally produce standing waves from a narrow-band antenna."

Charles Engman, WB6MIO, adds, "When the load is reactive, it interacts with the [voltage vs. current] curve of the detector diodes and also may change the coupling coefficient of the directional coupler [thus explaining] low/high power differences in the indication.

Q. *With so many early digital shortwave modes like CW and RTTY disappearing in favor of newer technologies, aren't some of expensive digital decoding software for those modes extravagant? And how about those "collectible" receivers like the Yaesu FRG-7, Drake R8B, and JRC NRD-515, and others with obsolete custom parts; aren't they way overpriced? (J.J.O., NC)*

A. In the first case, most new software now contains multiple decoders, so you are paying primarily for the current technology, and the older software is there if you need it. So far as old radios commanding a high price, those receivers were top of the line when they came out in their respective periods and their reputations remain.

Even though some current receivers meet or exceed those early specifications, they are far more expensive. In addition, their enduring reputations make them collectible. Obsolete parts are, indeed, hard to find, but antique auto collectors don't seem to mind.

Q. *In the U.S., AM broadcasters are spaced every 10 kHz; in Europe, it's 9 kHz. Why don't all digital portables have a 9 kHz/10 kHz switch so that U.S. listeners can tune in European DX stations?*

A. First of all, portables using their internal ferrite-bar antennas are not going to hear those European signals, and even if they have an accessory for an external antenna, they are easily overloaded by local powerhouses which would muffle weaker signals. The portables are designed to be price competitive and devoid of the additional circuitry and better components necessary to provide wide dynamic range required for competitive listening.

Secondly, since U.S. stations are populated every 10 kHz and have a 10 kHz bandwidth, the stronger domestic stations would overpower adjacent-channel Europeans. Successful reception of the 9 kHz-spaced Europeans is reported by U.S. listeners primarily using communications receivers with their superior designs, greater tuning flexibility and selectivity, and often using loop antennas to null out adjacent domestic broadcasters.

Q. *Why is so much fiber being used in place of cable? (J.J. Owens, NC)*

A. Fiber is inherently much faster, allows wider bandwidth capacity, is lighter in weight, has a smaller diameter, doesn't corrode like copper, and doesn't suffer insulation signal losses.

Q. *What is the future of AM radio with IBOC and shortwave with DRM? (Several inquiries)*

A. While neither AM radio nor international shortwave broadcasting is gaining ground, they are in place and readily receivable with the simplest, least expensive radios, so they will remain for years to come.

However, with the lukewarm consumer response to, and higher cost of IBOC and DRM, even during better economic times, I expect slow growth of these two technologies.

Q. *When using an antenna tuner (transmatch) with a transceiver to make the entire system matched at 50 ohms, how do you know how much of your RF power is actually getting to the antenna and not being wasted heating up the coax? Where do I place an RF wattmeter to determine my radiated power? (Tim Canan, N7PPA)*

A. The tuner becomes part of the antenna system, providing "conjugate matching" between the transmitter and feedline. This does nothing to change the mismatch at the antenna feedpoint; it only means that all the reactances of the antenna, feedline, and tuner now add up to 50 ohms resistance.

The lossy heating of the coax occurs at high voltage intervals every quarter-wavelength, and is produced by intersecting waves of forward and reflected RF power forcing current through the insulation. All of the RF power, reflective or forward, that makes it to the antenna is actually radiated.

If you place an RF ammeter between the output of the transmitter and the input of the tuner, it will display all the power, forward and reflective, that is going into the antenna system, including that which is wasted heating the resistive elements (coils, coax, traps, antenna element, etc.). If you place it at the antenna junction, it will display what's being radiated, including the infinitesimal amount wasted by the resistive antenna element. The difference in readings between the two points will be mostly the line loss.

There is an excellent treatment of this, including charts, at: **www.antennex.com/preview/vswr.htm**

Q. *When digital encryption was first brought into voice security for two-way communications, Motorola's DES (Datal Encryption Standard) was the leader. Now we have AES. Which is the prevailing standard?*

A. With DES now about 40 years old, AES (Advanced Encryption Standard) is rapidly assuming the forefront in secure communications. It has been estimated by the National Institutes of Science and Technology (NIST) that it would take a hacker using 255 keys every second 149 trillion years to crack!

That said, DES is still being offered as an option, but primarily for expanding or replacing assets in existing DES systems.

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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E10: Israeli "Numbers" Broadcasts Gone!

On the first of March, the world's largest shortwave "numbers" intelligence operation suddenly disappeared. As I write this in early April, it is still completely gone.

While activity had been down somewhat in January and February, this still came as a considerable surprise to the worldwide network of very dedicated listeners that followed this operation's many broadcasts. The last transmission anyone heard was at 0130 Coordinated Universal Time (UTC) on March first. The rest is silence.

Starting sometime in the 1960s, Israel had used at least 23 different identifiers or call signs on hundreds of frequencies, from transmitters in multiple locations. Evidence suggested Israeli intelligence as the source, perhaps even the notorious MOSSAD.

The designator "E10" came about when ENIGMA, the European Numbers Information Gathering and Monitoring Association, brought sanity to the "numbers" hobby by assigning numerical codes to everything on the air. E10 simply means that it's the tenth English-speaking station on the list.

Of course, the English was rather creepy. The female machine voice, dubbed "Tel Aviv Tina," spoke with a weird accent, not quite French, and all letters were in military phonetics. "Novembair" rhymed with "your red hair." "OsCAR," stressing the last syllable, rhymed with "NASCAR."

The sheer weirdness of all this attracted considerable attention from artists and musicians. E10's fifteen minutes of fame came when a popular avant-garde rock band named Wilco included a brief clip of the "Yankee Hotel Foxtrot" identifier in their album of the same name. This clip supposedly came from Irdial's legendary 4-CD collection of "numbers" recordings called "The Conet Project." I say "supposedly," because the resulting copyright suit never went to trial. Irdial accepted a legal settlement, some of which financed a reissue of Conet.

Interestingly, it's legal to download all of the Conet tracks, for free, on the Internet. Irdial has made them available, but for personal use only. They are worth the download time. One really gets an ominous sense of the Cold War at its absolute peak.

As always, the people who knew what E10 was really about weren't talking. What they were doing, apparently, was reading all the Internet speculation about themselves and getting a good chuckle from it all. We suspect this, due to the timing of perhaps the only intentional joke ever sent on a numbers station. In the midst of one particularly intense e-mail exchange regarding possible meaning of "abnormal" long identifiers, one of these was broadcast with the very lightly encoded word "GOODNIGHT."

Now, we have a different sort of goodnight. Its timing is unsettling, to say the least. Very subtle changes in E10's schedule often got listeners wondering if something was happening in the Middle East. But now, in the midst of the biggest events in decades, E10 has simply vanished.

It's easy to say that perhaps E10 never meant anything significant in the first place. However, it seemed important to all the countries which took the effort to jam it. E10 attracted a real zoo, from the Chinese "Firedrake" music to other various gurgles, bleeps, and zings. Israel responded with frequent repetitions on multiple frequencies. Someone certainly thought it was doing something.

Now, we're left with another shortwave riddle wrapped in an enigma and shrouded in a mystery. Will Israeli "numbers" ever be back? Will a new operation take their place? These things are not ours to know, until time and monitoring reveal them.

❖ Chinese Strangeness

There is still a lot of good activity out there to confound numbers fans and keep the speculation going. If anything, it's getting stranger.

Spring saw interesting activity from Asia. First up, we heard the return of the infamous Chinese Robot. ENIGMA doesn't have a designator for this weird babbler, since the content is suspected to be automated target tracking information rather than encrypted messages for spies.

The signal is in upper sideband (USB), with some odd-sounding audio notches. Ary Boender, of "Numbers and Oddities fame," calls it "VC01." This presumably stands for "voice chip," since the Chinese female voice is definitely coming from a chip running at a speed just short of self-destruction.

Transmissions can last for hours. Perhaps it's for machine decode, or maybe it just isn't working very well. It's also been suggested, though, that whoever listens to its machine-gun assault has gotten good at understanding it. Well, that's more than the rest of us ever will.

One great recording, obtained by the ultra-dedicated "Token" on his California antenna farm, is here: **http://token_radio.home.mchsi.com/UnkCR_7608u_04232010_1148.mp3**

Recent frequencies, again from Ary Boender, are 5303, 6479, and 7756 kilohertz (kHz). The full list is in his N&O newsletter number 162, at **www.numbersoddities.nl/**

❖ Viet Nam Back?

Spring also brings the US West Coast strong signals from that bizarre Vietnamese numbers station discovered in early 2010. This one has no ENIGMA designator yet, either, and "VTN" has been proposed for the time being. "Token" has really put in his time on this one, and it's worth going to his web page at **http://token_radio.home.mchsi.com/VTN.htm**

The frequency is still 10255 kHz USB, and time is still approximately 1600 UTC. The station had been in something of an idling state, running tones or nothing at all until early March. It then resumed with a female voice in the usual northern Viet Nam dialect. The call-up is still to "Lighthouse" ("hai dang"), though much of the other format has changed.

Typically, there are three repetitions of what is obviously a recording made or stored on a personal computer. Windows error sounds have been heard. Recordings can be repeated every day for a long time. Unfortunately, at press time the station appears to be silent again, though everyone's sure it'll be back.

There's still no agreement on whether this is actually a coded message for agents abroad, though the format and repetition count certainly suggest that this is the case. "Lighthouse" could mean various things, including (in order of possibility) a group call sign, an agent code word, an island (Lighthouse Cay), or an actual lighthouse with a beacon for ships.

❖ Libya Update

The Tripoli air route control radio station mentioned in last month's column vanished very early in Operation Odyssey Dawn (the

UN-mandated no-fly zone). Aircraft are using Cairo instead or routing completely around the region.

The Libyan "Great Man-Made River Authority" is still transmitting in USB Automatic Link Establishment (ALE). See last month for the frequencies or check the ALE list on this column's web site at **www.ominous-valve.com/uteworld.html**

The Libyan Navy uses the USB frequencies of 6877 and 10405 kHz USB. We know this from the appearance of powerful psychological operations (PSYOPS) broadcasts made from US aircraft, audible well into Europe. These advised Libyan sailors to stand down and go home or else face destruction. Ominous loops were repeated in English, Arabic, and sometimes French.

At least two clandestine broadcasters on the standard AM band can be authenticated as rebel operations. They were on and off 675 and 1449 kHz, covering much of Europe at night.

While it's well documented that the 675 frequency was from the rebel stronghold in Benghazi, there's considerable uncertainty over 1449. The huge signal led to speculation that an inactive 500-kilowatt transmitter had been reactivated. At least once, flipping back and forth on an Italian GlobalTuner remote receiver showed that both frequencies were simulcasting.

Programming consisted of stirring music, Arabic religious chants, and announcements. By this time, most other Libyan AM stations had left the air or had greatly reduced power.

The most bizarre intercept came on the very high frequency of 30,000 kHz, where high solar activity revealed apparent Libyan soldiers engaging in Arabic battlefield communications. One is reminded of World War II history, in which the Allies intercepted German tactical communications from North Africa via similar skip.

❖ Chilean Early Warning Center

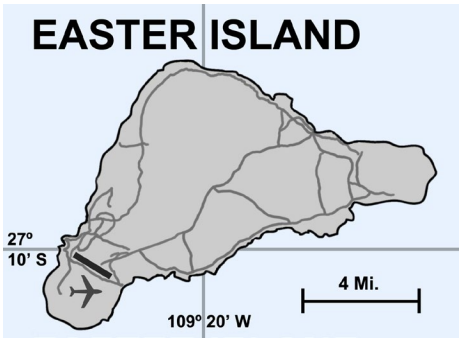
About a year ago, people all over the world started hearing a big, new ALE net. Stations all identified as ECO ("Echo" in Spanish) plus two numbers. Sometimes they worked an apparent control station called OMEGACERO ("Omega Zero").

Various locations were suggested for this activity. Now we have confirmation that the network belongs to the Chilean Ministry of the Interior's emergency communication system.

Omegacero is a base station in Chile's Metropolitan Region, the area around Santiago. It's operated by ONEMI, a Spanish acronym for the official "civil protection management" agency.

The "ECO" stations are all part of the far-flung alerting network maintained by ONEMI's Centro de Alerta Temprana (Early Warning Center). They are organized around Chile's various administrative regions. This system is part of a massive effort to disseminate timely warnings of earthquakes, tsunamis, floods, volcanoes, and whatever other possible disasters might strike a country as spread out and geologically active as Chile. It also works with the Navy's hydrometeorological office.

Interestingly, the only other long ALE identifier copied so far is ISLADEPASCUA, or Easter Island. This remote island, known mostly for its huge stone faces set in the ground, is part of Chile. It has a small naval presence and an important tsunami warning system. Here in California, Isladepascua can be copied daily around 0000-0200 UTC.



Mike Chace-Ortiz, *MT*'s capable *Digital Digest* editor, and Jon in Florida have both recorded occasional follow-on traffic in Spanish voice after ALE links have been established. We know it's the same people for a number of reasons, among them being a clearing in ALE when they are done talking.

The frequency structure of this net is interesting. It uses the 6, 9, 10, and 17 megahertz utility bands, but within these there are many frequencies clustered close together. This might be to enhance coverage within regions through a high-angle propagation mode called Near-Vertical Incidence Skywave (NVIS).

NVIS is considered a good tactical mode, optimizing the kind of close-in coverage needed for this type of operation by land-mobile units. The close bunching of frequencies is typical for NVIS systems.

Those wishing to find this interesting net can scan these frequency groups: 6834, 6843, 6861, 6871, and 6877; 9084, 9087, 9091, 9140, and 9150; 10128, 10135, 10160, 10176.5, 10187, 10193, 10218, 10222, 10234, and 10244; and finally 17411, 17426, 17446, 17450, and 17454.

❖ Japan Update

The "World's Most Accurate FAX List" still is (April *MT*), but now we can add the "missing" Japanese fishery frequency. It's 13074 kHz. As always, FAX is received 1.9 kHz lower than listed frequencies. The station received was JFC, Kanagawa Prefectural Fishery Information Radio.

Currently, there is great interest in Fukushima Prefectural Fishery Radio (JFW). This station is in the Iwaki area, dangerously near the stricken Fukushima nuclear power plant. When you hear about radiation threats to the fishery, these are the people who have lost their livelihood.

JJY, the Japanese standard time station which left shortwave some years ago, is currently off-air on its remaining frequency of 40 kHz. This is also due to the nuclear emergency, as the station is apparently inside the evacuation zone.

The Japanese weather FAX and VOLMET (aviation weather broadcasts) are in the extreme south of the country, and they were unaffected by the disasters.

❖ Russian Military

Perhaps in response to all the Middle East unrest, the Russian "Buzzer" on 4625 kHz amplitude modulation (AM) has been extremely busy as of late. Remember that this mysterious station sent only three voice messages that anyone knows of over its first 28 years of existence. In the past month alone, we've had at least 20. One can listen to the Buzzer live at **http://uvb-76.blogspot.com/**

It's becoming likely that the Buzzer (ENIGMA S28) really is a Russian command control station. Some messages resemble the sort of tactical communication found on other frequencies and modes, while others slightly resemble the sort of coded priority traffic broadcast by United States military in its Emergency Action Messages (EAM).

❖ Conclusion

This is a longer column than usual, and it still doesn't cover everything that's happened in the past couple of months. Obviously, *someone* still uses terrestrial radio!

ABBREVIATIONS USED IN THIS COLUMN

AFB	Air Force Base
ALE	Automatic Link Establishment
AM	Amplitude Modulation
AWACS	Airborne Warning And Control System
CAMSLANT	USCG Communications Area Master Station, Atlantic
CAMSPAC	USCG Communications Area Master Station, Pacific
CAP	US Civil Air Patrol
COTHEN	US Customs Over-The-Horizon Enforcement Network
CW	On-off keyed "Continuous Wave" Morse telegraphy
DHFCS	UK Defence High-Frequency Communications Service
DSC	Digital Selective Calling
EAM	Emergency Action Message
FAX	Radiofacsimile
FEMA	US Federal Emergency Management Agency
HFDL	High-Frequency Data Link
HF-GCS	High-Frequency Global Communication System
LSB	Lower Sideband
M89	Chinese CW "V ffff de ffff" coded markers
MCW	Modulated CW, by tone or in AM
MX	Generic for Russian single-letter beacons/markers
MARS	US Military Auxiliary Radio System
Meteo	Meteorological; weather office
NATO	North Atlantic Treaty Organization
RTTY	Radio Teletype
S06	"Russian Man," callup and 5-figure groups
S28	Russian UVB76, "Buzzer" and short voice messages
S30	Russian "Pip" marker and short voice messages
S32	Russian "Squeaky Wheel," well-named marker
Selcal	Selective Calling
SITOR	Simplex Telex Over Radio, modes A & B
UK	United Kingdom
Unid	Unidentified
US	United States
USAF	US Air Force
USCG	US Coast Guard
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 ().

3756.0 Unid-The Pip (S30), Russian military channel marker, MCW at 2237 (Ary Boender-Netherlands).
3828.9 Unid-The Squeaky Wheel (S32), descriptively named Russian military channel marker, at 2237 (Boender-Netherlands).
4009.5 NNN0FFJ-Control of US Navy/Marine Corps MARS Region 2 2G3B New Jersey Net, voice and MT63 (64-tone amateur teleprinting), at 0000 (MDMonitor-MD).
4013.5 NNN0AAJ-US Navy/Marine Corps MARS Region 4, 4K2B Kentucky Net, at 2334 (MDMonitor-MD).
4032.9 AAR3DS-Control of US Army MARS Region 3 net, with AAM3RT, others, LSB at 1119 (MDMonitor-MD).
4035.9 AAR2EN-US Army MARS Region 3 Net, LSB at 1209 (MDMonitor-MD).
4038.5 NNN0ABV-US Navy/Marine Corps MARS Region 4, 4G1B South Carolina Net, at 0018 (MDMonitor-MD).
4038.9 AAR2JQ-Control of US Army MARS Region 2 net, with AAR2RD/M, LSB at 1122 (MDMonitor-MD).
4041.0 NNN0BSV-Control of US Navy/Marine Corps MARS Region 5, 5N5B Ohio Net, at 2343 (MDMonitor-MD).
4482.0 0309MOCAP-CAP, MO, ALE with 0100NDCAP, ND, at 0100 (Jack Metcalfe-KY).
4515.0 "2-X-A"-Trigraph call of unknown US military, exercise EAMs at 2257 (Metcalfe-KY).
4532.0 UN2T-Chinese military automated CW markers (M89), calling JA3L, similar on 5278 and 5500, at 1128 (Eddy Waters-Australia).
4593.5 AFA3AJ-Control of USAF MARS Northeast Area NE1S1 Net, with AFA2RU, others, at 1302. AFA5NF-USAF MARS NE2S1 Net, at 2300 (MDMonitor-MD).
4625.0 UVB76-Russian military "Buzzer" marker and voice alerting channel (S28), male Russian voice with coded message from "MDZhB" to FLINTTGLAS, at 1526. S28, Russian message from "MDZhB" to BLIZNYaK, at 1725. S28, Russian messages from MDZhB to KLIMA and GLIKOKOL, at 2350 (Boender-Estonia). [Remote receiver. -Hugh]
4787.0 The Russian Man-Russian intelligence male voice (S06), callup 837 462/15, message ending "00000," at 2000 (Mike-West Sussex, UK).
5253.5 NF114BF-Possible USCG Auxiliary, net with NF114CZ, at 0245 (Metcalfe-KY).
5447.0 0901NCCAP-CAP, ALE with 0902NCCAP (both NC), and 0004SCCAP (SC), at 0305 (Metcalfe-KY).
5616.0 Canforce 3-Canadian Forces C-17A number 177703, enroute to UK, answered selcal HQ-BJ from Gander (Newfoundland), at 0631. Shanwick-North Atlantic air route control, Ireland, selcal check with USAF Air Mobility Command transport Reach 974, at 0825 (Boender-Netherlands).
5725.0 "3-S-N"-UK Royal Navy, tracking link coordination with "9-W-Z," at 2039 (ALF-Germany).
6450.0 GRECO-Italian Financial Police Patrol Vessel Greco, calling CINUS, ALE at 2120 (PPA-Netherlands).
6628.0 N661GA-Gulfstream V Bizjet, position for Santa Maria, at 0219 (ALF-Germany).
6668.0 Cosaque 34-French Air Force, unknown aircraft in Libya operation, at 1031 (Patrice Privat-France).
6676.0 AXQ429-Sidney Volmet, Ningi, Queensland, weather for Australian airports at 2002 (PPA-Netherlands).
6757.0 MKL-UK Royal Air Force and NATO, Northwood, encrypted RTTY, also 8986, at 2311 (ALF-Germany).
6807.0 "6-M-I"-US military, exercise EAMs at 2311 (Metcalfe-KY).
6833.0 "4-Z-C"-US military, EAMs at 2311 (Metcalfe-KY).
6835.0 "R-6-G," EAMs at 2327 (Metcalfe-KY).
6877.0 Unid-USAF PSYOPS (Psychological Operations) aircraft, probably an EC-130, broadcasting on Libyan Navy frequency telling sailors to stand-down or be killed, loop in English, Arabic, and French, at 0900 (Boender-Netherlands).
6884.0 HQ1-Great Man-Made River Authority headquarters, Tripoli, Libya, working MOBILE26, and calling MOBILE20 and MOBILE27, also on 8200 and 10125; at 0419 (ALF-Germany).
6903.0 "G-4-H," EAMs at 2244 (Metcalfe-KY).
6990.0 IW5EFX-Control of Italian Amateur Radio Emergency Net, Sienna, with Rome headquarters and many prefectural outstations in digital and LSB voice, for special anniversary message, at 1100 (ALF-Germany).
7039.2 "F"-Russian Navy CW cluster beacon (MX), Vladivostok, also on 8495.2 and 10872.2, at 1045 (Waters-Australia).
7039.3 "K"-MX, Petropavlovsk, also 10872.3, CW at 1045 (Waters-Australia).
7039.4 "M"-MX, Magadan, also 8495.4, 10872.4, and 13528.4; at 1045 (Waters-Australia).
7498.0 "K-5-V," EAMs at 2253 (Metcalfe-KY).
7501.0 "K-2-T," EAM at 2239 (Metcalfe-KY).
7527.0 YCQ-USCG Cutter Boutwell (WHEC 719), COTHEN ALE sounding at 0134 (ALF-Germany).
7540.0 AFN7VN-USAF MARS, Transcon net at 0130 (ALF-Germany).
7656.0 0021CTCAP, CAP, CT, ALE with at 2308 (Metcalfe-KY).
7756.0 Unid-Chinese Robot, "female" computer voice rattling rapid fire numbers, at 1907 (PPA-Netherlands).
7795.0 JMH2-Japan Meteorological Agency, double FAX chart with predicted temperatures and dew points, at 1832 (PPA-Netherlands).
7906.0 XVS-Ho Chi Minh Ville Radio, Viet Nam, weather warnings in English and Vietnamese, at 2110 (PPA-Netherlands).
8035.0 "8-M-T," EAMs at 2211 (Metcalfe-KY).
8050.0 IDR-Italian Navy, Rome, working IHMW, Mine Hunter Viareggio (M5559), at 2051 (PPA-Netherlands).
8143.0 BADR-Pakistan Navy vessel Badr (F184), calling NRS (control), ALE at 1944 (PPA-Netherlands).
8176.0 VMC-Charleville Meteo, Australia, male voice with gale warnings, at 1738 (PPA-Netherlands).
8414.5 003669991-US Coast Guard, Boston, MA, DSC safety test to self at 2134 (PPA-Netherlands).
8419.0 WLO-ShipCom/Mobile Radio, AL, CW identifier in SITOR-A sync marker, at 1726 (Robbie Spain-WY).
8433.0 XSG-Shanghai Radio, China, CW identifier in SITOR-A idlers, at 2230 (MPJ-UK).
8484.0 HLG-Seoul Radio, Korea, CW marker at 1611 (MPJ-UK).
8494.0 CN4-Singapore Navy, calling 7, ALE at 1100 (Waters-Australia).
8646.0 VTP6-Indian Navy, Visakhapatnam, CW message in 4-figure groups to VWGZ (group call: All Indian Warships), at 2256 (MPJ-UK).
8677.0 CBV-Valparaiso/ Playa Ancha Radio, Chile, grainy FAX pressure chart at 2305 (MPJ-UK).
8819.0 Tashkent Volmet, Uzbekistan, aviation weather at 2025 (PPA-Netherlands).
8825.0 ISS 5301-Meridiana A330 from Eurofly, registration I-EEZM, selcal BP-DQ and position for New York, at 0050 (ALF-Germany).
8891.0 M-MNBB-Dassault Falcon 7X bizjet, selcal KL-FJ and position for Reykjavik, at 1457 (ALF-Germany).
8918.0 Hobby 03-USAF C-130J, working New York at 2150 (Privat-France).
8971.0 Pelican 713-US Navy P-3C, working Fiddle, Jacksonville, FL, at 1818 (Allan Stern-FL). Fiddle, working P-3C Red Talon 712, at 2011 (MDMonitor-MD).
8983.0 CAMSLANT-USCG, Chesapeake, VA, rescue operation with HC-130J Coast Guard Rescue 2005, above vessel with medical emergency, at 1717 (MDMonitor-MD).
8992.0 Olive Oil-US military, possible airborne command post, with three 28-character EAMs and "standing by for traffic," simulcast 4724 and 11175, at 2300. Rear Door-US military, EAM and "standing by for traffic," simulcast on 15016, at 2310 (Jeff Haverlah-TX).
9016.0 Tascomm-UK DHFCS, Forest Moor, test count at 1931 (PPA-Netherlands).
9025.0 HAW-USAF, Wideawake Field, Ascension Island, calling PLA, Lajes Field, Azores, ALE at 1906 (PPA-Netherlands).
9040.0 STG-Myanmar, ALE link check with NDN at 1050 (Waters-Australia).
9198.0 TAC-Chilean Navy, ALE and data with "4-P-O," at 0110 (ALF-Germany).
9462.0 FR3FEM-FEMA Region 3, PA, ALE sound; similar by FR2FEM (Region 2, NY), FR4FEM (Region 4, GA), FC1FEM (Region 1, MA); also 14776; at 0000 (ALF-Germany).
9999.0 BPM-Chinese National Time Service Center, Xi'an, offset CW time pips at 1600 (MPJ-UK).
10113.0 TUD-Tunisian Ministry of Information, Tunis, calling STAT14, ALE at 1955 (PPA-Netherlands).
10160.0 ECO06-Chilean Early Warning Center "Echo Net," ALE sounding, went in sequence to 10176.5, 10187, 10193, 10218, 10222, 10234, and 10244; at 0005 (ALF-Germany).
10315.0 Magic 81-NATO E-3 AWACS back end on Libya operation, calling DHN66 (NATO, Germany), at 1406 (Privat-France).
10405.0 Unid-USAF PSYOPS aircraft, same type of broadcast to Libyan Navy as on 6877, telling sailors to lay down weapons and go home, loop in English and Arabic, at 0754 (Boender-Netherlands).
10555.0 VMW-Wiluna Meteo, Australia, FAX wind chart at 1805 (PPA-Netherlands).
11080.0 S1B-Lithuanian Navy, working P1G, ALE at 1752 (MPJ-UK).
11090.0 KVM70-US government, HI, FAX surface forecast, also 16135, at 0721 (PPA-Netherlands).
11106.0 EK9-Greek military, calling GEF, ALE at 1708 (PPA-Netherlands).
11175.0 Offutt-USAF HF-GCS, Offutt AFB, NE, radio checks with Reach 360, at 1650 (MDMonitor-MD). Spa 04-possible call sign of USAF calling Skymaster (US Strategic Command exercise call), passed coded message at 2237. Spa 04, called Skymaster and passed coded message at 2258 (Haverlah-TX).
11232.0 Trenton Military-Canadian Forces, Trenton, ONT, patching Darkstar Papa (USAF E-3B AWACS back end) to Raymond 24 (Tinker AFB, OK), at 1605 (MDMonitor-MD).
11235.0 Charly 46-Italian Air Force, Pisa-San Giusto, working 47, a C-130J, ALE at 181 (MPJ-UK).
11256.0 ETK4-Ethiopian Airlines, selcal DJ-PQ to B757 ET-AKF, at 1932 (PPA-Netherlands).
11300.0 Khartoum-Africa/Indian Ocean air route control, Sudan, working Ethiopian 470, a B737, at 2111 (PPA-Netherlands).
11312.0 "02"-HFDL Ground Station, Molokai, HI, uplinks to VP-BAZ (Aeroflot B767), and G-VGOA (Virgin Atlantic A340 "Indian Princess"), at 0644 (PPA-Netherlands).
11318.0 Samara Volmet, Russian aviation weather at 0520. "13"-HFDL Ground Station, Santa Cruz, Bolivia, uplink to CC-CXE (LAN Airlines B767), at 0650 (PPA-Netherlands).
12431.0 VIBOVALEN-Italian Financial Police, Vibo Valencia, working TARANTO, at 1319 (MPJ-UK).
12577.0 235078695-UK flag pressurized gas carrier Helle Kosan (2DGG3), DSC with 004773500, Hong Kong Marine Rescue, China, at 1409 (PPA-Netherlands).
12750.0 NMF-USCG, MA, FAX forecast chart at 1944 (MPJ-UK).
13270.0 "06"-HFDL ground station, Hat Yai, Thailand, uplink to A7-ADV (Qatar Airways A321), at 1934 (PPA-Netherlands).
13907.0 ROS-USCG Cutter Spencer (WMEC-905), COTHEN ALE sounding at 1048 (Privat-France).
13927.0 Gold 31-USAF tanker on Coronet mission, leaving US for Europe, probably joining Odyssey Dawn (Libya) operation, patch via USAF MARS AFA5YD, OH, at 0027. Rama 41-USAF B-1B, returning to US after Odyssey Dawn mission, patch via USAF MARS AFA5RS to Dyess AFB, TX, at 1624 (Stern-FL).
13993.0 AFN7VN-control of USAF MARS Transcon Net, replaced by AAA9USA (Army MARS Gateway Station, Ft. Huachuca, AZ), and then AFA6MP (TX), at 1645 (MDMonitor-MD).
14484.0 Looking Glass-US military airborne command post, probably an E-6B, receiving exercise traffic from "9-T-F," at 1953. "Uniform Sierra Alpha"-US Army MARS AAA9USA (Ft. Huachuca, AZ), raised Poker Face for AAR8AY, also Army MARS, who had traffic for Step Mother, went to 20994 at 2028. Poker Face, taking relay by "9-T-F" from AAN0BOI, US Army MARS, at 2138 (Metcalfe-KY).
14487.0 Top Hand-US military, working "9-T-F" and "9-T-C," secondary exercise frequency at 2336 (Metcalfe-KY).
14582.0 Coast Guard Sector Miami-USCG, FL, working N09, USCG HC-144 number 2309, at 2035 (MDMonitor-MD).
15867.0 Technical Center-US Customs Technical Service Center, FL, COTHEN ALE link and voice with Coast Guard 1502, an HC-130H, at 1836 (MDMonitor-MD). D14-US Customs P-3B "Slick," COTHEN ALE sounding at 1932 (PPA-Netherlands).
16331.9 "S"-MX, Arkhangelsk, CW at 1045 (Waters-Australia).
16332.0 "C"-MX, Moscow, CW at 1045 (Waters-Australia).
16804.5 P3LX9-Cyprus flag bulk carrier Evrialos, DSC Safety test with USCG CAMSPAC Point Reyes, CA, at 1444 (MPJ-UK).
17411.0 ISLADEPASCUA-Chilean Early Warning Center, Easter Island, also on 17426, 17450, and 17454; ALE sounding at 0655 (Waters-Australia).
20890.0 Coast Guard 1502-USCG HC-130H, telling unheard station they are back to COTHEN scan, at 2005 (MDMonitor-MD).

DIGITAL DIGEST

DIGITAL MODES ON HF

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Update on Codan Networks

Codan is an Australian radio equipment manufacturer that for a number of years has been the choice of many aid agencies, NGOs and other civil or MOI (Ministries of the Interior) operations that need reliable HF communications. Some diplomatic operations, most notably the Egyptians, also make use of Codan equipment. As one might expect, the Codan line has over the years extended from radios to integrate data modems, voice encryption, GPS tracking and automatic link establishment (ALE) features.

In terms of ALE, most Codan systems are set up with Codan's proprietary CALM (Codan Automatic Link Management) system. CALM is backwards compatible with the regular MIL-188-141A standard but offers other enhancements. Some Codan networks make use of a proprietary robust 80bd PSK signal called a Chirp. It's quite a distinctive sound (see Resources for an example audio clip). As with other link management systems, the Codan radios are able to test channels for best quality in addition to opening follow-on voice or data traffic. The Hoka Code300-32 decoder is able to decode and read both the chirp and proprietary 16 tone modem traffic but only as an expensive "professional" add-on option.

There are a number of signs that can help point to a Codan-based network:

- If voice is used, most of the radios send a brief tone at +1200Hz as the PTT (Press To Talk) button on the microphone is released
- If CALM/MIL-188-141A ALE is used, identifiers are usually 4 or 6 digits (occasionally 8 or 10)
- If Codan Chirp is used, the identifiers are often the same as those used for regular 141A-type ALE
- Virtual addressing can be used in CALM, so that, for example, voice traffic may use a different set of identifiers from that used for data connections, even though the same stations are involved
- GPS-connected networks use encrypted AMD data messages to send the location fix information. On these networks, you'll often see "/>A2001" sent (perhaps denotes an "empty" fix)

Here are a few of the most active Codan-based networks that you can hear today:

Maltese Forces Maritime Service Codan Network

Although some of this network's frequencies have been in use for voice traffic for some years, they weren't fully identified until CALM-based operations started in December of 2010.

Frequencies: 6205, 6838, 8207, 13118, 16402, 22372 kHz USB
Identifiers:

A1A	UNID
A2A	UNID
ABA	(Net Control Station, HQ) (voice/GPS)
AB1	Armidale class patrol vessel P21 (voice/GPS)
AB2	Armidale class patrol vessel P22 (voice/GPS)
AB3	Armidale class patrol vessel P23 (voice/GPS)
AB4	Armidale class patrol vessel P24 (voice/GPS)
3201	(Net Control Station, HQ) (data)
3202	Armidale class patrol vessel P21 (data)
3203	Armidale class patrol vessel P22 (data)
3204	Armidale class patrol vessel P23 (data)
3205	Armidale class patrol vessel P24 (data)

You can hear voice contacts after the ALE calls, and data is sent using the Rockwell Collins 1800bd "Airborne" waveform.

UNID Codan Network

This network remains a mystery and to-date I have found only one frequency using these identifiers.

Frequency: 16112 kHz USB
Identifiers:
1001 Net Control Station
1xxx-series outstations
90xxx1-series outstations (probably virtual addressing for the 1xxx-series stations)

There appear to be about 15 stations operating in the network. AMD messages have been seen like "DXU" and "//A112" but their meaning or purpose is not yet understood. Data traffic using the Codan proprietary 9001/3012 modem is sent with 16 tone waveform and is both secure and compressed.

Moroccan MOI Codan Network

This very active network has for a long time been logged as Civil Protection, but I was recently able to see two stations linking and then using the 16 tone HF modem to log in to the DGSN computer system. However, with such a large network of stations involved, this system may in fact be multi-agency in nature.

The DGSN (Direction Générale de la Sûreté Nationale) is part of the MOI (Ministry of the Interior) and is the civilian national police force which concentrates on mainly urban areas. The Royal Gendarmerie, formally part of the military, augments the DGSN and focuses its attention on mainly rural areas. The DPC (Direction de la Protection Civile) is also under the control of the MOI.

Voice traffic has been heard after CALM/ALE. Codan Chirp using the same identifiers often follows CALM calls and data has been heard (rarely) using the 16 tone HF modem waveform.

Frequencies:
3155, 3805, 3830, 4040, 4460, 4855, 5083, 5140, 5321, 5435, 5792, 5820
5823, 6500, 6792, 8600, 9200, 10390, 12065, 13490, 13499, 16240, 17435,
18765 kHz USB
Identifiers:
11xx
13xx
2011 Network Control Station, HQ, Rabat
22xx
24xx
25xx
11xxx
13xxx
20xxx
22xxx
24xxx

In this network, all 4-figure identifiers are related to a 5-figure one. For example, 2411 is related to 24111 and the same is true of the 1-series identifiers. While I haven't studied this scheme in detail, it looks likely that this signifies some kind of sub-network structure. Perhaps you have some ideas? This network puts in very strong signals to the Eastern and Midwest US during daytime hours and is an easy catch.

❖ ECO Network Solved!

Due to some sterling detective work by our own Hugh Stegman after a tip-off by long-time digital utility expert Leif Dehio, the ECO NVIS ALE Network reported in the February and April 2011 issues of this column has been identified. No spoilers … just be sure to read Hugh's column!

❖ UK MIL MATELO Returns

After a hiatus of many months, the UK Forces MATELO transmissions have returned to the air, albeit on slightly shifted frequencies. MATELO (Maritime Air TELecommunications Organization) is a broadcast to maritime reconnaissance aircraft of NATO's Allied Maritime Component. It is controlled from the Allied Maritime Command HQ (CC-MAR HQ) at Northwood (outside London) in England and is sent from two or more UK DHFCS (Defense HF Communications System) transmitters, usually Inskip or St Eval.

It may be a complete coincidence, but the return took place at almost the same time as the commencement of the main military actions against Libya by French, British and US forces.

You can hear the familiar 75bd/850Hz shift STANAG4481 KG84 encrypted RTTY (aka RATT) broadcast on four HF channels simultaneously: 4731.7, 6758.7, 8987.7 and 11212.7 kHz. Notice the familiar stream of reversals (binary 10101010...) that start and end each message.

That's all for this month. Sunspots are on the rise, so hopefully we've seen the end to the last few years of the solar doldrums, and better DX on higher frequencies is back! Good digital listening.

RESOURCES

Codan 80bd Chirp: **signals.taunus.de/WAV/CODAN-CHIRP.WAV**
Codan Voice Crypto: **signals.taunus.de/WAV/CODAN-NGT_VX_CRYPTO.WAV**
Codan PTT piptone: **signals.taunus.de/WAV/CODAN-PTT-RELEASE-TONE.WAV**
Codan 16 tone modem: **signals.taunus.de/WAV/CODAN16.WAV**

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

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Portable Power for Field Day and More!

As I write this month's column, the first thunderstorms of the season are rapidly approaching from the west. Just as the TV meteorologist starts to mention hail, my weather alert radio begins its ominous warbling. According to the National Weather Service, the first tornado watch of the season is now official. Yay! It's power outage season in the tornado belt!

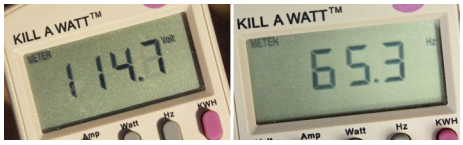
After years of learning things the hard way, all of my PCs and TVs are backed up by uninterruptable power supplies (UPSs), so if the power drops or see-saws, nothing goes boom. But the onset of bad weather is a reminder that I'm overdue to test and provision my backup power generator in case the power drops for more than an hour or two. I don't happen to own a Toyota Prius – the world's most luxurious drive-around backup generator – so Old Betsy, my 14-year-old Coleman 3.5-kilowatter, will have to do.

Here in the upper Midwest, Storm Season is a warm-up of sorts for Field Day, which may as well be called Portable Power Day: no power, no radio. Batteries don't charge themselves! Every FD station needs power, ideally from a source other than the ac mains. The whole point of Field Day – in addition to the mass consumption of bratwurst – is to prepare for disaster communications when the ac mains are down.

A QRP transceiver can operate from a small battery pack for several days, while a 100-watter will require its own deep-cycle battery, but sooner or later, power from a solar panel, a car alternator, a wind turbine or a portable power generator will be required.

Old Betsy, my trusty Coleman Vantage 3500 genset, has served me well for 14 seasons. She has 240-, 120- and 12-V outputs, AVR (made for the Canadian market), and an engine built to last. But she's loud as hell, weighs a ton and does not use inverter technology. Darn!—NT0Z

Much like modern ham gear, in the past 10 years, portable generators have become tiny, lightweight, powerful, portable, reliable and inexpensive. Thanks to inverter technology they can also put out butter-smooth ac, which you'll really appreciate if you've ever fried delicate electronics because your genset was putting out a 150-V, 50-Hz "modified sine wave."



As shown on the P3 KILL A WATT, when powering a 500-W load, Old Betsy is putting out 114.7 V at 65.3 Hz — a bit out of spec after 14 years! I guess it's time to find a service manual and adjust the governor and the AVR controller.—NT0Z

Safety lecture: Modern generators are still gasoline-powered devices that produce several kilowatts of ac power. Treat them with respect because they can still explode, disfigure, burn, electrocute or otherwise kill you and those around you. As with any ham radio activity, safety comes first.

❖ The Evolution of Gen Tech

Conventional generators are basically motors that are operating "backward." When you apply electricity to a motor, the motor shaft turns, allowing it to do work. If you need more rotational power, add more electricity or wind a bigger motor. If you take the same motor and physically rotate its shaft, it generates electricity. Turn the shaft faster or slower and the voltage increases and decreases commensurately. All motors are generators and all generators are motors. Because real-world designs are optimized for specific applications, however, motors aren't efficient generators, and vice versa, but the principles still apply.

Basic gensets use small gas-powered engines to turn ac alternators (like those in cars), the voltage and frequency of which depend on rotational speed. The generator is directly coupled to the engine, so if the engine is running at the correct speed, the voltage and frequency of the ac output will be a 120-V ac sine wave with a frequency of 60 Hz (just like the power company). To do this, most conventional gensets use two-pole armatures that run at 3600 RPM to produce a 60-Hz sine wave (diesel-powered gensets, which typically have much more torque, often run at 1800 RPM).

Honda's popular (and expensive) inverter gensets ($700 to $1200) have more than a few tricks up their sleeves, including the ability to be connected together to double their output capacity. Out of warranty service for these units can be very expensive, so consider an extended warranty, if available. (photo courtesy of Honda)

Various electronic and mechanical methods are used to stabilize voltage and frequency values as engine speeds vary (because of current loads or other factors). Conventional generators *must* turn at a specific RPM to maintain output regulation, so when more ac power is drawn from the generator, the engine *must* supply more torque to overcome the increased magnetic resistance in the generator's core. They *can't* simply spin faster to supply the extra energy.

Typical designs use mechanical and/or vacuum "governors" to keep the generator shaft turning at the correct speed. More sophisticated models incorporate electronic automatic voltage regulation (AVR) systems that use a microprocessor and special windings in the generator core to help keep output steady near 120 V/60 Hz. AVR systems respond to short-term load changes much more quickly than mechanical or vacuum governors alone.

AVR gensets used to be top dog, but today they're mostly used in medium to large units that can't practically use inverters to maintain output regulation. You'll find AVR gensets in higher-quality, 5- to 15-kW "home backup systems" and in many RVs.

Probably the best way to power "sensitive" Field Day electronics – including computers and ham rigs – is to use portable "inverter generators." These amazing gensets are available in 1- to 5-kW models, which makes them

perfect for most ham radio use. In addition to the usual mechanical regulation systems mentioned previously, these newer units use a built-in ac-dc-ac inverter system that produces clean 60-Hz sine waves at 120 V ac, with a 1% to 2% tolerance, even under varying load conditions (some power companies can't even do that!).

Instead of using the usual two windings in the generator core, inverter gensets use 24 or more windings, each paired with multiple rare-earth magnets, to produce a high-frequency ac waveform of up to 20 kHz! A solid-state inverter module converts the high-frequency ac to smooth dc, which is in turn converted back to clean, tightly regulated 120-V ac power.

If untamed, however, a 20-kHz ac wave inverter can produce an awful lot of RF noise (hash). Indeed, some inverter gensets are noisy, especially at HF. What's worse, some HF transceivers are especially susceptible to ac hash on their dc power inputs, making troubleshooting between makes and models quite difficult. As it stands, some users say a particular make and model of inverter genset is perfectly quiet, while other users liken it to a spark-gap transmitter! Variations in RF noise characteristics between different units of the same model have been observed. The same goes for transceivers.

In the end, you'll have to test for yourself. When I was in the market I took my radio to the store to test various gensets! I didn't have any noise issues with my gear, but it was nice to know that I could return or exchange any particular unit if it became an issue. Local vendors will be much more likely to accommodate this than will online sellers.

Potential noise issues aside, most inverter gensets are also compact, lightweight, and *amazingly* quiet. The smallest hand-held units put out a kilowatt of perfect ac power at sound levels no louder than that of a normal conversation! You no longer have to hide your generator in a faraway ravine or behind a plywood sound shield!

❖ Smart Shopping

Inexpensive gensets that don't have inverters are intended to power lights, saws, drills and stuff that can reliably be run on "garbage power." You risk destroying your sensitive gear if you power it directly from this type of generator! Home improvement stores everywhere sell these tiny gensets that claim to put out 750 W of ac power, weigh about as much as a gallon of milk, and cost as little as $120. Danger!

The safest way to use these little "darlings" is to find one that has a healthy 12-V dc output for charging batteries. Bring two deep-cycle batteries to your Field Day site. Use one while charging the other to protect your gear from unknown dangers. Swap batteries as necessary.

This Honeywell HW1000i inverter generator is rated for 900 W of clean ac power and has an attractive price tag of $349. Make sure your vendor has a liberal return policy, however, as the reviews of this unit on amazon.com and elsewhere have been poor. Manufacturers competing with top-tier genset players such as Honda, Yamaha, Subaru and Suzuki, often offer much lower price tags. To do so, however, means producing the gensets offshore, with a resulting drop in quality. Obtaining warranty service on these low-cost models is often impossible.—NT0Z

To safely power all of your devices, choose a genset that provides at least 30% more power than you need. Electric motors can take a *lot more* power to start than they do to keep running. A motor that takes 500 W to run may take 1000 to 1500 W to start (think RV air conditioners!). Besides, it's not a good idea to run your genset at max capacity for extended periods.

Low-end gensets are usually powered by low-quality, lawnmower-style engines that are noisy, need frequent servicing, and often die young. Better models have overhead-valve (OHV) or overhead-cam (OHC) engines, pressure lubrication, low-oil shutdown, cast-iron cylinder sleeves, oil filters and electronic ignition systems. They cost more but usually last much longer.

Although smaller gensets have small gas tanks, they don't necessarily need more frequent refueling. Some small gensets are super efficient and may run for half a day or more while powering small loads.

Run times are often exaggerated and are usually stated for 50% loads. If you're running closer to max capacity, your run times may be seriously degraded. The opposite is also true. Typical gensets run from three to nine hours on a full tank of gas at a 50% load.

Just by looking at the power panel it's apparent that this $120 discount genset was made in a faraway land. The panel lamp is marked "IN DIC," and the output receptacle is marked "AC 120V VOLT," whatever that means! I'd be afraid to power anything from this unit except an incandescent light bulb!—NT0Z

Old-style gensets are always too loud. If your FD site is at a campground or other public space, non-inverter gensets can sound like a construction site. RV gensets (in sound-dampened chambers) can be much quieter than typical "outside" models, but they're expensive, heavy, use more fuel and often don't have regulation specs on par with inverter models.

If you're thinking of adding an uninterruptable power supply (UPS) to the output of your old-style genset to add high-quality regulation, forget it! Most UPSs can't handle the variation in frequency and voltage when used in a generator-powered system and constantly switch in and out of battery-power mode (some don't ever switch back to ac power). When the UPS battery dies (or the unit fries from constant load switching) the unit shuts off. Just buy an inverter genset and be done with it. If you're determined to try a UPS, test the setup at home before heading to the field.

Some gensets have 12-V dc outputs for charging batteries. Be sure to test the outputs for voltage stability (under load if possible) and ripple. Car batteries aren't too fussy about a little ripple in the charging circuit, but your radio might not like it at all! Be safe, not sorry.

❖ Common Sense

Before starting your new genset, read the user manual carefully. Make sure the engine has oil. Many ship dry and expect users to add oil (included) before starting the engine! Make sure you understand how the unit operates and how to use the receptacles, circuit breakers and connectors.

Gensets should *always* be set up *outdoors*. Do not operate gas-powered engines in closed spaces, inside passenger vans, or in covered pickup beds. If rain is a possibility, set up a canopy or other outdoor protective structure. Keep power cords clean and dry.

Keep your genset away from buildings and keep the gas can and other flammable materials at a safe distance. Don't touch hot engines or mufflers! When refueling, shut down the generator and let things cool off for a few minutes. Don't smoke, and don't spill gasoline onto hot engine parts. Keep a fire extinguisher nearby!

Before starting (or restarting) the engine, disconnect all electrical loads. Starting the unit while loads are connected may damage the generator and any attached solid-state devices (your expensive radios).

To be safe, test the genset's output voltage and frequency before connecting loads. P3 International's popular Kill-A-Watt ac power meter, available for about $20 from **www.meritline.com** and other online sources, is inexpensive and handy for measuring ac frequency, voltage, and the power consumed by downstream devices. Be sure to test your generator under load (I use high-wattage quartz lights), as outputs typically vary between loaded and unloaded conditions.

Modern portable power generators are tiny, quiet marvels. Do your homework and get one that's right for your needs. You won't be sorry!

GETTING STARTED

THE BEGINNER'S CORNER

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Loop Your Way to HF DX Success

In last month's *Beginner's Corner* I wrote about starting over with a new antenna. Last October, with my original off-center-fed (OCF) dipole antenna having fallen victim to age and weather, and my three element tri-band beam in semi-retirement, it was time for a replacement. What I was looking for was something that would be less directional with more gain than a dipole, all-band capabilities, inexpensive and fairly easy to put up. It also had to do double duty as a shortwave listening antenna capable of not only great reception on HF but a good medium and long wave antenna as well. I'm not asking much!

The Loop Beckons

A feature article in *MT* from last July by Bob Patterson K5DZE (*An Easy to Build All-Band Loop Antenna*) piqued my interest in horizontal loops and last fall I was scurrying around trying to find materials to build one. I needed a lot of wire to make a decent loop and found it in the woods in the form of a 750-foot shortened Beverage longwave receiving antenna made from aluminum fence wire commonly stocked at your local Tractor Supply Co.

This one-quarter mile roll of 14 gauge aluminum fence wire from Tractor Supply ($38) could be all the antenna wire you'll need for the rest of your life! (Courtesy: Tractor Supply Co.)

Thanks to the tireless efforts of the local deer population, the Beverage was mostly on the ground, completely tangled up in undergrowth. [Wire antenna raising tip #1: When buying aluminum fence wire make sure to get the 14 gauge and not the 17 gauge. The 14 is considerably thicker and will take more strain than the 17 gauge.]

I had a couple of ceramic "egg" insulators, lots of polyester rope to put the loop in the air, and I planned to use the existing 50 ohm coax and 4:1 balun I had been using for decades on the original OCF dipole which was already through the exterior wall and hooked up the to rig. All I had to do was put the loop up and attach the coax. How could it take more than an hour? Well, it took that long just to wrestle the wire out of the woods.

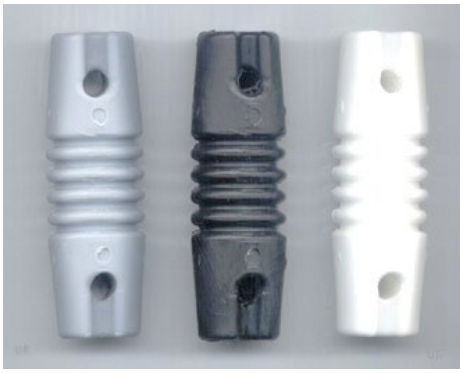
I originally used a 24 foot ladder to get

Use this WA1FFL Ladder-Loc center feed connector ($13) if you use ladder line and no balun. (Courtesy: Universal Radio)

the wire up over 25 feet, but found that it needed to be even higher to work better on the lower bands. For that I used a slingshot and a very large threaded nut attached to a spool of 30 pound test monofilament fishing line to reach the higher branches. I attached the end of the rope to the fishing line and pulled it back across the branch to the ground where it was attached it to one of the egg insulators to be raised to the proper height. [Wire antenna raising tip #2: A slingshot such as EZ-Hang costs about $100, but you can use any high-powered slingshot (under $20 at most hardware stores), as I did, with a roll of fishing line (under $5); you just won't have the convenience of a hand crank to quickly reel in the spent line.]

I managed to get the antenna up another 15 feet, but a certain amount of major branch trimming (more ladder work and a 14 foot tree trimmer saw/cutter) made the job last another couple of hours. In all, I spent the better part of a weekend just putting the antenna together and raising it. [Wire antenna raising tip #3: If you live in a part of the country that has ticks, chiggers and poison ivy, as I do, this project is best done in the winter or early spring.]

Antenna diagrams always show the loop as a square. In reality, you have to go with what you've got, and in my case there were few trees of substantial size that would be able to host the corners of the loop at 35 to 40 feet. My loop ended up having sides of 150, 125,



Dog bone insulators ($3.20 for 4) are cheap but necessary ways to isolate the antenna from your rope supports system. (Courtesy: Universal Radio)

115 and 90 feet. The loop is 480 feet overall, but it's lopsided.

[Wire antenna raising tip #4: Using the slingshot/fishing line method requires the skills of an archer and that of an angler. Aiming the projectile and getting it exactly across the limb you want it to be on may take more than a few attempts. A deft pull-and-drop, pull-and-drop on the line, as if you're reeling in a big one, lets you retrieve it from the wrong branch and, once you get it on the right branch, lets it sink through the branches and down to the ground where you can attach the rope.]

The Loop in Action

The first thing I did before trying to work the world was to check the solar propagation. It wasn't encouraging. A sunspot count of 70 was still better than zero, which is what we had for the better part of the last couple of years. [DX tip #1: You can't fight poor propagation. But, a better antenna will give better results and that's the whole point of this exercise. Still, it's good to know what the quality of your starting point is in order to know how good or bad your results are. As one measure, I kept track of the distance each station was from my own location.]

As a tune-up, I went to 20 meters where I worked ER4DX (Moldova) and UW5ZM (Ukraine), both about 5,000 miles from my home. Not much of a challenge, since they're big stations with little competition to work them. So, I went looking for some DX pileups to try to crack them with 100 watts and a horizontal loop!

The first DX pileup I came across was on 10 meters (my favorite band) and the

station was 3D2A from Fiji at 7,700 miles away. The operator was an Australian named Eddie, who would only be on the island for two more days. Now, I had never worked Fiji, so this was more than just a test; a new DXCC entity was at stake!

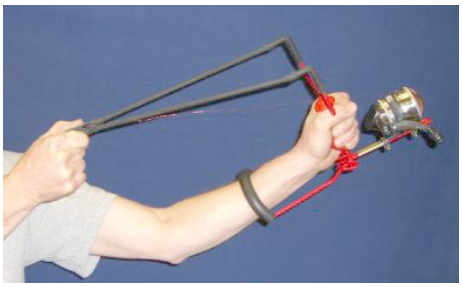
Unadilla W2AU 4:1 balun ($29) for coax fed loops. (Courtesy: Universal Radio)

Naturally, 3D2A had been spotted to the DX clusters and everyone with a rig and an antenna was trying to make a contact, or so it sounded on the air. He was working simplex (transmitting and listening on the same frequency) and I listened to the pileup dominated by west coast operators, who already had a 3,000 mile jump on my signal, and big guns from all over the U.S. whipping their massive beams around to Fiji on huge towers and unleashing their kilowatt amps. They were really impressive, but his signal was barely moving the needle. The propagation just wasn't there. [And, here's DX tip #2: Don't waste your time calling into a pileup with big guns when the propagation isn't there.]

So, just up the band was FO8RZ (French Polynesia), operated by a Frenchman named Paul, a good 6,000 miles away, working another big pileup. His signal rose and fell with the QSB, typical of 10 meters, requiring a sense of ionospheric surfing. You've got to anticipate the rise and hope you can squeeze in your call and snag the DX's attention before the fall. It was surprisingly easy, and in short order I made the contact.

Now, back to Fiji where there was a little bit more propagation and the contact was made. Eddie even commented on the prefix of my call (KS4), which had been the assigned prefix to Swan Island, the location of CIA-backed Radio Americas back in the 60s when the island was U.S. territory, since ceded to Honduras. "You're not by any chance on Swan Island?" he asked.

After that I went to 17 meters and worked through another big pileup to get D2AM Angola at 6,600 miles, YN2MG Nicaragua at 1,800 miles, and LU7YZ Argentina at 5,300 miles. I worked 5M2TT Liberia at 4,700 miles on 12 meters. The thing to note is that all contacts were on different bands and in different directions. Using the loop, my signal was heard from every part of the world when propagation was hardly there and without needing a rotatable antenna (or amplifier!). While some bands required the use of a tuner to get the SWR to an acceptable level, most bands worked directly into the antenna. For SWL, no tuner is needed.



EZ-Hang antenna launching slingshot (about $100) (Courtesy: EZ Hang)

Later I trolled the shortwave bands listening for news and music from around the world using the loop and *MT's Shortwave Guide*. Over a period of several hours I heard excellent signals in the 25 and 31 meter bands from all over the world with S9+10, 20 and 30 dB over signals that sounded more like local AM stations. Most of these signals were aimed at Europe, Africa and Asia, not North America, but were still easily heard here.

That evening I spun the dial through the medium wave frequencies and heard all the usual AM giants, lots of small stations and the Cubans in between. I even heard Morocco on 171 kHz. Low band beacons were a real surprise, as I copied dozens of stations in less than an hour on just a 100 kHz section, with many frequencies having two stations. Luckily, the code speed and gaps between letters and call sequences made it possible to copy several stations on a frequency.

That's when I realized that one of the interesting aspects of the loop is how quiet it is. While only the nearest beacons registered on the S meter, the meter rested right on the zero for most, but the signal was very readable. And, here's a shout-out to Kevin Carey, *MT's Below 500 kHz* editor: I can really see why there's so much interest in low band DXing. It's fun!

❖ DIY and Save $$

The cost of this antenna was zero because I already had the parts, but you can make your own loop this way: Buy a one-quarter mile roll of 14 gauge aluminum fence wire ($38) from Tractor Supply Co., and you'll have enough to make the loop and many more experimental antennas. One hundred feet of 450 ohm ladder line, to go from the back of your rig to the antenna feed point, is $19, or 100 feet of coax for $30, both from Universal Radio. If you use the ladder line, you won't need the balun, but you'll need a center connector. Figure one out for yourself or buy the WA1FFL Ladder-Loc center feed connector for just $13 from Universal Radio. If you use coax, you'll need the 4:1 balun at $29. Get four dog bone insulators for the corners at $3.2 total, and 100 feet of heavy duty Polyester rope ($15), all from Universal Radio.

This loop – assuming you have to buy everything and using the ladder line and no balun – is $88 (plus shipping). The loop with coax and balun is $115 (plus shipping). Compare that with similar store-bought loop antennas advertized at $185 (plus shipping). Plus, you'll have at least 1,000 feet of leftover antenna wire to use in many other antennas as well. And, you'll have the pleasure of telling each contact, "The antenna here is a homebrew, horizontal, all-band loop."

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

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I Love It When You Talk Nerdy

In today's high tech world, there are many radio programs – domestic, international, and on-line – devoted to tech and computer topics and issues. This month we'll shine the *Programming Spotlight* on some of these programs, as well as investigating a few programs that look in greater detail at current events.

Our world today is dominated by the World Wide Web, without which this column would not make it to print. Many of the programs discussed here can be heard via the internet, and then, after I write about them, I submit the column by email. We'd be lost without computers (at least I would be).

So, it is no surprise that there is a whole category of programs looking at computers and our wired high tech world. Let's take a look at just some of these.

***Spark* – CBC Radio (Canada)** Spark is a weekly program on the **CBC Radio One** domestic network, which can also be heard on the internet, and via shortwave on the **CBC Northern Quebec Service** (9625 kHz). It airs on Sundays at 1:05 pm EDT, and Wednesdays at 2:05 pm EDT. You can also listen by downloading the weekly podcast via iTunes. Another option is to listen to each week's program, segment by segment, via the Spark website at www.cbc.ca/spark/

Spark is hosted by **Nora Young** who was the longtime host of ***Definitely Not The Opera*****,** (so named because it ran opposite the Metropolitan Opera broadcasts on Radio Two) a staple of the Saturday afternoon schedule on **Radio One** since 1994. She began hosting ***Spark*** in 2007. Nora has one of the great voices in radio.

There is always lots of interesting discussion in this lively hour-long program. Any given episode might discuss such diverse topics as group buying online, why we need to give robots human characteristics, and the next tech bubble. "Spark is a weekly audio blog of smart and unexpected trendwatching. It's not just technology for gearheads, it's about the way technology affects our lives, and the world around us." (Nora Young)

Spark also encourages listener participation. There is a blog associated with the show featuring lively and sometimes heated discussions of that week's show topics. You can access it at **www.cbc.ca/spark/archives/**. The team also encourages listeners to contact the show via email *spark@cbc.ca*, Twitter *@SparkCBC*, and the "old fashioned" method of telephone at 1-877-34-SPARK. At the ***Spark*** page on the **CBC** website, the listener can see topics of upcoming shows and comment and contribute their opinions and stories. It's all very interactive and "high tech." I really like this show.

***Click On* – BBC Radio 4. Simon Cox** presents this program, which promises to discuss "the latest developments and issues from the world of information technology." There is a page of program archives for the show going back to early 2009.

This is one of those rare **BBC** programs that offer the listener more than just the current episode. You can go back and hear episodes about how computers are used in the air traffic system, to what it takes to compose music for a best selling video game. Cyber attacks, online privacy, the latest gadgets – these are all fodder for this very interesting program.

The program can be heard Mondays at 1630 UK time and for 7 days thereafter. Older episodes are available at the aforementioned archive page, which you can access at **www.bbc.co.uk/programmes/b006tht9/episodes/player** or if you prefer, just Google "Click On BBC" and you should end up there, too. ***Click On*** is also available as a podcast. There are links to this, and many other BBC podcasts at **www.bbc.co.uk/podcasts/radio4**

***The Kim Komando Show* – Kim Komando** has been hosting a computer show since the days when I was still using an Apple II computer (64k of raw computing power!) to write my ODXA column. Kim was one of the first people to realize that a radio program devoted to computers and computing would be viable. "'In order to take a radio show national, you start with the big networks like **ABC** and **CBS** to see if it is what they want. It was 1994 and the guy at **ABC** told me a syndicated show with people talking about computers would never work. This was in 1994!'

"Programmers at **CBS Radio** were even less enthusiastic. She laughs: 'They told me computers and the Internet were a fad; it would never go. They said computers are like the pet rock.'"

Komando and her husband and business partner built a syndicated network of stations over 470 strong to carry her show to most parts of North America and Canada. Here in my hometown of St. Catharines, Ontario, Kim is heard three times on the weekend, at 10 am and 7 pm Saturdays and at 2 pm Sundays on CKTB 610. (A brewery owner founded **CKTB** during the depression. At the time it was illegal to advertise alcohol on the radio. He got around it by calling his station **CKTB**… "Canadians Know Their Beer"!)

To find **Kim Komando** in your listening area, go to her website at **www.komando.com** For a price you can become a member of "Kim's Club" (6 bucks a month or $50 for the year) and receive on-demand access to all of her radio shows and program features. Even if you are cheap (one of my favorite words is *free*) there is a lot to see at her website. You can also subscribe to a number of her daily and weekly emails, with all kinds of neat computer information.

For Facebook fans, Komando has a page at **www.facebook.com/kimkomando** Her website claims that her program receives over 50,000 calls an hour. She also claims to have the most listened to weekend program in the United States.

These are just a few of the programs geared towards computers and technology that are out there. If you have a favorite that wasn't mentioned, drop me a line at the email listed at the top of the column and I'll endeavor to include it in a future *Programming Spotlight.*

❖ News You Can Use

So many newscasts these days are less than informative. How can anyone explain a complicated story in just a few minutes? Just in the first few months of 2011, we have witnessed dramatic events in Egypt, Japan and Libya, not to mention the usual political developments at home and abroad.

Often the best way to learn about what is happening in our world is to hear reports from foreign correspondents. Many stations send "boots on the ground" when international stories develop, and they have dedicated programs featuring reports from these correspondents. Let's take a look at a few of these, as well as other programs that take a more detailed look at the stories shaping our world. Listening to them can help one become much better informed about world events and current affairs.

BBC – *From Our Own Correspondent, FOOC*, is one of the longest running programs on the BBC World Service (and Radio 4 domestically in the UK). For over 50 years, ***FOOC*** has gone behind the headlines, providing listeners with background on the major stories of the day, and other stories, which may not be earth

shattering, but are interesting nonetheless. You may hear stories about coups, disasters, political machinations and other less headline-making stories like the near extinction of the Danube sturgeon, or Estonia's quirky Ice Road rules of the road. A recent episode featured reports from Ivory Coast, Afghanistan, the United States, Australia and Romania.

Kate Adie, who from 1989-2003 was the BBC's Chief News Correspondent, hosts the program. She brings a real sense of gravitas to the proceedings. If one wants to hear eyewitness reports about what is happening in the world, this is the place to start.

For more in-depth coverage of the stories heard, or to subscribe to the podcast, go to **http://news.bbc.co.uk/2/hi/programmes/from_our_own_correspondent/default.stm**

From Our Own Correspondent can be heard on Radio Four at 1130 UTC Saturday. As always ***FOOC*** can be heard for seven days after broadcast on the Radio 4 site, and in fact many past episodes are available at **www.bbc.co.uk/programmes/b006qjlq** For those in the "Twitterverse," you can follow the "tweets" of BBC correspondents at **http://twitter.com/bbcfooc**

CBC Radio One – *Dispatches* can be heard on Mondays at 730 pm local (2330 UTC via the **CBC Northern Quebec Shortwave Service**, 9625 kHz) and on Sundays at 630 pm local (2230 UTC, 9625 kHz). The program debuted in 2001 and is a fascinating look at reports from around the world. **Rick MacInnes-Rae** is the host. Rick has been a correspondent himself for over 20 years reporting from the field, wherever news is breaking.

"The majority of ***Dispatches*** reports are in documentary form. That means listeners are taken to places they might never have the opportunity to see, hear the voices of people from all over the world, and dramatically confront insights and issues that might have never been presented to them before." (***Dispatches*** website).

The most recent episode featured reports from Cairo (where demonstrators broke into state spy headquarters, finding files...and matching bathrobes!), travels with Libya's rookie rebels, and an effort by Tijuana opera singers to improve their city's image, one aria at a time. It is certainly not a dry program. While Rick is a serious reporter, he does have quite a quirky sense of humor.

A trip to the ***Dispatches*** website will give you details of the latest program as well as all contact information, a link to listen online to the latest program, and a link to subscribe to the podcast. **www.cbc.ca/dispatches/**

Radio New Zealand International – *Dateline Pacific/Pacific Correspondent* News from the Pacific region doesn't always make the headlines in North America, unless something major, such as the Japan earthquake/tsunami/nuclear disaster, jars the region into our consciousness. One of the better programs of news and analysis from the region is RNZI's ***Dateline Pacific***. During this program one hears news and reports from all around the South Pacific. It's a fascinating look at life, society and politics in places like Western Samoa, Melanesia, Papua-New Guinea and Fiji. ***Dateline Pacific*** can be heard via RNZI Mon-Fri at 0308, 0708, 1108, 1308, 1608, 1815, 2015, and Sun-Thurs at 2215 UTC

Pacific Correspondent is a weekly program, which complements ***Dateline Pacific***. It can be heard Thursdays at 0730, 1130, 1330, 1630, 2115, and Friday at 0330 UTC. Like ***Dateline Pacific*** it covers a lot of stories that would never make it to air in North America. Fascinating stuff.

A recent program looked at the budgetary and economic issues in American Samoa. The Samoan government was struggling to balance its budget without laying off workers. The economy, heavily dependent on the fishing industry, seemed to be improving slightly. A cautionary note was added; it seems the government had asked for more radiation monitoring of the fishery in light of the Fukushima nuclear disaster. American Samoa may seem relatively insignificant, yet ***Pacific Correspondent*** reminds us how interconnected our world is. Samoa is feeling effects of the Japan crisis, which in turn affects the world supply of tuna, among other products.

Both ***Dateline Pacific*** and ***Pacific Correspondent*** can be heard via shortwave, via a live stream on the RNZI website, and on demand. To listen on demand simply go to **www.rnzi.com/pages/audio.php** For a tiny service in a tiny country, **Radio New Zealand International** continues a tradition of quality programming.

Radio Australia – *Correspondents Report* In the same genre as other programs discussed here, in ***Correspondents Report***, "the **ABC**'s overseas reporters give their interpretation and analysis of the week's major events." Elizabeth Jackson hosts the program. The most recent program looked at events in Ivory Coast, the dangers facing Libyan "citizen journalists," the sex scandal involving Italian PM Berlusconi, and the Republican candidates for president in 2012.

You can listen to the current episode, and many past ones at the ***Correspondents Report*** web page at **www.abc.net.au/correspondents/** Here you can also subscribe to a podcast, contact the program and read reports that have been aired.

The program is heard on **Radio National** at 8 am Sunday. When is it heard on **Radio Australia**? Your guess is as good as mine. After poking around the **Radio Australia** site, the times of this program seem to be a state secret of some kind. In the coming days I'll employ a team of cryptanalysts to decipher the exact broadcast times. In the meantime, 8am Sunday in Melbourne is 2100 UTC Saturday. Give that one a whirl, or listen online.

❖ What's New

Thursdays on **CBC Radio One** listeners can usually hear drama at 11:30 am and 11 pm Eastern (1530 UTC and 03 UTC Fridays on CBC NQSWS 9625 kHz). Recently this drama half hour has featured a new series called ***The Backbencher***. Written by award-winning playwright Wendy Lill, herself a two term Member of Parliament from Dartmouth, NS, it details the life of a Canadian MP and life on the backbenches of Parliament. It's an intriguing look at the life of a Canadian politician.

The other drama that has aired in this time period is ***Afghanada***, featured in past *Programming Spotlight* columns, about the experiences of three Canadian soldiers in Afghanistan. I was prepared to dislike this when it first aired, but I have grown to really enjoy it. Expecting an anti-war screed, I was surprised to find a compelling, interesting look at Canadians at war in a far away country – warts and all. Perhaps because I know a few people serving over there it makes the story all the more interesting.

If ***The Backbencher*** is still on as you read this, episodes are available online for two weeks after they air; after that you'll have to purchase them via iTunes. **CBC Radio One** is to be commended for making Theater of the Mind programming available week after week. It is certainly a dying art form.

Speaking of **Radio One**, the summer schedule should soon be available. **CBC** often introduces new programs as summer replacement shows. Examples of this include ***White Coat, Black Art***, the medical program with Dr. Brian Goldman. Check out the **CBC** website as the days get warmer and longer and have a look at what is on offer this summer! **www.cbc.ca** To listen online, find a stream in your time zone at **www.cbc.ca/local**

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

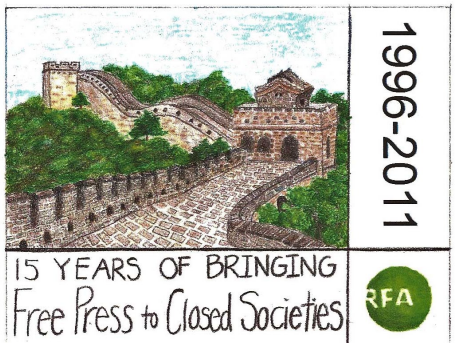
Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com
http://mt-shortwave.blogspot.com
Twitter @QSLRptMT

Radio Free Asia 15th Anniversary

RFA's Director of Productions, A.J. Janitschek, has announced the release of their 36th QSL card, and the first to commemorate 2011 as RFA's 15th anniversary, with more cards expected throughout the year.

The anniversary QSL card will be used to confirm all valid reception reports up to June 30, 2011. The color artwork depicts the Great Wall of China, drawn by artist Sarah L. Handler. Sarah is a junior in high school and the daughter of active DXer, Steve Handler. Good luck to Sarah with her future art endeavors.

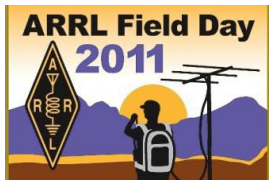
RFA welcomes all reception report submissions at **www.techweb.rfa.org** (follow the QSL Report link), not only for DXers, but also from the general listening audience. Reception reports are also accepted at *qsl@rfa.org* or postal address to: Reception Reports, Radio Free Asia, 2025 M. Street NW, Suite 300, Washington, DC 20036 USA. Upon request, RFA will also send a copy of the current broadcast schedule and a station sticker. RFA's complete by-hour shortwave broadcast schedule is included in the monthly edition of *MT Express*.



❖ Following *QSL Report* Works!

Larry Zamora sends in a big Texas "thanks" for the March tip on QSLing Radio Prague via the internet. Larry tuned in to Radio Prague via World Radio Network from his car on Sirius XM Satellite Radio, channel 135, and submitted his details online at **www.radio.cz/en/report**. Fourteen days later, he received a refrigerator magnet and castle card from the 2011 Czech Castles QSL series.

Frank Halaburak of Montreal, Canada is now known as "a happy new subscriber of *MT* magazine." Frank reports my January tip on enclosing an addressed return envelope when corresponding by postal mail ... works! After four previous attempts to verify WCBS, the SAE method worked in 27 days, including an apology from the Technical Supervisor for the delay. Special thanks to Larry and Frank for following *QSL Report*. Success stories are always welcomed here at *MT*, and readers love to read what's working for you.



FIELD DAY 2011 - JUNE 25-26

The most popular on-the-air amateur radio event in the world is Field Day. The goal is to work as many stations as possible on any and all amateur bands (excluding the 60, 30, 17 and 12 meter bands) and, in doing so, to learn to operate in abnormal and less than optimal conditions. Field Day is an excellent QSLing opportunity for hams and shortwave listeners. The event is conducted during the fourth full weekend in June: To find out more about it, consult **www.arrl.org/field-day.**

AMATEUR RADIO
Ten meter beacon K1KWH/B, Klamath Falls, Oregon, 28202 kHz. Verified in ten days via **www.qrz.com** (Jim Pogue, Memphis, TN).

CLANDESTINE
Open Radio North Korea, 7480 kHz. Verification letter and schedule from Kim Ik Hwan, Program Director. Received in 268 days for an English report and one IRC. Station address: P.O. Box 158 Mapo Post Office, Mapo Gu Seoul 121-600, Republic of Korea (Roberto Pavanello, Italy/playdx). Email: *opennk@naver.com* On-demand audio **http://english.nkradio.org/**

COLOMBIA
Radio Alcavaran, 5910 kHz. Full data station QSL signed by Rafael Rodriguez, plus souvenir sticker. Received for a Spanish report and one IRC. QSL address: Rafael Rodriguez, Apartado Aereo 67751, Bogotá DC Colombia (Pavanello).

HONDURAS
Radio Luz y Vida, 3250 kHz. Full data E-QSL from Jose Adoney Sanchez, Program Manager. Received in 90 days after many e-reports to *joseaso76@yahoo.es*. Postal address: Apartado Postal 303, San Pedro De Sula, Honduras (Hans Dieter, Buschal, Germany).

MEDIUM WAVE
39 Dover Street via Challenger Radio, 1368 kHz AM. Received E-QSL in ten days for e-report to *doverstreet@tiscali.co.uk* (Artur Fernández Llorella, Catalonia, Spain/playdx).

KFXY, 1640 kHz AM. Full data prepared card, signed by Ricky Raggow, Operations Manager. Received in 87 days for an AM report. Station address: 316 E. Willow, Enid, OK 73701 (Bill Wilkins, Springfield, MO).

WGTK, 970 kHz AM *(Intelligent Conservative Talk)*. Full data prepared card, signed by David Reichel, Program Director. Received in four weeks for an AM report. Station address: 9960 Corporate Campus Dr., # 3600, Louisville, KY 40223-4070 USA (Wilkins). Streaming audio **www.970wgtk.com/**

KJSL, 630 kHz AM (*Truth Talk 630 AM*). Full data prepared card and verification on station letterhead, signed by Laura Steinhoff, Office Manager. Also received station decal. Received in 50 days for an AM report. Station address: 10845 Olive Blvd., Suite 160, St Louis, MO 63141. (Wilkins) Streaming audio **www.truthtalk630.com/**

WKVQ, 1540 kHz AM. Full data verification from Craig Baker, plus his business card and info page on *Star Station* format. Received in six days for CD of station's DX Test. Station address: P.O. Box 3965, Eatonton, GA 31024 (Patrick Martin, Seaside, OR, Wilkins).

NORTHERN MARINAS/ SAIPAN
Voice of America relay 9705 kHz. Full data QSL unsigned, plus calendar, schedule, and souvenirs. Received in 27 days for an English report. Station address: 330 Independence Avenue SW, Washington, DC 20237 USA (Wilkins). Streaming audio **www.voanews.com/**

ROMANIA
Radio Romania International, 7355 kHz. Full data card of *Stavropoleos Monastery*, plus letter and station sticker. Received in 24 days for an English report posted online. Email:*eng@rri.ro* Postal address: 60-62 General Berthelot Street, P.O. Box 111, Bucharest, Romania (Frank Halaburak, Montreal, Canada). On-demand audio **www.rri.ro**

UTILITY
Non-Directional Beacon, AY, St Anthony, Newfoundland, Canada 356 kHz, 400 watts. Full data prepared QSL card returned as verified with illegible signature. Received in 73 days for an English report, SAE and $ 2.00 US. QSL address: Nav Canada Technical Operations, 1 Airport Road, Suite 2, Deer Lake, NL Canada A8A 1A3 (Pogue).

Non-Directional Beacon, BX, Lourdes de Blanc Sablon, Quebec, Canada 220 kHz, 400 watts. Full data prepared card returned as verified with illegible signature. Received in 93 days for an English report, SAE and $ 2.00 US. QSL address: (see above beacon AY address) (Pogue).

Non-Directional Beacon, S7. Hanover, Ontario, Canada. 268 kHz, 100 watts. Full data prepared QSL card returned as verified by Philip Mullin, Manager. Received in 62 days for an English report, SAE and $ 2.00 US (returned). QSL address: Saugeen Municipal Airport, 34 Saugeen Airport Road, R.R. # 1, Walkerton, ON Canada N0G 2V0 (Pogue).

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

Gayle Van Horn
Frequency Manager
gaylevanhorn@monitoringtimes.com

Larry Van Horn, MT Asst. Editor
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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 669-672; WWDXC/BC-Top News. Klingenfuss 2011 SW Frequency Guide.

Alexander Mazpo, Vitesk, Belarus; Anker Petersen, Denmark; Alokesh Gupta, New Delhi, India; Arnie Coro/R Havana; Arnulf Piontek, Berlin, Germany; Babcock; Bill Damick/TWR; Derek Kickbush/HCJB Australia; Elena Osipova/VO Russia; Evelyn Marcy, FL/WYFR; Gérald Theórêt/RCI; Ivo Ivanov, Bulgaria; Jose Bueno, Spain; Jose Jacobs, India; Rachel Baughn/MT; Rimantas Pleykisa, Lithuania; 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	11590am		
0000	0030		USA, Voice of America	7555as		
0000	0045		India, All India Radio/External Service			6055as
			7305as	11645as	13605as	
0000	0056		Romania, Radio Romania International			7385na
			9580na			
0000	0057		Canada, Radio Canada International			11700as
0000	0057		China, China Radio International			6005eu
			6020eu	6180eu	7350as	7425eu
			9425as	9570as	11650as	11790eu
			11885eu			
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	15240as	15415as	17715pa
			17750as	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		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		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			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0000	0100		USA, EWTN/WEWN Irondale, AL			11520af
0000	0100		USA, FBN/WTJC Newport NC	9370na		
0000	0100		USA, WBCQ Monticello ME	5110na		7415am
			9330am			
0000	0100		USA, WHRI Cypress Creek SC			5875 ma
			7315na			
0000	0100	Sat	USA, WHRI Cypress Creek SC			5920na
0000	0100		USA, WINB Red Lion PA	9265am		
0000	0100		USA, WRNO New Orleans LA	7505am		15590al
0000	0100		USA, WTWW Lebanon TN	5080va		5755va
0000	0100		USA, WWCR Nashville TN	3195na		5935na
			9980na			
0000	0100		USA, WWRB Manchester TN	2390na		5050va
0000	0100		USA, WYFR/Family Radio Worldwide			5950na
			6985na	7520sa	9505na	15440ca
0000	0100		Zambia, CVC 1 Africa	4965af		
0030	0045	twhfas	Albania, Radio Tirana	9860na		
0030	0100	fas	Canada, Bible Voice Broadcasting Network			
			7405as			
0030	0100	mtwhfa	Serbia, International Radio Serbia			9685na
0030	0100		Thailand, Radio Thailand World Service			15275na
0030	0100		USA, Voice of America/Special English			7430va
			9715va	9780va	11725va	12005va
			15205va	15290va	17820va	
0030	0100		USA, WHRI Cypress Creek SC			15680na
0035	0040		India, All India Radio, Delhi-Kingsway			7370do

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

0100	0130		Vietnam, Voice of Vietnam	6175am		
0100	0157		China, China Radio International			6005eu
			6020eu	6075eu	6175eu	7350eu
			9410as	9420as	9570as	9580as
			11650eu	11885eu		
0100	0157	DRM	China, China Radio International			6080na
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	15240as	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		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		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			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0100	0200		USA, EWTN/WEWN Irondale, AL			11520af
0100	0200		USA, FBN/WTJC Newport NC	9370na		
0100	0200		USA, Voice of America	7430va		9780va
			11705va			
0100	0200		USA, WBCQ Monticello ME	5110na		7415am
			9330am			
0100	0200		USA, WHRI Cypress Creek SC			5875na
			7315na	15680na		
0100	0200	Sat	USA, WHRI Cypress Creek SC			5920na
0100	0200		USA, WINB Red Lion PA	9265am		
0100	0200		USA, WRNO New Orleans LA	7505am		
0100	0200		USA, WTWW Lebanon TN	5080va		5755va
0100	0200		USA, WWCR Nashville TN	3215na		4840na
			5935na	9980na		
0100	0200		USA, WWRB Manchester TN	3185va		3215na
			6890va			
0100	0200		USA, WYFR/Family Radio Worldwide			6985na
			9505na	15440ca		
0100	0200		Zambia, CVC 1 Africa	4965af		
0130	0200		Iran, VOIRI/IRIB	9605na	11920na	
0130	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0130	0200	twhfa	USA, Voice of America/Special English			7465va
			9820va			
0130	0200	twhfa	USA, WRMI/Radio Slovakia Intl			9955ca
0140	0200		Vatican City State, Vatican Radio			5895va
			7335va			
0145	0200	twhfas	Albania, Radio Tirana	7425na		

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

0200	0227		Iran, VOIRI/IRIB	9605na	11920na	
0200	0230		Thailand, Radio Thailand World Service			15275na
0200	0230		USA, WINB Red Lion PA	9265am		
0200	0245		USA, WYFR/Family Radio Worldwide			5985ca
			11835ca			
0200	0257		China, China Radio International			11785as
			13640as			
0200	0257		North Korea, Voice of Korea	13650as		15100as
0200	0300		Anguilla, Worldwide Univ Network			6090am
0200	0300		Argentina, RAE	11710na		
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	15515as
			17750as	21725va		
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		Cuba, Radio Havana Cuba	6000na		6050na
0200	0300		Egypt, Radio Cairo	6270na		
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	17710me		
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			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, WBCQ Monticello ME	5110na	7415am	
			9330am			
0200	0300		USA, WHRI Cypress Creek SC			5875na
			5920na	7315na	7385na	15680na
0200	0300		USA, WRNO New Orleans LA	7505am		
0200	0300		USA, WTWW Lebanon TN	5080va	5755va	
0200	0300		USA, WWCR Nashville TN	3215na	4840na	
			5890na	5935na		
0200	0300		USA, WWRB Manchester TN	3145va	3185va	
			5050va			
0200	0300		USA, WYFR/Family Radio Worldwide			6985na
			9385ca	9505na		
0200	0300		Zambia, CVC 1 Africa	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		USA, WINB Red Lion PA	13570am		
0230	0300		Vietnam, Voice of Vietnam	6175am		
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			
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	0320		Vatican City State, Vatican Radio			7305as
0300	0325	Sun	Swaziland, TWR Africa	3200af		
0300	0330		Philippines, PBS/ Radyo Pilipinas			11880me
			15285me	17710me		
0300	0330		Sri Lanka, SLBC	6005as	9770as	15745as
0300	0330		USA, KJES Vado NM	7555na		
0300	0330		Vatican City State, Vatican Radio			7360af
			9660af			
0300	0330	DRM	Vatican City State, Vatican Radio			9660af
0300	0355	mtwhf	South Africa, Channel Africa	3345af		5980af
0300	0356		Romania, Radio Romania International			7335na
			9645na	11895as	15340as	
0300	0357		China, China Radio International			6190na
			9460na	9690as	9790as	11785eu
			13620as	15110as	15120as	
0300	0357		North Korea, Voice of Korea	7220as	9345as	
			9730as			
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	15515as
			17750as	21725va		
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		Cuba, Radio Havana Cuba	6000na	6050na	
0300	0400		Germany, Deutsche Welle	15595as		
0300	0400		Italy, IRRS-Shortwave/NEXUS	9670af		
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	DRM	Russia, Voice of Russia	15735as		
0300	0400		Russia, Voice of Russia	9665sa	15425na	
			15585as			
0300	0400		Taiwan, Radio Taiwan International			5950na
			15320as			
0300	0400		Turkey, Voice of Turkey	6165as	9515va	
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			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0300	0400		USA, EWTN/WEWN Irondale, AL			11520af
0300	0400		USA, FBN/WTJC Newport NC	9370na		
0300	0400		USA, Voice of America	4930af	6080af	
			9885af	15580af		
0300	0400		USA, WBCQ Monticello ME	5110na	7415am	
			9330am			
0300	0400		USA, WHRI Cypress Creek SC			5920na
			7315na	7385na	7590na	15680na
0300	0400		USA, WINB Red Lion PA	13570am		
0300	0400		USA, WRNO New Orleans LA	7505am		
0300	0400		USA, WTWW Lebanon TN	5080va	5755va	
0300	0400		USA, WWCR Nashville TN	3215na	4840na	
			5890na	5935na		
0300	0400		USA, WWRB Manchester TN	3145va	3185va	
			5050va			
0300	0400		USA, WYFR/Family Radio Worldwide			11740ca
			15255sa			
0300	0400		Zambia, CVC 1 Africa	4965af		
0300	0400		Zambia, Zambia Broadcasting Corp			6165do
0330	0400	twhfas	Albania, Radio Tirana	7425na		
0330	0400	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0330	0400		Vietnam, Voice of Vietnam	6175am		
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, Voice of America	4930af		4960af
			6080af	9855af	11670af	15580af
0400	0445		USA, WYFR/Family Radio Worldwide			6985na
			9505na			
0400	0455	mtwhf	South Africa, Channel Africa	3345af		
0400	0457		China, China Radio International			6190na
			9460na	13620as	15120eu	17725as
			17855af			
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	9590pa	12080pa	
			13690pa	15240as	15515as	21725va
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		Germany, Deutsche Welle	6180af	15400af	
0400	0500		Italy, IRRS-Shortwave/NEXUS	9670af		
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		South Africa, CVC 1 Africa	9430af		
0400	0500	Sun	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			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, WBCQ Monticello ME	5110na	7415am	
			9330am			
0400	0500		USA, WHRI Cypress Creek SC			5920na
			7315na	7385na		
0400	0500	smtwhf	USA, WHRI Cypress Creek SC			7465na
0400	0500	Sat	USA, WHRI Cypress Creek SC			9640na
0400	0500		USA, WINB Red Lion PA	13570am		
0400	0500		USA, WRNO New Orleans LA	7505am		
0400	0500		USA, WTWW Lebanon TN	5080va	5755va	
0400	0500		USA, WWCR Nashville TN	3215na	4840na	
			5890na	5935na		
0400	0500		USA, WWRB Manchester TN	3145va	3185va	
			5050va			
0400	0500		USA, WYFR/Family Radio Worldwide			5985na
			9680na	9715ca		
0400	0500		Zambia, CVC 1 Africa	4965af		
0400	0500		Zambia, Zambia Broadcasting Corp			6165do
			4828al			
0430	0500		Australia, Radio Australia	15415as		
0430	0500	mtwhf	Swaziland, TWR Africa	3200af	4775af	

0430	0500		USA, Voice of America	4930af	4960af	
			6080af	11670af	15580af	
0430	0500		USA, WHRI Cypress Creek SC		15680na	
0455	0500		Nigeria, Voice of Nigeria/Ikorodu		15120va	
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		7360af	
			9660af	11625af		
0500	0557		China, China Radio International		7220na	
			11880na	15350me	15465as	17505as
			17540as	17725af	17855as	
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	9590pa	12080pa	
			13630as	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		Greece, Voice of Greece	11645eu		
0500	0600		Italy, IRRS-Shortwave/NEXUS	9670af		
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		15120va	
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		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0500	0600		USA, EWTN/WEWN Irondale, AL		11520af	
0500	0600		USA, FBN/WTJC Newport NC	9370na		
0500	0600		USA, Voice of America	4930af	6080af	
			15580af			
0500	0600		USA, WHRI Cypress Creek SC		7315va	
			7465va	11565va		
0500	0600		USA, WINB Red Lion PA	13570am		
0500	0600		USA, WRNO New Orleans LA	7505am		
0500	0600		USA, WTWW Lebanon TN	5080va	5755va	
0500	0600		USA, WWCR Nashville TN	3215na	4840na	
			5890na	5935na		
0500	0600		USA, WWRB Manchester TN	3185va		
0500	0600		USA, WYFR/Family Radio Worldwide		5985na	
			9680na			
0500	0600		Zambia, CVC 1 Africa	6065af		
0500	0600		Zambia, Zambia Broadcasting Corp		6165do	
0530	0556	DRM	Romania, Radio Romania International		7305eu	
0530	0556		Romania, Radio Romania International		9655eu	
			17760eu	21500eu		
0530	0600		Clandestine, Sudan Radio Service/SRS		13720af	
0530	0600		Palau, T8WH/World Harvest Radio International			
			15680as			
0530	0600		Thailand, Radio Thailand World Service		17655va	
0530	0600		USA, WHRI Cypress Creek SC		15680va	

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

0600	0615	Sat/Sun	South Africa, TWR Africa	11640af		
0600	0620	mtwhfa	Vatican City State, Vatican Radio		4005eu	
			7250eu			
0600	0630	Sat/Sun	Australia, Radio Australia	15290pa	15415as	
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	0630	mtwhfa	Vatican City State, Vatican Radio		5965eu	
0600	0645	smtwhf	South Africa, TWR Africa	11640af		
0600	0655	mtwhf	South Africa, Channel Africa	15255af		
0600	0657		China, China Radio International		11750af	
			11770af	11880as	13645as	15145af
			15350as	15465as	17505af	17540as
			17710as			
0600	0658		New Zealand, Radio NZ International		11725pa	
0600	0658	DRM	New Zealand, Radio NZ International		11675pa	
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	9590pa	12080pa	
			13630as	13690pa	15160pa	15240pa
			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		Cuba, Radio Havana Cuba	6000na	6010na	
			6050na	6060na	6150sa	
0600	0700		Greece, Voice of Greece	11645eu		
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		15120va	
0600	0700		Palau, T8WH/World Harvest Radio International			
			15680as			
0600	0700		Papua New Guinea, Radio Fly	3915do	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		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		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0600	0700		USA, EWTN/WEWN Irondale, AL		11520af	
0600	0700		USA, FBN/WTJC Newport NC	9370na		
0600	0700		USA, Voice of America	6080af	11670af	
			15580af			
0600	0700		USA, WHRI Cypress Creek SC		7385va	
			9615va	15680va		
0600	0700		USA, WINB Red Lion PA	13570am		
0600	0700		USA, WRNO New Orleans LA	7505am		
0600	0700		USA, WTWW Lebanon TN	5080va	5755va	
0600	0700		USA, WWCR Nashville TN	3215na	4840na	
			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 1 Africa	4965af	6065af	
0600	0700		Zambia, Zambia Broadcasting Corp		6165do	
0602	0700		Swaziland, TWR Africa	6120af		
0630	0700		Australia, Radio Australia	15415as		
0630	0700		Bulgaria, Radio Bulgaria	9600na	11600na	
0630	0700		Congo Dem. Republic, Radio Kahuzi		6209do	
0630	0700		Vatican City State, Vatican Radio		7360af	
			9660af	11625af		
0645	0700	Sun	Germany, TWR Europe	6105eu		
0645	0700	Sun	Monaco, TWR Europe	9800eu		
0659	0700		New Zealand, Radio NZ International		6170pa	
0659	0700	DRM	New Zealand, Radio NZ International		15720pa	

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

0700	0730	Sun	Canada, Bible Voice Broadcasting Network			
			5945eu			
0700	0730		China, Xizang People's Broadcasting Sta/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 Network			
			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	0755	mtwhf	South Africa, Channel Africa	7230af		
0700	0757		China, China Radio International			11785as
			13645as	15125me	15350as	15465as
			17490as	17540as	17710af	
0700	0758		New Zealand, Radio NZ International			6170pa
0700	0758	DRM	New Zealand, Radio NZ International			15720pa
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	9475pa	9590pa	
			9710pa	11945pa	12080pa	15160pa
			15240as			
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		Equatorial Guinea, Radio East Africa/Malabo			
			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/World Harvest Radio International			
			9930as	15680as		
0700	0800		Papua New Guinea, Radio Fly	3915do		5960do
0700	0800		Russia, Voice of Russia	15405pa		
0700	0800		South Africa, CVC 1 Africa	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			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0700	0800		USA, EWTN/WEWN Irondale, AL			11520af
0700	0800		USA, FBN/WTJC Newport NC	9370na		
0700	0800		USA, WHRI Cypress Creek SC			9615va
			15680va			
0700	0800		USA, WINB Red Lion PA	13570am		
0700	0800		USA, WRNO New Orleans LA	7505am		
0700	0800		USA, WTWW Lebanon TN	5080va	5755va	
0700	0800		USA, WWCR Nashville TN	3215na	4840na	
			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 1 Africa	6065af		13590af
0700	0800		Zambia, Zambia Broadcasting Corp			6165do
0709	0712	mtwhf	Austria, Radio Austria International			6155eu
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	0745	mtwhf	Vatican City State, Vatican Radio			5965eu
			7250eu	9645eu		
0730	0745	mtwhfa	Vatican City State, Vatican Radio			4005eu
			11740eu	15595eu		
0730	0800		Australia, HCJB Global Australia			11750pa
0730	0800	Sun	USA, WHRI Cypress Creek SC			11565va
0759	0800		New Zealand, Radio NZ International			6170pa
0759	0800	DRM	New Zealand, Radio NZ International			7440pa

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

0800	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	0857		China, China Radio International			9415as
			11785as	11880as	15350as	15465as
			15625as	17490as	17540as	
0800	0900		Anguilla, Worldwide Univ Network			6090am
0800	0900		Australia, Radio Australia	5995as	9475pa	
			9485pa	9580va	9590pa	11945pa
			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		Equatorial Guinea, Radio African 2/Malabo			
			15190af			
0800	0900		Equatorial Guinea, Radio East Africa/Malabo			
			15190af			
0800	0900		Greece, Voice of Greece	11645eu		
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		New Zealand, Radio NZ International			6170pa
0800	0900	DRM	New Zealand, Radio NZ International			7440pa
0800	0900		Palau, T8WH/World Harvest Radio International			
			9930as	15680as		
0800	0900		Papua New Guinea, Radio Fly	3915do		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	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			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, KNLS Anchor Point AK	11870as		
0800	0900		USA, WHRI Cypress Creek SC			11565va
			15680va			
0800	0900		USA, WINB Red Lion PA	13570am		
0800	0900		USA, WRNO New Orleans LA	7505am		
0800	0900		USA, WTWW Lebanon TN	5080va	5755va	
0800	0900		USA, WWCR Nashville TN	3215na	4840na	
			5890na	5935na		
0800	0900		USA, WWRB Manchester TN	3185va		
0800	0900		USA, WYFR/Family Radio Worldwide			5985na
			6875na			
0800	0900		Zambia, CVC 1 Africa	6065af		13590af
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	0957		China, China Radio International			9415as
			15210as	15270as	15350as	17490eu
			17570eu	17690eu	17750as	
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	9475pa	9485pa	
			9580va	9590pa	11945pa	12080pa
			13630pa			
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		Equatorial Guinea, Radio African 2/Malabo			
			15190af			
0900	1000		Equatorial Guinea, Radio East Africa/Malabo			
			15190af			
0900	1000	3rd Sat	Germany, Radio City	9510eu		
0900	1000		Malaysia, RTM/Traxx FM	7295do		

0900	1000		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0900	1000		Micronesia, The Cross Radio/Pohnpei			4755 as
0900	1000		New Zealand, Radio NZ International			6170pa
0900	1000	DRM	New Zealand, Radio NZ International			7440pa
0900	1000		Nigeria, Voice of Nigeria/Ikorodu			9690af
0900	1000		Palau, T8WH/World Harvest Radio International			
			9930as	15680as		
0900	1000		Papua New Guinea, Radio Fly	3915do		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		Tajikistan, Voice of Tajik	7245va		
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			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0900	1000		USA, EWTN/WEWN Irondale, AL			11520af
0900	1000		USA, FBN/WTJC Newport NC	9370na		
0900	1000		USA, WHRI Cypress Creek SC			9840va
			11565va	15680va		
0900	1000		USA, WINB Red Lion PA	13570am		
0900	1000		USA, WRNO New Orleans LA	7505am		
0900	1000		USA, WTWW Lebanon TN	5080va		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 1 Africa	6065af		13590af
0900	1000		Zambia, Zambia Broadcasting Corp			6165do
0930	0945		Papua New Guinea, Radio Fly	3915do		5960do
0930	1000		China, Voice of the Strait/Fuzhou			6115do
0930	1000	Sun	Italy, IRRS-Shortwave/NEXUS	9510af		
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	Sat/Sun/DRM	Bulgaria, Radio Bulgaria/Euranet			
			11900eu			
1000	1030		Japan, Radio Japan NHK World			9605as
			9625pa	9840pa		
1000	1030		USA, WINB Red Lion PA	13570am		
1000	1030	mtwhf	USA, WRMI/Radio Prague	9955na		
1000	1030		Vietnam, Voice of Vietnam	9840as		12020as
1000	1040		Micronesia, The Cross Radio/Pohnpei			4755as
1000	1057		China, China Radio International			5955as
			7215eu	7255eu	11640as	13590as
			13720as	15190pa	15210pa	15350as
			17490as	17690as		
1000	1057		Netherlands, R Netherlands Worldwide			12065as
			15110as			
1000	1057		North Korea, Voice of Korea	11710ca		11735as
			13650as	15180sa		
1000	1058		New Zealand, Radio NZ International			6170pa
1000	1058	DRM	New Zealand, Radio NZ International			7440pa
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	6140as		9475pa
			9485va	9580pa	9590pa	11945pa
			12080pa			
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		Equatorial Guinea, Radio African 2/Malabo			
			15190af			
1000	1100		Equatorial Guinea, Radio East Africa/Malabo			
			15190af			
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	9510af		
1000	1100		Malaysia, RTM/Traxx FM	7295do		
1000	1100		Nigeria, Voice of Nigeria/Ikorodu			9690af
1000	1100		Palau, T8WH/World Harvest Radio International			
			9930as			
1000	1100		Russia, Voice of Russia	15170as		
1000	1100		Saudi Arabia, BSKSA/Saudi Radio			15250af
1000	1100	mtwhf	South Africa, Channel Africa	9625af		
1000	1100		South Africa, CVC 1 Africa	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			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1000	1100		USA, EWTN/WEWN Irondale, AL			9390as
1000	1100		USA, FBN/WTJC Newport NC	9370na		
1000	1100		USA, KNLS Anchor Point AK	11870as		
1000	1100		USA, WHRI Cypress Creek SC			11565va
1000	1100		USA, WRNO New Orleans LA	7505am		
1000	1100		USA, WTWW Lebanon TN	5080va		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 1 Africa	6065af		13590af
1000	1100		Zambia, Zambia Broadcasting Corp			6165do
1030	1100		Iran, VOIRI/IRIB	17710as	21630as	
1030	1100		Mongolia, Voice of Mongolia	12085as		
1030	1100	Sun	USA, WHRI Cypress Creek SC			7385va
1030	1100		USA, WINB Red Lion PA	9265am		
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	1104		Pakistan, PBC/Radio Pakistan	15725eu		17720eu
1100	1105		Pakistan, Azad Kashmir Radio/Islamabad			7265do
1100	1120	f/DRM	Japan, Radio Japan NHK World			9760eu
1100	1127		Iran, VOIRI/IRIB	17710as	21630as	
1100	1130	Sat/DRM	South Korea, KBS World Radio			9760eu
1100	1130	fa	UK, BBC World Service	9760eu		
1100	1130	Sun	Vatican City State, Vatican Radio			7250eu
1100	1130		Vietnam, Voice of Vietnam	7280as		
1100	1145		USA, WYFR/Family Radio Worldwide			6875na
			9550sa	9755ca		
1100	1156		Romania, Radio Romania International			15210eu
			15430eu	17510af	17670af	
1100	1157		China, China Radio International			5955as
			5960na	9570as	11650as	11795na
			13590as	13645as	13665as	13720as
			17490eu			
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	5995as		6020pa
			6140as	9475pa	9485pa	9560va
			9580va	9590pa	11945pa	
1100	1200	DRM	Australia, Radio Australia	12080as		
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		Equatorial Guinea, Radio African 2/Malabo			
			15190af			
1100	1200		Equatorial Guinea, Radio East Africa/Malabo			
			15190af			
1100	1200	Sun	Italy, IRRS-Shortwave/NEXUS	9510af		
1100	1200		Malaysia, RTM/Traxx FM	7295do		
1100	1200		New Zealand, Radio NZ International			9655pa
1100	1200		Nigeria, Voice of Nigeria/Ikorodu			9690af
1100	1200		Russia, Voice of Russia	12065as		
1100	1200		Saudi Arabia, BSKSA/Saudi Radio			15250af
1100	1200	mtwhf	South Africa, Channel Africa	9625af		
1100	1200		South Africa, CVC 1 Africa	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			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1100	1200		USA, EWTN/WEWN Irondale, AL			9390as

1100	1200		USA, FBN/WTJC Newport NC	9370na		
1100	1200		USA, WHRI Cypress Creek SC			9840va
			9985va			
1100	1200	Sat/Sun	USA, WHRI Cypress Creek SC			17540va
1100	1200		USA, WINB Red Lion PA	9265am		
1100	1200		USA, WRNO New Orleans LA	7505am		
1100	1200		USA, WTWW Lebanon TN	5080va		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 1 Africa	6065af		13590af
1100	1200		Zambia, Zambia Broadcasting Corp			6165do
1130	1140	f	Vatican City State, Vatican Radio			15595as
			17765as			
1130	1200		Vietnam, Voice of Vietnam	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

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

1200	1215		Vatican City State, Vatican Radio			9865am
1200	1225		Saudi Arabia, BSKSA/Saudi Radio			15250af
1200	1230		France, Radio France Internationale			21620af
1200	1230		Germany, AWR Europe	17535as		
1200	1245		USA, WYFR/Family Radio Worldwide			5950na
			5985na			
1200	1257		China, China Radio International			5955as
			7250eu	9460as	9600as	9645as
			9730as	11760as	11780me	11980as
			12015as	13665eu	13790eu	17490eu
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	6020pa		6140as
			9475pa	9485pa	9560va	9580va
			9590pa	11945pa		
1200	1300	DRM	Australia, Radio Australia	5995pa		
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		Equatorial Guinea, Radio African 2/Malabo			
			15190af			
1200	1300		Equatorial Guinea, Radio East Africa/Malabo			
			15190af			
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	DRM	Russia, Voice of Russia	9445as		
1200	1300		Russia, Voice of Russia	11500as		
1200	1300		South Africa, CVC 1 Africa	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			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
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	15320af		
1200	1300		USA, Voice of America	7575va		9510va
			12075va	12150va		
1200	1300		USA, WHRI Cypress Creek SC			9965va
1200	1300	Sat/Sun	USA, WHRI Cypress Creek SC			17540va
1200	1300		USA, WINB Red Lion PA	13570am		
1200	1300		USA, WRNO New Orleans LA	7505am		
1200	1300		USA, WTWW Lebanon TN	9480va		9990va
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 1 Africa	6065af		13590af
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		Bangladesh, Bangladesh Betar			7250as
1230	1300		Thailand, Radio Thailand World Service			9890va
1230	1300		Turkey, Voice of Turkey	15450va		
1230	1300	Sun	USA, WHRI Cypress Creek SC			7385va
1230	1300		Vietnam, Voice of Vietnam	9840as		12020as

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

1300	1330		Egypt, Radio Cairo	17870as		
1300	1330		Japan, Radio Japan NHK World			15735as
			15660al			
1300	1330		Turkey, Voice of Turkey	15450va		
1300	1357		China, China Radio International			5995as
			7300na	9570na	9655as	9730as
			9765as	9870as	11760me	11885as
			11900eu	11980as	13670as	13790as
			15230as			
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	6020pa		9485pa
			9560va	9580va	9590pa	
1300	1400	DRM	Australia, Radio Australia	5995pa		
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		Equatorial Guinea, Radio East Africa/Malabo			
			15190af			
1300	1400		Germany, Overcomer Ministries			15495af
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		Palau, T8WH/World Harvest Radio International			
			9930as			
1300	1400		Russia, Voice of Russia	12065as		
1300	1400		South Africa, CVC 1 Africa	13590af		
1300	1400		South Korea, KBS World Radio			9570as
1300	1400		UK, BBC World Service	5875as		6190af
			6195as	9740as	11760me	12095af
			15310as	15420af	15575as	17790as
			17830af	21470af		
1300	1400		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1300	1400		USA, EWTN/WEWN Irondale, AL			13580as
1300	1400		USA, FBN/WTJC Newport NC	9370na		
1300	1400		USA, Overcomer Ministries	11680af		17765af
1300	1400	Sat/Sun	USA, Voice of America	9510va		9760va
			12150va			
1300	1400		USA, WHRI Cypress Creek SC			9540va
			9840va	17540va		
1300	1400		USA, WINB Red Lion PA	13570am		
1300	1400		USA, WRNO New Orleans LA	7505am		
1300	1400		USA, WTWW Lebanon TN	9480va		9990va
1300	1400		USA, WWCR Nashville TN	7490na		9980na
			13845na	15825na		
1300	1400		USA, WWRB Manchester TN	3185va		
1300	1400		USA, WYFR/Family Radio Worldwide			11830na
			11865na	11910na	17795ca	11520as
			11560as			
1300	1400		Zambia, CVC 1 Africa	6065af		13590af
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		Vietnam, Voice of Vietnam	9840as		12020as
1345	1400	Sun	Canada, Bible Voice Broadcasting Network			
			17945as			
1359	1400		Netherlands, R Netherlands Worldwide			11835as

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

1400	1415	Sun	Germany, Pan American Broadcasting			13645as

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		China, China Radio International			5955as
			7300na	9460na	9700as	9765as
			9795eu	9870as	11665na	13675eu
			13685af	13740as	15230as	17630af
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		6080pa
			7240pa	9590pa		
1400	1500		Bahrain, Radio Bahrain	6010me		
1400	1500	DRM	Belgium, TDP Radio/Disco Palace			6015eu
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		Equatorial Guinea, Radio East Africa/Malabo			
			15190af			
1400	1500		Ethiopia, Radio Ethiopia/Home Service			5989do
			7110do	9705do		
1400	1500		Germany, Overcomer Ministries			15495af
1400	1500		India, All India Radio/External Service			9690as
			11620as	13710as		
1400	1500		Italy, IRRS-Shortwave/NEXUS	15710va		
1400	1500		Libya, LJBC Voice of Africa	17725af		17790af
			17820af			
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/World Harvest Radio International			
			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		UK, BBC World Service	5845as		5875as
			6190af	6195as	7435af	9740as
			12095as	13820as	15310as	17640af
			17830af	21470af		
1400	1500		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
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, KNLS Anchor Point AK	11765as		
1400	1500		USA, Overcomer Ministries	9460eu		13810me
			17580af			
1400	1500		USA, Voice of America	6080af		12080af
			15580af	17545af		
1400	1500	mtwhf	USA, Voice of America	7540va		7575va
			12150va			
1400	1500		USA, WBCQ Monticello ME	9330am		
1400	1500		USA, WHRI Cypress Creek SC			9840va
			15180va	17540va		
1400	1500		USA, WINB Red Lion PA	13570am		
1400	1500		USA, WJHR International Milton FL			15550usb
1400	1500		USA, WRNO New Orleans LA	7505am		15590al
1400	1500		USA, WTWW Lebanon TN	9480na		9990va
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 1 Africa	6065af		13590af
1400	1500		Zambia, Zambia Broadcasting Corp			6165do
1405	1435	Sat/Sun	Canada, Bible Voice Broadcasting Network			
			9345as			
1415	1427		Nepal, Radio Nepal	5005as		
1415	1430		Germany, Pan American Broadcasting			13645as
1415	1500	Sun	Canada, Bible Voice Broadcasting Network			
			17945as			
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		Bangladesh, Bangladesh Betar/Home Service			
			4750do			
1430	1445	Sun	Germany, Pan American Broadcasting			13645as
1430	1500	mtwhfa	Albania, Radio Tirana	13625na		
1430	1500		Australia, Radio Australia	9475pa		11825as
1430	1500	Sat	Canada, Bible Voice Broadcasting Network			
			17945af			
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 Network			
			12035as			
1500	1525	tf	Guam, TWR Asia/KTWR	12140as		
1500	1530		Guam, AWR/KSDA	11720as		
1500	1530		Vietnam, Voice of Vietnam	7280as		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		China, China Radio International			5955as
			6095me	7325as	7405as	9435as
			9525as	9720as	9785eu	9870eu
			13685af	13740as	17630af	
1500	1557		North Korea, Voice of Korea	9335na		11710na
			13760eu	15245eu		
1500	1558		Libya, LJBC Voice of Africa	17725af		17790af
			17820af			
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		6080pa
			7240pa	9475pa	9590pa	11825as
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		Equatorial Guinea, Radio East Africa/Malabo			
			15190af			
1500	1600		Germany, Overcomer Ministries			17580af
1500	1600		Italy, IRRS-Shortwave/NEXUS	15710va		
1500	1600		Malaysia, RTM/Traxx FM	7295do		
1500	1600		Nigeria, Voice of Nigeria/Ikorodu			15120va
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		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			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
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, Overcomer Ministries	9460eu		13810me
			17580af			
1500	1600		USA, Voice of America	4930af		6080af
			7540as	12080af	12150va	13750va
			15530va	15580af	17895af	
1500	1600		USA, Voice of America/Special English			6140af
			7465va	9485va	9760va	
1500	1600		USA, WBCQ Monticello ME	9330am		
1500	1600	Sat	USA, WBCQ Monticello ME	15420am		
1500	1600		USA, WHRI Cypress Creek SC			9840af
			21630af			
1500	1600	Sun	USA, WHRI Cypress Creek SC			15680va
1500	1600	Sat/Sun	USA, WHRI Cypress Creek SC			15180va
1500	1600		USA, WINB Red Lion PA	13570am		
1500	1600		USA, WJHR International Milton FL			15550usb
1500	1600		USA, WRNO New Orleans LA	7505am		15590al
1500	1600		USA, WTWW Lebanon TN	9480na		9990va
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 1 Africa	6065af		13590af
1500	1600		Zambia, Zambia Broadcasting Corp			6165do
1515	1530		Australia, HCJB Global Australia			15340as

1515	1545	Sat	Canada, Bible Voice Broadcasting Network 13670as				
1525	1555	Sat/Sun	Swaziland, TWR Africa	4760af			
1530	1545		India, All India Radio, Delhi-Kingsway 9575do	6085do 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	1550	smtwhf	Vatican City State, Vatican Radio 13765as	11850as			
1530	1550	Sat	Vatican City State, Vatican Radio	7585as			
1530	1558	Sat	Vatican City State, Vatican Radio 11850as	7585am 13765as			
1530	1600	sh	Canada, Bible Voice Broadcasting Network 13590me	13670as			
1530	1600		Germany, AWR Europe	15255as			
1530	1600		Iran, VOIRI/IRIB	9600as	11945as		
1530	1600	mwf	Mongolia, Voice of Mongolia	9665as			
1545	1600	mtwhfa	Canada, Bible Voice Broadcasting Network 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	1615	f	Canada, Bible Voice Broadcasting Network 13590me				
1600	1615		Pakistan, PBC/Radio Pakistan	11585va	15285va		
1600	1620	t	Canada, Bible Voice Broadcasting Network 13590me				
1600	1627		Iran, VOIRI/IRIB	9600as	11945as		
1600	1630		Eritrea, Radio Bana	5060	d0		
1600	1630		Guam, AWR/KSDA	11805as	12035as		
1600	1630		Vietnam, Voice of Vietnam 9550me	7220me 9730eu	7280eu		
1600	1645	h	Canada, Bible Voice Broadcasting Network 13590me				
1600	1645		USA, WYFR/Family Radio Worldwide 11865na		11830na		
1600	1657		China, China Radio International 6100as 7435eu 9600af	7235af 9435eu 11650af	7255eu 9525eu	6060as 7420eu 9570eu	
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 7240pa 11825as	9475pa	5995pa 9590pa	6080pa 9710pa	
1600	1700		Bahrain, Radio Bahrain	6010me			
1600	1700	Sat/Sun	Canada, Bible Voice Broadcasting Network 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		Egypt, Radio Cairo	12170af			
1600	1700		Ethiopia, Radio Ethiopia	7235af	9559af		
1600	1700		France, Radio France Internationale 17605af		15605af		
1600	1700		Italy, IRRS-Shortwave/NEXUS	15710va			
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		Palau, T8WH/World Harvest Radio International 9930as				
1600	1700		Russia, Voice of Russia 12040eu	4975va	11985va		
1600	1700		South Africa, CVC 1 Africa	13590af			
1600	1700		South Korea, KBS World Radio 9640as		9515eu		
1600	1700		Taiwan, Radio Taiwan International 15485as		9435as		
1600	1700		Uganda, Dunamis Shortwave	4750af			
1600	1700		UK, BBC World Service 5975as 13820as 17795af	6190af 15400af 17830af	9495as 15420af 21470af	12095as 17640af	
1600	1700		USA, American Forces Network 5446usb 12759usb	5765usb 13362usb	7812usb	12133usb	
1600	1700		USA, EWTN/WEWN Irondale, AL		15610me		
1600	1700		USA, FBN/WTJC Newport NC	9370na			
1600	1700		USA, Voice of America 15580af	4930af	6080af		
1600	1700		USA, Voice of America/Special English 12080va	11890va 13750va			
1600	1700		USA, WBCQ Monticello ME	9330am			
1600	1700	Sat	USA, WBCQ Monticello ME	15420am			
1600	1700		USA, WHRI Cypress Creek SC 15180af	9840af 21630af			
1600	1700		USA, WINB Red Lion PA	13570am			
1600	1700		USA, WJHR International Milton FL		15550usb		
1600	1700		USA, WRNO New Orleans LA	7505am	15590al		
1600	1700		USA, WTWW Lebanon TN	9480na	9990va		
1600	1700		USA, WWCR Nashville TN 13845na	9980na 15825na	12160af		
1600	1700		USA, WWRB Manchester TN	9385na			
1600	1700		USA, WYFR/Family Radio Worldwide 13695na 21525af	17555eu	17795ca	6085ca 18980eu	
1600	1700		Zambia, CVC 1 Africa	6065af	13590af		
1600	1700		Zambia, Zambia Broadcasting Corp	6165do			
1630	1700		China, Xizang People's Broadcasting Sta/Lhasa 4905do 6130do	4920do 7255do	5240do 7385do	6110do	
1630	1700		Guam, AWR/KSDA	11740as			
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	1715	t	Canada, Bible Voice Broadcasting Network 13590me				
1700	1730	Sat	Canada, Bible Voice Broadcasting Network 13590me				
1700	1730	DRM	Romania, Radio Romania International	7350eu			
1700	1730	m	South Africa, SA Radio League	3230af			
1700	1730		Turkey, Voice of Turkey	15520as			
1700	1750		New Zealand, Radio NZ International	7440pa			
1700	1750	DRM	New Zealand, Radio NZ International	6170pa			
1700	1755	mtwhf	South Africa, Channel Africa	9675af			
1700	1756	DRM	Romania, Radio Romania International	9535eu			
1700	1756		Romania, Radio Romania International	11735eu			
1700	1757		China, China Radio International 6100as 7335af 7435eu	6140eu 7410af 9570af	7205eu 7420as	6090as 7255af 7425as	
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 9475pa	5995pa 9580pa	6080pa 9710pa	11880pa	
1700	1800		Bahrain, Radio Bahrain	6010me			
1700	1800	Sat	Canada, Bible Voice Broadcasting Network 11960me	13590me			
1700	1800	Sun	Canada, Bible Voice Broadcasting Network 11960me	13590me			
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		Egypt, Radio Cairo	12170af			
1700	1800		Equatorial Guinea, Radio Africa/Malabo	15190af			
1700	1800		Malaysia, RTM/Traxx FM	7295do			
1700	1800		Palau, T8WH/World Harvest Radio International 9930as				
1700	1800		Russia, Voice of Russia 12040eu	4975as	11985af		
1700	1800		South Africa, CVC 1 Africa	4965af	13590af		
1700	1800		Swaziland, TWR Africa	3200af			
1700	1800	Sat	Swaziland, TWR Africa	3200af			
1700	1800		Taiwan, Radio Taiwan International	15690af			
1700	1800		Tajikistan, Voice of Tajik	7245va			
1700	1800		UK, BBC World Service 5975as 9495as	6190af 9810as 17795af	7405af 12095af 17830af	9410af 15400af	
1700	1800		USA, American Forces Network 5446usb 12759usb	5765usb 13362usb	7812usb	12133usb	
1700	1800		USA, EWTN/WEWN Irondale, AL		15610me		
1700	1800		USA, FBN/WTJC Newport NC	9370na			
1700	1800		USA, Voice of America 15580af	6080af 17895af		12015af	
1700	1800		USA, WBCQ Monticello ME	9330am			
1700	1800	Sat	USA, WBCQ Monticello ME	15420am			

1700	1800		USA, WHRI Cypress Creek SC	15180af
			21630af	
1700	1800		USA, WHRI Cypress Creek SC	9840af
1700	1800		USA, WINB Red Lion PA	13570am
1700	1800		USA, WJHR International Milton FL	15550usb
1700	1800		USA, WRNO New Orleans LA	7505am 15590al
1700	1800		USA, WTWW Lebanon TN	9480na 9990va
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, CVC 1 Africa	4965af 13590af
1700	1800		Zambia, Zambia Broadcasting Corp	6165do
1714	1800		Congo Dem. Republic, Radio Kahuzi	6209do
1715	1730		Vatican City State, Vatican Radio	4005eu
			5885eu	7250eu 7290eu 9645eu
1720	1740	Sat/Sun	USA, Voice of America/Studio 7	4930af
			15775af	
1730	1735		India, All India Radio, Delhi-Kingsway	6085do
			7370do	9575do 9835do
1730	1800		Bulgaria, Radio Bulgaria	5900eu 7400eu
1730	1800	DRM	Bulgaria, Radio Bulgaria	9700eu
1730	1800		Clandestine, Sudan Radio Service/SRS	9840af
1730	1800		Clandestine, Zimbabwe Comm Radio/Radio Dialogue 4895af	
1730	1800	mtwh	USA, Voice of America/Studio 7	4930af
			12080af	15775af
1730	1800		Vatican City State, Vatican Radio	9755af
			11625af	13765af
1745	1800		Bangladesh, Bangladesh Betar	7250as
1745	1800	DRM	India, All India Radio/External Service	9950eu
1745	1800		India, All India Radio/External Service	7400af
			7410af	7550eu 9415af 9445af
			11670eu	11935af
1751	1800	DRM	New Zealand, Radio NZ International	9890pa
1751	1800		New Zealand, Radio NZ International	9615pa
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 Network	
			13590me	
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, Voice of America	6080af 9850af
			12015af	15580af
1800	1830	Sat/Sun	USA, Voice of America	4930af
1800	1830		Vietnam, Voice of Vietnam	5955eu
1800	1845	Sun	Canada, Bible Voice Broadcasting Network	
			9430me	
1800	1850		New Zealand, Radio NZ International	9615pa
1800	1850	DRM	New Zealand, Radio NZ International	9890pa
1800	1855		Clandestine, Zimbabwe Comm Radio/Radio Dialogue 4895af	
1800	1857		China, China Radio International	6100eu
			7405eu	
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		Argentina, RAE	9690eu 15345eu
1800	1900		Australia, ABC NT Alice Springs	2310do
1800	1900		Australia, ABC NT Katherine	2485do
1800	1900		Australia, Radio Australia	6080pa 7240pa
			9475pa	9580pa 9710pa 11880pa
1800	1900		Bahrain, Radio Bahrain	6010me
1800	1900		Bangladesh, Bangladesh Betar	7250as
1800	1900	Sat	Canada, Bible Voice Broadcasting Network	
			9430va	11855as
1800	1900	Sun	Canada, Bible Voice Broadcasting Network	
			6030eu	6130al
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		Equatorial Guinea, Radio Africa/Malabo	15190af
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	fas	Italy, IRRS-Shortwave/NEXUS	7290va
1800	1900		Kuwait, Radio Kuwait	15540va
1800	1900		Liberia, Star Radio	3960do
1800	1900		Malaysia, RTM/Traxx FM	7295do
1800	1900		Nigeria, Voice of Nigeria/Ikorodu	15120va
1800	1900		Palau, T8WH/World Harvest Radio International	
			9955as	
1800	1900		Russia, Voice of Russia	4975me 12040va
1800	1900		South Africa, CVC 1 Africa	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	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, WBCQ Monticello ME	9330am 15420am
1800	1900		USA, WHRI Cypress Creek SC	9840af
			21630af	
1800	1900		USA, WINB Red Lion PA	13570am
1800	1900		USA, WJHR International Milton FL	15550usb
1800	1900		USA, WRNO New Orleans LA	7505am 15590al
1800	1900		USA, WTWW Lebanon TN	9480na 9990va
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		Yemen, Yemen RTV Corp/Radio Sana	6005me
			9780me	
1800	1900		Zambia, CVC 1 Africa	4965af 13590af
1800	1900		Zambia, Zambia Broadcasting Corp	6165do
1815	1845	Sat	Canada, Bible Voice Broadcasting Network	
			6030eu	6130al
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, Voice of America	4930af 6080af
			9850af	12015af 15580af
1830	1900	Sat	USA, WHRI Cypress Creek SC	15180af
1845	1850		Guinea, RTV Guineenne	7125do
1845	1900	mtwhfa	Albania, Radio Tirana	7520eu 13640na
1851	1900		New Zealand, Radio NZ International	11725pa
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	1930		Germany, Deutsche Welle	6150af 9735af
			11795af	17610af
1900	1930		Turkey, Voice of Turkey	9785eu
1900	1930		USA, Voice of America	4930af 4940af
			6080af	9850af 15580af 17895af
1900	1930		Vietnam, Voice of Vietnam	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	1957		China, China Radio International	7285af
			7295af	9440af
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
			9475pa	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		Cuba, Radio Havana Cuba	11760sa
1900	2000		Egypt, Radio Cairo	11510af
1900	2000		Equatorial Guinea, Radio Africa/Malabo	15190af
1900	2000		Indonesia, Voice of Indonesia/Jawa Barat	
			9525eu	11785eu

1900	2000	fas	Italy, IRRS-Shortwave/NEXUS	7290va		
1900	2000		Kuwait, Radio Kuwait	15540va		
1900	2000		Liberia, Star Radio	3960do		
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		New Zealand, Radio NZ International	11725pa		
1900	2000	DRM	New Zealand, Radio NZ International	15720pa		
1900	2000		Nigeria, Voice of Nigeria/Ikorodu	7255af		
1900	2000		Palau, T8WH/World Harvest Radio International 9930as			
1900	2000		Russia, Voice of Russia	12040va		
1900	2000		South Africa, CVC 1 Africa	4965af	13590af	
1900	2000	mtwhf	Spain, Radio Exterior de Espana 11610af		9665eu	
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		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
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, Voice of America/Special English 9630va		7485va	
1900	2000		USA, WBCQ Monticello ME	9330am	15420am	
1900	2000	mtwhfa	USA, WBCQ Monticello ME	7415am		
1900	2000		USA, WHRI Cypress Creek SC		9840af	
			15180af	17520na		
1900	2000		USA, WINB Red Lion PA	13570am		
1900	2000		USA, WJHR International Milton FL		15550usb	
1900	2000		USA, WRNO New Orleans LA	7505am	15590al	
1900	2000		USA, WTWW Lebanon TN	9480na	9990va	
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, CVC 1 Africa	4965af	13590af	
1900	2000		Zambia, Zambia Broadcasting Corp		6165do	
1905	1920	Sat	Mali, RTV Malienne	5995do		
1930	2000	Sat/Sun	Germany, Pan American Broadcasting		6020af	
1930	2000		Iran, VOIRI/IRIB	5940eu	6205eu	9780eu
			9800af			
1930	2000		South Africa, RTE Radio Worldwide		5840af	
1930	2000		USA, Voice of America	4930af	4940af	
			6080af	15580af		
1930	2000	Sat/Sun	USA, WRMI/Radio Prague	9955na		

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

2000	2015	Sun	Germany, Pan American Broadcasting		6020af	
2000	2027		Iran, VOIRI/IRIB	5940eu	6205eu	9780eu
			9800af			
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu	13640na	
2000	2030		Egypt, Radio Cairo	11510af		
2000	2030	Sat	Germany, Pan American Broadcasting		6020af	
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, 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	2057		China, China Radio International		5960eu	
			5985af	7285eu	7295af	9440af
			9600eu	11640eu	13630af	
2000	2057		Germany, Deutsche Welle	6150af		
2000	2057		Netherlands, R Netherlands Worldwide 11610af		7425af	
2000	2100		Anguilla, Worldwide Univ Network		11775am	
2000	2100		Australia, ABC NT Alice Springs		2310do	
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek		2325do	
2000	2100		Australia, Radio Australia	9500as	9700as	
			11650as			
2000	2100	Sat/Sun	Australia, Radio Australia	6080va	7240pa	
			12080pa			
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		Equatorial Guinea, Radio Africa/Malabo	15190af		
2000	2100		Kuwait, Radio Kuwait	15540va		
2000	2100		Liberia, Star Radio	3960do		
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100		New Zealand, Radio NZ International		11725pa	
2000	2100	DRM	New Zealand, Radio NZ International		15720pa	
2000	2100		Nigeria, Voice of Nigeria/Ikorodu		7255af	
2000	2100		Palau, T8WH/World Harvest Radio International 9930as			
2000	2100		Russia, Voice of Russia	12040va		
2000	2100		South Africa, CVC 1 Africa	4965af	9505af	
2000	2100		Syria, Radio Damascus	9330eu	12085va	
2000	2100		UK, BBC World Service	3255af	6005af	
			6190af	9410af	11810af	12095af
			13710af			
2000	2100		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2000	2100		USA, EWTN/WEWN Irondale, AL		15610as	
2000	2100		USA, FBN/WTJC Newport NC	9370na		
2000	2100	mtwhf	USA, Voice of America	5930va	9480va	
2000	2100		USA, WBCQ Monticello ME	7415am	15420am	
2000	2100		USA, WBCQ Monticello ME	5110am		
2000	2100		USA, WINB Red Lion PA	13570am		
2000	2100		USA, WJHR International Milton FL		15550usb	
2000	2100		USA, WRNO New Orleans LA	7505am	15590al	
2000	2100		USA, WTWW Lebanon TN	9480na	9990va	
2000	2100		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2000	2100		USA, WWRB Manchester TN	9385na		
2000	2100		USA, WYFR/Family Radio Worldwide		17725sa	
			17795ca	17845af	18980eu	
2000	2100		Zambia, CVC 1 Africa	4965af	9505af	
2000	2100		Zambia, Zambia Broadcasting Corp		6165do	
2000	21000		USA, WHRI Cypress Creek SC		7540na	
			15180na	15665na		
2030	2045		Thailand, Radio Thailand World Service		9680eu	
2030	2056	DRM	Romania, Radio Romania International		9765eu	
2030	2056		Romania, Radio Romania International 11940na		11880na	
2030	2100	mtwhf	Moldova, (Transnistria) Radio PMR		6240eu	
2030	2100		Turkey, Voice of Turkey	7205va		
2030	2100		USA, Voice of America	4930af	6080af	
			7555as	15580af		
2030	2100	Sat/Sun	USA, Voice of America	4940af		
2030	2100		Vietnam, Voice of Vietnam	7220me	7280eu	
			9550me	9730eu		
2045	2100		India, All India Radio/External Service		7550eu	
			9445eu	9910pa	11620pa	11670eu
			11715pa			
2045	2100	DRM	India, All India Radio/External Service		9950eu	
2045	2100	DRM	Vatican City State, Vatican Radio		9800am	
2050	2100		Vatican City State, Vatican Radio		4005eu	
			5885eu	7250eu		

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

2100	2110		Papua New Guinea, Wantok Radio Light		7325do	
2100	2120		Vatican City State, Vatican Radio		4005eu	
			5885eu	7250eu		
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	2130		Turkey, Voice of Turkey	7205va		
2100	2130	DRM	Vatican City State, Vatican Radio		9800am	
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		15720pa	
2100	2157		China, China Radio International		7250af	
			11640af	13630af		
2100	2157		China, China Radio International		5960as	
			6135as	7205eu	7225as	7250as
			7285as	7405eu	7415eu	9600af
			11640af	13630af		
2100	2157		North Korea, Voice of Korea	13760eu	15245eu	
2100	2200		Anguilla, Worldwide Univ Network		11775am	
2100	2200		Australia, Radio Australia	9500as	9660pa	
			11650as	11695va	12080pa	13630pa
			15515va			

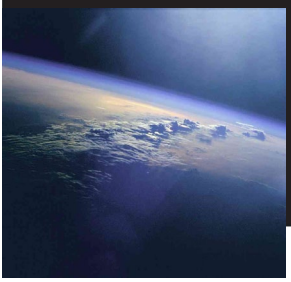
2100	2200		Bahrain, Radio Bahrain	6010me		
2100	2200		Belarus, Radio Station Belarus 7390eu	7255eu	7360eu	
2100	2200	DRM	Belgium, TDP Radio	17555eu		
2100	2200		Bulgaria, Radio Bulgaria	5900eu	7400eu	
2100	2200		Canada, CFRX Toronto ON	6070na		
2100	2200		Canada, CFVP Calgary AB	6030na		
2100	2200		Canada, CKZN St Johns NF	6160na		
2100	2200		Canada, CKZU Vancouver BC	6160na		
2100	2200	DRM	Canada, Radio Canada International	9800na		
2100	2200		Equatorial Guinea, Radio Africa/Malabo	15190af		
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/World Harvest Radio International 9930as			
2100	2200		South Africa, CVC 1 Africa	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	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2100	2200		USA, EWTN/WEWN Irondale, AL	15610as		
2100	2200		USA, FBN/WTJC Newport NC	9370na		
2100	2200		USA, Voice of America	6080af	7555as	
			15580af			
2100	2200		USA, WBCQ Monticello ME	7415am	9330am	
			15420am			
2100	2200	Sat	USA, WBCQ Monticello ME	5110am		
2100	2200		USA, WHRI Cypress Creek SC	7555na		
			15180na	15665na		
2100	2200		USA, WINB Red Lion PA	9265am		
2100	2200		USA, WJHR International Milton FL	15550usb		
2100	2200		USA, WRNO New Orleans LA	7505am	15590al	
2100	2200		USA, WTWW Lebanon TN	9480na	9990va	
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, CVC 1 Africa	4965af	9505af	
2100	2200		Zambia, Zambia Broadcasting Corp	6165do		
2115	2200		Egypt, Radio Cairo	6270eu		
2130	2200		Australia, ABC NT Alice Springs	4835do		
2130	2200		Australia, ABC NT Katherine	5025do		
2130	2200	mtwhfa	Canada, CBC Northern Quebec Service	9625na		
2151	2200		New Zealand, Radio NZ International	15720pa		
2151	2200	DRM	New Zealand, Radio NZ International	17675pa		

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

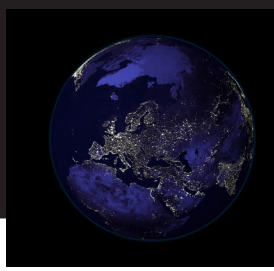
2200	2205		Zambia, Zambia Broadcasting Corp	6165do		
2200	2210		Guinea, Radio Familia FM	4900do		
2200	2230		India, All India Radio/External Service	7550eu		
			9445eu	9445eu	9910pa	11620pa
			11670eu	11715pa		
2200	2230	DRM	India, All India Radio/External Service	9950eu		
2200	2245		Egypt, Radio Cairo	6270eu		
2200	2245		USA, WYFR/Family Radio Worldwide	15770af		
2200	2256		Romania, Radio Romania International	5960eu		
			7435eu	9790eu	11940eu	
2200	2257		China, China Radio International	5915as		
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	11695pa	12080pa	
			13590as	13630pa	15230as	15240pa
			15360pa	15415as	15515va	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		Equatorial Guinea, Radio Africa/Malabo	15190af		
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/World Harvest Radio International 9930as			
2200	2300		Russia, Voice of Russia	9800va		
2200	2300		Syria, Radio Damascus	9330va	12085va	
2200	2300		Turkey, Voice of Turkey	9830va		
2200	2300		UK, BBC World Service	3915as	5875as	
			5905as	5935af	6195as	7490as
			9580as	9915af	12095af	
2200	2300		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2200	2300		USA, EWTN/WEWN Irondale, AL	15610me		
2200	2300		USA, FBN/WTJC Newport NC	9370na		
2200	2300	smtwh	USA, Voice of America	5915va	7480va	
			7575va	11955va		
2200	2300		USA, Voice of America	7555as		
2200	2300		USA, WBCQ Monticello ME	9330am		
2200	2300	fasmt	USA, WBCQ Monticello ME	7415am		
2200	2300	Sat	USA, WBCQ Monticello ME	5110am		
2200	2300		USA, WHRI Cypress Creek SC	9615na		
			15180na			
2200	2300		USA, WINB Red Lion PA	9265am		
2200	2300		USA, WJHR International Milton FL	15550usb		
2200	2300		USA, WTWW Lebanon TN	9480na	9990va	
2200	2300		USA, WWCR Nashville TN	3195na	5070na	
			9980na	13845na		
2200	2300		USA, WWRB Manchester TN	2390na	5050va	
2200	2300		USA, WYFR/Family Radio Worldwide	5950na		
			15255sa	15440ca		
2230	2300	mtwhf	Moldova, (Transnistria) Radio PMR	6240eu		
2230	2300		South Africa, AWR Africa	15320as		
2230	2300		USA, 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	12080pa	
			13590va	13690pa	15230as	15360pa
			15145as	15560pa	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		Cuba, Radio Havana Cuba	5040ca		
2300	0000		Egypt, Radio Cairo	11590am		
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	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2300	0000		USA, EWTN/WEWN Irondale, AL	15610me		
2300	0000		USA, FBN/WTJC Newport NC	9370na		
2300	0000		USA, Voice of America	5895va	7555as	
			7575va	11955va		
2300	0000		USA, Voice of America/Special English	7460af		
			9570va	11840va	15340va	
2300	0000		USA, WBCQ Monticello ME	9330am		
2300	0000	fasmt	USA, WBCQ Monticello ME	7415am		
2300	0000	Sat	USA, WBCQ Monticello ME	5110am		
2300	0000		USA, WHRI Cypress Creek SC	7315na		
2300	0000	smtwhf	USA, WHRI Cypress Creek SC	5920na		
2300	0000	Sat	USA, WHRI Cypress Creek SC	7335na		
2300	0000		USA, WINB Red Lion PA	9265am		
2300	0000		USA, WTWW Lebanon TN	5080va	5755va	
2300	0000		USA, WWCR Nashville TN	3195na	5070na	
			9980na	13845na		
2300	0000		USA, WWRB Manchester TN	2390na	5050va	
2300	0000		USA, WYFR/Family Radio Worldwide	5950na		
			11580sa	15440ca		
2300	2330		Australia, Radio Australia	11695pa	15240pa	
2300	2330	DRM	Vatican City State, Vatican Radio	7370am		
2300	2345		USA, WYFR/Family Radio Worldwide	11740na		
2300	2357		China, China Radio International	5915as		
			5990ca	6040na	6145eu	7350as
			7415as	9610pa	11790as	11970na
2330	0000		Australia, Radio Australia	17750as		
2330	0000		Vietnam, Voice of Vietnam	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.

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

0900	0945	USA, WYFR/Family Radio Worldwide 9505ca	5850ca
0900	1000	Argentina, RAE 6060sa	
0900	1000	Bolivia, Radio Santa Ana 4451do	
0900	1000	Clandestine, Radio Republica/WRMI	5954ca
0900	1000	Colombia, La Voz de tu Conciencia	6010do
0900	1000	Colombia, Marfil Estereo 5910do	
0900	1000	Cuba, Radio Nacional de Venezuela 12010sa 13680ca 13750na	11690ca 17750sa
0900	1000	Cuba, Radio Rebelde 5025na	
0900	1000	Dominican Republic, Radio Amanecer Int'l 6025do	
0900	1000	Dominican Republic, Radio Cristal Int'l	5009do
0900	1000	Ecuador, Radio Quito 4919do	
0900	1000	Honduras, HRMI/ Radio Misiones Intl	3340do
0900	1000	Mexico, XEOI/Radio Mil 6010do	
0900	1000	Mexico, XERTA/Radio Transcontinental	4800do
0900	1000	Peru, La Voz de la Selva 4824do	
0900	1000	Peru, Ondas del Huallaga 3329do	
0900	1000	Peru, Radio Cusco 6195do	
0900	1000	Peru, Radio Frecuencia Popular	5485do
0900	1000	Peru, Radio Genesis 4850do	
0900	1000	Peru, Radio Libertad de Junin 5039do	
0900	1000	Peru, Radio Melodia 5939do	
0900	1000	Peru, Radio San Miguel 4930do	
0900	1000	Peru, Radio Santa Monica 4965do	
0900	1000	Peru, Radio Union 6114do	
0900	1000	Peru, Radio Victoria 6019do	9720do
0900	1000	Peru, Radio Vision 4790do	
0900	1000	Spain, Radio Exterior de Espana 21540af 21610me	15585eu
0900	1000	USA, EWTN/WEWN Irondale, AL 11870sa	7555ca
0900	1000	USA, Radio Marti 5980ca 6030ca	
0900	1000	USA, WYFR/Family Radio Worldwide 9550sa 9715ca 11855sa	5950na 11970sa
0930	1000	Peru, Radio Maranon 4835do	
0930	1000	Peru, Radio Tarma 4775do	
0930	1000	USA, WRMI/Radio Prague 9955ca	

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

1000	1030	France, Radio France Internationale 9825ca	7375ca
1000	1030	Japan, Radio Japan NHK World 6195sa	6120ca
1000	1100	Bolivia, Radio Eco 4409do	
1000	1100	Bolivia, Radio Nacional de Huanuni	5965do
1000	1100	Bolivia, Radio San Jose 5580do	
1000	1100	Bolivia, Radio San Miguel 4700do	
1000	1100	Bolivia, Radio Santa Ana 4451do	
1000	1100	Bolivia, Radio Tacana 4781do	
1000	1100	Bolivia, Radio Virgen de Remedios	4834do
1000	1100	Colombia, La Voz de tu Conciencia	6010do
1000	1100	Colombia, La Voz del Guaviare	6035do
1000	1100	Colombia, Marfil Estereo 5910do	
1000	1100	Cuba, Radio Nacional de Venezuela	6180ca
1000	1100	Cuba, Radio Rebelde 5025na	
1000	1100	Dominican Republic, Radio Amanecer Int'l 6025do	
1000	1100	Dominican Republic, Radio Cristal Int'l	5009do
1000	1100	Ecuador, Radio Oriental 4781do	
1000	1100	Ecuador, Radio Quito 4919do	
1000	1100	Honduras, HRMI/ Radio Misiones Intl	3340do
1000	1100	Mexico, XEOI/Radio Mil 6010do	
1000	1100	Mexico, XERTA/Radio Transcontinental	4800do
1000	1100	Peru, La Voz de la Selva 4824do	
1000	1100	Peru, Radio Bethel 5921do	
1000	1100	Peru, Radio Bolivar 5460do	
1000	1100	Peru, Radio Cusco 6195do	
1000	1100	Peru, Radio Frecuencia Popular	5485do
1000	1100	Peru, Radio Genesis 4850do	
1000	1100	Peru, Radio La Reina de la Selva	5486do
1000	1100	Peru, Radio La Voz de Bolivar 5460do	
1000	1100	Peru, Radio Libertad de Junin 5039do	
1000	1100	Peru, Radio Madre de Dios 4950do	
1000	1100	Peru, Radio Maranon 4835do	
1000	1100	Peru, Radio Melodia 5939do	
1000	1100	Peru, Radio Ondas del Suroiente	5120do
1000	1100	Peru, Radio Rasuwilca 4805do	
1000	1100	Peru, Radio San Antonio 4940do	
1000	1100	Peru, Radio San Miguel 4930do	
1000	1100	Peru, Radio Santa Monica 4965do	
1000	1100	Peru, Radio Santa Rosa 6047do	
1000	1100	Peru, Radio Tarma 4775do	
1000	1100	Peru, Radio Union 6114do	
1000	1100	Peru, Radio Victoria 6019do	9720do
1000	1100	Peru, Radio Vision 4790do	
1000	1100	Spain, Radio Exterior de Espana 15585eu 21540af 21610me	13720eu
1000	1100	USA, EWTN/WEWN Irondale, AL 12050sa	7555ca
1000	1100	USA, Radio Marti 5980ca 6030ca	
1000	1100	USA, WYFR/Family Radio Worldwide 9550sa 9715ca 11855sa	6085ca
1000	1100	Venezuela, Radio Amazonas 4940do	
1045	1100	Peru, La Voz de las Huarinjas 5059do	
1059	1100	Netherlands, R Netherlands Worldwide	6165ca

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

1100	1127	Netherlands, R Netherlands Worldwide	6165ca
1100	1130	Peru, Radio Genesis 4850do	
1100	1130	Peru, Radio Rasuwilca 4805do	
1100	1145	USA, WYFR/Family Radio Worldwide 9355sa 9715ca 11855sa	5985na
1100	1200	Bolivia, Radio Eco 4409do	
1100	1200	Bolivia, Radio Nacional de Huanuni	5965do
1100	1200	Bolivia, Radio San Jose 5580do	
1100	1200	Bolivia, Radio San Miguel 4700do	
1100	1200	Bolivia, Radio Santa Ana 4451do	
1100	1200	Bolivia, Radio Tacana 4781do	
1100	1200	Chile, CVC La Voz 9635sa	17680sa
1100	1200	Colombia, La Voz de tu Conciencia	6010do
1100	1200	Colombia, La Voz del Guaviare	6035do
1100	1200	Colombia, Marfil Estereo 5910do	
1100	1200	Cuba, Radio Havana Cuba 6000na 6140am 6150am 11690ca 12040ca 15120sa	6095na 11760am 15230sa 15360sa
1100	1200	Cuba, Radio Rebelde 5025na 12040ca	6140na
1100	1200	Dominican Republic, Radio Cristal Int'l	5009do
1100	1200	Ecuador, HCJB/La Voz de los Andes	6050sa
1100	1200	Ecuador, Radio Oriental 4781do	
1100	1200	Ecuador, Radio Quito 4919do	
1100	1200	Honduras, HRMI/ Radio Misiones Intl	3340do
1100	1200	Honduras, Radio Luz y Vida 3250do	
1100	1200	Mexico, XEOI/Radio Mil 6010do	
1100	1200	Mexico, XERTA/Radio Transcontinental	4800do
1100	1200	Peru, La Voz de Anta 5323do	
1100	1200	Peru, La Voz de la Selva 4824do	
1100	1200	Peru, La Voz de las Huarinjas 5059do	
1100	1200	Peru, Radio Bethel 5921do	
1100	1200	Peru, Radio Bolivar 5460do	
1100	1200	Peru, Radio Cusco 6195do	
1100	1200	Peru, Radio Frecuencia Popular	5485do
1100	1200	Peru, Radio La Reina de la Selva	5486do
1100	1200	Peru, Radio La Voz de Bolivar 5460do	
1100	1200	Peru, Radio Libertad de Junin 5039do	
1100	1200	Peru, Radio Madre de Dios 4950do	
1100	1200	Peru, Radio Melodia 5939do	
1100	1200	Peru, Radio Ondas del Suroiente	5120do
1100	1200	Peru, Radio San Antonio 4940do	
1100	1200	Peru, Radio San Miguel 4930do	

1100 1200 Peru, Radio Santa Monica 4965do
1100 1200 Peru, Radio Santa Rosa 6047do
1100 1200 Peru, Radio Tarma 4775do
1100 1200 Peru, Radio Union 6114do
1100 1200 Peru, Radio Victoria 6019do 9720do
1100 1200 Peru, Radio Vision 4790do
1100 1200 South Korea, KBS World Radio 11795sa
1100 1200 Spain, Radio Exterior de Espana 21540af
1100 1200 USA, EWTN/WEWN Irondale, AL 7555ca 12050sa
1100 1200 USA, Radio Marti 5745ca 5980ca 6030ca
1100 1200 USA, WYFR/Family Radio Worldwide 6085ca 9605sa 11970sa
1100 1200 Venezuela, Radio Amazonas 4940do
1129 1157 Netherlands, R Netherlands Worldwide 6165sa
1130 1200 mtwhf USA, Voice of America 9885ca 13750sa 15590sa
1130 1200 Vatican City State, Vatican Radio 9865am
1159 1200 Netherlands, R Netherlands Worldwide 6165sa 9715ca

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

1200 1227 Netherlands, R Netherlands Worldwide 6165sa 9715ca
1200 1230 France, Radio France Internationale 15515ca
1200 1300 mtwhf Antarctica, Radio Nacional LRA36 15746va
1200 1300 Argentina, RAE 11710va
1200 1300 Bolivia, Radio Eco 4409do
1200 1300 Bolivia, Radio Nacional de Huanuni 5965do
1200 1300 Bolivia, Radio San Jose 5580do
1200 1300 Bolivia, Radio San Miguel 4700do
1200 1300 Bolivia, Radio Santa Ana 4451do
1200 1300 Bolivia, Radio Tacana 4781do
1200 1300 Chile, CVC La Voz 9635sa 17680sa
1200 1300 Colombia, La Voz de tu Conciencia 6010do
1200 1300 Colombia, La Voz del Guaviare 6035do
1200 1300 Colombia, Marfil Estereo 5910do
1200 1300 Cuba, Radio Havana Cuba 6000na 6095na 6140am 6150am 11690ca 11760am 12040ca 15120sa 15230sa 15360sa
1200 1300 Cuba, Radio Nacional de Venezuela 11705ca
1200 1300 Cuba, Radio Rebelde 5025na 6140na 12040ca
1200 1300 Dominican Republic, Radio Amanecer Int'l 6025do
1200 1300 Ecuador, HCJB/La Voz de los Andes 6050sa
1200 1300 Ecuador, Radio Oriental 4781do
1200 1300 Ecuador, Radio Quito 4919do
1200 1300 Honduras, HRMI/ Radio Misiones Intl 3340do
1200 1300 Honduras, Radio Luz y Vida 3250do
1200 1300 Mexico, XEOI/Radio Mil 6010do
1200 1300 Mexico, XERTA/Radio Transcontinental 4800do
1200 1300 Mexico, XEXQ/Radio Universidad 6045do
1200 1300 Mexico, XEXQ/Radio Universidad 6045do
1200 1300 Peru, La Voz de Anta 5323do
1200 1300 Peru, La Voz de la Selva 4824do
1200 1300 Peru, La Voz de las Huarinjas 5059do
1200 1300 Peru, Radio Bethel 5921do
1200 1300 Peru, Radio Bolivar 5460do
1200 1300 Peru, Radio Cusco 6195do
1200 1300 Peru, Radio Frecuencia Popular 5485do
1200 1300 Peru, Radio La Reina de la Selva 5486do
1200 1300 Peru, Radio Libertad de Junin 5039do
1200 1300 Peru, Radio Madre de Dios 4950do
1200 1300 Peru, Radio Maranon 4835do
1200 1300 Peru, Radio Melodia 5939do
1200 1300 Peru, Radio Ondas del Suroiente 5120do
1200 1300 Peru, Radio San Miguel 4930do
1200 1300 Peru, Radio Santa Monica 4965do
1200 1300 Peru, Radio Santa Rosa 6047do
1200 1300 Peru, Radio Tarma 4775do
1200 1300 Peru, Radio Union 6114do
1200 1300 Peru, Radio Victoria 6019do 9720do
1200 1300 Peru, Radio Vision 4790do
1200 1300 Spain, Radio Exterior de Espana 13720eu 15585eu 21540af 21610me
1200 1300 fa Spain, Radio Exterior de Espana 5970ca 11880na
1200 1300 smtwhf Spain, Radio Exterior de Espana 11815sa
1200 1300 USA, EWTN/WEWN Irondale, AL 7555ca 12050sa
1200 1300 USA, Radio Marti 5745ca 5980ca 7405ca
1200 1300 USA, Voice of America 9885ca 13750ca 15590ca
1200 1300 USA, WYFR/Family Radio Worldwide 6085ca 7730sa 9605sa 11970sa 13800sa 15130ca 15770sa
1200 1300 Venezuela, Radio Amazonas 4940do

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

1300 1345 USA, WYFR/Family Radio Worldwide 7730sa 9605sa
1300 1400 mtwhf Antarctica, Radio Nacional LRA36 15746va
1300 1400 Argentina, RAE 11710va
1300 1400 Bolivia, Radio Eco 4409do
1300 1400 Bolivia, Radio Nacional de Huanuni 5965do
1300 1400 Bolivia, Radio San Jose 5580do
1300 1400 Bolivia, Radio San Miguel 4700do
1300 1400 Bolivia, Radio Santa Ana 4451do
1300 1400 Bolivia, Radio Tacana 4781do
1300 1400 Chile, CVC La Voz 9635sa 17680sa
1300 1400 Colombia, La Voz de tu Conciencia 6010do
1300 1400 Colombia, La Voz del Guaviare 6035do
1300 1400 Colombia, Marfil Estereo 5910do
1300 1400 Cuba, Radio Havana Cuba 6140am 11730ca 11730am 11690ca 12040ca 13680na 13780na 15120sa 15230sa 15360sa
1300 1400 Cuba, Radio Rebelde 5025na 6140na 12040ca
1300 1400 Dominican Republic, Radio Amanecer Int'l 6025do
1300 1400 Ecuador, HCJB/La Voz de los Andes 6050sa
1300 1400 Ecuador, Radio Oriental 4781do
1300 1400 Ecuador, Radio Quito 4919do
1300 1400 Honduras, HRMI/ Radio Misiones Intl 3340do
1300 1400 Honduras, Radio Luz y Vida 3250do
1300 1400 Mexico, XEOI/Radio Mil 6010do
1300 1400 Mexico, XERTA/Radio Transcontinental 4800do
1300 1400 Mexico, XEXQ/Radio Universidad 6045do
1300 1400 Peru, La Voz de Anta 5323do
1300 1400 Peru, La Voz de la Selva 4824do
1300 1400 Peru, Radio Bethel 5921do
1300 1400 Peru, Radio Cusco 6195do
1300 1400 Peru, Radio Frecuencia Popular 5485do
1300 1400 Peru, Radio La Reina de la Selva 5486do
1300 1400 Peru, Radio Libertad de Junin 5039do
1300 1400 Peru, Radio Madre de Dios 4950do
1300 1400 Peru, Radio Melodia 5939do
1300 1400 Peru, Radio Ondas del Suroiente 5120do
1300 1400 Peru, Radio San Miguel 4930do
1300 1400 Peru, Radio Santa Monica 4965do
1300 1400 Peru, Radio Santa Rosa 6047do
1300 1400 Peru, Radio Tarma 4775do
1300 1400 Peru, Radio Union 6114do
1300 1400 Peru, Radio Victoria 6019do 9720do
1300 1400 Peru, Radio Vision 4790do
1300 1400 Spain, Radio Exterior de Espana 15585eu 17595na 21540af 21610me
1300 1400 Sat/Sun Spain, Radio Exterior de Espana 13720eu
1300 1400 fa Spain, Radio Exterior de Espana 5970ca 11880na
1300 1400 smtwhf Spain, Radio Exterior de Espana 11815sa
1300 1400 USA, EWTN/WEWN Irondale, AL 11550ca 12050sa
1300 1400 USA, Radio Marti 5745ca 9805ca 11930ca 13820ca 15330ca
1300 1400 USA, WYFR/Family Radio Worldwide 6085ca 13800sa 15130ca 15770sa
1300 1400 Venezuela, Radio Amazonas 4940do

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

1400 1415 Vatican City State, Vatican Radio 7250va 9645va
1400 1430 France, Radio France Internationale 17690ca
1400 1500 mtwhf Antarctica, Radio Nacional LRA36 15476va
1400 1500 Bolivia, Radio Eco 4409do
1400 1500 Bolivia, Radio Nacional de Huanuni 5965do
1400 1500 Bolivia, Radio San Jose 5580do
1400 1500 Bolivia, Radio San Miguel 4700do
1400 1500 Bolivia, Radio Santa Ana 4451do
1400 1500 Bolivia, Radio Tacana 4781do
1400 1500 Chile, CVC La Voz 9635sa 17680sa
1400 1500 Colombia, La Voz de tu Conciencia 6010do
1400 1500 Colombia, La Voz del Guaviare 6035do
1400 1500 Colombia, Marfil Estereo 5910do
1400 1500 Cuba, Radio Havana Cuba 6140am 11690ca 11730ca 11760am 12040ca 13680na 13750na 13780na 15230sa 15360sa 15370sa 17750sa
1400 1500 Sun Cuba, Radio Nacional de Venezuela 11690ca 12010sa 13680ca 13750na 17750sa
1400 1500 Cuba, Radio Rebelde 5025na 6140na 12040ca
1400 1500 Dominican Republic, Radio Amanecer Int'l 6025do
1400 1500 Ecuador, HCJB/La Voz de los Andes 6050sa

1400 1500 Ecuador, Radio El Buen Pastor 4814do
1400 1500 Ecuador, Radio Oriental 4781do
1400 1500 Ecuador, Radio Quito 4919do
1400 1500 Honduras, HRMI/ Radio Misiones Intl 3340do
1400 1500 Honduras, Radio Luz y Vida 3250do
1400 1500 Mexico, XEOI/Radio Mil 6010do
1400 1500 Mexico, XERTA/Radio Transcontinental 4800do
1400 1500 Mexico, XEXQ/Radio Universidad 6045do
1400 1500 Peru, La Voz de Anta 5323do
1400 1500 Peru, La Voz de la Selva 4824do
1400 1500 Peru, La Voz de las Huarinjas 5059do
1400 1500 Peru, Radio Bethel 5921do
1400 1500 Peru, Radio Cusco 6195do
1400 1500 Peru, Radio del Pacifico 9675do
1400 1500 Peru, Radio Frecuencia Popular 5485do
1400 1500 Peru, Radio La Reina de la Selva 5486do
1400 1500 Peru, Radio Libertad de Junin 5039do
1400 1500 Peru, Radio Madre de Dios 4950do
1400 1500 Peru, Radio Maranon 4835do
1400 1500 Peru, Radio Melodia 5939do
1400 1500 Peru, Radio Ondas del Suroiente 5120do
1400 1500 Peru, Radio San Miguel 4930do
1400 1500 Peru, Radio Santa Monica 4965do
1400 1500 Peru, Radio Santa Rosa 6047do
1400 1500 Peru, Radio Tarma 4775do
1400 1500 Peru, Radio Union 6114do
1400 1500 Peru, Radio Victoria 6019do 9720do
1400 1500 Peru, Radio Vision 4790do
1400 1500 Spain, Radio Exterior de Espana 15585eu
21610me
1400 1500 mtwhf Spain, Radio Exterior de Espana 17595na
21540af
1400 1500 fa Spain, Radio Exterior de Espana 5970ca
11880na
1400 1500 smtwhf Spain, Radio Exterior de Espana 11815sa
1400 1500 Sat/Sun Spain, Radio Exterior de Espana 17755af
1400 1500 Sun Spain, Radio Exterior de Espana 17715sa
1400 1500 USA, EWTN/WEWN Irondale, AL 11550ca
12050sa
1400 1500 USA, Radio Marti 11930ca 13820ca 15330ca
1400 1500 USA, WYFR/Family Radio Worldwide 6085ca
11670ca 11865na 11970sa 13800sa
15130ca 17555sa 18980sa
1400 1500 Venezuela, Radio Amazonas 4940do

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

1500 1545 USA, WYFR/Family Radio Worldwide 11670ca
11970sa 13800sa 17555sa
1500 1600 Bolivia, Radio Eco 4409do
1500 1600 Bolivia, Radio Nacional de Huanuni 5965do
1500 1600 Bolivia, Radio San Jose 5580do
1500 1600 Bolivia, Radio San Miguel 4700do
1500 1600 Bolivia, Radio Santa Ana 4451do
1500 1600 Bolivia, Radio Tacana 4781do
1500 1600 Chile, CVC La Voz 9635sa 17680sa
1500 1600 Colombia, La Voz de tu Conciencia 6010do
1500 1600 Colombia, La Voz del Guaviare 6035do
1500 1600 Colombia, Marfil Estereo 5910do
1500 1600 Cuba, Radio Havana Cuba 11690ca 13680ca
13750na 15370sa 17750sa
1500 1600 Sun Cuba, Radio Nacional de Venezuela 11690ca
12010sa 13680ca 13750na 17750sa
1500 1600 Cuba, Radio Rebelde 5025na 6140na
12040ca
1500 1600 Dominican Republic, Radio Amanecer Int'l
6025do
1500 1600 Ecuador, Radio El Buen Pastor 4814do
1500 1600 Ecuador, Radio Quito 4919do
1500 1600 Honduras, HRMI/ Radio Misiones Intl 3340do
1500 1600 Honduras, Radio Luz y Vida 3250do
1500 1600 Mexico, XEOI/Radio Mil 6010do
1500 1600 Mexico, XERTA/Radio Transcontinental 4800do
1500 1600 Mexico, XEXQ/Radio Universidad 6045do
1500 1600 Peru, La Voz de Anta 5323do
1500 1600 Peru, La Voz de la Selva 4824do
1500 1600 Peru, La Voz de las Huarinjas 5059do
1500 1600 Peru, Radio Bethel 5921do
1500 1600 Peru, Radio Cusco 6195do
1500 1600 Peru, Radio del Pacifico 9675do
1500 1600 Peru, Radio Frecuencia Popular 5485do
1500 1600 Peru, Radio La Reina de la Selva 5486do
1500 1600 Peru, Radio Libertad de Junin 5039do
1500 1600 Peru, Radio Madre de Dios 4950do
1500 1600 Peru, Radio Maranon 4835do
1500 1600 Peru, Radio Melodia 5939do
1500 1600 Peru, Radio Ondas del Suroiente 5120do
1500 1600 Peru, Radio San Miguel 4930do
1500 1600 Peru, Radio Santa Monica 4965do
1500 1600 Peru, Radio Santa Rosa 6047do
1500 1600 Peru, Radio Union 6114do
1500 1600 Peru, Radio Victoria 6019do 9720do
1500 1600 Peru, Radio Vision 4790do
1500 1600 Spain, Radio Exterior de Espana 15585eu
21610me
1500 1600 mtwhf Spain, Radio Exterior de Espana 15385af
17715sa
1500 1600 Sat Spain, Radio Exterior de Espana 9765ca
1500 1600 Sun Spain, Radio Exterior de Espana 11815sa
17715sa 17850na
1500 1600 USA, EWTN/WEWN Irondale, AL 11550ca
12050sa
1500 1600 USA, KJES Vado NM 11715ca
1500 1600 USA, Radio Marti 11930ca 13820ca 15330ca
1500 1600 USA, WYFR/Family Radio Worldwide 6085ca
13695na 15130ca
1500 1600 Venezuela, Radio Amazonas 4940do

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

1600 1630 France, Radio France Internationale 17690as
1600 1700 Bolivia, Radio Eco 4409do
1600 1700 Bolivia, Radio Nacional de Huanuni 5965do
1600 1700 Bolivia, Radio San Jose 5580do
1600 1700 Bolivia, Radio San Miguel 4700do
1600 1700 Bolivia, Radio Santa Ana 4451do
1600 1700 Bolivia, Radio Tacana 4781do
1600 1700 Chile, CVC La Voz 9635sa 17680sa
1600 1700 Colombia, La Voz de tu Conciencia 6010do
1600 1700 Colombia, La Voz del Guaviare 6035do
1600 1700 Colombia, Marfil Estereo 5910do
1600 1700 Cuba, Radio Havana Cuba 11690ca 13680ca
13750na 15370sa 17750sa
1600 1700 Sun Cuba, Radio Nacional de Venezuela 11690ca
12010sa 13680ca 13750na 17750sa
1600 1700 Cuba, Radio Rebelde 5025na 6140na
12040ca
1600 1700 Dominican Republic, Radio Amanecer Int'l
6025do
1600 1700 Ecuador, Radio Quito 4919do
1600 1700 Honduras, HRMI/ Radio Misiones Intl 3340do
1600 1700 Mexico, XEOI/Radio Mil 6010do
1600 1700 Mexico, XERTA/Radio Transcontinental 4800do
1600 1700 Mexico, XEXQ/Radio Universidad 6045do
1600 1700 Peru, La Voz de Anta 5323do
1600 1700 Peru, La Voz de la Selva 4824do
1600 1700 Peru, La Voz de las Huarinjas 5059do
1600 1700 Peru, Radio Bethel 5921do
1600 1700 Peru, Radio Cusco 6195do
1600 1700 Peru, Radio del Pacifico 9675do
1600 1700 Peru, Radio Frecuencia Popular 5485do
1600 1700 Peru, Radio La Reina de la Selva 5486do
1600 1700 Peru, Radio Libertad de Junin 5039do
1600 1700 Peru, Radio Madre de Dios 4950do
1600 1700 Peru, Radio Maranon 4835do
1600 1700 Peru, Radio Melodia 5939do
1600 1700 Peru, Radio Ondas del Suroiente 5120do
1600 1700 Peru, Radio San Miguel 4930do
1600 1700 Peru, Radio Santa Monica 4965do
1600 1700 Peru, Radio Santa Rosa 6047do
1600 1700 Peru, Radio Union 6114do
1600 1700 Peru, Radio Victoria 6019do 9720do
1600 1700 Peru, Radio Vision 4790do
1600 1700 Spain, Radio Exterior de Espana 15585eu
21610me
1600 1700 mtwhfa Spain, Radio Exterior de Espana 15385af
17715sa
1600 1700 Sat Spain, Radio Exterior de Espana 9765ca
11815sa 17850na
1600 1700 Sun Spain, Radio Exterior de Espana 11815sa
17715sa
1600 1700 Sat/Sun Spain, Radio Exterior de Espana 17755af
1600 1700 USA, EWTN/WEWN Irondale, AL 11550ca
12050sa
1600 1700 USA, KVOH Rancho Simi CA 17775ca
1600 1700 USA, Radio Marti 11930ca 13820ca 15330ca
1600 1700 USA, WYFR/Family Radio Worldwide 15130ca
21670eu
1600 1700 Venezuela, Radio Amazonas 4940do
1630 1700 Bulgaria, Radio Bulgaria 11700eu 15700eu
1630 1700 Turkey, Voice of Turkey 11930va

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

1700 1730 Turkey, Voice of Turkey 11930va
1700 1800 Argentina, Radio Nacional 6060do
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	Sun	Cuba, Radio Nacional de Venezuela			11690ca
			12010sa	13680ca	13750na	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		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, 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 Bethel 5921do			
1700	1800		Peru, Radio Cusco 6195do			
1700	1800		Peru, Radio del Pacifico	9675do		
1700	1800		Peru, Radio Frecuencia Popular			5485do
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 Maranon	4835do		
1700	1800		Peru, Radio Melodia	5939do		
1700	1800		Peru, Radio Ondas del Suroiente			5120do
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 Union 6114do			
1700	1800		Peru, Radio Victoria	6019do	9720do	

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/**
Austria, Radio Austria International **http://oe1.orf.at/service/international**
Bahrain, Radio Bahrain ..... **www.radiobahrain.fm/**
Bangladesh, Bangladesh Betar ..... **www.betar.org.bd/**
Bangladesh, Bangladesh Betar/Home Service ..... **www.betar.org.bd/**
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/**
Bulgaria, Radio Bulgaria/Euranet ..... **www.bnr.bg/**
Canada, Bible Voice Broadcasting Network ..... **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/Malabo ..... **www.panambc.com**
Equatorial Guinea, Radio African 2/Malabo ..... **www.panambc.com**
Equatorial Guinea, Radio East Africa/Malabo ..... **www.panambc.com**
Ethiopia, Radio Ethiopia ..... **www.erta.gov.et**
Ethiopia, Radio Ethiopia/Home Service ..... **www.erta.gov.et**
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, VOIRI/IRIB ..... **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/World Harvest Radio International ..... **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/Saudi Radio ..... **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 ..... **http://myafn.dodmedia.osd.mil/**
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, Voice of America ..... **www.voanews.com/**
USA, Voice of America/Special English ..... **www.voanews.com/**
USA, Voice of America/Studio 7 ..... **www.voanews.com/zimbabwe/news**
USA, WBCQ Monticello ME ..... **www.wbcq.com/**
USA, WHRI Cypress Creek SC ..... **www.whr.org/**
USA, WINB Red Lion PA ..... **www.winb.com/**
USA, WRMI/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 ..... **www.vov.org.vn**
Zambia, CVC 1 Africa ..... **www.voiceafrica.net**

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Something New in Monitoring Military

Back "in the day," when I first started monitoring aircraft communications, in order to hear any aircraft, you had to buy a tunable radio with an analog dial – there were no scanners. If you were patient and knew where to tune, you might get lucky and even hear a civilian aircraft or two.

By 1983, Bearcat finally released the first programmable scanner that included the 118-136 MHz civilian aircraft band – the Bearcat BC-220 scanner. That was great, but we still didn't have a consumer radio that included the 225-400 MHz military aircraft frequencies.

If you wanted to monitor military aircraft, your options were few. Those limited options usually required you to purchase a piece of military surplus gear that weighed in at a pound or two just south of a ton, and could only monitor one UHF frequency at a time.

Soon after the release of the BC-220, it didn't take long for a young radio entrepreneur by the name of Bob Grove to devise a way to add the 225-400 MHz UHF military aircraft band to that scanner. He developed an add-on electronic box that used a band stacking technique to let the monitor access to the military aircraft band. Thanks to the Grove Scanverter, anyone could now listen to military aircraft communications.

Little did Bob know that his milair Scanverter would start a bit of a revolution. Within a very short period of time, nearly every major scanner manufacturer decided that it would be worthwhile to produce scanners that included that secretive UHF military frequency band.

Of course, there have been other major technology changes that have affected the milcom monitoring hobby. We have P25 trunk tracking scanners that let us listen to the current crop of military land mobile radio systems. We have added more memory frequencies, computer control, and even Close Call/Signal Stalker to aid our listening efforts. But since the early 1980s, we haven't had any real advances in monitoring the aircraft themselves. We still use voice only frequencies to determine what is in our area.

But there is a new innovation – the virtual radar screen – that is changing this. No longer will you have to "catch" your military aircraft talking on a voice frequency to add them to your logbook or database. Virtual radar screen technology lets you graphically display the position of certain avionics-equipped aircraft on your computer screen and present them in relation to your monitoring location. Now that is a definite improvement on trying to be on the right frequency at the right time listening for an aircraft passing overhead!

To pull off this bit of magic, this new technology uses the Mode-S/ADS-B (1090 MHz) data stream that aircraft send to ground-based facilities. Most civilian and military aircraft carry Mode-S airborne transponders, which provide altitude and identification data. If the aircraft sends out an Automatic Dependent Surveillance-Broadcast (ADS-B) via its Mode-S transmission, a GPS derived latitude, longitude, and altitude is also included in the data stream. So, in order to see an aircraft's position on your computer screen, the aircraft has to be sending ADS-B with position information enabled. This ADS-B "squitter," as it is known, is broadcast randomly at between 0.5 and one second intervals.

Mode S transponders also broadcast information that includes the call sign of the aircraft and/or the transponder's permanent ICAO 24-bit address in the form of a hex code.

All modern aircraft are assigned a unique ICAO 24-bit address or (informally) Mode-S "hex code" upon national registration, and this address becomes a part of the aircraft's Certificate of Registration. Normally, the address is never changed; however, the transponders can be reprogrammed. Occasionally, they are moved from one aircraft to another (presumably for operational or cost purposes), either physically by maintenance or by changing the appropriate entry in the aircraft's flight management system (FMS).

There are 16,777,214 unique ICAO 24-bit addresses (hex codes) available. The ICAO 24-bit address can be represented in three digital formats: hexadecimal, octal, and binary. These addresses can be decoded and converted amongst each other online, using tools such as those at **Airframes.org** and **Kloth.net** to obtain the aircraft's tail number. Whichever format is used, the same information is carried through the Mode-S signal.

With the appropriate receiving equipment, you can take this Mode-S/ADS-B information, decode it and then, as mentioned before, display it on a computer screen relative to the position you have inputted into the decoding program.

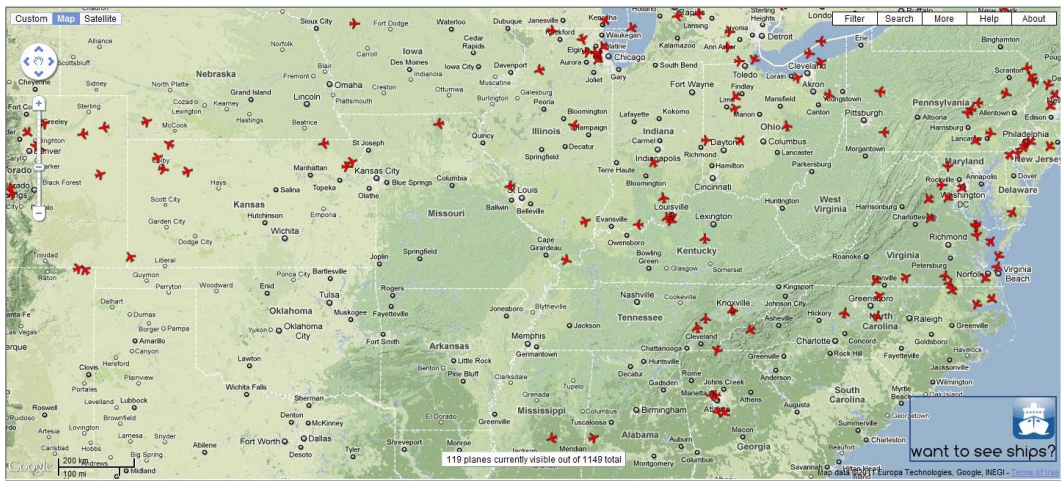
So what does it take to watch the planes on your display? You will need the following:

- An antenna for 1090 MHz
- An ADS-B receiver as the front end
- A Mode-S/ADS-B decoder
- A computer with the appropriate software package to display the data.

The antenna receives the 1090 MHz RF signals and feeds it via coaxial cable to the ADS-B receiver. The receiver then selects, amplifies and demodulates the signals. Its output is a so-called analog video signal (it has nothing to do with an image in the radar sense). This is sent to the digital decoder that converts the analog video into a digital signal. This digital signal is then sent via USB (or RS232) onto a computer. The computer receives the digital transponder data from the decoder and uses that data to post up the aircraft it receives on a virtual radar image on your computer screen.

For each of these four modules there are different solutions on the web and I have given you some links to investigate in Table 1.

Bottom line, we can track ADS-B equipped aircraft and identify Mode-S traffic in real-time



using a Mode-S/ADS-B equipped station.

Room precludes me from including a detailed technical explanation on all this, so I will divert that discussion to future columns here in *MT*. In the meantime, if you want to get an idea of what may be possible, I have included in Table 2 an abbreviated list of the military aircraft that I saw over a two-week period here in B'town.

If you would like to get a sense of what is happening right now, you can do that by going to a free online map (PlaneFinder) supplied by PinkFroot (see reference guide). It will show you all the active ADS-B aircraft currently being received worldwide, including the ones I am seeing here in Btown. You can also purchase apps to monitor these ADS-B equipped aircraft for your smartphone from PinkFroot.

In addition to watching my ADS-B intercepts on the PlaneFinder map mentioned above, you can follow my current exploits in Mode-S/ADS-B monitoring on my *Milcom* blog (**mt-milcom.blogspot.com**) or late breaking stuff on my twitter feed **@MilcomMP**. Until next time, 73 and good hunting.

MODE-S/ADS-B REFERENCE GUIDE

Active Display Lite - **www.gatwickaviationsociety.org.uk/ADL_home.asp** (Software)
ADS-B Decoder (Russian) - **http://diseqc.org.ua/projects/hard/adsb/index.html** (Homebrew)
Airframes.org - **www.airframes.org/**
AirNav Systems - **www.airnavsystems.com/RadarBox/**
Aurora Mode - **www.auroraeurotech.com**
Bones Aviation Page - **www.homepages.mcb.net/bones/index.htm**
DPD Productions - **www.dpdproductions.com/** (High-end 1090 MHZ antennas)
Easy ADS-B decoder - **http://xavier.fenard.free.fr/fxad.htm** (Homebrew)
F5ANN Mode-S Projects (French) - **http://f5ann.pagesperso-orange.fr/** (Homebrew)
Gatwick Aviation Society (Mode-S lookups) - **www.gatwickaviationsociety.org.uk/modeslookup.asp**
Kinetic Aviation - **www.kinetic-avionics.co.uk/**
Kloth.Net - **www.kloth.net/radio/**
MiniADSB (German) - **http://miniadsb.web99.de/** (Homebrew)
Pinkfroot - http://my.pinkfroot.com/ (Aviation and Marine iPhone/Touch/Pad and Android Smartphone Apps)
Plane Finder - **http://planefinder.net/** (Sponsored by Pinkfroot)
Plane Gadget Radar - **www.radargadgets.com/**
Plane Plotter - **www.coaa.co.uk/planeplotter.htm** (Software)
RxControl Mode-S Receiver - **http://rxcontrol.free.fr/PicADSB/index.html** (Homebrew)
SBS Support Pages by jetvision - **http://jetvision.de/sbs.shtml**
Ship Finder - **http://shipfinder.co/** (Sponsored by Pinkfroot)
Simple ADSB Receiver - **www.lll.lu/~edward/edward/adsb/Very%20Simple%20ADSB%20receiver.html** (Homebrew)

MODE-S/ADS-B MILITARY AIRCRAFT SAMPLER FROM BRASSTOWN NC

U.S. Air Force

ICAO24 Hex Code	Aircraft Serial No.	Mode-S Callsign	Aircraft Type	Military Unit Assigned
AE0301	78-0811	ALLIED 1	C-130H	
ADFE7E	92-3285	ALLIED 1	C-130H	934AW/96AS
ADFDEB	94-6706	ANVIL78/85	C-130H	130AW/130AS
AE066F	62-3580	BACKY78	KC-135	916ARW/77ARS
AE0651	58-0057	BAT91	KC-135R	185ARW/174ARS
AE01AA	84-0071	BATTL02	C-21A	110FW/172AS
AE017A	84-0142	BATTL10	C-21A	110FW/172AS
AE0192	84-0125	BATTL14	C-21A	103AW/118AS
AE0192	84-0125	BATTL22	C-21A	103AW/118AS
AE05E0	87-9283	BISON21	C-130H	914AW/328AS
AE0154	63-8045	BOLT31	KC-135R	6AMW/927ARW
ADFDBA	93-1040	BULL44	C-130H	19AW
AE1245	62-1841	BULL99	C-130E	189AW/154TS
AE02E7	84-0204	COBB04	C-130H	94AW/700AS
AE02E2	81-0627	COBB27	C-130H	94AW/700AS
AE02E3	81-0628	COBB28	C-130H	94AW/700AS
AE02E5	81-0630	COBB30	C-130H	94AW/700AS
AE07FE	98-0052	COHO85	C-17A	62AW
AE018C	84-0098	COUGR08	C-21A	375AW/457AS
AE0189	84-0095	COUGR22	C-21A	375AW/457AS
ADFE68	91-1237	DERBY32	C-130H	123AW/165AS
AE02F4	86-0411	DEUCE43	C-130H	440AW/95AS
AE08E2	01-1462	E11462	C-130J-30	46AW/115AS
AE119A	03-3117	E33117	C-17A	172AW/183AA
ADFDC2	93-1455	EPIC55	C-130H	145AW/156AS
ADFDC5	93-1458	EPIC60	C-130H	145AW/156AS
ADFDC9	93-1563	EPIC63	C-130H	145AW/156AS
AE01A8	84-0069	FAME66	C-21A	314AW/45AS
AE055F	85-0002	FIXER50	C-5M	LockheedRERPMod Aircraft
AE2739	KC-3805	FIXER55	C-130J	India AF Lockheed Test Flight
ADFEA7	96-1004	GOFER04	C-130H	133AW/109AS
ADFEA9	96-1006	GOFER22	C-130H	133AW/109AS
AE0321	74-2134	HAFER54	C-130H	317AG
AE05B3	85-0040	HANK40	C-130H	908AW/357AS
AE022A	86-0032	HOIST91	KC-10A	305AMW
AE04E9	61-0272	INDY81	KC-135R	434ARW/72ARS
AE0485	62-3521	INDY81	KC-135R	434ARW/72ARS
AE01AA	84-0071	JOSA261	C-21A	110FW/172AS
AE0196	84-0065	JOSA262	C-21A	375AW/458AS
AE01AA	84-0071	JOSA481	C-21A	110FW/172AS
AE018E	84-0100	JOSA714	C-21A	119WG/117AS
AE0175	84-0120	JOSA721	C-21A	119WG/117AS
AE01BC	84-0130	JOSA903	C-21A	375AW/311AS
AE1222	65-0988	KING 15	MC-130P	347RQW/71RQS
AE20C7	07-7186	LIFTR35	C-17A	437AW
AE04BD	58-0076	MASH83	KC-135R	434ARW/72ARS
AE08E2	01-1462	OCEAN93	C-130J-30	146AW/115AS
AE05D8	85-0038	ODIN10	C-130H	908AW/357AS
AE05DA	85-0041	ODIN11	C-130H	910AW/757AS
AE02F1	85-1368	ODIN13	C-130H	136AW/181AS
AE1BF0	07-4637	ODIN14	C-130J-30	19AW
AE0840	58-0058	OKIE83	KC-135R	507ARW/465ARS
AE0244	63-8044	OKIE91	KC-135R	507ARW/465ARS
AE0222	85-0030	OPEC38	KC-10A	305AMW
AE05E7	88-4405	PACKR320	C-130H	440AW/95AS
AE1488	86-0416	PEACH24 Also PEACH 31/35/61/68	TE-8a	330th CTS
AE148B	92-3290	PEACH33	E-8C	116ACW
AE1493	96-0043	PEACH33	E-8C	116ACW
AE149A	02-9111	PEACH33/35	E-8C	116ACW
AE0302	78-0812	PITT12	C-130H	911AW/758AS
AE0303	78-0813	PITT13	C-130H	911AW/758AS
AE12FE	62-1806	PUMA79	C-130E	19AW
AE117E	02-1112	RCH252/2112	C-17A	172AW/183AS
AE10C0	01-0197	RCH528T	C-17A	437AW
AE1174	02-1102	RCH2102	C-17A	62AW
AE07D5	92-3291	RCH2291	C-17A	62AW
AE0154	63-8045	RCH3045	KC-135R	6AMW/927ARW
AE1196	03-3113	RCH3113/890	C-17A	172AW/183AS
AE1197	03-3114	RCH3114	C-17A	172AW/183AS
AE1198	03-3115	RCH3115	C-17A	172AW/183AS
AE1199	03-3116	RCH3116/597	C-17A	172AW/183AS
AE119A	03-3117	RCH3117	C-17A	172AW/183AS
AE1196	03-3119	RCH3119/528	C-17A	172AW/183AS
AE1233	03-3122	RCH3122	C-17A	437AW
AE0589	87-0044	RCH7044	C-5B	60AMW/22AS
AE07F4	97-0042	RCH9742	C-17A	62AW
ADFEB3	73-1676	RENT46	E-4B	NAOC55WG/1ACCS
ADFE82	92-0547	ROCK42	C-130H	19AW
ADFDBA	93-1040	ROCK43	C-130H	19AW
AE119B	03-3118	RULER31	C-17A	172AW/183AS
AE128A	69-5822	SHADO91	MC-130P	16SOW/9SOS
AE12BC	69-5823	SHADO98	MC-130P	16SOW/9SOS
AE02FE	78-0808	SHARK14	C-130H	911AW/758AS
AE0272	64-14840	SLUFF31	KC-135R	121ARW
AE0368	63-8013	SLUFF41	KC-135R	121ARW
AE0379	63-7992	SLUFF62	KC-135R	121ARW
AE11EB	80-0138	SNTRY30H	E-3C	552ACW
AE11E4	78-0576	SNTRY60H	E-3B	552ACW
AE11EF	82-0006	SNTRY60H	E-3C	552ACW
AE087F	01-0029	SPAR29	C-37A	6AMW/310AS
ADFEAD	84-0192	SPUR53	KC-10A	305AMW
AE0238	58-0074	STEEL83	KC-135T	171ARW
AE0196	84-0065	SWIFT01	C-21A	375AW/458AS
AE0173	84-0118	SWIFT23	C-21A	375AW/458AS
AE12B8	88-0193	TALON11	MC-130H	
AE0362	59-1453	TAZZ32	KC-135R	121ARW
AE0272	64-14840	TAZZ51	KC-135R	121ARW
AE0384	59-1458	TAZZ52	KC-135R	121ARW
AE025E	61-0264	TAZZ82	KC-135R	121ARW
AE035A	57-2593	TAZZ86	KC-135R	121ARW
AE01DD	79-1712	TEAM 43	KC-10A	305AMW
ADFDCA	93-2041	TORCH55	C-130H	182AW/169AS
AE04B8	58-0018	TURBO81	KC-135R	22ARW
AE04FC	58-0011	TURBO85	KC-135	22ARW
AE02D4	92-3024	VADER4	C-130H	910AW/757AS
AE02D3	92-3023	VADER23	C-130H	910AW/757AS
ADFE81	92-3288	VIKNG61	C-130H	934AW/96AS
ADFE7A	92-3281	VIKNG96	C-130H	934AW/96AS
AE49C1	09-9205	VOLT29	C-17A	437AW
AE07EE	96-0004	VOLT35	C-17A	437AW
AE1234	03-3123	VOLT36	C-17A	437AW

U.S. Army Aircraft

AE2126	07-27011	BOXCAR10	C-27J	
AE4ADF	09-27016	BOXCAR15	C-27J	
AE04AD	99-0104	DUKE88	UC-35a1	A/2-228 AVN (TA)
AE118A	02-1863	PAT63	C-37A	OSACOM PATD
ADFEBD	96-0107	PAT283	UC-35a1	USARC 2-228 AVN
ADFECB	84-0485	PAT0485	RC-12N	
ADFED2	85-1264	PAT878	C-12U	OSACOM VA RFC
ADFE4D	94-0321	R40321	C-12R	USARC 6-52 AVN (TA)

U.S. Navy/Marine Corps

AE29FD	166694	CNV4342	C-40A	VR-59
AE04D7	165829	CNV4877	C-40A	VR-58
AE04D8	165830	CNV4882	C-40A	VR-59
ADFEF1	161529	CNV9654	C-9B	VR-46
AE040F	162783/784	GOTOFMS	E-6B	VQ-3
AE0416	164404	GOTOFMS	E-6B	VQ-4
ADFEEA	160046	LOBO 01	C-9B	VMR-1
AE1192	166474	LOBO625	UC-35D	MAW-4
AE1194	166472	OTIS03	KC-130J	VMGR-252
AE0409	165737	OTIS11	KC-130J	VMGR-252
AE08DA	166380	OTIS24	KC-130J	VMGR-252
AE0409	165737	OTIS31	KC-130J	VMGR-252
AE151A	166377	VV377	C-37B	VR-1
ADFEF2	161530	VVJS349	C-9B	VR-46
ADFEF0	161266	VVJS917	C-9B	VR-46
ADFEEC	160048	VVJT733	C-9B	VR-52
ADFEED	160049	VVJU049	C-9B	VR-56
ADFEE2	159113	VVJU446	C-9B	VR-61

Foreign Military Aircraft

477FF2	02	BRK97	C-17A	Hungary NATO
C2B567	130607	CFC2517	CC-130J-30	Canada CAF 8WG
C2B3F5	177704	CFC3635	CC-177	Canada CFC 429SQN

Government Contract Airlines

A62778	N496MC	GTI603	Boeing 747-212B	Atlas Air
AA90A0	N780BA	GTI4433	B-747-409	Evergreen International
A7D27A	N603AX	OAE362	DC-10	Omni Air International
A6B43A	N531AX	OAE366	DC-10	Omni Air International
AA59AE	N766VA	RBY601	Boeing 767-2Q8	Vision Airlines
A05408	N120DL	RYN200	Boeing 767-332	Ryan Intl Airlines
A6A065	N526NA	RYN7527	Boeing 757-236	Ryan Intl Airlines
15407F	RA-82047	VDA2403	An-124-100	Russia Volga-Dnepr Airlines
A2AC28	N271WA	WOA8129	MD-11F	World Airways
A2B396	N273WA	WOA8129	MD-11F	World Airways
A2C272	N277WA	WOA8520	MD-11F	World Airways
A2A871	N270WA	WOA9614	MD-11F	World Airways

BROADCAST BANDSCAN

THE WORLD OF DOMESTIC BROADCASTING

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Radio, Dead or Alive?

Ken Reitz forwarded me a link to an article on the Motley Fool investment website: "Radio is Dead" will certainly catch a radio hobbyist's attention! In this article, Rick Aristotle Munarriz questions Cumulus Media's decision to buy Citadel Broadcasting. Munarriz suggests that competition from Sirius XM satellite radio and from online stations streamed through smartphones and Internet-enabled dashboards will make it difficult to impossible for Cumulus to make a reasonable return on their investment.

In my opinion, the commercial broadcasting industry has cost-cut itself to death. Local content has given way to edicts to "shut up and play the music: it's cheaper." Commercial broadcasters now dedicate staffs to a careful selection of music, designed to match listeners' tastes. Given the field on which they're competing, I think Munarriz missed radio's most dangerous competitor: the iPod. The problem radio faces is that when I'm programming my MP3 player, the person matching music to my tastes is *me*. No radio programmer can do a better job of matching my tastes than I can.

I'm old enough (51) to remember a day when radio provided added value to the music it broadcast. You learned something about the record you just heard; about similar artists and music; about events in the community. Today, that seems to be missing. Radio has become a remote-control jukebox, but it's under the control of the guy at the other end of the bar. (*Why did he play E-37? I hate that song!*)

Talk radio isn't performing much better. Local content is rapidly disappearing. Whether you agree with Glenn Beck's political viewpoints or not, there is a limit to how many times you want to hear his position on the same issue. I remember a time in which, when something happened, you went to the radio and tuned into the local news station. Today, you go to the TV or to cnn.com – but only if the event is big enough to be covered.

Quite simply, radio isn't providing anything you can't get somewhere else.

This situation is not limited to North America. The BBC World Service reports the closure of their broadcasts on 648 kHz via their transmitter in Orford Ness in southeastern England. AM broadcasts to Russia on other unspecified frequencies have also ceased. The BBC notes these broadcasts continue to be available across Europe via satellite, cable TV, and the Internet. (And, in the UK on digital terrestrial radio and TV, and overnight on BBC Radio 4.)

On the other hand...

On the other hand, recent developments in Internet billing may limit the ability of online streaming media and podcast downloads to replace traditional broadcast radio. As online listening/viewing becomes more popular, Internet Service Providers ("ISP"s) are finding it more difficult to provide promised speeds. Rather than backing off on their promises, ISPs are working to limit large downloads. A common method is "metering," allowing a moderate amount of data download as part of the standard monthly charge, then levying a significant additional charge for each megabyte of data downloaded beyond that limit.

Metering is common among wireless providers and is seeing growing interest from fixed ISPs. It has become a bit of a political issue in Canada, with the Canadian Radio-television and Telecommunications Commission (CRTC) deciding not to prohibit the practice. (I'm writing two days after the May election was called, so it's too early to know who won, let alone how the results will affect the metering issue.)

Metering is probably a bigger issue for online television, given the very large size of video downloads. Lower download caps for wireless service may, however, make it economically impractical for streaming media to replace traditional radio for mobile listening.

❖ FM "Translator Stations"

If you've been reading *Broadcast Bandscan* for awhile, you've read about how FM translators have recently been converted into standalone radio stations. These low-power stations were originally intended to extend the signals of FM stations into places they didn't ordinarily reach. More recently, the FCC has allowed these translators to relay AM stations (and, to continue to operate at night, even if the associated AM station is required to sign off). Plus, they've been allowed to relay the HD2, HD3, and HD4 subchannels of FM High Definition radio stations. But, does anyone actually *listen* to these newly-minted low-powered stations?

The antenna of FM translator station W271AB

Apparently, the answer is yes. Arbitron recently released the February ratings for Nashville. In either 23rd or 28th place (depending on which methodology you choose), is "WPRT-FM HD2." Either way, WPRT-HD2 beat every Nashville AM station except 50,000-watters WSM-650 and WLAC-1510, and one of the market's Hispanic AM stations. (Which one, also depends on which methodology.) It also beat most of the non-commercial FM stations.

What the numbers don't say is that WPRT-HD2 is relayed on an FM translator. W271AB transmits on 102.1 *analog* FM, with a power of 145 watts from the channel 4 TV tower on Nashville's west side. The station is promoted as "102.1 The Light," with a format of gospel music. I think you can probably assume nearly all of the people listening are listening to the translator.

Low-power analog TV stations on channel 6 are another form of "not really a radio station radio station." Their TV sound can be heard at 87.75 on the FM dial, and due to loopholes in the FCC regulations, they can be operated as radio stations as long as a picture signal also exists. WLFM in Chicago is an example of such a station. It came in 27th in the ratings – beating seven of Chicago's AM stations, including two 50,000-watt outlets.

❖ Digital Radio: Dying in Canada

The CBC has surrendered the licenses of 14 DAB transmitters for cancelation. These transmitters had operated in Windsor, Toronto, Ottawa, and Vancouver since 1998. They used the Eureka 147 DAB system which has found some success in the UK. However, in Canada it is possible the 14 DAB transmitters outnumbered DAB receivers. (I'm being facetious, though I wonder if that's not too far from the truth!)

DAB is still *allowed* in Canada, and there are still a small number of private transmitters

on the air. I suspect these transmitters will soon join the CBC DAB transmitters in oblivion.

IBOC/HD Radio, the US system, is also allowed in Canada. To my knowledge there are currently no Canadian stations using IBOC, though. Two CBC stations in Toronto had experimented with it. A private station in Northern Ontario has been promoting itself as being in HD, but observers believe that's probably not actually the case.

❖ IBOC: Bad for DXers and Stations, too?

The Detroit Pistons may have dropped WDFN-1130 as their radio affiliate due to IBOC interference. An article in *Radio & Television Business Report* quotes the Pistons' Director of Broadcasting as citing "...a weak signal..." as the reason for moving the games from Clear Channel's WDFN to CBS's WXYT.

The *Report* writer speculates the "weak signal" was the result of interference from IBOC on adjacent-channel stations KMOX-1120 (St. Louis) and WRVA-1140 (Richmond, Va.). I can certainly confirm that KMOX's IBOC yields a heck of a punch here in the Nashville area!

❖ Radio on the Road

I received a couple of letters in response to my query about Travelers' Information Stations (TISs) in my April column.

Paul Manning of Massachusetts is listening to "Logan Radio," on 1650 kHz from the Logan International Airport in Boston. WQBQ732 is operated by the Massachusetts Port Authority (Massport), broadcasting a loop of information on airport parking and similar subjects. I suspect many listeners remember hearing similar stations at the DFW Airport in Texas on 1640 and 1680 kHz.

Larry Wheeler W9QR of Indiana did some cross-border TIS DXing. He heard CFYZ-1280 from Pearson International Airport in Toronto, using an Icom R71A and a 160m inverted-V antenna. The airport's Operations Manager provided a QSL for Larry's reception, noting their transmitting antenna was about 0.2% efficient... I believe this station was operating at 99 watts at the time. It eventually increased power to 400 watts, then switched to a business-news format and changed call letters to CFBN, before going off the air.

TISs in Canada can switch to other formats. That's not allowed in the US.

❖ Hello testing 1..2..3..4..

Saul Chernos succeeded in scheduling a number of DX test broadcasts in March. A test on WKVQ-1540 Eatonton, Georgia was heard across North America and in Europe. (WKVQ was *very* strong here in Tennessee, and I have an "e-QSL," received by email from WKVQ's Craig Baker.)

A test on nearby WYTH-1250 Madison, Georgia was also widely heard. Tests at three stations in the Quincy, Illinois area have been postponed. Stay tuned!

❖ New Community Radio

Myron, of community station KZGM "KZ88" in Missouri, passed along notice of the sign-on of another similar station in Greenville, Mississippi. WDSV-91.9 debuted on the afternoon of March 11th.

"Community" stations generally broadcast massive amounts of locally-originated programming, including spoken-word (often of a left-of-center viewpoint) and unusual types of music. Many observers felt this was the kind of radio we'd be seeing on LPFM stations.

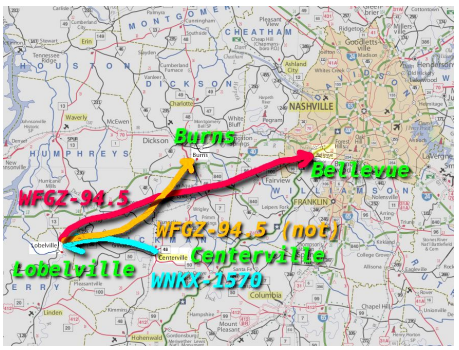
A fair number of LPFMs do indeed operate as community stations, including my local WRFN-LP. But, we've also seen a number of new community stations appear with "regular" non-commercial FM licenses. KZGM and WDSV are, of course, two examples; another one to recently debut is WDRT in Viroqua, Wisconsin.

❖ Musical chairs

If you look in the sidebar, you'll note WNKX-1570 has been granted permission to move from Centerville, Tennessee to Lobelville. This move is part of a bit of musical chairs, involving WNKX and two FM stations.

WFGZ-FM 94.5 wished to move from Lobelville, about 80 miles west of Nashville, into the Nashville neighborhood of Bellevue. Their application was temporarily blocked by the request of a station in Cookeville, 80 miles east of Nashville, to install a taller tower. Eventually, the Cookeville station dropped their tower plans, removing the technical block to WFGZ's plans.

However, there was still a legal block. WFGZ was the only radio station in Lobelville. FCC policy does not allow deletion of a city's only frequency assignment. WFGZ's answer was to buy an AM station in Centerville, 22 miles away, and move it to Lobelville. This move works, since, unlike Lobelville, Centerville has two radio stations. The other station, WNKX-FM, will stay put in Centerville and satisfy the FCC policy.



Tennessee stations WNKX-1570 and WFGZ-94.5 are playing musical chairs

The WNKX move will result in a significant reduction in power. This is a tough catch as it is. (I'm only about 50 miles from the existing site, and I consider WNKX-AM to be DX...) It will be that much harder to log after it moves.

❖ 'Til next month

Do you listen to radio over something other than a radio? Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to *dougsmith@monitoringtimes.com*. Good DX!

URLS IN THIS MONTH'S COLUMN

http://americanbandscan.blogspot.com My DX blog.

www.rbr.com/radio/detroit-pistons-moved-to-cbs-due-to-hd-radio-interference.html Detroit Pistons' game coverage moved due to IBOC?

www.fool.com/investing/general/2011/03/10/radio-is-dead.aspx *Motley Fool* article on the viability of the radio business

www.radio-info.com/markets - See how your favorite station did in the February ratings...

http://en.wikipedia.org/wiki/Countries_using_DAB/DMB Status of Digital Audio Broadcasting in various countries

www.michaelgeist.ca/content/blogcategory/71/161/ Michael Geist's blog on telecommunications law and Usage Based Billing

www.smooth877.com/ - WLFM-LP, a Chicago radio station that isn't really a radio station.

JUNE BANDSCAN STATION REPORT

NEW

New stations on the air:

Malmstrom AFB, Mont.	1490	KGFR	1,000/580 ND

Permits granted for new stations:

Fultondale, Alabama	1520	6,000/250 DA-2
Elk Grove, California	1030	50,000/10,000 DA-2
Golden, Colorado	1550	5,000/250 DA-N
Terre Haute, Indiana	640	250/250 DA-N
Big Rapids, Michigan	1460	1,000/920 DA-2
Snohomish, Washington	1520	20,000/50,000 DA-2
Shawano, Wisconsin	1460	1,000/620 DA-2

Applications for new stations:

Montreal, Quebec	1400	1,000 ND
Montreal, Quebec	1610	1,000 ND
Midland, Texas	1550	50,000/300 DA-2

The Midland application was dismissed, but reinstated.

CHANGES

Frequency & location changes on the air:

Daphne, Alabama	540	WASG	from 550, 2,500/19 ND

Frequency & location changes granted:

Wainwright, Alberta	1080	CKKY	from 830; 10,000/9,000
Jeffersontown, Kentucky	1200	WGRK	from 1200 Greensburg; 2,500 daytime only
Kalamazoo, Michigan	1440	WKPR	from 1420; 2,700/24 ND
Lobelville, Tennessee	1570	WNKX	from Centerville, 1,000 watts

Frequency & location changes denied:

Pensacola, Florida	770	WPNN	from 780; 50,000 D3

Frequency & location changes requested:

Clayton, Georgia	830	WGHC	from 1400; 2,800 daytime only
Soda Springs, Idaho	800	KBRV	from 790; 10,000/150 ND
Burns, Oregon	1210	KBNH	from 1230; 12,000/600 DA-2

Stations deleted:

Canton, Ohio	1520	WINW
Frederiksted, Virgin Is.	1290	WRRA

ND: non-directional
DA-N: directional at night only
DA-D: directional during daytime only
DA-2: directional all hours, two different patterns
DA-3: directional day, night and critical hours, three different patterns

BOATS, PLANES, AND TRAINS

TRAINS

Ernest Robl
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Train Symbols and Ballast Dumping

Major railroads use a variety of designations for train symbols – the alphanumeric codes by which trains and work assignments (such as yard switchers) are identified. On some railroads, the symbols are mostly alphabetic, often based on the three letter codes for the points of origin and destination and a priority code, such as "Z" for intermodal trains. On other railroads, the symbols are mostly numbers, where the class and type of service can be determined by the beginning number.

You'll hear these train symbols in radio exchanges between trains and dispatchers – and these symbols can tell you quite a bit about what's operating nearby and what may be approaching your location.

In central North Carolina, where I live, Norfolk Southern in the predominant railroad and train designations are mostly numeric. Trains 350 and 351 are major through freights, operating between Linwood Yard (near Salisbury, NC) and the NC coast. The number of cars in these daily trains can, among other things, be a gauge of the economy. During slow times, two engines may handle a few dozen cars; during very busy times four engines may have as many as 150 freight cars behind them.

Amtrak operates six daily passenger trains through my hometown, Durham, NC. These are trains 73, 74, 75, 76, 79 and 80. The first four are round trips between Raleigh and Charlotte; trains 79 and 80 operate between Charlotte and New York City.

Amtrak uses numeric train designations nationwide; however, as a concession to host railroads out West that use alphabetic symbols, on those lines, the Amtrak train numbers are preceded by a "P" for passenger when trains identify themselves by radio.

On the other hand, on Norfolk Southern, letters preceding a train number identify local freights and yard assignments. The "H" line through my home town is part of the Piedmont Division of NS, so PO7 is a local freight based here, also referred to as the Burlington Local.

❖ Looking for the Unusual

Pay enough attention to usual trains on a line (here, there are also coal trains heading to a power plant near Goldsboro, NC, and returning empty hoppers, as well as grain trains going to eastern feed mills) and your ears perk up when you hear a symbol that doesn't appear every day. In a moment I'll get to one such special train that made several appearances in my home region in February.

First, however, it's worth knowing a few more things about train symbols. The first is that symbols are assigned at the prerogative of each railroad's management. When a new service starts, that management may assign a symbol that may or may not fit in with the previous pattern – though it usually will. Or, when new management comes in, it may change the pattern by which train symbols are assigned.

Where do you find these symbols? Search on the Internet for the railroad name and "train symbol" and you are likely to find lists compiled by railroad fans. These lists may be one or two pages explaining the basic patterns used for assigning symbols, or they may be quite detailed. One list I found for Norfolk Southern ran more than 20 pages when printed out – though I know at least some of the symbols on that list are now obsolete or used in a different manner.

Second, the symbol you usually hear on the radio is actually a shortened version of the actual identification that the railroad uses to track the train. Let's say that we're talking about train 350 (Linwood Yard, Morehead City, NC). If today is the 26th of the month, the train would be 350-26. The suffix is the date the train originated.

In some cases, there may be more than one version of a particular symboled train on a railroad at the same time. Remember that the large railroads in the U.S. and Canada span thousands of miles, and it may take a day or more for a train to make its way from one end of a system to the other.

Normally, train ABCDEFZ-26 (a made-up symbol) would be hundreds of miles behind train ABCDEFZ-25, but sometimes things go wrong. If the train that originated on the 25th was involved in a derailment or is stuck on a line blocked by a natural disaster, the train that originated on the 26th may be sent on a different route and actually arrive at its destination first.

❖ Running in Sections

Though it doesn't happen that often now, it's also possible that trains run in sections. A second section of a train is usually run when there is too much traffic for the basic train to handle, and the railroad does not want to hold the remaining cars for the next day's train. So you may have a 1-ABCDEFZ-25 and a 2-ABCDEFZ-25. The prefix is pronounced "first" and "second" etc. when spoken.

Passenger trains can also run in sections. I saw this late last year. Amtrak's train 79, the daily New York City to Charlotte, N.C., train was delayed for many hours by a fatal accident in Virginia that essentially shut down the north-south CSX route by which the train reaches North Carolina. The NC Dept. of Transportation's Rail Division, which provides passenger services in the state and which owns engines and passenger cars used on in-state Amtrak trains, ran a substitute train on 79's original schedule between Raleigh and Charlotte, which became the first section of 79. When the original version of train 79 showed up some five hours late (if I remember correctly), it ran as the second section.

The first section of 79, with the state owned equipment, turned at Charlotte that evening and deadheaded back to Raleigh empty. The original second section of 79 turned at Charlotte and became the next morning's scheduled train 80 (Charlotte-NYC).

One reason that you don't see trains running in sections much these days is that railroads set aside symbols for "as needed" trains, which don't operate unless there's demand. This makes internal record-keeping simpler.

Why are train symbols so important to railroads? Obviously, unique identification of trains is important for safety reasons. But, railroads can also use a variety of information associated with these symbols to analyze traffic levels and other operating data on the routes that these trains cover.

❖ Ballast Dumping with GPS

Well, earlier this year, my ears perked up when, while listening to my scanner in my car, I heard trains with a "Q" series prefix. On Norfolk Southern, Q series trains are special work trains on the Piedmont Division. (As mentioned above, local trains on the Piedmont Division begin with P; and Q follows P in the alphabet.)

Being alert to these trains gave me another chance to go trackside and see one of the more high-tech applications used by railroads – though the typical passersby probably had no clue as to what they were seeing.

The Q series trains that I had heard on the scanner were GPS-controlled Herzog ballast trains. (Herzog is a major railroad contractor that supplies a wide range of services to railroads, ranging from equipment maintenance to delivery of track ballast.)

Ballast is the large gravel that holds in place the ties that hold the rails. Ballast, which railroads use by the hundreds of tons, plays a key role in providing a safe track structure. By being compacted under the ties – a process called tamping, done with machines called tampers – keeps the

This car in the GPS-controlled Herzog ballast train has just passed a grade crossing and the discharge gates are in the process of opening and resuming the ballast dumping process. The train is dumping ballast on the outsides of both rails but not between the rails.

track level on straight sections and allows for elevation of one side of the track on curves. Early railroads simply laid their track – ties and rail – on graded ground. But they quickly figured out that this didn't work too well for any number of reasons. In addition to holding the ties in place, ballast also plays a key role in the drainage of the right of way.

However, since railroads began using ballast, they also found that it breaks down over time. Some washes away in heavy rains. So, it has to be continually renewed, just as ties and rails are replaced from time to time.

Early ballast dumping required large numbers of railroad workers riding on the sides of ballast hopper cars, manually operating the levers that opened and closed the gates at the bottom of the cars that discharge the gravel.

❖ Flash forward

Today, some "spot ballasting" to repair small washouts or similar problems is still done manually. But major ballasting over many miles of line during either new construction or major rehabilitation work is now done with GPS ballast trains.

GPS plays an important part in this mass application of ballast because there are many locations where you do *not* want to dump ballast. They include road crossings – they will be dug up and rebuilt manually – to most types of bridges. Motorists driving under a railroad bridge would hardly he happy to find large chunks of gravel raining down on them.

So, the process begins with someone in a hi-rail vehicle (a truck or SUV equipped with flanged rail wheels) using a GPS-equipped computer to map the line that is to be ballasted, marking all sections where no ballast is to be applied. Ballast hoppers are set up to discharge ballast through chutes on either side or between the rails. The process of mapping includes determining on which side of the rails the ballast is to be dumped.

The actual ballast train has a fixed length, and all cars, in addition to having the usual air brake line, are also connected by an electrical cable. That cable provides the power to the gates of the discharge chutes and carries the commands to open and close these chutes. In this train, every discharge gate has a unique electronic address and can be opened and closed individually.

An employee of the contractor (Herzog) rides in the cab of the trailing locomotive unit with a GPS equipped computer. That computer has been programmed with the address of all the discharge gates on the hopper cars – and how far they are from the front of the train (the location of the GPS unit).

Watch one of these trains dumping ballast, and, as each car (from the group of cars being used for a particular dump) approaches a grade crossing, the gates on those cars will close and cut off the flow of ballast. A few feet past the grade crossing, the gates open up again and the flow of ballast resumes.

Using this GPS technology has several advantages:

It greatly cuts down on the manpower needed for the ballasting operation;

It provides a much more even application of ballast at the locations where it is needed;

And, most importantly, it cuts down on the time that the work train ties up the main line and keeps it from being used by revenue freight and scheduled passenger trains.

The particular Herzog ballast train that I saw put down enough ballast so that about every other day (depending on how much territory it could cover) it returned to a nearby quarry to refill or top off its ballast hoppers.

The Herzog GPS ballast train leaving Norfolk Southern's East Durham Yard in North Carolina for a dumping assignment between Durham and Raleigh. The train gives little clue as to the high-tech equipment used to control the ballast discharge. The train had just had its ballast hoppers topped off and refilled at a quarry north of Durham and had stopped at the yard to add an additional engine to help get the heavy train up the grade toward Raleigh. The main line track in the foreground had additional ballast dumped within the last two weeks.

❖ PTC Update

I had hoped in this issue to provide a progress report on major railroads' efforts to comply the with the Positive Train Control (PTC) mandate. But right now, though testing continues, railroads are finding that implementation is far more complex and time-consuming (and expensive) than initially projected.

Railroads are seeking a postponement of the federal system-wide deadline, by as much as five years. As several railroad officials have pointed out, the railroads simply do not have the signal crews and computer programming resources to implement such a vast project in the time provided. So, we'll visit this topic again later.

GLOBALNET

Exploring the World of Internet Radio and Television

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Breaking News, Online

In the last year, we have seen an unprecedented number of natural disasters and large-scale breaking news stories. Thanks to the spread of social media such as Facebook and Twitter, the spread of information from ground zero of these events has taken on a whole new dimension. But, there are other online sources of information that you can turn to as well for the latest news from the affected regions.

I have commented before that I remember my parents turning on their shortwave radio or scanner during major news stories, such as the onset of the Gulf War or during a major hurricane. Pulling in signals from halfway around the world was nothing new in the Van Horn household, so it seemed natural that we would do the same when breaking news was happening. For us, it was one thing to hear the story through a filter such as CNN, but to hear the unfiltered information from the source was both fascinating and enlightening.

Now, with the barrage of social unrest and protests in the Middle East, the disaster in Japan, and the onset of hurricane season, I have the urge more than ever to skip the middleman of cable news and get my information directly from the center of the action.

While my parents fired up the radio and hoped that conditions would be right to tune in signals from Iraq or the Caribbean, the Internet has now made it possible to simply turn on my computer and have direct access 24 hours a day! All I have to do is to know where to turn.

❖ Streaming Radio – Voice of the people

In the fall of 2004, I had the chance to be in the middle of a major breaking news story myself and witnessed firsthand the power of radio in times of disaster.

After striking the Gulf Coast of the United States, the remnant of Hurricane Ivan made its way through Western North Carolina, causing historic flooding and devastation. There were mudslides, catastrophic flooding of the Pigeon and French Broad rivers, massive power outages, and devastation over much of the area.

At the time, I was working at Clear Channel Radio in Asheville. Our six stations carried continuous coverage of the storm, as well as calls from residents, through the duration of the event. For thousands of residents stuck in the dark and fearing the rising flood waters would reach their homes, the "voice in the dark" of stations like 570-AM WWNC or 99.9-FM WKSF was the only point of reassurance.

I witnessed similar scenarios during other disasters, such as major snowstorms in the Southeast in 1993 and 2009, and the devastation of Hurricane Katrina in 2005. In the latter, I stayed glued to my AM radio during nighttime hours, tuning in the non-stop coverage of 870-AM WWL in New Orleans. At the time, my Internet radio knowledge was in its primitive stages. Had I been more used to streaming radio, I would have been tuning in other communications from the Gulf Coast as well.

Let's say a major breaking news event has just occurred and you want to tune in the latest information online. Where do you go? The first thing I usually do during a breaking news event is check out the local radio stations of the affected area.

When the news is from an area that mainly speaks English or has stations broadcasting in English, this is an invaluable resource for finding out exactly what is happening at ground zero. For example, during the Japan earthquake disaster in March, though many of the local stations were in Japanese, NHK's English service was providing the latest information from Japan.

However, this isn't always going to be an option. During the Haitian earthquake of 2010, I wasn't able to find any local radio stations broadcasting in English. Of course, if you are fluent in the language of the affected area, this will greatly increase the number of useful stations.

There are a few great places to start your search for local streaming radio stations. The first place I usually turn to is one of the two main streaming radio services: Reciva or RadioTime. Both have the ability to search for stations by name or location. Additionally, you can usually find links to the station Web sites, which you can monitor for breaking news coverage.

I usually start with news/talk stations: they tend to have the best coverage of breaking news, as they have a staff already in place to handle these types of events. In the case of a truly wide-escale event, though, don't discount stations that traditionally play music or sports. They may be simulcasting audio from a local TV station or carrying their own coverage as well.

Also, don't forget about Internet-only radio stations. During the Tunisian revolution, an Internet-only radio station called Radio Kalima ("the word") became the voice of the uprising. The government tried to prevent the station from spreading information, but ultimately, the people found ways to circumvent the shutdown. Due to the relative ease with which an Internet radio station can be operated, they can spring up out of nowhere and prove excellent sources of information. This is especially true in areas with oppressive governments that only allow state-sponsored media or where the media is heavily censored.

Be mindful of the situation, however. If the event you are chasing is a natural disaster such as a hurricane or earthquake, widespread power outages may have knocked radio stations off the air. If it is a situation of political unrest or war (Tunisia and the Egyptian protests), government censorship may be trying to silence or control what is being broadcast on radio stations in their country.

Another good routine is to do a quick Google search to see what the state of media is in the affected country when these types of upheavals take place. For instance, during the Egyptian protests, I searched "Egyptian media" and "Egyptian internet" under the "news" search on Google. This brought me to news stories about alternative ways that Egyptians were able to access the Internet after the government tried to shut it down. These alternative options meant that there was a good chance that at least some radio streams would still exist to tune in.

If outside forces have turned off the local radio options where news is occuring, there may be general streaming sources of information available. First, check to see if the country involved has a central world service station or network, like NHK, BBC or Deutsche Welle. Even if the country doesn't have a world service option of its own, the stations I just mentioned are usually excellent sources of general breaking news information around the globe.

But, radio stations aren't the only audio options you can find on the Internet to get the latest news.

❖ Streaming Receivers: It's like you're there!

Great as streaming radio stations are for providing information, there is still a delay before the information is broadcast to their listeners. If you want to hear the news live from the scene, the ultimate would be an on-site shortwave receiver or scanner. If only there was a way to combine the ease and global presence of the Internet with the "as it happens" coverage of shortwave and scanner communications.

There is: streaming receivers. I have written before about the glory of streaming shortwave receivers and scanners. All around the globe, DXers are interfacing their receivers with their computers and allowing people anywhere on Earth to use those receivers to pull in signals.

I first started using streaming receivers as an AM DXer, tuning in the local AM radio from places I could only dream of DXing. I had always

wondered, what would I hear if I turned on the radio in Europe? Finally, I had my answer!

But they can be helpful for tuning in other types of communications as well. Those interested in listening to military communications from areas they are unable to tune in from their home location can finally hear those elusive signals, thanks to streaming receivers.

They are especially helpful when you want to tune in communications in the VHF/UHF bands from long distances. For this, there are a large number of streaming scanner resources on the Internet, including smartphone apps dedicated to streaming scanner communications. If you want to hear the emergency responder communications from live on the scene, streaming scanner audio can be just what you are looking for.

There are a number of places to find streaming scanner audio. There are several groups and Web sites devoted to providing links to streaming scanners, including some that highlight when breaking news is occurring by providing links to the agencies involved in the event.

One example of this type of group is the Yahoo Live Scanner Audio group. The group sends email alerts when new postings about breaking news are made. This is an easy way to find new streams as well as to stay up-to-date with breaking news events around the United States.

I am providing links to streaming audio sources, from radio stations to streaming receivers, in the GlobalNet links table at the conclusion of this column.

❖ Scenes from the Scene

Audio is one thing, but sometimes you have to actually *see* what is happening to get a full understanding. For example, during the Egyptian protests, no amount of descriptive words could come close to capturing what was truly happening in Tahrir Square. This was definitely a visually arresting event.

But, beyond the cable networks and large-scale international news organizations, what does online streaming have to offer for those searching for video of breaking news?

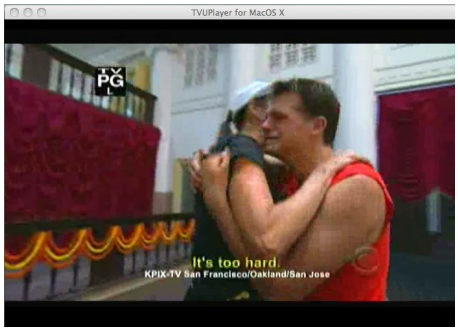
First, look to see if there are any streaming television stations from the area affected. In the United States, broadcast stations typically do not stream their signals on their Web sites, but during breaking news or other important news coverage, stations will often make their broadcast available online.

An example of this was in 2008, when several Atlanta, Georgia television stations streamed their broadcasts after a tornado swept through the downtown area. This continued the following day when additional severe weather struck the Atlanta metro area.

To find these local stations, you can do a simple Google search. Something along the lines of "[city] television stations" should suffice. Even if the stations in question aren't streaming their signal directly, they will often have on-demand video that you can access to see news coverage of the event.

A piece of advice about Google searches: In all cases, the use of quotation marks can be very helpful to find exactly what you are looking for in your search. Using quotation marks around certain words or phrases forces the search engine to search for that phrase specifically. For instance, if you searched for "Atlanta television stations" you would find listed Web sites that have that specific phrase included in their pages. If you took the quotation marks out of that search string, you would find all web sites that included all three words. This dilutes your search results and can make finding what you are looking for more difficult.

Outside of the U.S., the availability of streaming television stations is a little more hit-or-miss. One place to look for stations is through services such as TVU or Justin.TV. You can often find streaming video and television stations from other countries from these services, especially Justin.TV, as these streams are made available by users themselves.



In any case, the Internet can be a bountiful resource for breaking news information. In addition to streaming audio and video, services like Twitter can be another great way to get the latest information about certain topics and breaking news information.

The key to finding what you are looking for is knowing where to look and how to find it when you don't. This column has hopefully given you a good starting point for the majority of situations you will encounter, but ultimately, you have to pinpoint what level of information and interactivity you want in your search.

As always, if you find something particularly helpful and useful, be sure to send it along by emailing me at *loyd@globalnetmt.com* or send me a Twitter message. You can follow me on Twitter: my username is @GlobalNetMT.

Until next month, 73

GLOBALNET LINKS

Radio Kalima in Tunisia - **www.kalimatunisie.com**
Reciva Internet Radio - **www.reciva.com**
RadioTime Online Radio - **http://radiotime.com**
DXZone Online Receivers - **www.dxzone.com/catalog/Internet_and_Radio/Online_Receivers**
Onlinereceivers.net - **http://onlinereceivers.pa3ang.nl/home.php**
N2JEU's Web Controlled Shortwave Receivers - **www.ralabs.com/webradio**
Global Tuners - **www.globaltuners.com**
RadioReference – Online Scanner Reference - **www.radioreference.com**
Live Scanner Audio Group - **http://groups.yahoo.com/group/LiveScannerAudio**
TVU - **www.tvunetworks.com**
Justin.TV - **www.justin.tv**
NHK World English - **www3.nhk.or.jp/nhkworld**
BBC - **www.bbc.co.uk**
Deutsche Welle - **www.dw-world.de**

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
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Top-End Talk

As indicated by this column's title, we normally limit our topics to signals of 500 kHz and down. This is not a rigid requirement, though, and we've been known to stray outside this range when something fits the general theme of longwave-style operation. Beacon or experimental stations are prime candidates for such coverage – whatever the frequency band – and also any stations in the nearby 500 to 530 kHz range.

This month, we'll explore the work being done in the vicinity of 500 kHz by experimental, licensed stations. We could soon see an amateur allocation near this frequency if things go well for hams at the World Radiocommunication Conference 2012 (WRC-12). The conference is set for January-February 2012 in Geneva, Switzerland. At present, the dual frequency ranges of 461-469 kHz and 471-478 kHz enjoy wide support by several governments, including the US.

If we do gain a new band here, it will be due in large part to the work of experimenters, who have proven the viability and usefulness of the band over several years. In the US, a large portion of that work has been done by the folks in the WD2XSH experimental program, operated by the ARRL. Over 40 stations are included in the authorization, and their work in the 495 to 510 kHz range has resulted in a better understanding of the upper longwave band, and some impressive DX achievements.

❖ Who's On the Air?

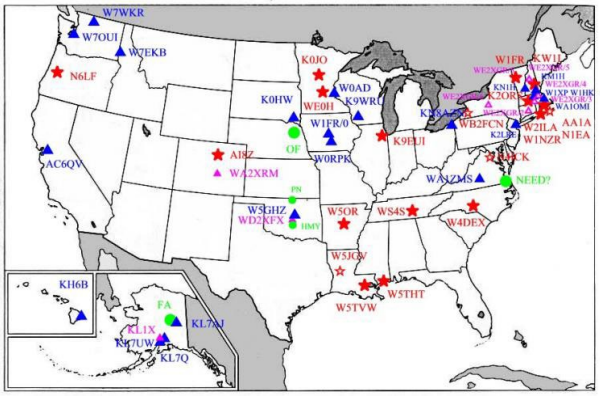
According to the WD2XSH website at **www.500kc.com**, there are several additional North American stations active (or recently active) near this frequency range, including those under the licenses of WA2XRM, WD2XFX, WE2XGR, WE2XPQ, WE2XTT, WF2XAU, VX9BDQ, VX9MRC, and VX9ZZZ. The current distribution of US stations shows a heavy concentration east of the Mississippi River, a few in the Plains states, and a respectable number in the far west, including California, Oregon, Washington, and Alaska. There is at least one station listed for Hawaii. The WD2XSH site also lists over 30 stations located *outside* North America, mostly in Europe. At present, there are at least two license-free, low power stations in the US near 510 and 512 kHz. Both of these are in Connecticut, according to a recent issue of the *Lowdown* journal.

If you haven't sifted through the frequencies around 500 kHz, I strongly recommend doing so, especially after dark when longer range propagation kicks in. (Daytime propagation can also be productive, but with shorter range.) Keep a list of what you hear, and then check the **www.500kc.com** site to identify your catches. If you don't see the information there, try entering the ID in your favorite search engine. Something is likely to turn up. In the case of the plentiful WD2XSH stations, you can even enter a reception report online at their website and see the reports of others.

I should mention that not all of the stations in this band use conventional keyed CW Morse Code. While this mode is quite common, some also use QRSS (super-slow CW) with the aid of decoding software, and there are other data modes used, such as PSK31 and FSK modes. An Internet search for the terms QRSS, PSK31, and FSK will yield more information on these formats.

Not set up for QRSS reception? No problem; the 500kc.com site even includes an online QRSS viewer you can log onto (direct link at **www.500kc.com/grabbers.htm**).

Some of the WD2XSH stations also have their own personal websites, which can be a good way to learn more about the hardware behind these signals. One such website for WD2XSH/34 (Iowa) can be seen at **http://showcase.netins.net/web/wallio/WD2XSH-34.htm**. As you will see, this part of the band is prime territory for homebrewing your own gear, in the longwave tradition.



Location map of the authorized stations for the 600 Meter Experiment. 20 FEB 2010, courtesy www.500kc.com

❖ Other 500 kHz Users

At exactly 500 kHz, there used to be a heavy stream of marine users prior to the advent of the GMDSS satellite system. It was the international distress and calling frequency going back to the days of the *Titanic* disaster. Today, what little activity exists there is from historical marine stations. In a recent column, we covered the excellent work being done by the Maritime Radio Historical Society in California (**www.radiomarine.org**) at 500 kHz and nearby frequencies.

There is also a movement afoot to declare 500 kHz as a historical/memorial frequency, in respect to the many lives saved through the use of radio at sea. More information on this movement can be found at **www.save500khz.org**.

A mystery signal identifying in CW as "NEED" at 505 kHz has been heard sporadically by recent users of this band. Up to this point, I have still not found a definitive answer as to where this station is located or who runs it, but the predominant belief is that it is some sort of military beacon operating in the Virginia-Maryland area. A small number of documented aviation beacons also use frequencies above 500 kHz.

At 518 kHz you will hear NAVTEX signals operating in SITOR Mode B (Broadcast) with marine safety and weather information from the Coast Guard. SITOR-B is essentially the same as AMTOR Mode B used by amateur stations. All you need is a PC with a soundcard and the appropriate software to decode it.

Only time will tell what happens with an amateur allocation in the upper longwave band, but it would serve hams and other DXers well to become familiar with this part of the spectrum. It comes with its own challenges in antenna size/efficiency and natural static levels (QRN) which can be quite severe at times. Its unique propagation traits more than offset these challenges for those who are willing to learn the ropes of 500 kHz propagation.

❖ Going Higher: Fishnet Beacons

From time to time we've discussed the unmanned, floating radio-buoys used by fishermen in some parts of the world. These transmitters are capable of operation from about 1600 to 3000 kHz in CW mode, and at power levels of 3 to 15 watts. The antennas used are simple whip designs with appropriate loading coils. Fishermen use these beacons to locate large nets that

have been deployed on the water, the lengths of which can measure up to several miles. They use direction finding (DFing) techniques to locate the transmitters.

MT reader Al Underwood (NY) was one of the first I am aware of to study the patterns, IDs, and frequencies of these stations many years ago. He had a particular curiosity as to why so many could be heard right in the 160-meter amateur band. Quite surprising to Al was the fact that there was little interest among groups he thought would be highly concerned about their appearance, including the ARRL, FCC, and even the UN (due to driftnet fishing bans). The FCC claims no knowledge of the callsigns used by these transmitters, and says they are not their concern. Much misinformation exists among hams as to what these stations are for. Al had even witnessed several occasions where a ham tried to answer one of these beacons via CW (to no avail, of course)!

These beacons are still heard today, but do not seem to be as plentiful as they were 10 to 15 years ago. In addition to conventional CW, I believe that some of these beacons are now transmitting data streams with location information, possibly based on received GPS coordinates. Could these be a more advanced type of buoy that has become available in recent years?

At any rate, these stations make for interesting monitoring, and perhaps you can add to the store of information that has been gathered about them. Ken Alexander (ON) passed along a very interesting website regarding fishnet beacons at **www.genesisradio.com.au/VK2DX/fishnet.html**. The website contains detailed information about frequencies, specifications, and propagation of these transmitters. There are even photos of them from key manufacturers.

❖ This Month's Loggings

This month's loggings are courtesy of Bill Smith (MA), John Davis (KS), John Reed (OK), Russ Hill (MI), Richard Palmer (MO), and Todd Brown (NY). All contributors are identified by their initials and state in Table 1.

See you next month!

TABLE 1. SELECTED LW LOGGINGS

kHz	ID	ST/PR/ITU*	CITY	BY
11.9	Alpha-1	RUS	Unknown	J.R.(OK)
12.65	Alpha-2	RUS	Unknown	J.R.(OK)
14.88	Alpha-3	RUS	Unknown	J.R.(OK)
19.8	NWC	AUS	Exmouth	J.R.(OK)
21.4	NPM	HI	Lualuahei	J.R (OK)
21.7	HWU	F	Rosnay	J.R.(OK)
22.2	NDT	J	Ebino	J.R.(OK)
24.0	NAA	ME	Cutler	J.R.(OK)
24.8	NLK	WA	Jim Creek	J.R.(OK)
25.2	NML	ND	La Moure	J.R.(OK)
37.5	NRK	ISL	Grindavik	J.R.(OK)
40.0	JJY	J	Ohtakadoyayama	J.R.(OK)
40.8	NAU	PTR	Aguada	J.R.(OK)
77.5	DCF	G	Mainflingen	J.R.(OK)
198	DIW	NC	Dixon	T.B. (NY)
212	TS	ON	Timmins	T.B. (NY)
230	BU	OH	Columbus	R.P. (MO)
245	UDG	SC	Darlington	R.H. (MI)
257	DT	TX	Denton	J.D. (KS)
257	PEA	IA	Pella	J.D. (KS)
260	PYA	NY	Penn Yan	T.B. (NY)
263	YGK	ON	Kingston	T.B. (NY)
276	YEL	ON	Elliot Lake	J.D. (KS)
278	CRZ	IA	Corning	J.D. (KS)
278	NM	QC	Matagami	J.D. (KS)
300	YOG	ON	Ogoki Post	T.B. (NY)
332	DC	MD	Oxon Hill	B.S. (MA)
332	FIS	FL	Key West	B.S. (MA)
338	DE	MI	Detroit	B.S. (MA)
338	ZEM	QC	Eastmain	B.S. (MA)
341	YYU	ON	Kapuskasing	T.B. (NY)
344	JA	FL	Jacksonville	B.S. (MA)
344	MK	MO	Kansas City	R.P. (MO)
348	EM	??	Unid	R.H. (MI)
350	DF	NL	Deer Lake	T.B. (NY)
353	IN	MN	Int'l Falls	T.B. (NY)
362	JWE	CT	Oxford	B.S. (MA)
362	YZS	NU	Coral Harbour	R.P. (MO)
366	YMW	QC	Maniwaki	J.D. (KS)
368	ZYZ	ON	Toronto	B.S. (MA)
369	TT	NJ	Trenton	B.S. (MA)
370	MQI	NC	Manteo	B.S. (MA)
371	GW	QC	Kuujjuarapik	T.B. (NY)
372	CQD	PA	Erie	R.P. (MO)
377	YRR	ON	Ottawa	J.D. (KS)
380	UCY	CUB	Cayojabo	R.P. (MO)
382	UCC	CUB	Cayo Coco	J.D. (KS)
382	UCC	CUB	Jardines del Ray	B.S. (MA)
385	LY	VA	Evington	B.S. (MA)
385	ZDH	ON	Toronto	J.D. (KS)
386	D8	QC	Dolbeau	B.S. (MA)
388	AM	FL	Tampa	B.S. (MA)
391	OO	ON	Oshawa	T.B. (NY)
395	YL	MB	Lynn Lake	J.D. (KS)
396	YPH	QC	Inukjuak	T.B. (NY)
398	HFY	IN	Indianapolis	J.D. (KS)
400	AHQ	NE	Wahoo	J.D. (KS)
400	MDS	SD	Madison	R.H. (MI)
404	CKI	SC	Kingstree	B.S. (MA)
409	YTA	ON	Pembroke	T.B. (NY)
410	BA	IN	Columbus	B.S. (MA)
410	DQU	LA	DeQuincy	J.D. (KS)
413	YHD	ON	Dryden	J.D. (KS)
416	LB	NE	North Platte	J.D. (KS)
417	HQT	NC	Coats	B.S. (MA)
418	CW	LA	Lake Charles	J.D. (KS)
420	CFY	SC	Lake City	B.S. (MA)
426	UV	MS	Oxford	J.D. (KS)
432	IZN	NC	Lincolnton	J.D. (KS)
508	WD2XSH/31	VT	Experimental	R.H. (MI)
510	OF	NE	Norfolk	J.D. (KS)
516	YWA	ON	Petawawa	J.D. (KS)
523	JJH	NY	Johnstown	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

Marc Ellis, N9EWJ
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Wrapping up the Philco Project

In last month's column, we once more took up the restoration of our Philco 37-62, a 5-tube a.c. table model with an attractive art deco cabinet. During that work session, the radio had been made ready for a smoke test. The i.f. transformers – which had been disconnected and removed to facilitate painting the chassis – had been re-installed. The set had also been completely recapped, except for two Bakelite block capacitor assemblies – each containing one capacitor –that I had decided to take a chance on.

A new line cord was installed to replace the rotted one that had been clipped early in the restoration. Also installed, along with their shields, was the original set of tubes, which had previously been cleaned and tested. The speaker had been removed from the cabinet so that it could be connected to the radio, via clip leads, for the test. In passing, it was noted that the speaker finish, like the chassis top, had suffered from the radio's long-term occupancy by mice. But luckily most of the damage was confined to the main frame of the speaker, which could be repainted later; the cone was okay.

Now I thought I was ready to apply power, but at the last minute, I noted that the speaker wires had cracked where they emerged from the chassis rear apron. Rather than replace these cloth wires, with their distinctive color codes, with modern plastic-insulated ones, I fixed the cracked places with short lengths of shrink tubing.

That done and the speaker temporarily connected, I gradually applied power and was pleased to hear the static crashes at about 80 volts. Tuning around with a short basement antenna connected, I could even hear a few weak signals. Once full power was applied, there were many strong signals all over the band.

However, I noticed a slight "edge" in the audio that sounded to me like a leaky audio coupling capacitor. It turned out to be one of those in a Bakelite block enclosure. Disconnecting it, I installed a replacement and the audio cleared up.

I had been originally mystified that I could still hear broadcast stations in their same tuning positions (though much weaker) when the bandswitch was changed to the 2.3 - 2.5 MHz setting. I could not hear any 2.3-2.5 MHz signals. Then I thought I had figured out what was going on and mentioned that I would test my theory later, when realigning the radio – which brings us to this month's work session.

The Tuning Indicator

Before I could do any realignment work, I needed to re-install the tuning indicator system. This consists of a translucent plastic dial scale disc bearing the frequency markings – a segment of which shows through a window in the cabinet when the set is installed. A pilot light illuminates the frequency markings and also projects a bright indicator line on the dial by passing through a screen with a slit in the center. I had delayed replacing the disc because it could easily have been damaged while the set was turned upside down for servicing.

The disc was easily installed on the tuning capacitor's vernier drive system (the vernier feature is very helpful, by the way, because the set tunes so sharply). However, the pilot light was another matter. It didn't come on, so I figured that it was burned out. Maybe it was, but I couldn't remove it. I wasn't able to push it, pull it, twist it, or do anything else that would release it from the tenacious grip of the socket.

Pilot light fixture ready for reassembly.

Finally I had to resort to digging it out, bit by bit, with a screwdriver. Then I saw the problem. An insulating sleeve in the socket – probably rubber – had disintegrated and turned to a sort of glue. Now I had to stop everything and get the pilot light back into service, because without the indicator line I would not be able to make the various dial settings required for the realignment.

I was able to salvage the little metal button that connects with the pilot bulb's center contact, as well as the spring that pushes the button against the contact when the bulb is installed. What I needed was a replacement for the fiber washer that would bear against the spring and into which the little button would seat.

Rummaging through my washer drawer, I found one that would accept the button, but which was a little too fat to slide freely down the socket as the bulb was pushed in. I took care of that by scraping it, edgewise, against a piece of fine aluminum oxide sandpaper, rotating it a little between each scrape. Eventually, the washer gave up, along with a little of my fingertip, and I was able to reassemble the socket, using a bit of shrink tubing to replace the original insulating sleeve.

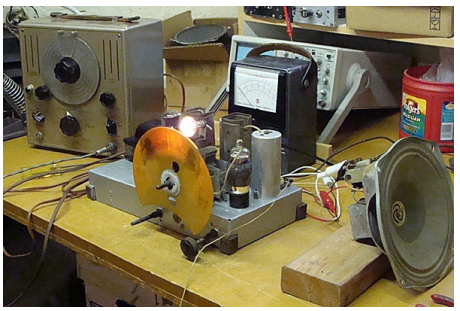
The pilot light projects a novel bright line cursor on the tuning dial.

I have to admit, simple-minded as it might have been, I was almost as excited seeing the pilot turn on and the bright line appear on the screen as I was when the radio first came to life. Incidentally, you may notice on some of the pictures that the dial scale has what looks like a dark shadow on one area. This is an "image" of the dial window and results from the radio having been stored for many years – who knows how long? – with the dial in one position.

About the only way to fix this would be to order a reproduction dial scale. I note that Radio Daze (**www.radiodaze.com**) shows a dial scale for the 37-62 for $22.00. However, they advise that the prices on this site are no longer current and this price may have been revised.

I.F. Alignment

My favorite way to measure output during alignment adjustments is to connect a vtvm



With the speaker temporarily connected via clip leads, the realignment can begin.

across the avc bus. The stronger the signal, the greater the negative voltage on the bus. This is a much more sensitive indicator than the alternatives – which are to connect an a.c. voltmeter across either the speaker voice coil or the primary of the output transformer and measure audio output.

Also, when measuring the audio output of a test signal, one has to keep the volume turned up all the way. This is so that the test signal can be kept as weak as possible to avoid engaging the avc, which would interfere with obtaining peak output readings. The loud audio can be annoying and distracting. On the other hand, when measuring avc voltage, one *does* want to avc to be engaged, and the position of the volume control is immaterial

However, in this case, I did opt for connecting to the output transformer primary (through a .05 uf capacitor to keep d.c. out of the meter) for purely physical reasons: I could make the connection without turning the set upside down, which would have been inconvenient with the tuning dial installed.

For the i.f. alignment, the signal generator is set for a modulated 470 kHz signal and connected, through a 0.1 uf capacitor, between the grid cap of the 6A8 oscillator/mixer tube and ground. With the connections made and the receiver and generator turned on, the audio tone was heard clearly on the speaker and registered on the meter.

The service notes call for the i.f. transformer trimmer screws to be adjusted in the following order: 2nd i.f. secondary; 2nd i.f. primary; 1st i.f. secondary; 1st i.f. primary. This was done and the process was a real pleasure. All adjustments were very smooth and I picked up so much additional gain while making them that I had to substantially reduce generator output several times to keep from pinning the meter and/or swamping the avc.

❖ R.F. and Oscillator Adjustments

For these adjustments, the signal generator is connected between the radio's antenna terminal and chassis ground through a 200 ufd capacitor. The purpose of the capacitor is to somewhat simulate the electrical characteristics of the antenna that would normally be connected to the radio. The adjustments are to be made only on the broadcast band (530 - 1720 kHz) setting of the band switch. There are no special adjustments for the (former) police band (2.3 - 2.5 MHz).

There are three adjustment points: the r.f. and oscillator trimmers and the oscillator padder. The first two are located on the tuning capacitor; the third is under the chassis, but accessed through a round opening in the chassis located behind the tuning capacitor.

The r.f. trimmer maximizes the response of the r.f. circuits to the dial frequency being tuned; the oscillator trimmer and padder controls exactly where the signals being tuned appear on the dial.

All these adjustments are made with a 1/4" nut driver instead of the usual slotted screws. Ideally one should have a nut driver

Restoration and realignment completed, the speaker and chassis are ready for installation in cabinet.

made of some insulating material, but I don't have one, and I had to make do with a metal driver having an insulated handle. However, my metal tool didn't seem to affect any of the adjustments; there was never a change in meter reading as I removed it from an adjustment nut.

The r.f. and oscillator trimmers are adjusted first, with the signal generator and receiver dial set at 1600 kHz (near the top end of the broadcast band). Then the oscillator padder is adjusted with the generator and receiver dial set at 580 kHz (near the bottom end of the broadcast band). The combined effect of the oscillator trimmer and padder adjustment is to maintain the receiver calibration as closely as possible across the entire broadcast band.

❖ About the 2.3-2.5 MHz Band

As already mentioned, last month I had been wondering why moving the bandswitch from the broadcast band to the 2.3-2.5 MHz police band didn't seem to eliminate the broadcast band signals – merely reducing their volume. Nor was I able to pick up any signals normally in that police band. Studying the schematic, I could see that, when set to the police band, the bandswitch shorted out part of the r.f. tuning coil so that it could resonate at the higher frequency but not affect the oscillator circuitry.

With that setting, I had theorized that the higher frequencies would be admitted and appear at their proper spot on the dial by interacting with the second harmonic of the oscillator frequency. However, the strong local broadcasting signals would leak through the r.f. tuning circuit even though it is not tuned to their frequency, and then beat with the oscillator signal to enter the i.f. chain and appear at their normal spot on the dial even if much attenuated.

The finished product–another worthy radio rescued from the landfill.

That being the case, I could assume that the radio was really acting normally on the high-frequency setting of the bandswitch and my plan was to test this assumption during the alignment process. With the alignment completed, I still wasn't able to hear any stations on the 2.3-2.5 MHz range. And that wasn't too surprising. Propagation on the shortwave bands varies tremendously with time of day and the season. However, I had no trouble receiving a 2.4-MHz signal from the signal generator at exactly the proper place on the band.

With that, I was ready to reinstall the set in its cabinet and declare the restoration completed. Regular readers will remember that when I first laid eyes on the innards of this set, I decided to abort the project. The extensive chassis corrosion , not to mention having to deal with those annoying Philco Bakelite block capacitors, were a big turnoff.

But the partially dismantled set in its cardboard box under my bench somehow kept beckoning. Eventually I gave in and I'm very glad I did! What almost remained a pile of junk is now a very decent looking and nicely operating radio!

❖ Next Month

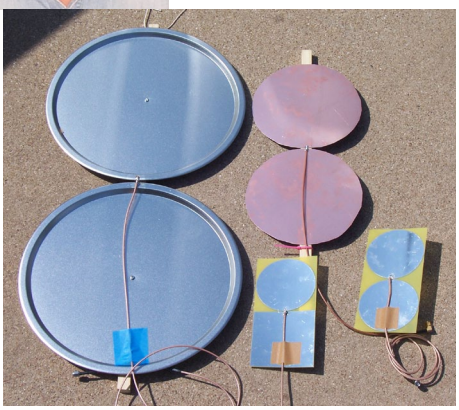
Now that we've completed the restoration of a couple of household radios, it's time to get back to some military gear. The radio will be a World War II vintage BC-1206 200-400 kHz tower and beacon receiver. Many of these little sets were temporarily installed in planes being ferried from the aircraft manufacturer to the sites where the permanent radio installation would be carried out. We have a neat example of this little radio to work on and I'm looking forward to firing it up!

ANTENNA TOPICS

BUYING, BUILDING AND UNDERSTANDING ANTENNAS

Kent Britain, WA5VJB
kentbritain@monitoringtimes.com

Construct Super Wide Band Antennas



This month I have an extremely broad band antenna design that makes a great scanner antenna. This family of antennas goes under a variety of names: Planar Notch, Elliptical Dipole, Planar Disk or Planar Circle dipole. These antennas were first described by Walter Stohr in the 1960s and they are noted for their extremely wide bandwidths.

The lowest frequency on which the antenna will work well is determined by the size of the disks. The highest usable frequency is determined by your coax and how close you can space the two circles. Just over 20 years ago I got one of those new ICOM R7000 25-2000 MHz receivers and of course it needed a wideband antenna. I built one of these antennas to help cover the wide frequency range of the R7000, and after all these years it's still hanging in my attic.

When I first saw one of these antennas it was the one in Photo B and it used a circle over a square for the two shapes. Originally this antenna was sold as an external antenna for analog cell phones. But it was usable over a frequency range of 800 MHz to nearly 10,000 MHz. I was impressed! In photo A you see a few of the variations I built for this column and a few are etched on PC Board, so any of the variations can work. It just depends on what kind of cookie sheets, pizza pans, pie plates, or other metal items you can dig up. I got most of my "antenna elements" at a local Dollar store.

The antenna elements can be two circles, or a circle and a square. The important part is to have the curved slot between the two elements. Howevwer, out of the dozen or so I built, the disk-to-disk was the easiest to work with. Electrically, the pizza pan/cookie sheet is the same as the pizza pan – pizza pan version. But watch out for the aluminum pans. They are a real ##$@$! to solder the coax to. The sheet steel pans have a plated coating that was easy to solder on the coax.

❖ A Bit of Theory

At the lower frequencies, the antenna acts like a vertical dipole with very fat elements. Broad elements give just about any antenna a wider frequency range than if you had used thin elements.

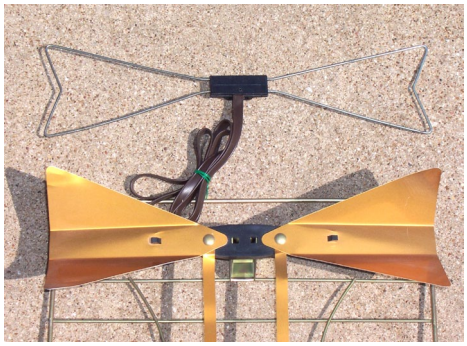
In this table I ran several 100 MHz dipoles though EZNEC to find their 3 to 1 SWR range. All dipoles are tuned to 100 MHz

TABLE 1

Element Length	Element Diameter	3 to 1 SWR Range
58″	.001″	10 MHz
56″	.5″	16 MHz
52″	2″	22 MHz
49″	6″	40 MHz

Beyond 6 inches in diameter, the NEC code had some trouble calculating with very fat dipole elements. But notice that, as the element gets fatter and fatter, the length of the elements gets shorter for the same resonant frequency. And note how much wider the bandwidth of the antenna goes up with increased element diameter.

There are other ways to get fat elements to work over a broad range of frequencies. In Photo C is a UHF TV antenna where the elements have



been made out of sheet Aluminum to form a wide and broadband element. Above it is where the wire has been formed into a "bowtie" shape to again make the equivalent of a fat dipole. The bowtie is not quite as wide in frequency as a fat dipole or the sheet metal version, but it's pretty close and the bent wire is a lot cheaper to make.

❖ Frequency Range

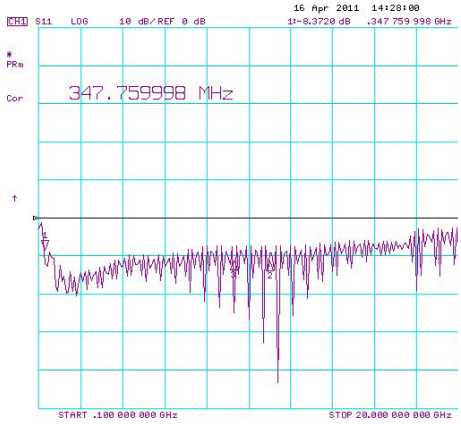
The low end of their frequency range is the size of the disks. An approximate frequency range is listed in Table 2.

TABLE 2

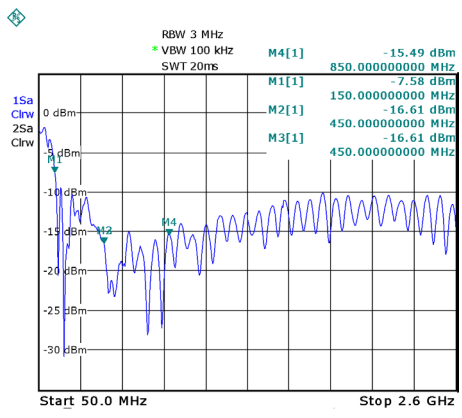
Disk Diameter	Lowest Frequency
16″	130 MHz
13″	150 MHz
7″	350 MHz
3″	600 MHz

I only show the lowest frequency, because the upper end of their frequency range is limited by how closely you can mount the disks and how lossy your coax is in the microwave bands. When mounted .001 inch apart they may work at 50,000 MHz, but you are not going to get that 50 GHz signal to go through your RG-58 and PL-259 connector. About a 1/16th inch gap is fine for use up to 5000 MHz

At the upper end of the frequency range, the gap between the two elements forms a tapered slot antenna. The slot antenna works great, well into the microwave bands. My thanks to W5LUA for letting me use his 8722 40 GHz Network analyzer.



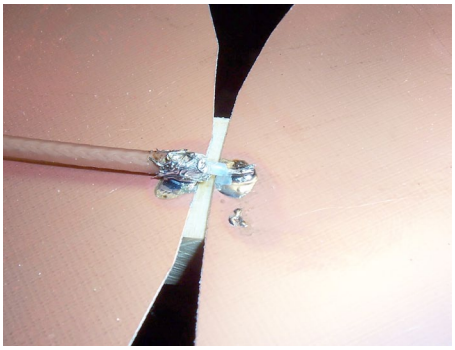
I show the sweep in Plot 1. The 7" Copper disk version was swept in frequency from 100 MHz to 20 GHz. The vertical scale is 10 dB per division. -10 dB Return Loss is equal to about a 2 to 1 SWR. So the 7" disk has a better than 2 to 1 SWR from 350 MHz to 7 GHz and is still working great at 10 GHz. Now you see what I mean when I say these antennas really don't have an upper frequency limit.



In Plot 2 I show a sweep with a better view of the low end of the frequency range of the larger planar disk antenna, this time on my analyzer. Again -10 dB return loss is equal to about a 2 to 1 SWR. So we have a 2 to 1 or better SWR from just over 150 MHz to 2.6 GHz and beyond.

❖ Construction

These are certainly easy antennas to build. I just used a piece of trim wood and a couple of screws on one version. Then a bit of glue to hold the disks on the wood for the second version.



In Photo D you can see how the coax is attached. You want the leads VERY short for best high frequency response. I find that the Teflon insulated coax is the easiest to work with, but RG58 can be used if you solder very quickly.

The impedance of the antenna is a bit higher than 50 Ohms, so you can also use 72 Ohm RG-59 or RG-6 for your coax run with a similar SWR. Besides, RG-59 and RG-6 have less loss than RG-58 and you can often find this inexpensive 72 Ohm coax as leftovers from Cable TV and Satellite TV installations. Low loss and cheap, a great combination!

❖ Mounting

With simple construction and those big plates, this is not an antenna you would want to mount outside. If any of our readers come up with a good way of weatherproofing these antennas, by all means let us know. That will make a great item in a future column

As you can see in Photo E, I just drilled a hole in the top of the wood support, a bit of thin rope, and hung the antenna from a rafter in the attic.

For the ham radio community, look for some disks at least 16 inches across and you can easily build a 146, 222, 440, 915, 1290 MHz antenna for that fancy new rig. The money you save making this cheap antenna just might help you to afford it! hihi

❖ Next Time

"There is no such thing as a Monopole Antenna!" I will be covering this quote and why a quarter wave antenna will not work in many situations.

❖ Future Topics

You, the reader, are one of my best sources of topics for antenna columns. If there is enough interest, I can work up a 406 MHz Yagi for the new Digital ELT beacons. For the public service sectors I can work up 150, 460, and 800 MHz beam antennas. For the digital side of the hobby, there are 915, 2400, and even some 5700 MHz antenna prototypes strewn around my work bench. For the amateur radio community, I have a collection of ham antennas available as downloads from my website **www.wa5vjb.com** Reference section.

The quickest way to contact me is at *kent-britain@monitoringtimes.com* or via snail mail to the QRZ.COM address for WA5VJB. Now go get some more antennas in the air before the summer gets too hot!

SKY SURFING

RADIO FROM THE OUTER REACHES

Stan Nelson, KB5VL
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Manned Space and Amateur Radio

Welcome back. The focus in this month's column is 'Sky Surfing.' I would like to broaden it briefly this month to include aircraft and space communications and related activities. If it flies above 30,000 feet, it has to be sky surfing, right? First, let's explore briefly some fun ways to explore the high flying aviation world.

❖ ACARS

The ACARS (Aircraft Communications Addressing and Reporting System) has been around for years and is an interesting way you can monitor data sent from aircraft using a radio capable of tuning the VHF aviation band, 118 to 136 MHz. This band uses AM (Amplitude Modulation), which should be available on most wide range receivers.

A few years ago, I used a Radio Shack RS-400 scanner that covered the aviation band. The audio was fed to my PC's microphone input driving an early version of an ACARS software decoder that was part of a general communications package. Only raw data was displayed.

To revisit the present offerings, I did the usual Google search. I found a number of software offerings. I narrowed the search for free ones and found one that works well. It has a number of neat features and pulls down information from the Web with data related to the aircraft you're listening to, including a picture, if available. Go to **www.acarsd.org/** for the free ACARS decoding software.

My first attempt to load the software was on a Windows 7 PC. It wouldn't install. I then put it on a Windows XP machine using the "quick install" mode to get a successful install. With a stereo audio cable plugged into the PC's microphone jack and then connected to the audio jack of my Yaesu VR-500 receiver, I tuned to 130.025 MHz, a frequency used in my area. ACARS messages started arriving. A variety of data is presented and there are codes that can be read. For a lengthy list check out: **www.universal-radio.com/catalog/decoders/acars.pdf**

The antenna I'm using is a Radio Shack 20 inch outdoor VHF-Hi/UHF scanner antenna, catalog number 200-0176. It's on the roof about 18 feet above the ground. I have logged aircraft out to approximately 300 miles. Most of the airlines I have logged with ACARS are flying around 30,000 feet ASL (Above Sea Level) or at Flight Level 30.

If you go to 'Fight Aware' on the Web and search for the flight you're hearing, you can see where it is on a map. This helps you determine the range of your set-up. Occasionally, a general aviation aircraft will wander through that is equipped with the ACARS system. Below are some of the frequencies used:

ACARS FREQUENCIES

MHz	Use/Function
131.550	Primary USA & Canada
130.025	Secondary USA (works for me in New Mexico)
129.125	Tertiary USA
131.725	Primary Europe
131.450	Primary Japan
131.475	Private - Air Canada

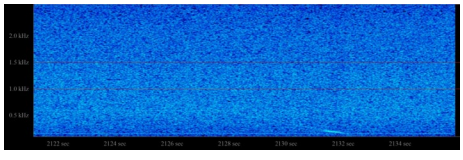
❖ Satellite Monitoring

A local radio amateur called me in late January to see if I could program a frequency into his old handheld portable radio. The frequency was 437.270 MHz. Unfortunately, the radio couldn't be programmed, since it was out of its range. When I asked him what he was going to listen to, he noted it was NanoSail-D, the Solar Sail satellite. Amateurs were invited to monitor the signal. Many amateurs world-wide successfully captured the transmissions. The signal was short-lived, though, and no longer transmitting by the time I got wind of it.

However, the Nano-Sail is still up there. Check NASA's site for more details at: **www.nasa.gov/mission_pages/smallsats/fastsat/11-009.html**. They have some audio recordings of telemetry received from the satellite posted online. And there is a photo contest you can enter if you capture the "best" reflection or flare on camera.

You can try to detect it as a passive object as it passes through a 217 MHz CW beam by listening to **www.spaceweatherradio.com** radar when it passes over the Lubbock, Texas area. For a favorable pass for your location, check **www.heavens-above.com**. After some effort, I finally captured this very weak trace on my receiver using USB (Upper Side Band) on March 1, 2011. See below.

Heavens-Above also features ham satellites. You will be presented with a list of satellites with their rise and set times, the maximum altitude time, and azimuth, with their downlink frequencies. For a comprehensive list of ham radio satellites and their frequencies, go to AMSAT's site at: **www.amsat.org/amsat-new/satellites/frequencies.php**.



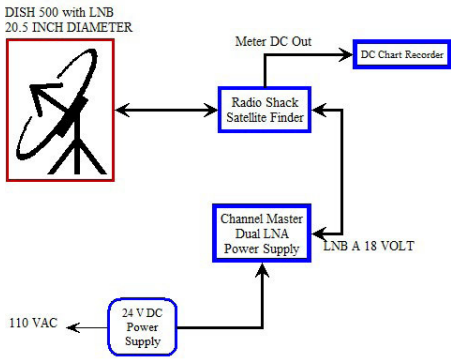
Another satellite tracking application I downloaded for my iPOD Touch/iPhone is "HamSat." It is currently available through the iTunes App Store for $4.99. The orbital elements can be downloaded via your WiFi or Cell Phone link. The software has a 2D/3D screen that shows typical track and LOS (Line of Sight) circles that can be rotated using your finger. An iPad version called HamSat HD for the iPad is also available at the same price.

There are also numerous apps for the iPod/iPad that can design antennas, do microwave dish calculations, etc. to help you entertain yourself while everyone else is texting. Not while driving, of course…

❖ Inexpensive 12 GHz Radio Telescope

Just in case you are looking for an inexpensive entry into radio astronomy, there is an interesting project using a surplus DISH or Direct-TV dish and possibly others. The project is known as the Itty Bitty Radio Telescope. Though it's a small dish and won't compete with the big guys, with it you can detect the Sun, Moon, your body heat, and even compare temperatures of the sky and trees. The project refers to the detected temperature specified in (K) Kelvins. (The clear sky is about 300 K.)

I had such a television dish that has been unused for several years since going to cable. I decided to use it as an Itty Bitty Radio Telescope. I hauled the dish down and rearranged the mounting. I then built a swivel base using a couple of wood disks and a Lazy-Susan mounting that I purchased at a local hardware. The mounting should make it easy use at star parties and public gatherings. Below is a sketch of my system:



And here is the completed (IBT) Itty Bitty Radio Telescope on the Lazy Susan mount:

There are numerous references and construction details on the Web. Check out **www.aoc.nrao.edu/epo/teachers/ittybitty/procedure.html**. The satellite finder is used as an IF amp/Detector. You will need to provide the Low Noise Block (LNB) converter voltage, and I found a solution using a surplus Channel Master Model 8002IFD that had the AC power supply. Here's a link with the technical details for the Channel Master: **www.mjsales.net/items.asp?FamilyID=239&this_Cat1ID=270&Cat2ID=51**

For future portability, I'll use a couple of 12 VDC batteries for the 24 VDC source.

While trying to align the dish on the Sun, I found what I thought was its peak, nearly full scale. For kicks, I decided to check it with a small circular mirror at the center of the dish. An image of the Sun appeared on the plastic cover of the LNB. The Sun had a giant sunspot, too. This was on March 13, 2001. One thing to remember is the Sun could damage the electronics or heat the LNB plastic if focused on the Sun too long. Keep the dish surface dull or you'll have a solar cooker.

Later, during a near full-moon, I was able to detect the Moon while holding the dish up and slowly moving it around. A clear view is needed to avoid other heated bodies such as trees and buildings.

My dish aligns with the dish pointed nearly straight at the observed object. The LNB is offset and you may have to hunt around to find the best alignment for your dish.

With the completed set-up, I am now able to peak it on the Sun, myself, and the Moon. It's a 12 GHz thermometer or radiometer! I hooked a logging DVM (Digital Voltage Multi-meter), a Fluke Model 289, to the meter for a quick check. To get an idea of the dish's beam-width, I aligned the dish on the Sun and timed how long the meter voltage on the satellite finder took to fall off 3 dB. The Sun should drift nearly 0.25 degrees per minute, so I calculate the beam-width of my little dish is close to 4 degrees. Also, the calculated 22 inch dish's gain at 12 GHz should be 35.1 dB.

There are several ways the system can be used for educational purposes or just plain fun. Various sources on the web detail ways to demonstrate the IBT. Some include measuring beam-width, differences in temperatures of the Sun, Moon, trees, and people. It's hard to believe we radiate microwave energy!

❖ Radio Free Zones

Since radio astronomy sites work with weak signals, finding sites that shield their antennas from interference has always been a priority. The FCC (Federal Communications Commission) provides protection for radio astronomy sites by not licensing transmitters or requiring strict coordination to operate near specific sites. For example, in 1995, rule making was proposed to limit how close Channel 37 could operate near the following sites, which use this channel for radio astronomy:

Location	N. Latitude	W. Longitude
Kitt Peak, AZ	31°-57′-23″	111°-36′-45″
Owens Valley, CA	37°-13′-54″	118°-16′-34″
Mauna Kea, HI	19°-48′-16″	155°-27′-29″
North Liberty, IA	41°-46′-17″	91°-34′-27″
Hancock, NH	42°-56′-01″	71°-59′-12″
Los Alamos, NM	35°-46′-31″	106°-14′-44″
Pie Town, NM	34°-18′-04″	108°-07′-09″
Socorro, NM	34°-03′-43″	107°-37′-04″
Arecibo, PR	18°-20′-46″	66°-45′-11″
Fort Davis, TX	30°-38′-06″	103°-56′-41″
Saint Croix, VI	17°-45′-31″	64°-35′-03″
Brewster, WA	48°-07′-52″	119°-41′-00″
Green Bank, WV	38°-25′-59″	79°-25′-59″

(From FCC 95-35)

TV channel 37 (608-614 MHz) is allocated for radio astronomy and the wireless medical telemetry service (WMTS) and is not used for TV broadcasting. (From FCC 10-174).

Earlier, in 1958, the FCC established the National Radio Quiet Zone (NRQZ) for the National Radio Astronomy Observatory at Green Bank, West Virginia. See **www.gb.nrao.edu/nrqz/** for details. Other protected sites are also referenced.

Natural and man-made interference affects us all. Since early radio, the subject has been with us. Recently, I happened on a book buried deep down in my shelves: *The Radio Noise Spectrum*, 1960, edited by Donald H. Menzel, Harvard University Press, addressed the issues related to radio astronomy. The first chapter deals with *Man-Made Radio Noise*. This is all before cellular phones were common. The author, E. W. Allen, notes in this 1960 book that the Federal Communications Commission (FCC) is planning to protect the 1400-1427 MHz hydrogen 21 centimeter (cm) line for use in radio astronomy. Today, other frequency bands are protected as well.

A New Mexico *MT* reader, **Hank Newton**, an engineer working at National Radio Astronomy Observatory (NRAO) in Socorro, New Mexico, sent me a copy of a paper he had written. In a section that mentioned possible satellite RF interference from CloudSat, a Cloud Profiling Radar CPR), he indicated the peak power is around 4000 Megawatts. The 94 GHz receivers at the Chilean telescope have to be closed when the satellite passes overhead to prevent receiver front-end burnout. Now that's "potential" interference!

Another case of managing RF interference at astronomy sites involved the Very Large Array (VLA). I found a reference that described the filming of *Contact* at the VLA in the 1990s. The film crews used radios for coordination of the filming, which required the VLA to schedule dish frequencies to avoid the film crew's communications from causing harmful interference. The show must go on!

One of the other chapters that fascinated me was *Electromagnetic Emission from Meteors,* by Gerald S. Hawkins. A team of researchers used a 24 ft. dish on 218 MHz located in Harvard, Massachusetts. Another 17 ft. dish operating on 475 MHz was set up at Mayhill, New Mexico, along with a 30 MHz dipole antenna. They used visual and photographic techniques for correlation, but after it was all over, they could not prove there were any radio emissions from the meteors. However, they were suspicious there was some energy being reflected off of the meteor's trail. All of this was back in 1956 to 1957.

What caught my eye was the use of 218 MHz. The Naval Space Surveillance System (NAVSPASUR) satellite detection system, a kind of electronic fence, was commissioned in 1961. It was an outgrowth of an earlier system from the '50s called MiniTrack, whose job it was to keep up with *Sputnik* and other early satellites. NAVSPASUR was recently turned over to the Air Force. The frequency used at the Lake Kickapoo, Texas facility is 216.983 MHz using Continuous Wave (CW) emission. It makes you wonder if the meteor teams were doing some advanced research for the satellite age.

As a parting thought, NAVSPUR will be phased out in the near future with a more widely distributed microwave radar system. Alas, no more meteor detection using 218 MHz.

❖ Society of Amateur Radio Astronomers (SARA)

A *Monitoring Times* reader sent me an e-mail that noted that he was a member of SARA and suggested I mentioned the organization. Thanks, **Ken**. I, too, had recently joined. If you're into radio astronomy, they offer a wealth of materials and an on-line bi-monthly journal. It's only $20/year. Their web address is: **www.radio-astronomy.org/**

❖ Radio Astronomy at the Movies

Hank Newton, mentioned earlier, said the Atacama Desert in Chile was featured in the movie, *Quantum of Solace*, a 2008 James Bond movie. He noted NASA used the Atacama for its Mars vehicle simulation. In the peaks and desert nearby sits a rather extensive radio telescope site called ALMA. The 66 dishes in the array sit high in the Andes at an altitude of 16,500 feet above sea level, far from RFI (Radio Frequency Interference) and at the driest place on Earth. Low RFI and dry desert conditions make the northern Andes an ideal location for radio astronomy. Check out ALMA's web site for details at: **www.almaobservatory.org/en/technology/antennas**

Send me your favorite movie titles that feature radio astronomy. Or even communications gaffs or anachronisms. I caught some fun goofs in a crazy take-off on 1950s Sci-Fi movies. The 2009 movie *Alien Trespass* shows a policeman making a call but he doesn't release the microphone button. You hear a response, but his hand is still on the button. Maybe they had VOX (Voice Operated Transmitting)?

Thanks for checking in, and happy sky surfing.

Building a Simple Ham Radio Project

By Dave Schmarder, N2DS

Soon after Marconi started throwing sparks around, the radio experimenter began building his own equipment. There were no radio manufacturers in the old days. But, soon after radio became a popular pastime, there were plenty sellers of radio parts. The purchasers were mostly ham radio operators. Rolling their own radios was not only a necessity, it was also fun.

But why build in modern times? As Amateur Radio progressed, the equipment became more complicated. Transmitters and receivers became commercially available, but the increasing complexity shut most radio builders out, and turned them into radio operators only.

However, there is still room for the electronics builder hobbyist. Granted, it's no longer so easy to obtain parts for the projects. The small electronics parts stores have all but disappeared. But don't be discouraged. There still are ways for the radio "home brewer" to succeed.

❖ What should I build?

If you have a good magazine collection (you do save your back issues, don't you?), there may be some good project ideas at your fingertips. When I was a teenager, I practically memorized every article in the back issues. Looking for a project to build was as much fun as building it.

The internet offers many opportunities to pick a project. A website such as my *makearadio.com* has over 100 small radio related projects. A search engine and some good search terms will return many great choices.

If you are a beginner, try not get in over your head! The outcome might result in irreversible disappointment. Judge the project complexity and compare it with your skills. Check the difficulty both electrically and mechanically. Read the entire article for the project. Is it well written in an orderly manner that you can understand? Does the schematic diagram look correct? Sometimes there are errors that were later corrected. If something doesn't look right, perhaps you can contact the author and confirm the correctness.

I've selected a project that I built a couple of years ago to demonstrate how to go about planning and building a small ham radio accessory project. The project is a one tube code practice oscillator, or CPO. A CPO is an audio oscillator connected to a Morse code key. Code can be sent and received locally as a ham operator would. Although knowing the Morse code is no longer a requirement for a ham radio license, it is still very popular among even the newest ham operators.

Via Skype, I've already helped a friend on the internet learn the code using my CPO.

❖ How are your tools?

Go through the building steps in your mind and see if you can perform all that is required with the tools on hand. In the example of the code practice oscillator, there is not much needed in the way of tools to reproduce the project. There are two pieces of flat material that need drilling. The maximum hole sizes are about 3/4 inch. A forstner bit was used to drill the holes, but any size holes would let the sound through. A good quality combination square is helpful for accurate hole position measurement.

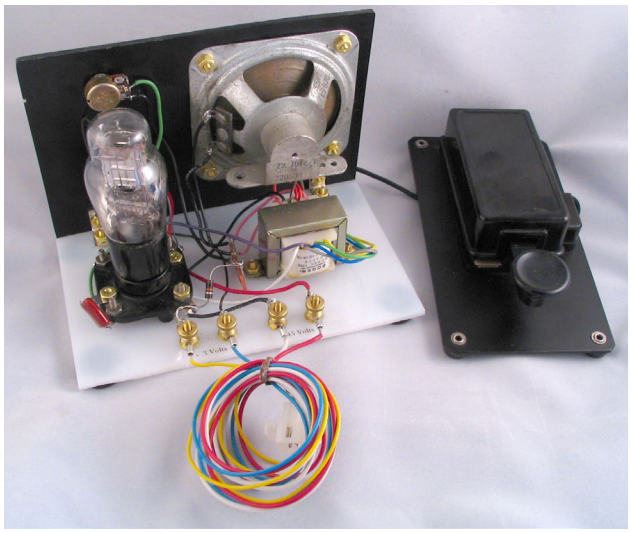
Other tools needed to make the CPO are for the electrical construction. A soldering tool is needed. In this case, you would want a soldering pencil with a 25 to 50 watt rating. Purchasing a quality pencil is recommended if you are planning more projects. My favorite brands are Ungar and Weller.

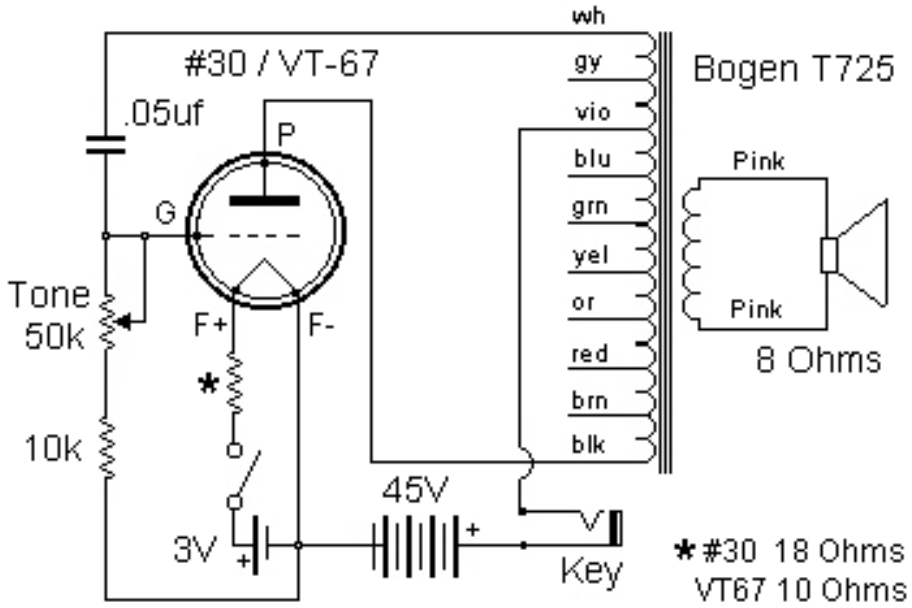
Purchase extra tips, too. Some pencils have tips available in multiple sizes, which makes soldering a pleasure. The gun type of soldering tool generally has a much higher wattage. While it wouldn't be a big problem with this project, you might cook a sensitive semiconductor project with a high wattage soldering gun.

Because some solders contain lead, your work area should be well ventilated. My favorite solder is a "60/40"type, containing 60% tin and 40% lead. Added to the solder are several "cores" of rosin flux. The flux allows the solder to stick. Make sure you purchase rosin core solder. Acid core solder is for plumbing and will ruin an electronic circuit. If you desire, there are lead free solders available, too.

The proper way to solder electronic connections is to first heat the connection with the soldering pencil. Then apply the solder to the joint, and not the pencil tip. Apply enough heat to completely melt the solder and you will be set. Keep a wet sponge around to wipe off the tip as it does get dirty. This will ensure good heat transfer to the joint being soldered.

Other tools needed to build the CPO are a pair of pliers, wire cutters, and a screwdriver or two. A set of nut drivers makes an excellent





addition and is a great gift request idea.

How about test equipment? This example project won't need any test equipment to speak of. A multimeter should be available, in this case to measure battery voltages and perhaps the continuity of the tube filament. Other projects you build may need other tools for test and alignment. A friend may have the needed piece, such as a signal generator to do the final alignment.

❖ How available are the parts?

Where can I get the parts for the CPO and how much are they going to cost me? When I plan a project, I first look for what might be the most difficult part to obtain. In this case, the tube and tube socket would be the hardest to get. There are still lots of tubes still around! Surface mount tube sockets, too. Check on the internet using a search engine, and go on the auction websites. Don't forget to ask friends for parts.

A Bogen T725 transformer is fairly easy to obtain. They are widely used in public address system installations. Builders of crystal radios also found them useful. This is one of those items that became re-purposed because of the difficulty and expense of finding or buying a real audio output transformer.

The rest of the parts are not critical. Don't be afraid to make a parts substitute here and there. In the case of the CPO, just about any tube that is at least a triode will work. The filament or heater voltages and currents may differ, so accommodation will be required for proper tube operation. If there is doubt, the project author may be able to shed some light on the changes you want to make.

❖ Final planning before the build

Okay, so you have selected the project, the parts are available, and you are ready to build. There are now some details to think about. If the project is well presented, with pictures and great descriptions, most of the work is done. But sometimes you are presented with only a schematic. In this case, some mechanical layout skills will be needed. If the article is written in a foreign language, the schematic is universal.

One thing that the schematic doesn't show is the mechanical layout. You may need some solder connection tie points. The CPO project needs one connection that doesn't already have a tie point. The rest of the tie points are made to the tube socket, switch, tone control or the speaker.

This connection is between one side of the .05uF capacitor and the white transformer lead. A solder tie point should be used at this point. You could join these two components in mid-air, but that would be sloppy. Before I start a project, I print a copy of the schematic. Then, at any point where a connection is needed but there is no nearby tie point, a dot is made to indicate that some thought is needed there.

A less than obvious aspect of building a project is whether you will ruin it if there is a problem and it must be disassembled. All my projects are planned so that, if repair or adjustment is needed, the task is made easy because of the thought that went into the project in the first place. This means screw, and not rivet fastener construction. Try not to layer parts, as the part you may want to change may require other parts to be removed. Alignment adjustment screws should be accessible, too. The CPO is an easy project due to the lack of additional adjustments.

❖ Safety First!

Make sure that your tools are in safe condition and are used safely. Imagine anything that can go wrong and attempt to mitigate those conditions. Move your soldering pencil power cord so it won't get burned. Place the soldering iron stand nearest to the hand you use to hold the soldering pencil.

If you are new at building, stick with building projects that use batteries or wall warts. Building something that requires the AC mains be brought to your project increases the risk for injury. If your project uses mains power, build it so that under normal operation, there is little chance of accidental contact with high voltage.

Many years ago, little thought was given to safety. Many older project plans routinely used circuits directly powered from the AC line, without the isolation benefit of a transformer. I always discourage people from building these projects. Fuses were also few and far between. You can add fuses as a safety feature to your project.

Good luck building your CPO or other ham project. There is sometimes frustration involved, but when your project works, you will be grinning from ear to ear and thinking about your next project.

FLEX-1500 SDR Transceiver Review, Part 2

By Kirk A. Kleinschmidt, NT0Z

Last month, in Part 1, I introduced the technology and some of the features of FlexRadio's FLEX-1500 QRP SDR HF transceiver. This month it's time to connect the radio to a PC and an antenna. Be sure to read Part 1 if you haven't done so.

For once, my tendency to procrastinate has paid off, as FlexRadio *just* released *PowerSDR* version 2.0.22, a new non-beta release of the Windows PC software that makes the magic happen. Technically in beta for the better part of a year, the FLEX-1500 is now "official."

❖ Tiny Radio, Tiny Box, Easy Connections

Neatly packed inside the small box is the radio, user manual, a quick-start guide and the usual paperwork, a driver CD, a BNC-to-UHF female coaxial adapter, a dc power cable with a plug, and a USB cable (with RFI-suppressing ferrites at each end).

To get started you'll need the USB and dc power cables that came with the radio; an HF or 6-meter antenna or dummy load; stereo headphones or computer-type powered speakers (the plug *must be stereo* to avoid shorting out the radio's audio amplifier); a stable 13.8-V dc power source that can supply at least 2A peak; a Windows PC (XP, Vista or Windows 7) with a USB 2 port; a mic (PTT switch preferred, no VOX) and/or CW paddles/keyer/straight key.

Making the initial connections is straightforward. Before diving in, however, at least *glance* at the included Quick Start Guide. After making the physical connections to the transceiver (don't power up the radio yet), install *PowerSDR* on your shack PC. Instead of using the installer supplied on the disk, visit **www.flexradio.com** to obtain the latest version.

Carefully follow the installation procedures outlined in the Quick Start Guide. Depending on your specific version of Windows and its "Windows update status," you may have to install some .NET files and .NET service packs to complete the installation.

The initial power-up will prompt USB port handshaking and driver installation. Vista and Windows 7 will load multiple drivers in the background and will notify you when everything's complete. Windows XP users will probably have to click through several instances of the "Found New Hardware" wizard, but the end result is the same: *PowerSDR* and all necessary drivers are installed, the radio is attached and powered up, and your SDR experience is about to begin!

At first launch *PowerSDR* will run a short optimization routine. When everything's loaded, *PowerSDR*'s main screen is displayed, but the software is in standby mode until you click on the START button in the upper-left part of the main screen.

The urge to start clicking on buttons and controls may be overwhelming at this point, but in addition to audio input/output and antenna port settings, you will probably want to adjust the buffer settings for the USB and audio drivers *before* you get too far along. For some PCs and some USB hardware these settings can be critical, especially when transmitting Morse code. Carefully follow the set-up instructions in the Quick Start Guide, the User's Manual and on **www.flexradio.com**. Setting things up correctly from the get-go can eliminate a lot of potential frustration down the road.

❖ A Smorgasbord of Options

Because the FLEX-1500 is a pure SDR – and every imaginable under-the-hood setting can be tweaked to your personal preference – configuring the radio can be fabulous *and* frustrating. For control freaks, the sheer magnitude of all possible customizations is a dream come true.

If your favorite radio has three controls, the FLEX-1500 (or any SDR) may not be for you. Most of the settings are behind the scenes and don't require constant fiddling, but there are dozens – even hundreds – of possible settings and adjustments, especially if you're transmitting, using the radio with digital-mode or logging software, or interfacing to external amplifiers or transverters.

Enjoying the full measure of the '1500's capabilities will require some effort, study, trial and error, and a willingness to get your hands dirty (digitally speaking). You may also have to make major adjustments to your PC and its operating system (or buy/build a new one or wipe your existing PC and install a fresh copy of Windows).

Final Rating, 4 out of 5 stars

❖ The Main Screen

As presented by *PowerSDR*, the FLEX-1500's virtual front panel can initially seem a bit overwhelming, but if you take a step back, most of the functions should seem familiar. The software controls look and work just like their hardware counterparts.

On the right is a multifunction "S-meter" (nicely calibrated) and buttons for changing bands, modes and filters. Frequency readouts for VFOs A and B run across the top of the screen, and along the left-hand side you'll find controls for PTT, RF and AF volume, squelch, AGC and preamp levels. The bottom of the screen includes familiar controls for RIT, XIT, noise-blanker and keyer settings, but then displays some less-familiar controls for stereo audio, binaural "3-D" reception, multi-RX panning (multiple audio source L-R panning, like on a DJ's audio mixer), and CPU utilization (which leaves no doubt that this is a PC-radio hybrid!).

The Main Attraction is the large spectrum display in the center of the screen that shows a 48-kHz swath of the band in real-time, with your tuned frequency near the center of the band scope (certain settings and adjustments allow precise centering, if desired). This spectrum display graphically shows signals up and down the band.

If you see a signal emerge from the noise, you can simply click on it with the mouse pointer to tune it in. Rotating the scroll wheel on your mouse makes for easy fine tuning (tuning step size can be adjusted on the main screen). The band scope is an SDR's "killer app." Once you use it, you won't want to be without it.

I don't have nearly enough room to describe operation of the '1500 in detail. The User Manual does a great job of that, and FlexRadio's web site and community-based online user forums can help you with just about any issue.

❖ Transmitting

After you've gotten comfortable with turning the radio and *PowerSDR* on and off, explored the many set-up menus, and marveled at the usefulness of the band scope, it's time to transmit. The easiest TX mode to get started with is SSB (or other voice modes). The front-panel mic jack has the same pinouts as a late-model Yaesu hand

mic. If you don't have access to one, wiring up an RJ-45 (LAN cable style) plug or adapter isn't difficult. The diagram in the user manual will probably be all you need.

Although the FLEX-1500 doesn't support VOX operation, *PowerSDR* rewards its "PTT pressers" with a variety of powerful DSP-based sonic and performance enhancements, including a multiband EQ, noise gate, speech compressors, and more. Whether listening to a second receiver in my own shack or talking with other ops on the air, all audio quality reports were favorable.

Depending on your specific PC hardware and operating system, sending Morse code may be more of a challenge. Prior to *PowerSDR* version 2.0.19 RC1 (the release candidate from March 2011, just before the first full, non-beta release), the rig's CW-sending difficulties were well known. Prior to version 2.0.22 I had to use an external keyer and employ manual T/R switching via foot pedal. Although nostalgic, "going old school" took some getting used to (but the radio's outstanding receiver performance was too good to ignore).

As it turns out, the problem is related to the intricacies of using real-time USB signals to synchronize the flow of data between *PowerSDR* and the FLEX-1500. More expensive FLEX models use Firewire instead of USB and do not have these issues. It's important to optimize the USB buffer settings mentioned earlier to minimize any potential Morse code transmission issues. More aggressive buffer settings – if your PC and its USB hardware can handle them – allow the radio to more quickly sense and respond to key and keyer paddle inputs, which make for better keyer performance and better T/R (break-in) response.

After testing various PCs and aftermarket USB2 adapter cards, I found a combination that "feels right" through 25 WPM or so (my maximum ragchew speed). I have also settled on "semi break-in mode" using a 400-ms T/R delay. With this setting I can't hear between elements, but the slight delay eliminates a lot of relay chatter (the T/R relay is loud) and makes for a usable CW machine. The engineers at FlexRadio will likely continue to improve the radio's CW timing performance, as evidenced by the tremendous improvements made over the past 10 months.

❖ External Software Interfacing

Making the FLEX-1500 work with external rig-control, logging and digital-mode software is the most challenging part of integrating the '1500 into your station. The FLEX-1500 is a capable digi-mode transceiver that plays nicely with most external software. Because the radio is software-defined, however, making audio and CAT connections is quite a departure from what you're probably used to and requires additional software and some poking around "under the hood."

Remember: When the FLEX-1500 is powered up, *PowerSDR* is running on your shack PC. Because your logging or digi-mode software is also running on the same PC, there's no need to connect the usual audio, COM or USB cables to interface the ham radio software with your transceiver, because they're already running on the same PC! Defining these connections in a way that satisfies your external software is the tricky part.

Let's start with audio. Because *PowerSDR* already has access to the radio's RX and TX audio, you don't need to route those signals through an external interface to bridge the gap between radio and PC. You do need to route the audio from *PowerSDR* to your digi-mode software, however, which is most commonly done by using a utility program called *Virtual Audio Cable* (VAC). Just like it sounds, VAC creates a user-defined virtual connection between *PowerSDR* and your digi-mode software. Two virtual connections are defined, one for RX audio in, the other for TX audio out. If you want to pipeline the radio's RX audio to multiple programs at once, simply define additional virtual connections.

VAC, which is widely used in PC-based audio and video production, is an elegant solution, but it's not included with the FLEX-1500. To get a legitimate copy you need to purchase it from its author at **http://software.muzychenko.net/eng** ($30 at press time). Some *PowerSDR* users report success with *VACard*, a similar program available for free at **www.datanab.com/audio/VAcard.htm**.Sooner or later, VAC or something like it will likely be bundled with FLEX radios or built into *PowerSDR*.

Defining similar internal, virtual connections between logging and rig-control software and *PowerSDR* requires the use of a virtual serial port (VSP) utility. Ultimately, VSP software works a lot like VAC software, but configuring it is less intuitive and often more difficult. FLEX owners typically use vCOM (free, XP only), VSPmanager (free for licensed hams) or com0com (free). VSP software isn't supplied with the FLEX-1500, either, but I expect that it will one day be built into *PowerSDR*.

To interface with logging and rig-control software, *PowerSDR* uses the Kenwood TS-2000 CAT command set. Getting everything set up and working with virtual audio and COM pipelines can be a challenge. Once everything's installed, actually using all of the integrated software can also be challenging.

❖ Issues

In addition to the CW/keyer/USB timing issues mentioned previously, a few other issues popped up during testing. When my test radio transitions from TX to RX, there are noticeable audio "pops" or "clicks." This is most pronounced when pressing and releasing the TUNE button. At first I thought that optimizing the USB and audio buffer settings would cure this, but FLEX engineers told me that the issue is being researched and will hopefully be resolved in a future release of *PowerSDR*. The disturbance can be minimized by adjusting the AGC and AGC-threshold settings, but it's still a bit "clicky."

I experienced a few BSODs (blue screens of death) in Windows 7 testing and had to change some settings to prevent Windows 7 from "sleeping," a condition from which *PowerSDR*, for some reason or another, would never "wake up." After I disabled sleep I had no more BSODs.

❖ Impressions and Conclusion

At this point in the review it's important to point out that the FLEX-1500 is arguably the least expensive 160-6 meter transceiver on the market. Despite that, its receiver performance, as evidenced by extensive tests at Sherwood Engineering, holds its own when tested against the best ham rigs ever made, many of which cost thousands or even tens of thousands of dollars more. It's a QRP transceiver that offers rare (probably unique) built-in transverter connectivity (which, unfortunately, I was unable to test). Thanks to *PowerSDR*, the '1500 constantly evolves and improves. The little FLEX was designed to provide a low-cost introduction to the world of software-defined radios. It succeeds admirably.

Copying signals under any band condition is a snap. Thanks to the rig's adjustable AGC threshold, razor-sharp filters, point-and-click band scope tuning, superb close-in dynamic range, and effective DSP-based noise blankers and noise-reduction systems, I easily copied stations I would have struggled to copy with my other radios.

I know it's a ham rig, but the FLEX-1500 is a fantastic shortwave receiver. You can tune in AM stations with a single mouse click, then jump back and forth between AM, synch-AM, USB or LSB modes without hearing even a hint of frequency shift or heterodyne.

PowerSDR is so feature-rich that, even at the end of this two-part review, many of the radio's niftiest features haven't even been mentioned. One of the most useful is Multi-RX mode. The '1500 doesn't have a built-in secondary receiver like its FLEX-5000 sibling, but as long as both signals are inside the radio's 48-kHz "hardware digitizer window," you can simultaneously listen to VFO A in one ear and VFO B in the other! If you're operating split you can listen to your receive and transmit frequencies at the same time (stereo).

Depending on your preferences, for better or worse, the features and the killer RF performance come with the ergonomic realities of a PC-based radio. Until you try one for yourself, on your own hardware, you won't really be able to predict how you'll react to the SDR experience.

I'm absolutely thrilled with the '1500's receiver performance, feature set, and price tag. After using one for a few months, operating without a band scope just seems wrong! I still prefer traditional front-panel knobs and switches, but thanks to the FLEX-1500's raw performance, *PowerSDR* is growing on me.

If you're ready to experience the leading-edge technology called SDR, you won't have to go it alone. FlexRadio Systems provides top-notch technical support on the phone, through extensive training and resource materials on its web site, and through a helpful, well-attended online community.

All FLEX models are designed, manufactured, assembled, tested and calibrated in the company's Austin, Texas facility. The FLEX-1500 transceiver sells for $649 and is available from **www.flexradio.com** (13091 Pond Springs Rd. Suite 250, Austin, TX USA 78729; 512- 535-4713).

What's NEW

Tell them you saw it in Monitoring Times

Larry Van Horn, New Products Editor

Aircraft and Ship Tracking Go High Tech

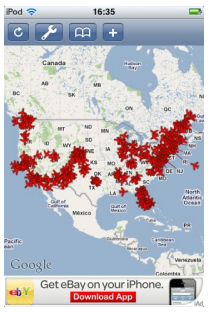
There are many radio hobbyists who love to track planes and ships, and thanks to the UK company Pinkfroot, you can now do that on your smartphone or via the web.

For tracking aircraft, Pinkfroot (**http://my.pinkfroot.com/**) has the Plane Finder app for your iPhone, iPad, iPod Touch, Android or Windows Mobile devices. Plane Finder provides the user with a near real time "virtual radar" air traffic radar maps. The app is easy to use and a great addition to your radio monitoring toolkit, or for anyone interested in aviation, planes, flights or air traffic control.

Features for the free version of Plane Finder (available at iTunes) include:

- Live moving planes.
- The program lets you share your sightings with friends and family via Facebook and Twitter.
- You can bookmark favorite locations you want to regularly monitor with the program (e.g., set a ground level view of major airports).
- Flight number or registration number for aircraft displayed on a screen.
  Pinkfroot also has a full paid version app that incorporates the free features above with the following features:
- Flight path contrails.
- Search by flight number or aircraft registration number.
- Detailed aircraft illustrations.
- Photographs of aircraft (if available).
- You can filter by airline and/or altitude.
- Flight information for each aircraft includes (if available) flight number, route, altitude, speed, plane type, airline, and aircraft registration number.
- Technical information for each aircraft (if available) includes squawk codes, International Civil Aviation Organization (ICAO) / International Air Transport Association (IATA) codes, Automatic Dependent Surveillance (ADS) Hexcode (ICAO24), and aircraft heading.

Plane Finder works by picking up Automatic Dependent Surveillance - Broadcast (ADS-B) data stream plane feeds used by all commercial planes and some military aircraft to transmit their name, position, destination and lots more (see this month's *Milcom* column). The servers at Pinkfroot collate data from multiple sources for delivery to their Plane Finder app, Plane Finder HD app and planefinder.net website (this website is a free service).



ADS-B is gradually replacing radar as the most efficient method for air traffic control. Ultimately, ADS-B will enable aircraft to fly closer together, resulting in more efficient use of airspace, especially around airports, and it will enable advanced transfer of information both to and from the cockpit.

While the ADS-B technology has been the norm in Europe for some time now, it is slowly being implemented in the United States. Over the next three years, however, expect to see a huge rise in the number of aircraft streaming these data transmissions in the U.S. In coming years, the Plane Finder app will prove even more useful to radio hobbyists.

Ship Finder

Shifting gears to the High Seas, Pinkfroot also has apps to track ships.

Ship Finder provides near real time "virtual radar" Automatic Identification System (AIS) maps that are fun and easy to use. You can get Ship Finder for your iPhone, iPad, iPod Touch, Android or Windows Mobile device and current pricing for these apps from the Pinkfroot website. This app should be of interest to anyone interested in shipping, cruising and sailing in ports and locations around the world.

There is a free Apple device app available from iTunes with the following features:

- Live moving ships are displayed.
- You can share your sightings with friends and family via Facebook and Twitter.
- You can bookmark your favorite locations to facilitate faster operation in areas you are interested in viewing.
  Pinkfroot also has a full paid version app that incorporates the free features above with the following features:
- Ship route trails to display a history of where the ship has been.
- Search by vessel name for display on screen.
- Photographs of ships (if available)
- Ship information available may include vessel name, port of registration, destination, and estimated time of arrival (ETA).
- Technical information that may be available includes a ship's Maritime Mobile Service Identity (MMSI), International Maritime Organization (IMO) identification, the ship's callsign, current ships heading, and ship length / width / draft in feet.

When looking at the symbology used on the Ship Finder screen, stationary vessels can be shown as either standard icons or balloon shapes. The programmers use the following color conventions to help indicate the type of vessel being displayed.

• Blue	Passenger
• Yellow	Cargo
• Black	Tanker
• Cyan	High Speed Craft
• Orange	Pleasure Craft
• Green	Dredger
• White	Unspecified/Reserved (Can also mean we are not receiving enough data)
• Purple	Pilot
• Red	Military Operation
• Dinghy	Search and Rescue (SAR) Craft
• Helicopter	Search and Rescue (SAR) Aircraft

Ship Finder works by picking up AIS feeds used by all passenger vessels, vessels more than 300 tons, and increasing numbers of smaller pleasure craft to transmit their name, position, destination and other data about the vessel. This technology is actually faster than radar and is used by vessels for navigation.

The Automatic Identification System (AIS) is an automated tracking system used on ships and by Vessel Traffic Services (VTS) for identifying and locating vessels by electronically exchanging data with other nearby ships and VTS stations. AIS information supplements marine radar, which continues to be the primary method of collision avoidance for water transport.

Information provided by AIS equipment, such as unique identification, position, course, and speed, can be displayed on a screen. This system is intended to assist a vessel's watch standing officers and allow maritime authorities to track and monitor vessel movements.

AIS integrates a standardized marine VHF transceiver with a positioning system such as an LORAN-C or GPS receiver, with other electronic navigation sensors, such as a gyrocompass or rate of turn indicator. Ships outside AIS radio range can be tracked with the Long Range Identification and Tracking (LRIT) system with less frequent transmission.

An AIS transponder normally works in an autonomous and continuous mode, regardless of whether it is operating in the open seas or coastal or inland areas. AIS transponders use two different frequencies, VHF maritime channels 87B (161.975 MHz) and 88B (162.025 MHz), and use 9.6 kbit/s Gaussian minimum shift keying (GMSK) modulation over 25 or 12.5 kHz channels using the High-level Data Link Control (HDLC) packet protocol.

Pinkfroot shares data to their apps from their own AIS receivers and from a global network of AIS receivers data picked up by both professional and amateur base stations. Their servers collate and process this data for use in their applications.

Both the Plane Finder and Ship Finder apps are relatively inexpensive to purchase. They sell for anywhere from $2.99 to $7.99, depending on the app and the platform for which it is being purchased. If you want to see what all the shouting is about and like "free," check out the following website **www.planefinder.net** and **http://shipfinder.co/.**

So next time you see that contrail overhead or a ship steaming into port, grab your scanner, and keep your Plane/Ship Finder apps handy.

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, *larryvanhorn@monitoringtimes.com*.

When ordering or inquiring about the products mentioned in this column, be sure to tell them that you saw it in the pages of *Monitoring Times* magazine.

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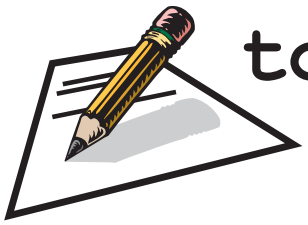

to the editors

editor@monitoringtimes.com

A Window to the World

I am a subscriber from Texas. I only listen to shortwave on small portables. Grundig G5, S350DL and Eton E10 are my best – each one better in different areas of my house for some reason. Radio Australia and sometimes Radio New Zealand are my best catches. RA is almost always clear as a bell from 0800 to 1100 hrs. Although I don't understand most of the technical stuff I thoroughly enjoy your magazine.

I made my living doing ranch work in southwest and Big Bend areas of Texas for 40 years and there literally were no radio stations except late at night, like KVOO-Tulsa and WBAP-Ft. Worth. I wish I'd had a shortwave radio back then.

I suffered a head injury in a horsewreck and am disabled now, so having your magazine helps me in my listening.

Robert Shuford

Free to Air

Just received my March issue of *MT*. After reading the *Beginners Corner* by Ken Reitz I just had to write in.

Over a year ago I was a beginner at Free to Air satellite reception. A good friend gave me an old Ku Band dish and FTA receiver. From there it was a learning process. First, you definitely need a 1 meter dish 39" and a linear LNBF. The circular ones that DISH Net and Direct TV use *will not work*. Also a good signal meter to connect to the LNBF helps you to find the satellites you want.

Galaxy 19, 97° West has the most FTA unencrypted channels. However, there are other FTA satellites up there. I use four FTA 1meter dishes, two DiSEqC switches and a 22kHz switch to connect 8 LNBFs to my receiver. That way I do not have to motorize any of my dishes.

Also you can place more than one LNBF on a single dish. I have up to three LNBFs on a single dish, as long as they're no more than 10 degrees apart from the center LNBF.

Www.LyngSat.com has an excellent FTA listing for both C and Ku Band FTA satellites.

I still like listening to the world wide broadcasts on shortwave; however, the shortwave stations are on the radio side of the FTA channels, too! And over 200 worldwide TV channels – It's great!

So, thanks to Ken Reitz for writing about the great hobby of FTA.

Craig Campbell

Congratulations on your great FTA dish farm and spirit of satellite experimenting, it's half the fun of the hobby! An even better source for FTA channel info is found at http://www.global-cm.net/mpeg2central.html. The site is run by Mike Kohl of Global Communications in Wisconsin. Mike is a longtime FTA equipment dealer with some excellent C and Ku-band analog and digital equipment at reasonable prices. His list of FTA signals, on both C and Ku-band satellites that cover CONUS as well as Pacific and Atlantic birds visible to US viewers, is the most accurate and up-to-date anywhere. Every couple of months I print out the latest list and go hunting for new channels. I'm always amazed at what I can see *and* hear!

Ken KS4ZR

Ken, I wanted to bring to your attention that MHz Networks is no longer FTA or on G19. They are only available via DirecTV now. In your article you mention they are on G19.

John, AA3XN

Yes, John, thanks for the heads-up. I noticed that myself; unfortunately it seems the change happened after I had written the column. At a time when Congress is considering slashing what's left of federal funding to public broadcasters, it's hard to blame MHz Networks for cashing in on access to DirecTV viewers and hence their donation dollars.

In my location, MHz is available via a 3rd auxiliary channel on our local PBS station, so it's actually easier for us to tune in (no FTA dish necessary). But, most others across the country won't have that option. MHz Networks does have an extensive list of affiliates (24 over-the-air broadcast stations and 24 cable-TV systems) which may be found here: **www.mhznetworks.org/mhzworldview/carriage/**.

Ken KS4ZR

Ken, I enjoyed your TVRO/FTA piece in the March issue. Brought back a lot of fun memories. I built my first big-dish system in 1988, and after I moved to MN in 1994 I had a BUD, a 4-foot prime-focus dish for Ku-band, and a Hughes satellite internet dish (plus the usual ham antennas, etc). My house looked like a Russian embassy...

Now condo-bound, I still have two 4DTV receivers, a Uniden TVRO RX or two, two giant 36-inch dish movers (saved for elevation actuators for phased arrays, etc :), a bunch of feed horns and LNBs, etc, plus a new FTA receiver and a DiSEqC switch that I haven't yet messed with (I'm thinking Ku, though, after reading your article...)

I also have two SCPC (single-channel-per-carrier) audio tuners given to me by Bob Heil, who used to market them on the side from his Heil Sound Ltd business!

I miss watching my favorite TV shows a week early!

Kirk

Additions and Corrections

Thanks very much for including KSM among the stations that are still transmitting SITOR-B [*March issue, Digital Digest and Below 500 kHz columns-ed.*]. We have recently received authorization for an additional FSK frequency, 6328.0kc. The crack MRHS Transmitter Department is hard at work restoring a transmitter for operation on that frequency. It will be a Henry HF-5000D like the others, running about 5000W TPO into a double extended Zepp antenna. Our 6Mc CW frequency does so well both day and night that we thought adding 6Mc to our FSK channels would give more people a chance to copy us. Of course in addition to SITOR-B we also use Baudot on the same frequencies.

Just one correction: the transmitter site is actually located in Bolinas, CA rather than Salinas! The site is just down the road from the NMC (CAMSPAC) transmitter site. We consider the Coast Guard guys to be the new kids on the block. They got there in 1972 while our site was established in 1913 by the American Marconi Company!

Richard Dillman, Chief Operator, Coast Station KSM
Maritime Radio Historical Society

I just wanted to offer a small correction to the story on Air Show Photography Tips by Kevin Burke in the March issue. When talking about memory cards, he states that any camera must complete the write to the memory card before the next picture can commence. Actually, digital SLR cameras like the Canon that Kevin bought have a "burst" feature: the number of photos that can be instantly stored internal to the camera before ANYTHING is written to the data card.

I have an older Canon SLR, and it can take 9 photos at its very fast continuous shooting burst rate before you experience the writing delay. This specification is important to those shooting action such as air shows, and is often talked about in ratings for cameras in photo magazines. This softens a bit the criticality of have to spend more money to obtain the fastest memory card.

Judy May, W1ORO

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

Happy monitoring!
Rachel Baughn, Editor

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Columnist Blogs and Web Sites

These blogs and web pages were created by some of our columnists to better serve their readers. While we highly recommend these resources, they are not official instruments of Monitoring Times.

AMERICAN BANDSCAN
http://americanbandscan.blogspot.com/ - by Doug Smith

ANTENNA TOPICS
www.wa5vjb.com - by Kent Britain

BELOW 500KHZ
http://below500khz.blogspot.com/ - by Kevin Carey

FED FILES
http://mt-fedfiles.blogspot.com/ - by Chris Parris

LARRY'S MONITORING POST
http://monitor-post.blogspot.com/ - by Larry Van Horn

MILCOM
http://mt-milcom.blogspot.com/ - by Larry Van Horn

SCANNING REPORT
http://www.signalharbor.com/ - by Dan Veeneman

SHORTWAVE
http://mt-shortwave.blogspot.com/- by Gayle Van Horn

UTILITY WORLD
http://mt-utility.blogspot.com/- by Hugh Stegman
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